NOVA SCOTIA invasive SPECIES COUNCIL

—SECOND EDITION—

INVASIVE SPECIES

IN NOVA SCOTIA

Mersey Tobeatic Research Institute

IDENTIFICATION AND INFORMATION GUIDE

Invasive Species of Nova Scotia: Identification and Information Guide

This guide is the second edition of the *Invasive Alien Species in Nova Scotia - Identification and Information Guide* that was produced by the Mersey Tobeatic Research Institute in 2012. This iteration was led by the Nova Scotia Invasive Species Council.

Invasive Species of Nova Scotia: Indentifiation and Information Guide can be downloaded from **nsinvasives.ca**

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This guide is a companion to the following MTRI guides (available at https://www.merseytobeatic.ca/content/guides):

- Species at Risk in Nova Scotia: Identification and Information Guide
- Healthy Lakes and Wetlands for Tomorrow: A Landowner Stewardship Guide for Species At Risk in Nova Scotia
- Atlantic Coastal Plain Flora in Nova Scotia: Identification and Information Guide
- Common Ferns of Southwest Nova Scotia: Identification and Information
- Guide to FSC Certification for Woodlot Owners in Canada

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Photo: Linda Wilson, University of Idaho, Bugwood.org
Photo: John Tucci

INVASIVE SPECIES

WHAT IS AN INVASIVE SPECIES?

Invasive species are plants, animals and micro-organisms that have been introduced into areas beyond their native range and negatively impact the environment, the economy, or society.

WHAT IMPACTS DO INVASIVE SPECIES HAVE?

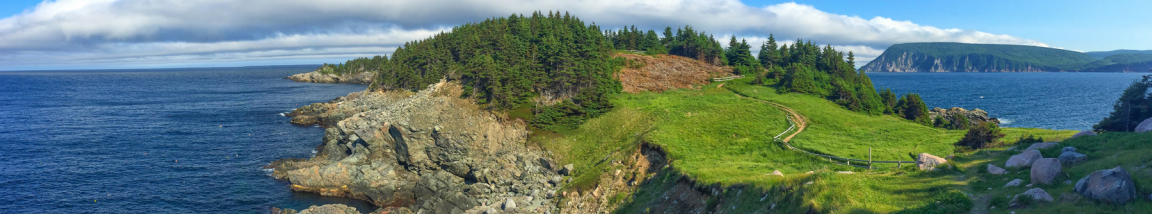
It is widely accepted that invasive species are an immense threat to biodiversity worldwide. In Canada alone, more than 20% of our species at risk are threatened with extinction by invasive species. Invasive species cause harm in several ways. For example, they may eat native species, take their food and space, contribute to soil degradation and erosion, introduce new diseases, and degrade water quality and habitat. The destruction caused by invasive species also has adverse effects on human life. Invasive species can damage buildings and roads. From an economic viewpoint, invasive species greatly impact productivity and profit in forestry, agricultural, and fishing industries – as well as reducing recreational opportunities.

HOW DID INVASIVE SPECIES GET HERE, AND HOW DO THEY SPREAD?

Humans are largely responsible for the movement of invasive species from one area to another. Many human-assisted pathways have permitted the introduction of invasive species in Nova Scotia. Examples of these pathways include – but are certainly not limited to – horticultural trade, aquarium trade, the movement of shipping containers, ballast water tanks in cargo ships, recreational boating, and the release of species for hunting or angling purposes. Once established, invasive species can spread naturally, or be moved further by human activities such as outdoor recreation, release of pets into the environment, or movement of firewood.

Live more sustainably

Everyday activities often contribute to the spread of invasive species. For example, buying products from overseas requires transportation via container ships; those ships may inadvertently transport invasive species to Nova Scotia. Buying local products and reducing your overall ecological footprint not only helps to reduce habitat destruction, climate change, pollution, and overexploitation of natural resources – it is also fundamental for the prevention of invasive species introductions across the globe.



WHAT CAN I DO ABOUT INVASIVE SPECIES?

Learn to identify and report invasive species

Knowledge is power. The ability to recognize invasive species gives you the power to detect, report, and respond to invasions before it is too late. Some of the most threatening invasive species can be completely eradicated from a habitat if detected and reported early – but this is only possible if keen, knowledgeable stewards are monitoring the province's vast landscape and oceans. Use this guidebook, the extensive resources on the internet, and the experience of local experts to spread the word about invasive species in your community. You can report any observations to our **iNaturalist project** (inaturalist.ca/projects/invasive-species-in-nova-scotia) or directly to the **Nova Scotia Invasive Species Council** (nsinvasives.ca/report-an-invasive-species).

Ask questions and demand change

From stewardship to science to politics, questions can be drivers of positive change. Consider the invasion of Purple Loosestrife in Nova Scotia in the 1990s: once it was recognized as a potential threat, people started spreading the word – identifying it in many new areas, and asking how we could stop or slow down this invasion.

As a result, researchers developed biocontrol methods that slowed down the spread significantly. Today, most garden centers do not sell this species. To provoke similar positive change, consider asking these questions:

At the garden center: *Will this garden plant be invasive?*

At a local fishing hole: *Could fish eggs or plant parts be present on my boat or fishing gear?*

While hiking or enjoying the outdoors: *Could there be seeds, plant matter, or spores on my boots or recreational equipment?*

While camping, or moving firewood long distances: *Could I be transporting a deadly insect or fungi?*

While rearing non-native species: *Do I have safe plans to rehome non-native plants or pets when I can no longer care for them?*

While on a private woodlot: *Can I recognize non-native species when they appear? Do I know what to look for as a sign of new invaders such as Hemlock Woolly Adelgid, Beech Bark Disease, or Emerald Ash Borer?*

STEWARDSHIP ACTIONS

HUNTERS AND OUTDOOR ENTHUSIASTS

Do you enjoy spending time outdoors? Whether you are hunting in the woods, hiking a coastal trail, or camping in a provincial park, you can play an important role in preventing the spread of invasive plants, animals and insects. Here are some simple ways you can do your part:

PLAY, CLEAN, GO

Terrestrial invasive species are easily spread from one location to another when they become stuck to shoes, tires, pets, and more. Plants, seeds, and insects can easily be transported to new locations if they are not removed before leaving the region in which they were picked up.

Remove any insects, mud, or plants from your gear, boots, and pets after spending time outdoors. Check ATV and bike tires, and remove any plants that may be caught in your equipment before moving to a new trail. Clean your gear and boots before entering and leaving a recreation site. Stay on designated trails and roads and learn how to identify invasive species.

BUY LOCAL BURN LOCAL

Several new forest pests have found their way to Nova Scotia in recent years, and they pose a significant threat to the environment and economy. Forests provide many ecosystem benefits in Nova Scotia, supporting biodiversity, rare species and clean air and water. Forests also support a range of recreational and economic activities. Invasive forest pests are destructive, and can threaten the survival of entire forest stands. They are able to spread by hitchhiking on firewood that is transported from one part of the province to another. This means that people who take firewood with them to parks and campsites may be inadvertently transporting pests that are living on or in the firewood. Be sure to leave firewood at your park or campsite, too – do not bring it back home with you. If you bring firewood home with you, the chance of introducing an invasive forest pest to your community increases.

In order to control and stop the spread of invasive species, there are federal regulations in place that ban the movement of firewood out of areas where there are known forest pests.

The best approach to protecting our forests is to leave firewood in the same area that you found it. If you are going camping or to your cottage for example, you can *buy local*, and *burn local* to prevent the spread of invasive forest pests. If you see any forest pests on your firewood or in trees, report your observations to the **Nova Scotia Invasive Species Council**, or to the **Canadian Food Inspection Agency** by calling **902-536-1010**.

Help keep our forests healthy – do not move firewood.

Photo: Jon Sweeney, Natural Resources Canada, Bugwood.org

STEWARDSHIP ACTIONS

ANGLERS AND RECREATIONAL BOATERS

Are you someone who enjoys being on or near the water in your free time? Whether you prefer fishing or boating, you can play an important role in preventing the spread of aquatic invasive species. It is important that you keep the following points in mind when you are visiting any body of water:

CLEAN DRAIN DRY
Prevent the Spread of Aquatic Invasive Species

always *clean, drain, and dry* your vessel after you leave the water, and never release or introduce aquatic species to new water bodies!

CLEAN DRAIN DRY

Aquatic invasive species are non-native species that spread rapidly and cause harmful ecological or economic impacts. One way that aquatic invasive species are transferred between bodies of water is by attaching themselves to watercraft and fishing gear. Once attached, they can be transported between bodies of water, and spread into native ecosystems, causing environmental and economic damage.

When leaving a body of water, remember these three simple steps:

(1) Clean all visible debris and plants off your boat and gear

(2) Drain all water from your boat

(3) Dry your boat and gear before leaving the area. If it is not possible to dry your gear before leaving, be sure to let it dry before entering another body of water.

DON'T LET IT LOOSE

Non-native plants and animals such as pets, live bait, and aquarium plants are easily spread when they are accidentally or intentionally released into the wild. Many species do not have the necessary skills to survive in these circumstances. However, if the species do survive, they can become invasive, outcompeting native species for valuable resources such as food and space.

NEVER release or introduce live bait or aquatic species into new bodies of water. If you choose to release your catch after angling, ensure that you are doing so within the same body of water from which it came!

DON'T LET IT LOOSE

STEWARDSHIP ACTIONS

GARDENERS AND PET OWNERS

GARDENERS

Escaped horticultural plants – including landscaping, garden, pond, and aquarium plants – can have serious impacts on biological diversity in wild habitats, and can also be troublesome in public spaces and cultivated fields.

Do your part by only purchasing native plants for your gardens and ponds, learning how to identify invasive plants, and disposing of plant material properly! Consult your local plant nursery to learn more about which species are native to Nova Scotia before adding new plants to your garden or yard.

PET AND AQUARIUM OWNERS

Non-native plants and animals are easily spread when they are accidentally or intentionally released into the wild. Many species that are released into the wild do not have the necessary skills or resources to survive there. However, if these species do survive, they can invade habitats, outcompeting native species for valuable resources such as food and space.

You can help by properly disposing of unwanted aquarium plants, and rehoming pets rather than releasing them in the wild. Never release or introduce pets or aquarium species into the wild. Ensure you have a plan in place to properly dispose of unwanted plants or rehome pets by following the steps below:

(1) **Return**: Contact the place where you purchased the pet and see if they will take it back.

(2) **Rehome**: Contact local science centres, zoos or aquariums to see if they can use the animal for educational purposes.

(3) **Dispose**: Dry and freeze unwanted aquatic plants and dispose of in the garbage. For those who use baitfish, it is illegal to empty your bait bucket, drain the water or release live bait into a lake, river or other waters. Instead, you must: drain your bucket onshore (30 metres from the water) freeze the excess minnows for another day.

(4) **Be Kind**: If all else fails, have a qualified veterinarian euthanize the animal in a humane manner; it's far kinder than letting it starve to death in the wild or destroy the homes of native animals and plants.

DON'T LET IT LOOSE

STEWARDSHIP ACTIONS

CITIZEN SCIENCE

Citizen science is a term used to describe public participation and collaboration in scientific research. Many different people make up the citizen science community: children, students, birdwatchers, amateur astronomers, gardeners, and naturalists – all of whom share an interest in science or nature. Citizen science can inform research and increase scientific knowledge in many important ways! For example, simply reporting species observations, discovering new species in a given habitat, or volunteering with scientists to collect data and interpret results all help to provide data and guide research.

Citizen scientists play a key role in identifying invasive species throughout Nova Scotia, and their input is extremely valuable to organizations such as the Nova Scotia Invasive Species Council. For example, when citizen scientists report their invasive species observations in our iNaturalist project, it allows the NSISC staff to see where these species populations are established, if any species have spread to new regions, and if a new invasive species has been introduced in Nova Scotia.

You can become a citizen scientist for NSISC by joining our iNaturalist project titled "Invasive Species in Nova Scotia," and reporting your invasive species observations. Join today and start making a difference in your community!

inaturalist.ca/projects/invasive-species-in-nova-scotia

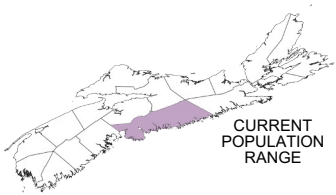
iNaturalist

Other names: Carolina Watershield, Fanwort

Carolina Fanwort

Cabomba caroliniana

TYPE: Vascular Plant



KEY IDENTIFICATION FEATURES: Aquatic plant with fan-like, finely divided underwater leaves and small, white-to-pale yellow flowers. Forms large monocultures.

DESCRIPTION: Carolina Fanwort is a bottom-rooted, submersed aquatic plant. Its stems are typically 1–2 m long, but can grow up to 10 m. Underwater leaves are opposite, fan-like, and finely divided, while floating leaves are small, oblong, and up to 3 cm long. Carolina Fanwort blooms late-spring to early-fall with small flowers (0.6–1.6 cm wide) that rise above the water surface. Its flowers are white to pale yellow, and sometimes have a purple or pink tinge.

