Invasive Plant Identification and Management

Land Stewardship Volunteer Training Manual

Barnstable Land Trust

2021 Edition

Acknowledgments

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Introduction

Background and Purpose

The Barnstable Land Trust (BLT) is a community-supported nonprofit whose mission is to preserve the natural resources and special places in the Town of Barnstable and nearby areas. BLT actively stewards about 750 acres through direct management projects and protects about 350 acres through Conservation Restrictions. Invasive plant growth control and prevention constitute a large part of the land stewardship work of BLT. To achieve the goal of stewarding our protected spaces to serve their best possible conservation role, removing invasive plants to support native habitat is vital. For this reason, plant identification is a necessary skill to successfully manage invasive plants. The following guide contains identification material on some of the most common and problematic invasive species seen across Barnstable Land Trust properties.

Defining Invasive Species

The Massachusetts Invasive Plant Advisory Group (MIPAG) has deemed 66 plant species as invasive (35) or likely invasive (31) to the state. MIPAG defines invasive plants as "nonnative species that have spread into native or minimally managed plant systems...These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."[1]

Oriental bittersweet (*Celastrus orbiculatus*) smothering trees.

Every natural area has a set of plants and animals that, without human interference, are naturally present. These are considered native species. Nonnative species are plants that have been introduced from other regions or countries, usually by humans. For Cape Cod, and most locations in the United States, nonnative plants have been introduced for gardening or landscaping purposes. Most of these species are relatively harmless because they stay contained to where they are planted and are easy to control. However, some nonnative plants have an ecological advantage and can rapidly spread and outcompete local species, characterizing them as an invasive species. Common traits of invasive plants include (1) having few to no natural predators, (2) having a longer leaf season to capture more sunlight, (3) releasing chemicals into the soil that deter the growth or germination of other plants, (4) producing seeds with high germination rates, and (5) producing fruit that is very attractive to and easily dispersed by birds. With these advantages over native plants, invasive plants can quickly overrun native wildlife forage areas and habitat.

The Dangers of Invasive Plants

Invasive species present a huge threat to native ecosystems, particularly sensitive wetlands and areas that are in recovery from disturbance, such as wildfire. According to the USDA, invasive species have contributed to the decline of nearly half of the plants listed as endangered or threatened under the

[1] Kramer, R., Lombard, K., & Brumback, B. (2006). A Guide to Invasive Plants in Massachusetts. Massachusetts Division of Fisheries and Wildlife.

Endangered Species Act[2]. Besides direct habitat loss from humans, invasive species are the second largest cause of both plant and animal species endangerment in the United States. The harm caused by invasive species extends far beyond just the destruction of native ecosystems. The U.S Fish and Wildlife Service published an article[3] on the cost of invasive species stating that the U.S "…will spend $100 million on invasive species prevention, early detection and rapid response, control and management, research, outreach, international cooperation and habitat restoration."

The Importance of Native Plants

Native plants promote biodiversity and stewardship of our natural heritage. Biodiversity is the presence of a large variety of species that coexist in an area. Native plants are the foundation for a healthy ecosystem and the base of the food web. Our native wildlife has coevolved with our native plants, resulting in the grand majority of wildlife relying on these native plants for food and shelter. Wildlife are often very specialized to feed on or nest in specific species of native plants. Insects especially are specialist feeders, feeding only on a few select plants pertaining to that insect. Monarch butterflies are a popular example of specialist feeders. Their caterpillars will only feed and grow on milkweed in order to grow to adults and complete their life cycle. According to Doug Tallamy, author of Nature's Best Hope, 90% of plant-eating insects rely on the plants they have co-evolved with in order to feed, grow and reproduce – meaning native plants. Considering that over 90% of a baby bird's diet are insects, native plant availability is an essential connection to the survival of our birds. In recent years, observations in stark bird population declines have been linked to the disruption in native plant availability due to vast invasive plant intrusion, yielding fewer insects to feed on.

A Black-capped Chickadee with a caterpillar. Caterpillars make up 90% of the diet of baby birds.

Barnstable Land Trust recognizes the important role native plants have in our ecosystems. With the threats of development and other factors to our ecosystems, we are determined to provide valuable native sanctuaries for vulnerable wildlife and native plant species to the best of our abilities. Invasive plant management is an essential practice and common focus of our land stewardship projects in order to achieve this long-term goal.

Management Strategies

There are several strategies that BLT incorporates either separately or combined in approaching effective invasive plant management and native plant support:

Hand-pulling: Many invasive species can be simply pulled out of the soil, allowing the entire plant to be removed. When pulling, it is important to not disturb the soil more than necessary as this can create new opportunities for invasive plants to establish. Small plants can be pulled best when the soil is moist. Put fingers on either side of the plant and pull straight out to minimize soil disturbance. Larger plants can be pulled with a tool known as the 'weed wrench' or 'uprooter', utilizing leverage. Pulled plants can

[2] https://www.fs.fed.us/wildflowers/invasives/index.shtml

[3] https://www.fws.gov/verobeach/PythonPDF/CostofInvasivesFactSheet.pdf

be left in place with roots exposed and not in contact with soil. Asiatic bittersweet can often be controlled by pulling. Any exposed soil should be seeded with native plant seed.

Cutting/Mowing: Also referred to as 'vegetation harassment,' cutting or mowing of invasive plants can be used to reduce plant biomass, starve them of carbohydrates, and generally slow their growth and vigor over time. Some species can be eliminated by repeated cutting and/or mowing. Cutting or mowing is a less effective strategy to remove invasives as it leaves the root system intact and ready to re-sprout, but it is a management tool if full plant removal is not feasible during a season. BLT only mows areas in the early spring or into the fall in order to avoid damaging active wildlife habitat, such as turkey nesting areas. During the growing season, BLT will brush cut invasive plants with hand tools only.

Solarizing/Smothering: This strategy can be effective for tough, hard-to-control invasive species. This method is applied by securing tarps over large, infested areas, utilizing the heat from the sun to kill the plants and sterilize the soil. To be effective, materials used for solarizing/smothering must be stable and impermeable over multiple growing seasons. This technique can be unsightly, especially when kept in place for multiple years. Japanese knotweed can be controlled by this method.