HABITAT & IMPACT: Carolina Fanwort grows in calm, slow-moving freshwater lakes and streams to a depth of 3 m, and particularly thrives in acidic conditions. It grows quickly, and forms dense underwater mats that shade out native plants and reduce biodiversity. It can create stagnant areas with lower levels of oxygen, which negatively affect fish habitat, and become breeding grounds for mosquitoes. Its dense growth can also clog drainage systems, and cause recreational activities like swimming, canoeing, and fishing to become difficult or impossible.

PATHWAY: Carolina Fanwort is a popular aquarium plant, and is most likely to be introduced to new areas via improper disposal. Once introduced, it can spread naturally along connected waterways, by animals, or by human activities (e.g., boats, fishing). In Nova Scotia it is only known from one location, in Frog Pond (Halifax County).

INTERESTING FACT: This species can spread by both seed and stem fragments. New plants can be established from broken fragments as small as 2.5 cm, which may remain viable for up to six weeks before rooting. Boat propellers can easily break up plants, and moving just a small piece of stem can be enough to spread this invasive species to a new water body or river system.

Flowers

Finely divided, fan-like leaves

Invasion of Frog Pond, Nova Scotia

Stewardship Actions

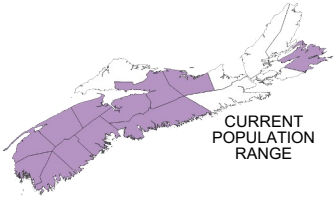
Purchase native plants for aquariums and water gardens. Properly dispose of unwanted plants, or rehome instead of releasing them into natural habitats. Follow the *Clean, Drain, Dry* initiative when moving boats or recreational gear from one water body to another. When boating near a known patch of this invasive plant, slow down to reduce the likelihood of creating additional fragments. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

Other Names: Pickerel, Water Wolf, Pike

Chain Pickerel

Esox niger

TYPE: Freshwater Fish

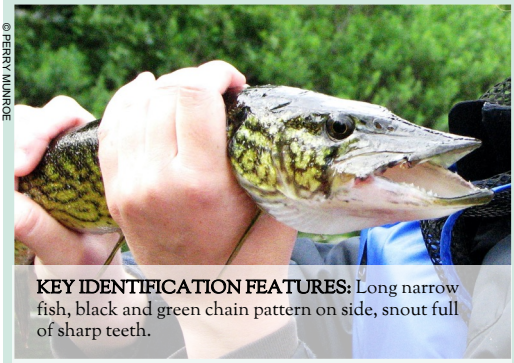


DESCRIPTION: Chain Pickerel is a freshwater fish with a long, narrow, torpedo-shaped body that is green with a darker back and white belly. Adults have a chain-like pattern on their sides; juveniles lack pattern. They have a long snout, akin to a duckbill, filled with many large, sharp teeth. Their caudal (tail) fin is deeply forked. Average length is 38–51 cm.

HABITAT & IMPACT: Chain Pickerel inhabit shallow, vegetated ponds, lakes, and sluggish streams. They are a freshwater species but have been known to wander into brackish waters and survive for some time. They are voracious predators and are known to consume fish, insects, aquatic invertebrates, rodents, and even snakes. Within just a few years, they can decimate native Speckled Trout populations. Chain Pickerel not only transform aquatic ecosystems, but also negatively impact traditional sport fishing opportunities.

PATHWAY: Chain Pickerel were illegally introduced in southwestern Nova Scotia during the 1940s. Illegal introduction, in combination with natural migration, has expanded their distribution.

INTERESTING FACT: Chain Pickerel have many rows of finely serrated, inward-facing teeth. They use them to capture and hold prey, turning them in and swallowing them head first!



© PERRY MUNROE

KEY IDENTIFICATION FEATURES: Long narrow fish, black and green chain pattern on side, snout full of sharp teeth.

A mouth full of sharp teeth

© KEN HAMMOND, US DEPT. OF AGRICULTURE © PERRY MUNROE

Torpedo-shaped body

Pattern of light and dark green chains on side

Native Alternative

Native fish species such as Speckled Trout and White Perch are exciting and tasty sport fish. The presence of Chain Pickerel often eliminates populations of these preferred native sport fish.

© PETER POOLE

Trout fishing in Nova Scotia

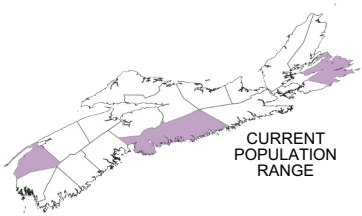
Stewardship Actions

If you are in a lake or river that is known to have Chain Pickerel, keep your fishing gear, boating gear, livewell, and buckets clean to ensure that you are not accidentally transporting fish or fish eggs into another watershed. It is illegal to use or possess Chain Pickerel for bait in Nova Scotia. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

Red-eared Slider

TYPE: Reptile

Trachemys scripta elegans



DESCRIPTION: The Red-eared Slider is a semi-aquatic turtle with a brown to olive green shell, green-black stripes along its body and distinct red patches behind its eyes. Its shell has a slight keel running down the center. Sliders are sexually dimorphic; females grow larger (up to 24 cm in length) than males (up to 11 cm in length). In their native habitat, sliders can lay 4–23 eggs at a time, and have multiple clutches per year. Sliders can live for up to 40 years.

HABITAT & IMPACT: Red-eared Sliders inhabit freshwater ponds and slow-moving rivers with soft substrate, aquatic plants, and basking sites. They are omnivores that feed on aquatic plants, insects, crayfish, snails, tadpoles, fish, and small frogs. They hibernate in hollow logs, or partially buried in mud at the bottom of ponds. Red-eared Sliders compete with native turtle species for basking spots, nesting spots, food, and other resources. They may also carry respiratory diseases harmful to native turtles.

PATHWAY: Red-eared Sliders are a popular pet species and are often released into the wild once they become too big and difficult to care for.

INTERESTING FACT: When hibernating, turtles' main source of oxygen is through cloacal respiration – using their cloaca at the base of their tail for oxygen/carbon dioxide exchange.

Stewardship Actions

Red-eared sliders have been reported in Nova Scotia waters although it is uncertain whether they are breeding in the wild. More surveillance and early detection is needed to understand their distribution and status. If you keep turtles as pets, ensure you have a long-term plan to care for them as they grow and never release them into the wild. If you spot this invasive species, upload your observation to iNaturalist and report it directly to the NSISC.

© PEYWAY, iNat

KEY IDENTIFICATION FEATURES: Medium-sized freshwater turtle with red patch behind eyes.

© DVOLLMAR, iNat

Basking Red-eared Sliders

Similar Native Species

Native Eastern Painted Turtles (*Chrysemys picta picta*) may appear similar but do not have the red "ear" mark behind their eyes. They are threatened by the introduction of Red-eared Sliders, which occupy similar habitat, and compete for resources.

© IANWHYTE, iNat

Basking Painted Turtle

Other invasive Sliders

Yellow-bellied Sliders (*Trachemys scripta scripta*) are also popular pets. Like Red-eared Sliders, they have brown to olive green shells with a slight keel running down the center, and green-black stripes along their bodies. They are distinguished by a yellow patch behind their eyes instead of red. Average size is between 12–20 cm. They like warm, shallow, stagnant ponds and also compete with native species for resources.

© DINGOKING, iNat

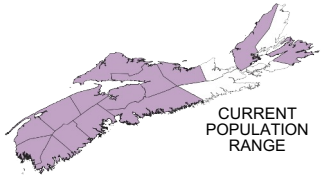
Yellow-bellied slider

Other Names: Smallie, Brown Bass, Black Bass

Smallmouth Bass

Micropterus dolomieu

TYPE: Freshwater Fish



DESCRIPTION: Smallmouth Bass is a freshwater fish with a robust, brown to green body and a white belly. Adults have dark, blotchy vertical bars on their sides, and several dark horizontal bars on their head. Their dorsal (back) fin is spiny. Average length is 23–38 cm.

HABITAT & IMPACT: Smallmouth Bass inhabit lakes, streams and rivers with rocky bottoms and plenty of shade. They are efficient predators of many smaller fish, mammals, and amphibians – not only eating native species, but also consuming much of the food that some native fish require for survival. The spread of both Smallmouth Bass and Chain Pickerel threatens native fish communities in more than half of the primary watersheds in Nova Scotia.

PATHWAY: Smallmouth Bass were first released into Bunkers Lake, Yarmouth County in 1942 for sportfishing. In total, 13 introductions were authorized by the government, with the last occurring in 1984.

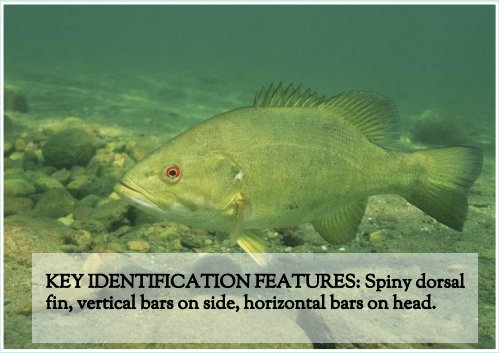
INTERESTING FACT: Smallmouth Bass are inactive and do not eat during the winter. They also grow very slowly in Nova Scotia due to low-productivity waters; a fish of 50 cm may be upwards of ten years old.

Native Alternative
The native White Perch is similar in appearance, and is known for its thrilling fight and delicious flavour.

© JASON LEBLANC

White Perch: a fun-to-catch native fish species

Stewardship Actions
If you are in a lake or river that is known to have Smallmouth Bass, keep your fishing gear, boating gear, livewell, and buckets clean so that you are not accidentally transporting fish or fish eggs into another watershed. It is illegal to use or possess Smallmouth Bass as bait in Nova Scotia. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.



© ERIC ENGBRETSON, US FISH AND WILDLIFE SERVICE, BUGWOOD.ORG

KEY IDENTIFICATION FEATURES: Spiny dorsal fin, vertical bars on side, horizontal bars on head.

Robust body and spiny back fin

© BRIAN GRATWICKE

Distinct horizontal bars on head

© ALAIN BELLIVEAU

Typical habitat where Smallmouth Bass thrives

© JOHN KINLEY

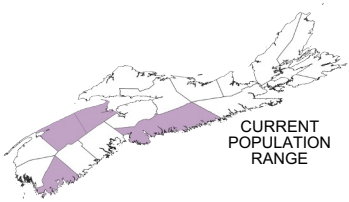
A Smallmouth Bass swimming near the bottom of a stream

Other names: Fringed Water Lily, Water Fringe

Yellow Floating Heart

Nymphoides peltata

TYPE: Vascular Plant



DESCRIPTION: Yellow Floating Heart is a bottom-rooted, floating-leaved aquatic plant. It has long, creeping stems that produce erect leaf-bearing stems 2–3 mm thick. Leaves are round, heart or kidney-shaped, 3–15 cm in diameter with slightly wavy edges, and often tinged purple-brown beneath. Plants produce several flowers on individual stalks from a common point on the stem. Flowers are yellow, 3–4 cm in diameter, star-shaped with five fringed petals, and bloom from June to August.

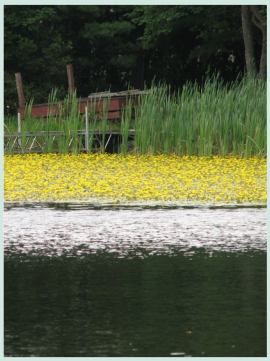
HABITAT & IMPACT: Yellow Floating Heart grows in slow-moving waters of ponds, lakes, rivers, streams, and wetlands, from water's edge to a depth of 4 m. It can form dense mats of floating vegetation that exclude native species. It can also create stagnant areas with lower levels of oxygen which negatively affect native fish habitat. Its dense growth threatens the quality of native freshwater habitat, and can cause recreational activities (like swimming and canoeing) to become difficult or impossible.

PATHWAY: Yellow Floating Heart was first marketed as an ornamental plant in 1891 in the United States, and subsequently spread as a horticultural species. It was only recently introduced to Nova Scotia, where it was first reported as escaped from a water garden at Little Albro Lake (Halifax County) in 2006.

INTERESTING FACT: This species, which reproduces abundantly by seed and through its root system, may also spread over long distances via broken root and stem fragments. Even moving just a small piece of stem can be enough to spread this invasive species to a new water body or river system.


© MARTIN THOMAS

KEY IDENTIFICATION FEATURES: Aquatic plant with rounded floating leaves and yellow flowers with five fringed petals.


© CATHY CONRAD

Invasion in Dartmouth


© MARTIN THOMAS

Round and heart-shaped

Native Alternative
Floating Heart (*Nymphoides cordata*), Yellow Pond Lily (*Nuphar variegata*), and Fragrant Water Lily (*Nymphaea odorata*) are all attractive native aquatic plants.


© ALAIN BELIVEAU

Fragrant Water Lily

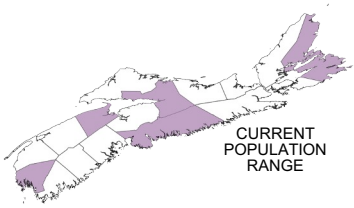
Stewardship Actions
Promote the use of native ornamental aquatic plants and avoid planting invasive species. Always clean your recreational gear properly after visiting a waterway. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

Other name: Yellow Flag Iris

Yellow Iris

TYPE: Vascular Plant

Iris pseudacorus



DESCRIPTION: Yellow Iris is a perennial wetland plant with stems up to 1 m tall and flat, sword-shaped leaves up to 90 cm long and 3 cm wide. Flowers are bright yellow with three drooping petals and sometimes have brown spots or purple veins. Flowers are formed at the top of stems and bloom from April through July.

HABITAT & IMPACT: Yellow Iris grows along shorelines and in ditches, wetlands, and shallow ponds. It reproduces through propagation of broken pieces of rhizomes, horizontal root dispersal, and seed dispersal. Its underwater horizontal root system forms thick mats which reduce water flow, crowd out native species, and dry out wetlands. Plants are poisonous when consumed by both humans and animals. Seeds float on the water in spring and fall, and can be carried long distances with the current.

PATHWAY: Yellow Iris was introduced to North America as an ornamental plant for ponds and water gardens, and is still commonly planted in many areas.

INTERESTING FACT: The first-recorded sighting of Yellow Iris in the wild in Canada occured in Newfoundland.

Stewardship Actions:
Promote the use of native ornamental aquatic plants and avoid planting invasive species. If removing Yellow Iris from your property be sure not to burn or compost the plant, but instead double bag it and leave it in the sun to rot, then discard. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.


© GREGB, iNat

KEY IDENTIFICATION FEATURES:
Yellow iris is the only Iris in North America with entirely yellow flowers.


©VANILENDIL, iNat

Flower

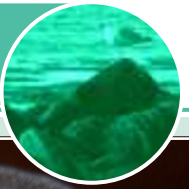

©WJCD, iNat

Seed pod

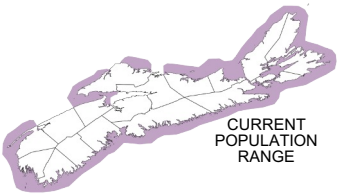
Other Names: Lacy Crust Bryozoan, Kelp Lace Bryozoan

Coffin Box Bryozoan

Membranipora membranacea



TYPE: Marine Animal



DESCRIPTION: The Coffin Box Bryozoan is a marine organism that consists of tiny (< 1 mm in length) individual filter-feeding invertebrate animals. They are 'coffin' shaped, and live in encrusting circular colonies of hundreds to thousands. These colonies can reach 10 cm or more in width.

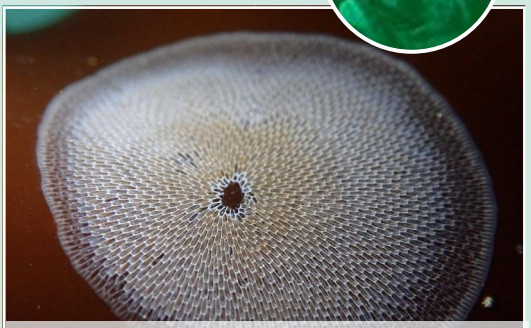
HABITAT & IMPACT: Coffin Box Bryozoan usually grows in shallow subtidal water with strong currents, to depths of up to 10 m. Colonies grow on the surface of kelp and seaweeds, rocks, boat hulls, and other underwater surfaces. They are especially detrimental to kelp forests, which are otherwise known to be highly productive marine habitats. Coffin Box Bryozoan can starve kelp by absorbing nutrients, blocking light needed for photosynthesis, and reducing the kelp's ability to release reproductive spores.

PATHWAY: Coffin Box Bryozoan first appeared in Nova Scotia in the early 1990s. It spreads mostly in the larval phase, when it can be easily picked up in ballast water. It has also been known to raft to new locations on dislodged kelp and drift plastic.

INTERESTING FACT: Coffin Box Bryozoan causes kelp to become brittle, which leads to defoliation in extremely wavy conditions.

Stewardship Actions

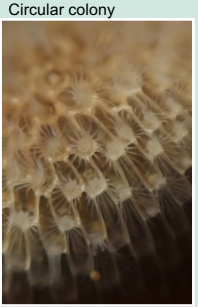
To reduce the spread of Coffin Box Bryozoan, regularly clean and disinfect boats and boating gear. Avoid transporting water between locations. If you spot this invasive species, report its location to iNaturalist or directly to the NSISC.



© CHILIPOSSUM, iNat

KEY IDENTIFICATION FEATURES: Rounded colonies made of tiny 'coffin' shaped individuals.

Circular colony



© CHILIPOSSUM, iNat

© CHILIPOSSUM, iNat

Close up of individual Bryozoans Close up of filter feeding apparatus

©ANDREACALA, iNat

Kelp encrusted by Coffin Box Bryozoan

© CASA_DE_CHAOS, iNat

Kelp encrusted by Coffin Box Bryozoan

© MERAV, iNat

Dried Coffin Box Bryozoan found on beaches

Other name: Sea Squirt

Colonial Tunicates

Didemnum, Diplosoma, Botryllus, Botrylloides spp.

TYPE: Marine Animal

DESCRIPTION: Colonial Tunicates are small marine filter-feeding animals, sometimes referred to as sea squirts. They live attached to underwater objects. Their name is inspired by the thick, protective skin that coats their sac-like bodies, resembling a tunic. Colonies are made up of many individual organisms (zooids).

HABITAT & IMPACT: Colonial Tunicates usually grow in sheltered, low-current areas, attached to rocks, seaweeds, Eelgrass, and other native species, or on man-made structures such as ropes, docks, boat hulls and shellfish culture gear. They alter natural marine ecosystems by outcompeting native species for food and space. They also threaten coastal and offshore fishing and aquaculture activities by fouling aquaculture species and gear.

INTERESTING FACT: Tunicates are said to eat their own brains during metamorphosis. Tunicate fossils date back as far as 540 million years ago – a time when plants were not yet found on land.

© SANDWICH, iNat

Violet Tunicate
Botrylloides violaceus

Description: Native to the Northwest Pacific Ocean. Forms dense mats of many small individuals that are arranged in curving tracks. Colour varies from whitish, yellow, orange, reddish-brown, to violet.

Pathway: Present in Nova Scotia since the 1990s, pathway not definitively known.

© HAWNZD, iNat

Golden Star Tunicate
Botryllus schlosseri

Description: Native to the Mediterranean Sea. Forms dense mats of star- or flower-shaped colonies made up of many small, daisy petal-shaped individuals. Colour varies from orange, yellow, red, greenish grey, violet, dark grey to black.

Pathway: Present in Nova Scotia since the 1980s, pathway not definitively known.

© JEFFGODDARD, iNat

Compound Sea Squirt
Diplosoma listerianum

Description: Native to Northern Europe. Forms dense, gelatinous, fragile colonies that are difficult to remove without tearing. Darkish grey in color, though they remain translucent. Openings sometimes have white spots.

Pathway: Has spread up the eastern coast of the United States, most likely from hull fouling.

© AL KORDESCH, iNat

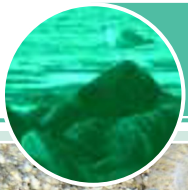
Pancake Batter Tunicate
Didemnum vexillum

Description: Native to the Pacific Ocean. Colonies are dense and resemble pancake batter. Dark lines may run randomly through them, and white spots may appear due to calcareous spicules embedded within.

Pathway: Not yet in eastern Canada, but present on the east coast of the United States.

Stewardship Actions

If boating or fishing in Tunicate-infested waters, keep your boat hull and gear clean to avoid accidentally transporting tunicates to new locations. Avoid transporting infested shellfish or water that may contain tiny bits of Tunicate to avoid accidental introductions into unaffected or less-affected areas. If you spot any of these invasive Tunicate species, report the location to iNaturalist, or directly to the NSISC.



Green Crab

Carcinus maenas

Other Name: European Green Crab

TYPE: Crustacean

© BENOIT_SEGERER, iNat

KEY IDENTIFICATION FEATURES: Five spines on either side of eyes; three bumps between eyes; back legs pointed; slightly flat and hairy.

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Other invasive crabs:

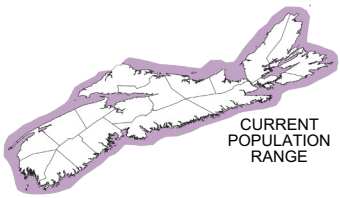
Asian Shore Crab

Hemigrapsus sanguineus

© JACK80156, iNat

The Asian Shore Crab is a small, intertidal shore crab with a carapace up to 44 mm wide, spotted, reddish-brown, greenish, or dark purple.

They have three spines on either side of their shell and light and dark banding patterns on their legs. They live in low-energy, intertidal, boulder/cobble beaches and are generalist omnivores, known to eat mollusks, small crustaceans, polychaetes, and algae.



DESCRIPTION: The European Green Crab is a shore crab with a carapace up to 10 cm wide (usually less than 8 cm) and varied in colour from mottled, green, red, yellow or brown. Adults have five obvious spines on either side of their eyes, and three bumps between their eyes. Their back legs are pointed, slightly flattened, and hairy.

HABITAT & IMPACT: Green Crabs are common in shallow water of salt marshes, beaches and rocky coasts, or in vegetation. They can tolerate a wide range of salinities. They are voracious consumers of plants and animals, especially soft-shell clams, oysters, quahogs, and mussels. They uproot and destroy beds of Eelgrass – an important habitat-forming species for native fish, invertebrates, and waterfowl. Predation and habitat destruction by Green Crabs negatively impacts biodiversity, and harms local shellfish fisheries.

PATHWAY: Green Crab appeared in the Bay of Fundy in the 1950s, probably moving up along the infested coast of the northeastern United States. However, its pathway is not definitively known.

INTERESTING FACT: Green Crab is often referred to as the cockroach of the sea.

Stewardship Actions

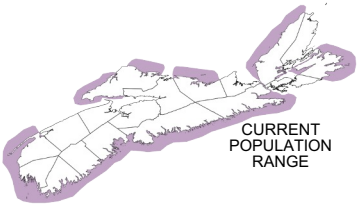
If boating or fishing in infested waters, keep your gear clean to avoid accidentally transporting crabs or crab larvae. Avoid transporting water or vegetation that may contain tiny crab larvae to prevent the accidental introduction into unaffected or less-affected areas. If invasive crabs are caught as bycatch, do not release them. If you spot these invasive species, report the location to iNaturalist, or directly to the NSISC.

Other Names: Codium, Dead Man's Fingers

Oyster Thief

Codium fragile ssp. fragile

TYPE: Marine Macroalgae



DESCRIPTION: Oyster Thief is a light- to dark-green alga, velvety and spongy to the touch, which grows in a small bush-like formation. It has cylindrical branches that are 3–10 mm thick and up to 90 cm long, spreading into Y-shaped tips. It lacks the golden yellow blisters of native Rockweed. Dried on the beach, branches may appear white, resembling thick spaghetti noodles.

HABITAT & IMPACT: Oyster Thief grows in tide pools and subtidal areas to depths of up to 18 m – it is often seen drifting in bays. It typically attaches to rocks, reefs, wharves, and even native species of algae, molluscs, and crustaceans. It gradually uproots, overtakes and replaces Eelgrass and kelps, which are important habitat-forming species for native fish, lobster, and shellfish. It attaches to mollusc shells, thereby preventing feeding and making them weaker and more prone to predation. It negatively affects and reduces economically important populations of shellfish.

PATHWAY: Oyster Thief has been present in Eastern Canada since 1989, but its pathway of introduction is not definitively known.

INTERESTING FACT: Oyster Thief can float away after attaching to oysters and other shellfish, hence its common name.

Stewardship Actions

If boating or fishing in infested waters, keep your gear clean to avoid accidentally transporting the species elsewhere. Avoid relocating any water that may contain fragments of Oyster Thief. If you spot this invasive species, report its location to iNaturalist or directly to the NSISC.

KEY IDENTIFICATION FEATURES: Branched, velvety, spongy green alga without golden yellow blisters; looks white like thick spaghetti noodles when dry on the beach.

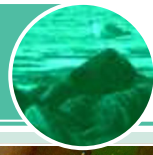
Invasion off Nova Scotia coast

Oyster Thief in shallow water

Oyster Thief uprooting native algae

Other name: Sea Squirt

Solitary Tunicates



TYPE: Marine Animal

Styela, Ascidiella, Ciona Spp.

DESCRIPTION: Solitary Tunicates are small marine filter-feeding animals, sometimes referred to as sea squirts. They look somewhat like fingers, or cylinders with two siphons at the top. They have thick, muscular skin that looks like a tunic, and can retract or close their siphons when disturbed. Solitary Tunicates develop individually, but can form dense aggregations.

HABITAT & IMPACT: Solitary Tunicates are very hardy, and can tolerate a wide range of water temperatures and salinities. They prefer sheltered bays, and like Colonial Tunicates, attach themselves to rocks, seaweeds, Eelgrass, and other native species, or on man-made structures such as ropes, docks, boat hulls, and shellfish culture gear. They alter natural marine ecosystems by outcompeting native species for food and space. They also threaten coastal and offshore fishing and aquaculture activities by fouling aquaculture species and gear.

© GREG-B-C, iNat

Vase Tunicate

Stewardship Actions

If boating or fishing in Tunicate-infested waters, keep your boat hull and gear clean to avoid accidentally transporting tunicates to new locations. Avoid transporting infested shellfish or water that may contain tiny bits of Tunicate, to prevent accidental introductions into unaffected or less-affected areas. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

©SLEBRIS, iNat

Clubbed Tunicate

Styela clava

Description: Native to the Western Pacific Ocean. Grows up to 18 cm in size – the stalk anchoring it to the substrate makes up one third of its body length. Body is firm, with little wrinkles and bumps. Overall leathery texture.
Pathway: Present on the South Shore of Nova Scotia. Most likely introduced by commercial shipping.

©JEANPAULBOEREKAMPS, iNat

Vase Tunicate

Ciona intestinalis

Description: Native to Northern Europe. Up to 15 cm long, cylindrical, without a stalk, translucent, smooth, and varying in colour from light greenish-yellow to orange or pink. Can form dense groups of individuals.
Pathway: Present in the Bay of Fundy since the 1850s, abundant since the mid-1990s. Pathway not definitively known.

©ZACPETERSON, iNat

European Sea Squirt

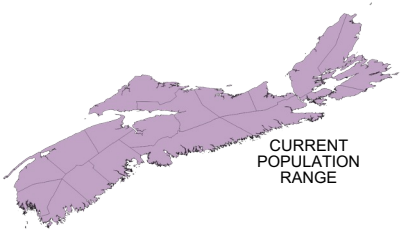
Ascidiella aspersa

Description: Native to the Mediterranean Sea and throughout Europe. Reaches up to 5 cm in length. Egg-shaped with a firm and bumpy surface. Translucent, but color is grey with a pinkish hue.
Pathway: First detected in Nova Scotia in 2012 on the South Shore. Most likely introduced through ballast water fouling.

Beech Bark Disease

Cryptococcus fagisuga & Neonectria spp.

TYPE: Insect & Fungus



DESCRIPTION: Beech Bark Disease results from a combination of the exotic Beech Scale insect and two fungus species, one of which (*Neonectria faginata*) may also be exotic. The Beech Scale insect is only 1 mm long and usually covered by a whitish, cottony wax secretion. The insect damages the tree's bark and then the fungi, which are not seen with the naked eye, infect damaged trees, often leaving severe crater- or target-shaped scars.

HABITAT & IMPACT: Beech Bark Disease affects the vast majority of Beech (*Fagus grandifolia*) trees in Nova Scotia, which are found in mixedwood and hardwood forests, especially on drier ridges and hilltops. Trees are usually weakened and often die. If trees persist, it is often by root suckering, which can result in a dense shrubby forest that is ecologically and economically unproductive. Beech are an important tree species of the Acadian forest which once dominated many hardwood stands; they have been greatly affected by this disease.

PATHWAY: Beech Bark Disease was first recorded in North America in 1890, likely introduced on a European Beech tree planted in the Halifax Public Gardens.

INTERESTING FACT: Towering Beech trees once grew all over Nova Scotia – sometimes living as long as 300 years!

Stewardship Actions

About one in 100 Beech trees remains disease-free. This is likely due to genetics. If you have healthy Beech trees in your woodlands, let them disperse their seeds and root suckers so that these good genetics spread and help the species recover. Use local wood products to avoid the long-distance transportation of insects and pests from faraway timber and firewood. If you spot invasive species, report the location to iNaturalist or directly to the NSISC.

KEY IDENTIFICATION FEATURES: Spots of white, cottony secretion on bark; crater- or target-shaped scars on bark.

Typical disfigurement

Rare, healthy Beech

Severe scarring

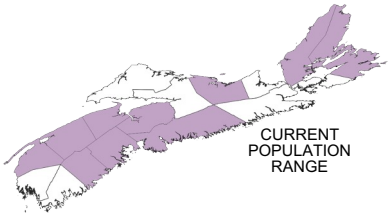
Fruiting bodies from fungus

White, waxy wool from Beech Scale

Beech Leaf-Mining Weevil

Orchestes fagi

TYPE: Insect



DESCRIPTION: The Beech Leaf-Mining Weevil is an insect pest of Beech (*Fagus* spp.) trees. Adult weevils are 2–3 mm long, with short golden hair, and long back legs. They jump like fleas when foliage around them is disturbed. In their larval stage, they are about 5 mm long, with a shiny white body, and black head. Beech Leaf-Mining Weevils spend most of their life in the adult stage, even overwintering in this form under bark scales, or in surrounding leaf litter. In the spring, they eat and lay their eggs inside the new leaf growth of Beech trees.

HABITAT & IMPACT: Beech Leaf-Mining Weevils feed on Beech tree foliage. As larva, they feed from within the leaf, creating narrow mines which appear as small brown blotches from the midrib to the edge of the leaf. In early summer, invaded trees will appear defoliated or scorched. After several years of invasion, trees will decline and eventually die. As adults, Beech Leaf-Mining Weevils eat foliage emerging in the spring, peppering leaves with small holes.

PATHWAY: Beech Leaf-Mining Weevil was first noted in Nova Scotia in Halifax and Cape Breton in 2011. Although its pathway from Europe is not definitively known, it is easily spread via transported firewood, logs, and infested host plants.

INTERESTING FACT: Beech Leaf-Mining Weevils are part of the Curculionidae family, which are also called "true weevils," or "snout beetles" due to their common trait of having long snouts.

Stewardship Actions

Avoid moving firewood long distances, since pests like Beech Leaf-Mining Weevil could be hiding underneath bark scales and between cracks. If you are going camping, buy and burn local firewood to prevent the spread of this invasive species and others. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

KEY IDENTIFICATION FEATURES: long beetle with prominent snout, short golden hair, and long back legs. Jumps like a flea when disturbed.

Adult form, foraging on new leaf growth

Adult form

Leaf mining damage

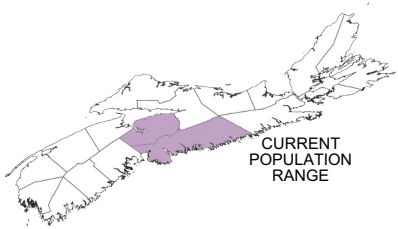
Larval form

iNaturalist sighting in Cape Breton, 2020

Blue Sedge

Carex flacca

TYPE: Vascular Plant



DESCRIPTION: Blue sedge is a cool-season sedge that grows to a height of 30-45 cm and a width of 30-45 cm, forming a dense clump that slowly creeps and spreads. Its leaves are 3 mm wide, narrow, arching, and coarse, blue-green on top and blue-gray underneath. Flowers are inconspicuous and appear on terminal, cylindrical spikes in early summer (May-July). At maturity, spikes bear densely-packed fruit, which are 2-2.5 cm long and roundish with a very short beak.

HABITAT & IMPACT: Blue Sedge thrives in moist soils. It is often found in full sun, but also does well in the shade of large trees. It prefers areas of high pH bedrock, rich forests, swamps, and wet meadows. Blue Sedge threatens and out-competes native species that live in these areas, including the Ram's Head Lady's Slipper – a legally protected species in Nova Scotia.

PATHWAY: Blue Sedge was introduced from Europe as a garden ornamental.

INTERESTING FACT: Carex comes from the Latin word for "cutter," referring to the sharp leaves and stem edges of this plant.

Native Alternative

Switchgrass (*Panicum virgatum*) is a pink-tinged ornamental grass that is native to North America.

Stewardship Actions

Choose native plants over invasive plants when planning your garden. If removing Blue Sedge species from your property, double bag it and leave it in the sun to rot, then discard. If sighted, report to iNaturalist or directly to the NSISC.

© MVP2020, iNat

Mat of Switchgrass

© JACK4, iNat

KEY IDENTIFICATION FEATURES: Soft Blue foliage, densely packed fruits on a spike.

Forest floor of invasive Blue Sedge

© JECLERENCIA, iNat

Inflorescence

© KILIANK.

Seed bundle

© DANIELCHEN, iNat

Seed bundle

© DANIELCHEN, iNat

Close-up view of seeds

© DAVID STANG, WIKICOMMONS

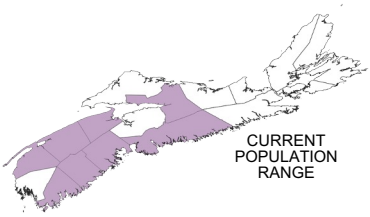
Mat of Blue Sedge

Other Names: Elephant Grass, Giant Reed Grass

Common Reed

Phragmites australis ssp. australis

TYPE: Vascular Plant

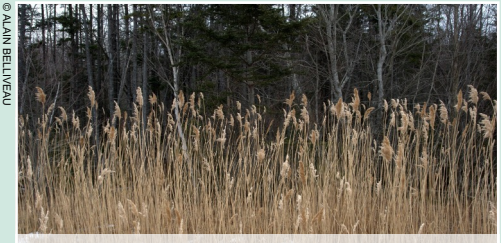


DESCRIPTION: Common Reed is a very tall grass, often reaching heights of 3 m or more. Its stems are hollow and up to 1.5 cm thick. Leaves are usually blueish-green, 15–50 cm long, and 2–4 cm wide. Flower heads are large; 15–40 cm long, blooming in late July to September, purplish when young, and straw-coloured at maturity. Each tiny flower is surrounded by silky hairs, giving the inflorescence its feathery appearance. This plant looks similar to our native subspecies (ssp. *americanus*).

HABITAT & IMPACT: Common Reed grows in wet ditches, and various freshwater or brackish shores and wetlands. It spreads quickly through its roots – up to several meters per year! It can quickly form large, dense stands that exclude native species and can alter the structure and function of native marsh ecosystems.

PATHWAY: Common Reed was probably first introduced to North America in ships' ballasts, or as a seed contaminant in the late-1700s or early-1800s. It also spread to a limited extent as an ornamental grass. The introduced subspecies has been present in Nova Scotia for more than a century, as the earliest specimen collections date back to 1910.

INTERESTING FACT: This reed and others like it have been used as a premium thatching material for thousands of years.


© ALAIN BELLIVEAU

KEY IDENTIFICATION FEATURES: Very tall with feathery flower head. Check with an expert to distinguish from very similar native subspecies.


© DAVID MAZEROLLE

Similar native subspecies


© ALAIN BELLIVEAU

As tall as 4 m!


© ALAIN BELLIVEAU

Feathery flower head


© ALAIN BELLIVEAU

Flower head

Native Alternative

Old Switch Panic Grass (*Panicum virgatum* var. *spissum*), Blue-joint Reedgrass (*Calamagrostis canadensis*); and Blunt Manna-grass (*Glyceria obtusa*) are lovely, non-invasive grasses.


© MEGAN CROWLEY

Blunt Manna-grass

Stewardship Actions

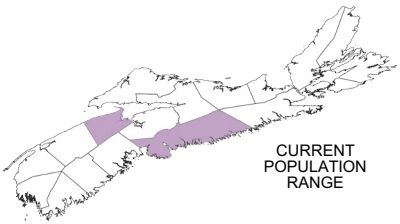
Promote the use of attractive, native or non-invasive grasses. Mowing plants often or grazing them with livestock may help reduce dense stands. Do not compost pulled and cut plant parts. Instead, dry and burn them on site (with a permit). If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

Other names: Black Swallowwort; Pale Swallowwort

TYPE: Vascular Plant

Dog-Strangling Vine

Cynanchum rossicum & louiseae



DESCRIPTION: Dog-Strangling Vine is a herbaceous vine that grows up to 2 m high, twining onto plants and trees, or trailing along the ground. Its leaves are opposite, oval-shaped with a pointed tip, and 7–12 cm long. Flowers are small and star-shaped, with five pink to dark-purple petals 5–9 mm long, blooming from late May to mid-July. Feathery white seeds are released in late summer from a yellow-green, bean-shaped seed pod 4–7 cm long. Dog-Strangling Vine is perennial, growing back from its well-established root system each year.

HABITAT & IMPACT: Dog-Strangling Vine prefers open sunny areas, but can survive in light shade. It forms extensive, dense patches that outcompete native plants for space, water and nutrients. It is difficult to destroy, as it produces large amounts of seeds which are spread by the wind, and can also grow from root fragments. Dog-Strangling Vine is especially detrimental to endangered Monarch Butterfly populations, as they mistakenly lay their eggs on this plant instead of native Milkweed. Unable to complete their life cycle, the larvae do not survive.

PATHWAY: Dog-Strangling Vine was imported from Europe with early settlers as an ornamental plant for gardens.

INTERESTING FACT: Dog-Strangling Vine does not actually strangle dogs, but strangles and kills trees and other plants.

© FLICKR

KEY IDENTIFICATION FEATURES: Vine, twining onto plants or trees, 1–2 m high; opposite leaves, small pink to purple star-shaped flowers.

Dog-Strangling Vine growing over plants and trees

© JONATHAN M. FLICKR

Forest invasion of Dog-Strangling Vine

© ROB ROUTLEDGE, WIKI COMMONS

Full plant

© SUSAN BROWN, FLICKR

Flowers

© FLICKR

Pods

© ELENA SHEN, FLICKR

Seeds

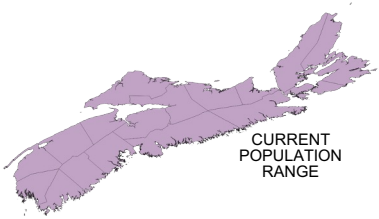
Stewardship Actions

Small populations of Dog-Strangling Vine can be pulled out by hand; larger populations should be treated with herbicides. Treatment may need to be repeated over many years. Remove seed pods to prevent spread. Rot plant material in black garbage bags in the sun prior to disposal in a landfill. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

Dutch Elm Disease

Hylurgopinus, Scotylus, & Ophiostoma spp

TYPE: Insect & Fungus



DESCRIPTION: Dutch Elm Disease results from several different microscopic sac fungi (all of which are probably exotic) infecting Elm (*Ulmus* spp.) trees via exotic Elm bark beetles that feed on the tree's bark. As the beetles reproduce, they continue to spread fungi to other Elm trees. Early signs of Dutch Elm Disease include significant leaf wilting in early summer, followed by tree death within a year or two. Other signs include very small boring holes; the presence of reddish-brown or black beetles about 2–3 mm in length; networks of beetle feeding galleries under the surface of the bark; and brown staining under bark.

HABITAT & IMPACT: Dutch Elm Disease is most commonly found in floodplains and along cultivated fields. This insect-fungi combination makes for a very contagious disease that has destroyed a significant portion of the White Elm (*Ulmus americana*) tree population in Nova Scotia.

PATHWAY: Dutch Elm Disease was first found in Nova Scotia in Liverpool in 1969. It was probably brought to North America in wooden crates made of Elm wood.

INTERESTING FACT: The fungi was identified by a Dutch phytopathologist in 1921, hence its common name.

Stewardship Actions

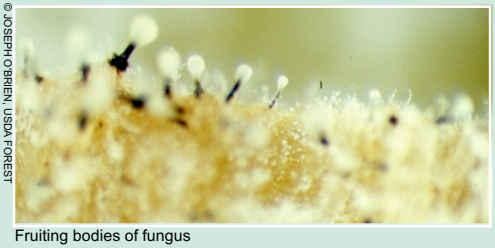
Only about one in 100,000 White Elm trees will display some level of resistance to Dutch Elm Disease. If you have healthy White Elm trees in your woodlands, let them disperse their seeds so that the species persists. Use local wood products to avoid the long-distance transportation of insects and pests via timber and firewood. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

KEY IDENTIFICATION FEATURES: Leaf wilt, brown leaves, and brown stains under bark.

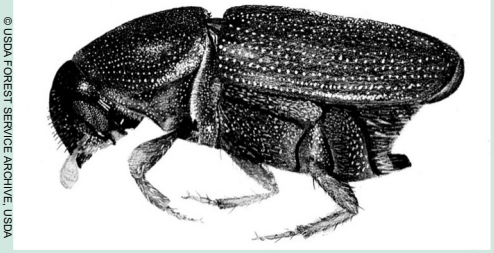
Stand of dead White Elm trees in Cape Breton

Healthy White Elm Leaves

Healthy White Elm



Fruiting bodies of fungus

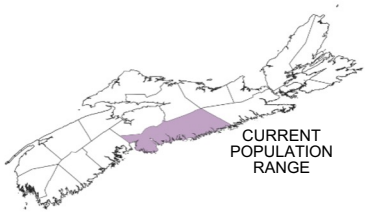


European Elm Bark Beetle

Emerald Ash Borer

TYPE: Insect

Agrilus planipennis




© DELAWARE AGRICULTURE, FLICKR

KEY IDENTIFICATION FEATURES: Green metallic beetle; winding galleries in trees; D-shaped exit holes in trees.

DESCRIPTION: The Emerald Ash Borer is a narrow, elongated beetle that is 8.5–14 mm long, and 3.1 –3.5 mm wide. Adults have a metallic-green back and bright-emerald belly. Their head is flat with black or bronze kidney-shaped eyes. Adults are present from June through August. Their small oval eggs turn from cream to brown with age. White larvae grow up to 30 mm in length, and chew characteristic serpentine galleries in the living tissues of Ash (*Fraxinus* spp.) trees. They create D-shaped holes in the bark, causing symptoms that range from foliage thinning and premature yellowing, to tree death.

HABITAT & IMPACT: Emerald Ash Borer is a highly destructive pest to our native Ash trees, including the threatened Black Ash (*Fraxinus nigra*) as well as our urban forests. Adults damage the foliage by grazing. Larva hatch from eggs laid in bark crevices, burrowing into and feeding on the living tissue of hosts trees. Infested trees die within 1–4 years, and more than 99% of Ash trees in a stand can be killed within ten years when not managed. Loss of Ash trees causes negative ecological impacts, affects herbivores that depend on Ash species, and also affects the cultural use of Black Ash in traditional Mi'kmaq practices.

PATHWAY: Emerald Ash Borer was first observed in Canada in 2002, and in the Maritimes in 2018. It was most likely first introduced in wooden pallets from China, then spread within Canada on firewood being transported between regions.

INTERESTING FACT: The Emerald Ash Borer is capable of surviving temperatures as low as -50 °C.


© CFIA


© CFIA

Boring in Firewood


© CFIA

Feeding Gallery


© CFIA

Tree destruction


© CFIA

Ash Borer damage: tree death

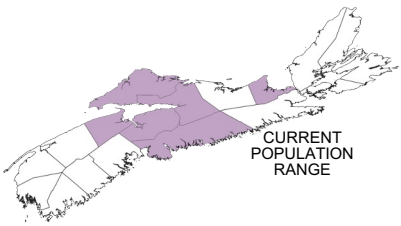
Stewardship Actions

Emerald Ash Borer is capable of short-range flight, but longer-range spread is mostly attributed to human activities. Avoid moving Ash logs and firewood. Know the applicable regulations for your area. When in doubt contact your local CFIA office at https://inspection.canada.ca/. If you spot this invasive insect, report the location of the tree on iNaturalist or directly to the NSISC.

Garlic Mustard

Alliaria petiolata

TYPE: Vascular Plant



© SANNSE, WIKIPEDIA

KEY IDENTIFICATION FEATURES: Garlic smell in new leaves; small white flowers with 4 petals; sharply toothed leaves.

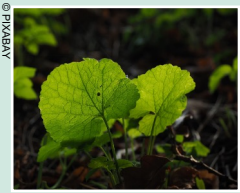
Mature Garlic Mustard plant with leaves and flowers

© IAN CUNLIFFE

Cluster of Garlic Mustard plants

© ALAN WOLF, FLICKR

First year stage



© PIXABAY

Early leaves

DESCRIPTION: Garlic Mustard is an herbaceous biennial that produces vegetative rosettes in its first year. Rosettes have dark green, kidney-shaped leaves with scalloped margins that have a strong smell of garlic when crushed. In the second year, plants extend a hairy, flowering stalk that can reach up to 1 m in height, bearing alternate, triangular leaves, 3–8 cm long with toothed margins. Flowers are small, white, four-petaled, borne in unbranched or weakly branched clusters, and blooming from May through August. Seed pods, or siliques, are long (2.5 – 6 cm), containing 10–20 small black seeds in two rows, and grey at maturity. Single plants commonly produce about 600 seeds. They have a thin, white taproot that extends deep into the soil.

HABITAT & IMPACT: Garlic Mustard grows along paths and fence lines where humans and animals help disperse its seeds. It is slightly intolerant of acidic conditions, and prefers damp, calcium-rich soil with partial shade. It forms dense stands in early spring, monopolizing resources and shading out native species. Garlic Mustard is avoided by deer, which encourages over-browsing of native species. It can also sabotage competitor species by harming their mycorrhizal partnerships with anti-fungal secretions. In Ontario, it has been shown to invade and reduce the biodiversity of old growth forests within five years.

PATHWAY: Garlic Mustard was introduced to North America by European settlers in the 1800s as a garden herb due to its high levels of vitamins A and C.

INTERESTING FACT: When dairy cows eat Garlic Mustard it causes a garlic taste in their milk, which renders it unusable.

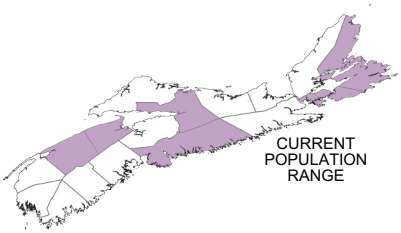
Stewardship Actions

Promote the use of non-invasive herbs for gardens. Humans and animals are the main seed dispersal vector for this invasive species, so be sure to stick to the trails in natural areas. Clean off gear and pets before and after hiking. If removing Garlic Mustard from your property, do not burn or compost the plant. Instead, double bag it and leave it in the sun to rot, then discard. Garlic Mustard is easiest to remove in its first year. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

Giant Hogweed

TYPE: Vascular Plant

Heracleum mantegazzianum



DESCRIPTION: Giant Hogweed is a perennial member of the carrot family which can grow to exceed 5 m in height. Its basal leaves are lobed, coarsely toothed, up to 3m in length, glabrous (smooth) on the upper surface and bristled on the lower surface. After 3-5 years as a vegetative rosette, plants produce a massive flowering stalk which is rigid, hollow, blotched with purple, bristled and up to 10 cm in diameter. Flower heads are large compound umbels (up to 80 cm) with rays of 50-150 pink to white flowers around 24 mm in diameter, blooming in late June to August. It typically produces 50,000 elliptical flat seeds between 6-18mm long. The roots of this plant are yellow and branching.

HABITAT & IMPACT: Giant Hogweed grows in disturbed areas and along riverbanks and roadways, and is especially suited to damp riparian areas. The winged seeds are well adapted for dispersal by wind (up to 10 m) and water (seeds can float for 3 days). The immense size and fast growth of this plant can lead to the shading out of native species. Giant Hogweed increases the risk of erosion around waterways when it dies back in the winter or at the end of its life cycle. Its watery sap contains chemicals which, when activated by the sun's UV rays, can cause severe burns in humans and other animals.

PATHWAY: Giant Hogweed was introduced in the 1900s as a garden ornamental.

INTERESTING FACT: The first known record of Giant hogweed in the Maritimes was in Alexander Graham Bell's garden in Baddeck.

KEY IDENTIFICATION FEATURES: Giant size compared to other Hogweeds. Purple prickly stems with white hairs, flowers, leaf and leaf size.

Giant Hogweed with leaves and flowers

Forest of Giant Hogweed

Hogweed Leaves

Hogweed Flowers

Stewardship Actions

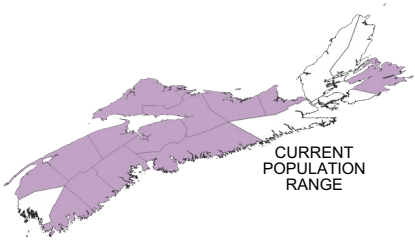
Promote the use of beautiful, native plants for gardens and landscaping. If found on your property, it is not recommended to touch or attempt the removal of this species. Instead take clear photos for identification purposes and report sightings to iNaturalist or directly to the NSISC. It is recommended to hire professional landscaper familiar with the appropriate safety protocols. It is very important not to burn or compost this plant and instead double bag it in heavy duty plastic and let it rot in the sun before discarding.

Other Name: European Alder Buckthorn

Glossy Buckthorn

TYPE: Vascular Plant

Frangula alnus



KEY IDENTIFICATION FEATURES: Glossy oval leaves with smooth edges, blackish-brown bark spotted with grey, and yellow inner bark.

Invasion of wetlands, Kings County, NB

Glossy leaves, black ripe berries

Flower clusters

DESCRIPTION: Glossy Buckthorn is a single- or many-stemmed shrub or small tree that can reach heights of 6 m. Its oval-shaped leaves are alternate along the stem, 3–7 cm long and 2.5–4 cm wide, with smooth edges and a glossy upper surface. Flowers are star-shaped with five petals, greenish- white, 3–5 mm wide, clustered in leaf axils, and bloom from May to June. Glossy Buckthorn produces 6–10 mm red, berry-like fruits which turn black when ripe, and are not edible. Its bark is blackish-brown and spotted with grey, and inner bark is bright yellow.

HABITAT & IMPACT: Glossy Buckthorn grows in wet to moist old fields, thickets, forest, shores, and open wetlands. It forms dense stands which can replace wetland and shoreline plant communities and take over forest understories – even eliminating tree seedlings. It is tolerant of acidic conditions and well adapted to invade a wide variety of natural habitats in Nova Scotia; it may represent the greatest threat to plant communities in the province.

PATHWAY: Glossy Buckthorn was introduced to North America in the late-1700s or early-1800s as a hedge or ornamental species. It was first noted as a serious invader of native habitats in the early 1900s. Sale of this species has mostly been phased out in North America, though a few cultivars remain on the market. The species has been present in Nova Scotia for at least half a century.

INTERESTING FACT: Although this plant's berries are poisonous to many animals (including humans), they are commonly eaten by a variety of birds and some small mammals. Once the berries are consumed, the seeds can be spread over several kilometers, starting new infestations.

Native Alternative

Chokecherry (*Prunus virginiana*) and Serviceberries (*Amelanchier* spp.) are native shrubs similar in appearance to Glossy Buckthorn. However, their berries make a wonderful jelly.

Chokecherry

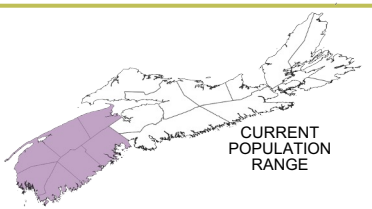
Stewardship Actions

Promote the use of attractive native and non-invasive shrubs in gardens and landscaping. Uproot smaller plants, and repeatedly cut larger plants to slow down spread. Feed branches and foliage to livestock. Do not compost pulled and cut plant parts. Instead, dry and burn on site (with a permit). If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

Hemlock Woolly Adelgid

Adelges tsugae

TYPE: Insect, Tree Pest



DESCRIPTION: Hemlock Woolly Adelgid is an aphid-like insect that parasitizes Eastern Hemlock (*Tsuga canadensis*) trees. The first generation of the bug are 1.4 mm long, and are present from June to March. Second-generation crawlers are 0.9 mm long, and are present March to June. Both generations are black, wingless, have heavy waxy coats, and lay clusters of oblong amber eggs (0.3–0.4 mm long) in white woolly ovisacs. The nymphal stage is the only mobile stage. During this period, they are less than 1.5 mm long, and are brownish-orange in colour.

HABITAT & IMPACT: This pest affects the Eastern Hemlock – a foundational tree in Nova Scotian forests – especially on riverbanks and lakeshores. It feeds on the base of hemlock needles, causing premature dieback, needle loss, foliage thinning, and tree death. Wide-scale Hemlock death causes changes in forest nutrient cycling, and deprives birds, moose, and deer of winter shelter and food. If adjacent to water, Hemlock death increases erosion rates, and decreases the shade available to aquatic organisms.

PATHWAY: In North America, Hemlock Woolly Adelgid was first recorded in Virginia in the 1950s, likely imported unintentionally with Japanese nursery stock. From there, it slowly spread up the Eastern seaboard. This species was first recorded in south-west Nova Scotia in 2017. It has been spreading steadily since.

INTERESTING FACT: There are two generations of Hemlock Woolly Adelgid born per year. Each generation can produce over 150 eggs. Once this species has become established in a habitat, its population grows rapidly.

Stewardship Actions

Monitor Hemlock Trees for indicators of infection. Because adult Hemlock Woolly Adelgid are wingless, they spread mostly via wind, birds, and human activities. Avoid moving firewood or wood scraps over long distances. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

Hemlock Woolly Adelgid infestation on Eastern Hemlock

Hemlock Woolly Adelgid eggs

Woolly egg sacks cling to branches

Dead Hemlocks in a distant forest

Infestation on Hemlock

Woolly sacs on Hemlock

Similar species:

Balsam Wooly Adelgid (*Adelges piceae*)

This tiny insect is native to central Europe, and was likely introduced accidentally through the nursery trade. It attacks both stems and shoots of our native Balsam Fir (*Abies balsamea*), which weakens and kills trees. This species occurs throughout the province, however, it does not kill trees as quickly or as extensively as Hemlock Woolly Adelgid.

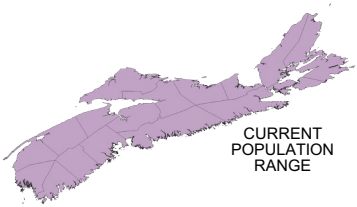
Infestation of Balsam Woolly Adelgid on tree trunk

Other Names: Mexican Bamboo, Fleeceflower

Japanese Knotweed

Reynoutria japonica

TYPE: Vascular Plant



DESCRIPTION: Japanese Knotweed is a woody-stemmed herbaceous perennial 1-3 m tall, with annual stems extending from the perennial root system. It can grow up to 8 cm per day. New growth is purplish in color, and turns to green as the plant matures. Leaves are alternately arranged, 10–17 cm long and 7–10 cm wide, and oval to triangular in shape with a pointed tip and flat base. Flowers are small, white-green, borne in sprays near the ends of stems and in the leaf axils, and bloom from July– August. Seeds are small and winged for wind dispersal.

HABITAT & IMPACT: Japanese Knotweed grows primarily in urban habitats, but may also be found in riparian areas. It thrives in full sunlight, preferring open exposure, but can also survive in deep shade. Look for Japanese Knotweed along roadsides, ditches, fence lines, and around old homesteads. This invasive species grows in thick clumps that block out sunlight, effectively shading out native species and reducing biodiversity.

PATHWAY: Japanese Knotweed was introduced to North America in the late 1800s as a horticultural plant, but has since escaped cultivation.

INTERESTING FACT: The spring shoots of Japanese Knotweed are edible! Their flavour has been described as something like a cross between asparagus and rhubarb.


© VMORRONGIELLO, iNat

KEY IDENTIFICATION FEATURES: Oval to triangular leaves with flat base. Stems are hollow and smooth. Winged, triangular, small and shiny fruit.

Flower clusters


© JNBRAVO, iNat

Leaves with flat base


© ROBYNCAMPLBELL, iNat

Small, triangular, winged fruits


© ABC3, iNat

Flower cluster up close

Stewardship Actions

Promote the use of beautiful native plants for gardens and landscaping, and avoid planting invasive species. If removing Knotweed species from your property, be sure not to burn or compost the plant. Instead, double bag it and leave it in the sun to rot, then discard. Make sure to remove the entire root system, or else the plant will resprout from the rhizome fragments. Digging up young Knotweeds is the best way to prevent new or early infestations. Alternatively, you can cover the plant with dark material to block out the sun and "cook" the plant. This process, called tarping, is best done when started in late spring. It is not recommended for low light areas. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

Other Invasive Knotweeds

Giant Knotweed (*Reynoutria sachalinensis*):
Woody-stemmed herbaceous perennial which can reach 2–4 m in height. Stems are smooth, hollow, and remain standing when dead. Leaves are heart-shaped, with thin hairs on their underside.


© SOLOHIKES, iNat

Bohemian Knotweed (*Reynoutria ×bohemica*):
A hybrid of the Japanese and Giant Knotweed. Woody-stemmed herbaceous perennial up to 2–3 m in height. Leaves are spade- to heart-shaped, with short, broad hairs on underside of the leaf.


© ALEXANDER_BARANSKY, iNat

Common names: Multiflower Rose, Rambler Rose

Multiflora Rose

Rosa multiflora

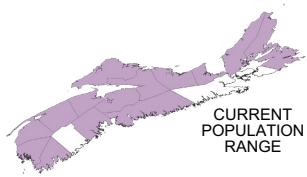
TYPE: Vascular Plant

DESCRIPTION: Multiflora Rose is a woody shrub that grows up to 3 m tall and 4 m wide. Its stem is green to red with stiff, curved thorns. Leaves are compound, with 5–11 oblong, oval leaflets with serrated edges. The upper surface of the leaves is smooth, while the underside is paler with short hairs. Flowers are white to pinkish, 1.3–2 cm wide, appearing in clusters at the end of branches, and blooming in late May through June. Rosehips are small – 6 mm or less – and green to bright red.

© Melissa McMaster, iNat

Multiflora Rose

HABITAT & IMPACT: Multiflora Rose invades a variety of environments. It can grow, for example, in open woodlots, forests, marshes, swamp edges, and in disturbed areas. It is often found in hedgerows, gardens, and along trails. It prefers locations with full sun, but can tolerate moderate shade. It is able to outcompete most native plants, and reduces biodiversity in habitats where it establishes.



Rugosa Rose

Rosa rugosa

TYPE: Vascular Plant

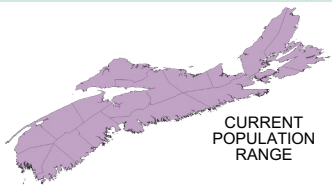
DESCRIPTION: Rugosa Rose is a dense shrub that grows up to 2.5 m tall. Its stem is robust, with abundant thorns of all sizes. Twigs are covered in fine hairs, and have 5–7 oval-shaped, toothed leaflets. Flowers are dark pink to white, 6–9 cm wide, strong-scented, and blooming in summer. Rosehips are large, smooth, dark red and 2–2.5 cm in diameter.

© Orfano Mondo, iNat

Rugosa Rose

HABITAT & IMPACT: Rugosa Rose grows in sandy coastal areas and ditches. It spreads mainly by its roots, but can also be moved long distances by mammals and birds, or by old hips floating in seawater. Once established, very few – if any – native species can compete with Rugosa Rose. It threatens biodiversity and ecosystem function in many areas of the province.

PATHWAY: Both species were brought to northeastern North America as ornamental plants in the late 1800s and early 1900s.



Native Alternative

Virginia Rose (*Rosa virginiana*) is a beautiful native species, and sometimes considered the best all-around wild rose, with attractive flowers and excellent fall colours.

© Tom Potterfield, iNat

Virginia Rose

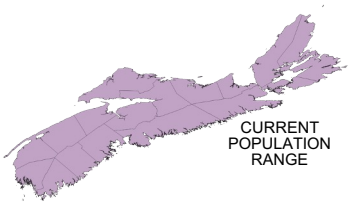
Stewardship Actions

Promote the use of attractive, native roses for gardens and landscaping. Dig out, mow, or uproot plants. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

Norway Maple

Acer platanoides

TYPE: Vascular Plant

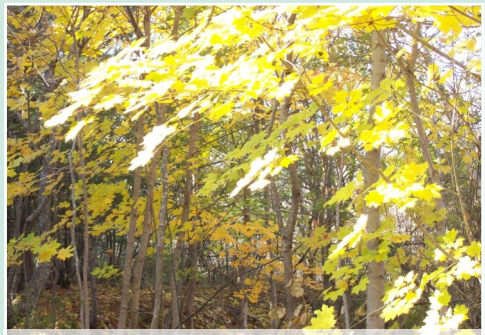


DESCRIPTION: Norway Maple is a large deciduous tree that grows up to 18 m tall with a large crown. It has large, maple-shaped leaves, which can be green or dark red. Leaf stems have milky sap. Its flowers are greenish, and bloom in early spring. Seeds of Norway Maple look like a pair of green wings and buds are round.

HABITAT & IMPACT: Norway Maple grows in upland forests, and is so far mostly limited to urban areas. It creates dense shade, grows competitive networks of shallow roots, and releases toxic chemicals – all of which are detrimental to other native species. Once established, Norway Maple can reduce native biodiversity and even provoke soil erosion due to a lack of ground vegetation.

PATHWAY: Norway Maple is said to have first been brought to the United States in 1756, and became even more widespread during the 1940s, when it was used to replace White Elms that were dying of Dutch Elm Disease.

INTERESTING FACT: This species has been banned in two states in the United States due to its invasive nature.



KEY IDENTIFICATION FEATURES: Maple leaves with bottom two lobes close in size to top lobes; milky white sap in leaf stem.

Invasion of woodlands in Lunenburg County

Norway Maple seed

Norway Maple leaf (left) vs. Sugar Maple leaf (right)

Norway Maple Leaf, green

Norway Maple leaf, red/purple

Other Invasive Maples

Manitoba maple
Acer negundo
DESCRIPTION:
Medium-sized tree with compound leaves of 3–9 leaflets that resemble Ash leaves. Native to the Prairies. It prefers floodplains and riparian areas, but can grow in dry, disturbed areas.

Manitoba Maple leaflet

Sycamore Maple
Acer pseudoplatanus
DESCRIPTION:
Large tree with orange-brown or pinkish-orange bark broken in long scales when mature. Grey, smooth bark when sapling.

Sycamore Maple leaf

Stewardship Actions

Promote the use of beautiful native or non-invasive trees. Pull or dig out small seedlings by hand. Saplings and larger trees can be cut down or girdled. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

Native Alternative

Sugar Maple (*Acer saccharum*) and Red Maple (*Acer rubrum*) are excellent native Maple trees. Both have vibrant fall colours and produce maple syrup. For a smaller, shrubby, native Maple, try Striped Maple (*Acer pensylvanicum*) or Mountain Maple (*Acer spicatum*).

Sugar maple leaf

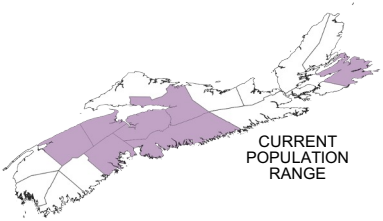
Red Maple leaf

Other Name: Asian Bittersweet

Oriental Bittersweet

TYPE: Vascular Plant

Celastrus orbiculatus



Entangled tree

DESCRIPTION: Oriental Bittersweet is a deciduous woody vine or trailing shrub that can reach heights of over 18 m. Its leaves are simple, alternate, roundish and slightly toothed. Flowers are small with five petals, grow in clusters, and bloom in late spring or early summer. Berries are yellow when mature, later opening up to three red seed pods. Roots are typically bright orange.

HABITAT & IMPACT: Oriental Bittersweet grows in forests, fields, habitat edges and gaps, and even coastal areas. Its fast and aggressive growth can completely cover native vegetation, which can lead to girdling, uprooting (due to its heavy weight), and shading of native species. Fallen, rotting leaves can even change soil chemistry and prevent the germination of native species.

PATHWAY: Oriental Bittersweet was introduced to North America around 1860 as a decorative plant.

INTERESTING FACT: Even today, dried flower arrangements and wreaths may contain this plant. Be aware and avoid accidentally spreading its seeds!

Berries

Leaves

Full plant

Native Alternative
Virginia Clematis (*Clematis virginiana*) is a native and charming vine with clusters of white flowers.

Virginia Clematis

Stewardship Actions
Promote the use of beautiful non-invasive ornamental plants for gardens and landscaping.

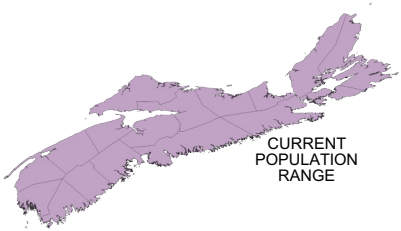
Pull up all roots for seedlings.Trim repeatedly (bi-weekly, especially in the spring) for larger plants. Do not compost pulled and cut plant parts. Instead, dry and burn the entire plant on site (with a permit). If you spot this invasive species, report its location to iNaturalist, or directly to the NSISC.

Other Names: Loosestrife, Spiked Loosestrife

Purple Loosestrife

Lythrum salicaria

TYPE: Vascular Plant



DESCRIPTION: Purple Loosestrife is a perennial wetland plant typically 60-120 cm tall, but up to 2 m. Multiple stems arise from a single rootstock. Stems are woody, stiff, and square-shaped with 4–6 sides. They are smooth with fine hairs, evenly spaced nodes, and somewhat branched. New growth is green, while older growth is a reddish or brown-purple colour. Leaves are opposite or whorled, lance-shaped, and 3-10 cm long with smooth edges. Flowers are pink-purple with a yellow center, with 5–7 petals, and each flower is 7–10 mm long. They grow in dense terminal spikes and bloom between June and October.

HABITAT & IMPACT: Purple Loosestrife is a wetland plant that thrives in moist habitats, but also has a high tolerance to drought, which allows it to colonize a wide variety of habitats. It prefers recently disturbed areas with exposed soil and abundant sunlight. It can create dense monospecific stands with thick mats of roots that spread over large areas, outcompeting native plant species and degrading habitat for native wildlife. In some habitats, Purple Loosestrife has replaced 50% of the natural species. Its leaves decompose faster than those of most native species, which changes the existing water chemistry of the wetlands it inhabits.

PATHWAY: Purple Loosestrife was brought to North America in the early 1800s, as seeds for gardens, for use in beekeeping, in soil used in ship ballast, and more. It disperses naturally via wind, water, birds, other wildlife, and human activity.

INTERESTING FACT: Larger plants of Purple Loosestrife can produce 2.7 million seeds per growing season.

Flower spikes © diogeno, 2021

Lance-shaped leaves © rockfreight, 2021

KEY IDENTIFICATION FEATURES: Square-shaped stalk with fine hairs, opposite or whorled lance-shaped leaves, pink-purple flowers with 5–7 petals arranged in spikes.

© kjanicki83, 2021

Pink-Purple Flowers

© davidsandler, 2021

Seed pods

© samrking, 2021

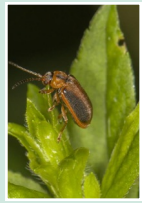
Square-shaped stalk

© rudolphous, 2018

Wetland habitat

Biological Control Success Story

Purple Loosestrife control programs have been in place in North America since the 1980s, but with little success until 1992, when a biocontrol program using beetles such as the Black-margined Loosestrife Beetle (*Neogalerucella* spp.) was introduced. This brought a significant reduction in Purple Loosestrife populations and restored the health of many wetlands.



© DAVIDLARSON, iNat

Black-margined Loosestrife Beetle

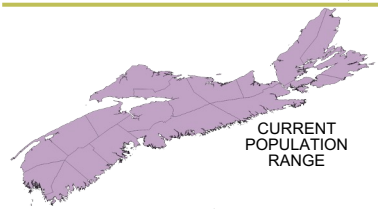
Stewardship Actions

Promote the use of native plants. Humans and animals are a potential seed dispersal vector for this invasive species, so be sure to stick to the trails in natural areas, and clean off gear and pets before and after hiking. If removing Purple Loosestrife from your property, be sure not to burn or compost the plant, but instead double bag it and leave it in the sun to rot, then discard. It is easiest to remove when it is less than two years old. If you spot this species, report its location on iNaturalist, or directly to the NSISC.

Reed Canary Grass

TYPE: Grass/Sedge

Phalaris arundinacea



DESCRIPTION: Reed Canary Grass is a cool season, perennial grass that grows up to 1.7 m tall. Its leaf blades are flat, 30–120 cm long, 1.9 cm wide, smooth, and taper gradually. Leaf stems are rounded, and greyish to bluish-green. Flowers/seed heads are green, purple, or brown in colour and 7.5–15.5 cm long. Flowering occurs from May to July. As the seeds mature, they turn from green, to purplish, to tan. Reed Canary Grass forms dense clumps, or mat-like colonies.

HABITAT & IMPACT: Reed Canary Grass prefers to live in seasonally wet or continually moist areas (i.e., wetlands, ditches). It quickly dominates these sites, spreading along ditch systems and other land adjacent to watercourses. It can crowd out native vegetation, and is extremely hard to remove once it is established. This is due to the large soil seedbank and permanent rhizome bed that it builds up in the first year of establishment.

PATHWAY: Reed Canary Grass was introduced to North America in the 1800s as a cultivated plant, mainly used to feed livestock. Since then it has escaped, and its many subspecies have hybridized to become the invasive plant we see today.

INTERESTING FACT: The name *Phalaris* is Greek for "shining," and refers to the shiny seeds; *arundinacea* means "reed-like."

Stewardship Actions

Choose to plant and maintain native plant species, taking care not to disperse Reed Canary Grass seeds. This species must be dug up when found, as mowing will not be sufficient to kill it. When digging it out, be sure to remove the entire root mass and rhizomes, as a plant can sprout from a single rhizome. Dispose of the plant material properly, and be sure to check back for sprouting rhizomes. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

© JAMIE NIELSEN, UNIVERSITY OF ALASKA FAIRBANKS, BUGWOOD.ORG

KEY IDENTIFICATION FEATURES: Grows in dense clumps or colonies, up to 1.7m tall. Usually among the first species to emerge in the spring.

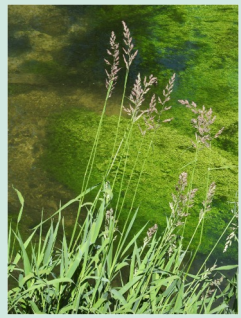
Reed Canary Grass

© RYAN HODNETT, WIKICOMMONS

Reed Canary Grass

© P.A. NONENMACHER, WIKICOMMONS

Inflorescence



© ROBERT FLOGAUS-FAUST, WIKICOMMONS

Leaves and flower heads

© CHRIS EVANS, UNIVERSITY OF ILLINOIS, BUGWOOD.ORG

Seed heads

© MINNESOTA MASTER NATURALIST, FLICKR

Dense colony

© LIZA_OVCHINNIKOVA, iNat

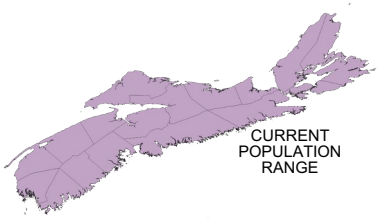
Reed Canary Grass in Fall

Other Names: Scots Pine, Caledonian Pine

Scotch Pine

TYPE: Vascular Plant

Pinus sylvestris



DESCRIPTION: Scotch Pine is a large, evergreen, coniferous tree that can grow up to 25 m tall, with an irregularly shaped crown. It has twisty needles in bundles of two, which are 4–6 cm long, blue-green, and sharp-pointed. The bark of its upper branches and trunk are yellowish to orange-brown, and its cones are 3–6 cm long.

HABITAT & IMPACT: Scotch Pine grows in many soil conditions and different moisture levels, and requires sunlight. It can escape into open woodlands, wetlands, and barrens, which threatens native biodiversity by outcompeting species and modifying ecosystems.

PATHWAY: Scotch Pine was first used in Canada during the 1920s for reforestation of abandoned agricultural lands. It became more widespread later, when used as Christmas trees, for landscaping, and as shelterbelts.

INTERESTING FACT: This species is the national tree for Scotland – hence its common name.


© NPZ, iNat

KEY IDENTIFICATION FEATURES: Pine needles about 4 to 6 cm long, bark of upper tree often orange.


©ELIZAVETA_MANOKHINA, iNat

Cone


©ELIZAVETA_MANOKHINA, iNat

Bark


© ALEKSEY_STAROSTIN, iNat

Needles

Native Alternative

Three versatile, native pine trees grow in Nova Scotia: White Pine (*Pinus strobus*), Red Pine (*Pinus resinosa*) and Jack Pine (*Pinus banksiana*).


© LADA51, iNat

Red Pine has long needles in bundles of 2


© ANDYFYON, iNat

White Pine has long needles in bundles of 5


© MATTHEW8616, iNat

Jack Pine has short needles in bundles of 2

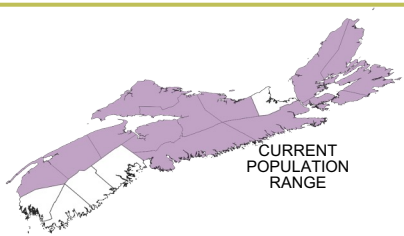
Stewardship Actions

Use native or non-invasive pine trees when plantain trees. Pull out seedlings, cut down bigger trees, and burn cones on site. If you spot this invasive species, report the location to iNaturalist, or directly to the NSISC.

White-Nose Syndrome

Pseudogymnoascus destructans

TYPE: Fungus



DESCRIPTION: White-Nose Syndrome is a fungal disease characterized bywhite fuzzy growth on a bat's snout, wings, and ears. It grows well in cool and humid underground sites, such as caves and other bat hibernacula. Weakened, infected bats suffer from increased rates of dehydration and awaken more frequently from hibernation to replenish water, but starve to death due to excessive activity. Symptoms include considerable body fat loss, winter or daytime flying, wing damage and scarring, and death.

HABITAT & IMPACT: This fungus attacks many bat species, including the Little Brown (*Myotis lucifugus*), the Northern Long-Eared (*Myotis septentrionalis*), and the Tricolored (*Perimyotis subflavus*) here in Nova Scotia. Because the fungus grows well in cold temperatures, overwintering bats in caves and other hibernacula are affected. During the winter of 2012–2013, White-Nose Syndrome caused a decline in bat populations of over 90% in Nova Scotia.

PATHWAY: This syndrome was first detected in New York State in 2006, having possibly been transported from Europe. It then spread rapidly between bats and eventually between colonies.

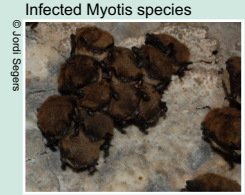
INTERESTING FACT: Generally, a female bat has only one pup per year. Bats are insect eaters, making them a vital part of North American ecosystems.

Infected Myotis species, daytime flight

KEY IDENTIFICATION FEATURES: White fungus on bat's snout, wings, or ears; bats flying in winter or during day.

Infected Myotis species

Infected Myotis species



Myotis species hibernation

Snout covered in fungus

Stewardship Actions

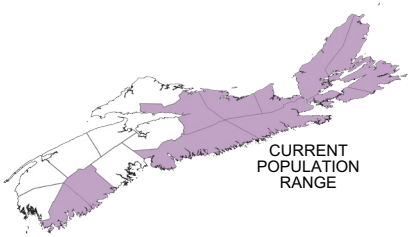
If you are travelling, try to keep your belongings free of spores and seeds by cleaning them thoroughly upon arrival. Avoid entering hibernacula (e.g. caves, abandoned mines) as your clothes, shoes, or person could spread the fungus. Avoid disturbing or handling bats. Immediately report any irregular bat behaviour, such as flying during the winter or daytime, or dying/dead bats. Upload your observation to iNaturalist and report it to the NSISC council.

Other names: Wild Angelica

Woodland Angelica

Angelica sylvestris

TYPE: Vascular Plant



KEY IDENTIFICATION FEATURES: Umbrella-like flower heads and leaf sheaths, can grow more than 2 m!

Woodland Angelica flowers

Woodland Angelica

Flower in bud

At flowering bloom

Woodland Angelica leaves

DESCRIPTION: Woodland Angelica is a large biennial member of the carrot family commonly 1-2 m tall and flowering from July to September. Its leaves are pinnately compound and leaf-sheaths are enlarged. Leaflets are ovate and often lobed, with toothed margins. Flowers are small, fragrant, white to pale-lilac, and borne in an umbel (umbrella) formation on thick bamboo-like stalks with purplish joints. It is known to be a prolific seed producer.

HABITAT & IMPACT: Woodland Angelica usually grows in open areas with damp soil including ditches, hedgerows, marshes, fields, and woodlands. It is tolerant of full sunlight, full shade, and drought, but not usually tolerant to acidic conditions. It can dominate disturbed habitats due to its prolific seed production and ability to shade out competitors. It is strongly attractive to pollinators, and may divert them from using native species. The sap of Woodland Angelica contains chemicals which can cause rashes and burns when in contact with human skin.

PATHWAY: Woodland Angelica was first introduced to North America by French settlers in the 1600s or 1700s.

INTERESTING FACT: Cape Breton and Fredericton are the ground zero of Woodland Angelica invasion in North America.

Stewardship Actions

Promote the use of attractive native and non-invasive plants for gardens and landscaping. If you identify Woodland Angelica on your property, physically remove first year plants and cut the seed heads of second year plants to stop the spread. It is recommended to wear gloves, work on cloudy days, and wash thoroughly after handling to avoid burns and rashes. Do not compost or burn plant or plant parts, instead double bag them and let them rot in the sun before discarding. If you spot this invasive species, report the location to iNaturalist or directly to the NSISC.

Species to watch in Nova Scotia

The species highlighted in this guidebook represent only a few examples of exotic organisms that have proved detrimental to our native species and ecosystems. A few others are listed here.

© DENIS DAVYDOV, iNat

Fig Buttercup, Lesser Celandine (*Ficaria verna*): Native to Europe, temperate Asia, and Northern Africa, this herbaceous perennial features dark green leaves and bright buttercup-like yellow flowers that bloom in the spring. It competes with native spring plants.

© TIPETALAURA, iNat

Scotch Broom (*Cytisus scoparius*): Native to the Mediterranean, this shrub is an escaped garden plant in North America. It has bright yellow, pea-like flowers. It threatens native biodiversity by outcompeting native plants, and produces seeds that can live in the soil for 30 years.

© LUBOŠ RAČANSKÝ, iNat

Common or Yellow Hawkweed (*Hieracium lachenalia*): Native to most of Europe, this yellow-flowered herbaceous plant was likely introduced accidentally. It threatens native plant diversity of some forest habitats, and reduces forage for wildlife.

© SVETLANA KUTUEVA, iNat

Himalayan Balsam, Purple Jewelweed (*Impatiens glandulifera*): Native to Western Himalaya, this herbaceous plant is an escaped ornamental in North America. It has soft-green to red-tinged stems and pink, helmet-shaped flowers. It spreads quickly along watercourses, threatens native biodiversity by creating dense stands that block out native species.

© ALEKSANDR EBEL, iNat

European Buckthorn (*Rhamnus cathartica*)**:** Native to Europe and Western parts of Asia, this small-tree sized shrub is an escaped cultivated plant. It has inconspicuous flowers that give rise to dense clusters of green fruit, which turn black when ripe. It threatens biodiversity by forming dense thickets that crowd out native species, and change the nitrogen composition of soil.

© ALAIN MAIRE, iNat

Common Valerian (*Valeriana officinalis*): Native to Eurasia, this herbaceous plant was intentionally introduced as a garden herb. It can be recognized by its hairy stem nodes, compound leaves with many lance-shaped segments, and fragrant flowers. It thrives in a variety of habitats, and its dense spread threatens native biodiversity by displacing native plant species.

© JIMMY_E, iNat

Autumn Olive, Oleaster, Silverberry, Autumn Elaeagnus (*Elaeagnus umbellata*): Native to temperate and tropical Asia, this deciduous perennial shrub was intentionally introduced from Japan. It threatens native biodiversity by outcompeting plants for sunlight, nutrients, and space, thereby displacing them and forming monospecific thickets.

© SOKOLOV YURIY IVANOVICH, iNat

Goutweed, Bishop's Weed, Ground Elder (*Aegopodium podagraria*): Native to most of Europe, Northern Asia, and Eastern Siberia, this small, herbaceous, perennial plant produces white flowers in mid-summer, and forms dense patches that reduce ground layer biodiversity.

© DANIEL POHL iNat

Black Locust (*Robinia pseudoacacia*): Native to the Appalachian Mountains, this medium sized tree was intentionally planted throughout North America as a useful pioneer species in poor soil locations. It threatens native biodiversity by aggressively invading dry and nutrient-poor locations, outcompeting native plants, and shading out other species.

Species to watch in Nova Scotia

© ROBERTDIFRUSCIA, iNat

LDD Moth(*Lymantria dispar*): Native to Europe, Asia, and North Africa, the caterpillars of this species defoliate large numbers of trees by eating their leaves. Adult moths are brown or white, and caterpillars have a distinctive pattern of five pairs of blue dots and six pairs of red dots on their backs.

© PHILBENSTEAD, iNat

Brown Spruce Longhorn Beetle (*Tetropium fuscum*): Native to Northern and Central Europe, Russia, and Japan, this forest pest attacks spruce stands that are under stress from natural disturbances, and can kill a spruce tree within one to five years.

© NSOUC, iNat

Cottony Ash Psyllid (*Psyllopsis discrepans*): This invasive insect is native to Europe. Its presence damages Ash trees by sucking the sap from the leaves, which leaves the trees weaker and more susceptible to disease.

© PHAULACTIS, iNat

European Fire Ant (*Myrmica rubra*): Native to Europe and Asia, this stinging ant was likely brought to Nova Scotia in potted plants, mulch, or fill. It threatens to alter natural ecosystems that depend on specific, native species of ants. Due to its aggressive sting, it can significantly impact human enjoyment of areas where it is present in large numbers.

© HEDERA.BALTICA, iNat

European Starling (*Sturnus vulgaris*): Native to parts of Europe, Asia, and Africa, this blackish, usually white-spotted bird competes with some of Nova Scotia's native birds.

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Chinese Mystery Snail (*Cipangopaludina chinensis*): Native to Asia, this species has a distinctively large cone-shaped shell with six to seven whorls. It can quickly overpopulate freshwater habitats and outcompete native molluscs for resources. It preys opportunistically upon native fish eggs, reducing survival rates, and may also clog irrigation system intake pipes.

© JENNAMAC, iNat

Spinycheek Crayfish (*Orconectes limosus*): Native to the northern United States, this small crayfish may have been introduced into Nova Scotia as live fishing bait, or as an aquarium species. It can outcompete native aquatic species and alter habitat structure, which impacts freshwater fish that use shallow water near shoreline habitat as nurseries. It is the only crayfish found in Nova Scotia, established in Freshwater Lake in the Cape Breton Highlands National Park. Nova Scotia has no native crayfish species.

© DEVONTED, iNat

Goldfish (*Carassius auratus*): Native to East Asia, these commonly released pets are voracious predators of many native species and can alter aquatic ecosystems by increasing water turbidity.

© HAKAIINSTITUTE, iNat

Japanese Skeleton Shrimp (*Caprella mutica*): Native to Eastern Asia, this amphipod crustacean overtakes man-made structures such as buoys and mussel aquaculture socks, and may out-compete native mussel species for important resources such as food and space.

Species plaguing other parts of North America

A few high priority invasive species that are not yet in Nova Scotia are listed here. If you think you have spotted one of these species, report it to both iNaturalist and directly to the NSISC.


© LIJIN HUANG, iNat

Kudzu (*Pueraria montana*): Native to Japan and southeastern China, this perennial vine was introduced to North America as an ornamental plant. Kudzu is an aggressive invasive species, growing over nearly anything in its path.


© ORDOG, iNat

European Cherry Fly (*Rhagoletis cerasi*): Native to Europe, this insect is a serious pest of cherries. Adults are small and black, with transparent wings and a yellow thorax. It contaminates and damages fruit, making it unsafe for consumption.


© BENNYSEE, iNat

Sudden Oak Death (*Phytophthora ramorum*): Caused by a water mold pathogen, this disease kills Oak trees. It causes cankers to form on trees, that ooze red or black, and turns leaves yellow. Loss of Oak trees reduces biodiversity, wildlife habitat, and water quality in forest ecosystems.


© GCHORVATH, iNat

Oak Wilt (*Bretziella fagacearum*): Caused by a fungal pathogen, this disease also kills Oak trees. Infected trees begin to lose their leaves at the top of the crown, and the leaves turn bronze in color. Trees infected with Oak Wilt do not typically survive longer than one year.


© TOMFIELD, iNat

Spotted Lanternfly (*Lycorma delicatula*): Native to Asia, the Spotted Lanternfly is a fruit tree pest and could have a major socio-ecological impact on Nova Scotian agriculture if it were to become established here. Its wings are light grey, with black spots and red underwings.


© AUDREY PONOMAREV, iNat

Brown-Tail Moth (*Euproctis chrysorrhoea*): Native to Europe, this invasive species poses risks to biodiversity and native species, as well as human health. It competes with native species for resources. Its caterpillar hairs cause reactions similar to the effects of Poison Ivy on sensitive individuals.


© JEFF GARNER, iNat

Brown Marmorated Stink Bug (*Halyomorpha halys*): Native to Asia, this species is considered a serious agricultural pest because adults and nymphs feed on the fruit flesh of many crops. It is of ecological concern as well because it eats all vegetative parts of plants: flower buds, leaves, and stems.


© AUDREY PONOMAREV, iNat

Nun Moth (*Lymantria monacha*): Native to Eurasia, this moth poses a threat to the health of native trees, specifically conifer forests. It is moderately sized, hairy, and often stout bodied. It has white forewings with dark, transverse, wavy lines and patches. Its larvae feed on leaves or needles, which is harmful to the overall health of a tree.


© AWIL I PRO, iNat

Pine Shoot Beetle (*Tomicus piniperda*): Native to Europe, North Africa, and Asia, this beetle was brought to North America unintentionally, probably while transporting lumber. It causes damage to new Pine shoots. Coupled with larval feeding and pathogenic fungal introduction, it can be lethal to Pine populations.

Species plaguing other parts of North America


© BENANNA, iNat

Asian Longhorn Beetle (*Anoplophora glabripennis*): Native to Asia, this beetle readily attacks and kills many hardwoods trees, and especially Maple trees – a culturally and ecologically important Canadian species.


© ANDREAS TAEGER, iNat

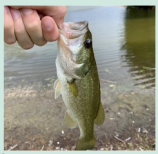
Elm Zig-Zag fly (*Aproceros leucopoda*): Native to parts of China and Japan, this fly causes severe defoliation of Elm trees. Its larvae leave a distinctive zig-zag pattern in leaves while feeding. Adults are shiny black with very thin bodies.


© ANDREW BRINKER, iNat

Snake Fungal Disease (*Ophidiomyces ophiodiicola*): An emerging disease in North America, this fungus causes skin infection in snakes, and has potential to threaten snake populations. Signs of this disease include crusted or ulcerated scales, abnormal bumps on the skin, abnormal molting cloudiness in the eyes not associated with molting, and facial disfiguration.


© BAPAPETER, iNat

Eurasian Watermilfoil (*Myriophyllum spicatum*): This freshwater aquatic plant is native to Eurasia, and is believed to have been introduced intentionally, or possibly as an aquarium escape in the United States. It can form dense infestations that crowd out native species. It is found in some parts of New Brunswick, but has not yet been observed in Nova Scotia.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Largemouth Bass (*Micropterus salmoides*): Native to eastern-central North America, this freshwater fish has expanded its natural range through accidental introductions and unauthorized transfers between bodies of water. A top predator, it primarily eats other fish, but will eat insects, crustaceans, and even frogs. Its introduction can dramatically alter natural food webs.


© THOMAS MESAGLIO, iNat

Invasive Carps (*Cyprinus carpio, and others*): Native to Russia and China, this freshwater fish species has been found to outcompete native species. It voraciously eats aquatic plants, causing devastating damage to wetlands.


© OGEUKORD, iNat

Zebra and Quagga Mussels (*Dreissena polymorpha*): Native to the Black and Caspian Seas, these small freshwater mussels were likely introduced to Canada via ballast water. These mussels can outcompete native species for resources, alter aquatic habitats, and damage infrastructure.


© GAILTV, iNat

Didymo (*Didymosphenia geminata*): This alga is native to Europe, Asia and parts of North America. It forms dense algal blooms on submerged surfaces, which can cover stream bottoms entirely. This algae species is now found in several northeastern states.


© NICOOROWITSCH, iNat

Chinese Mitten Crab (*Eriocheir sinensis*): Native to the northwestern Pacific Ocean, this crustacean has been known to drive native invertebrates to extinction, and can even cause river bank erosion where it burrows.

INVASIVE SPECIES
IN NOVA SCOTIA

Invasive Alien Species are a group of species that have been introduced to Nova Scotia by humans and threaten us and the environment. In the last several hundred years, many human-assisted pathways have permitted these introductions, which threaten our province's incredible biodiversity and jeopardize the health and integrity of natural ecosystems. This has, in turn, placed added pressure on our oceans, forests, and watersheds. We all depend on these vital natural resources for our own wellbeing and prosperity; it's in our best interest to take note and to take action. This guidebook outlines some of the impacts and threats presented by these species, and stewardship actions that we can all take to help provide healthy and vibrant ecosystems for future generations.

Nova Scotia Habitat Conservation Fund
Contributions from Hunters and Trappers

Cape Breton University

E. C. Smith Herbarium
Acadia University, Wolfville, NS

Acadia University

K.C. Irving Environmental Science Centre
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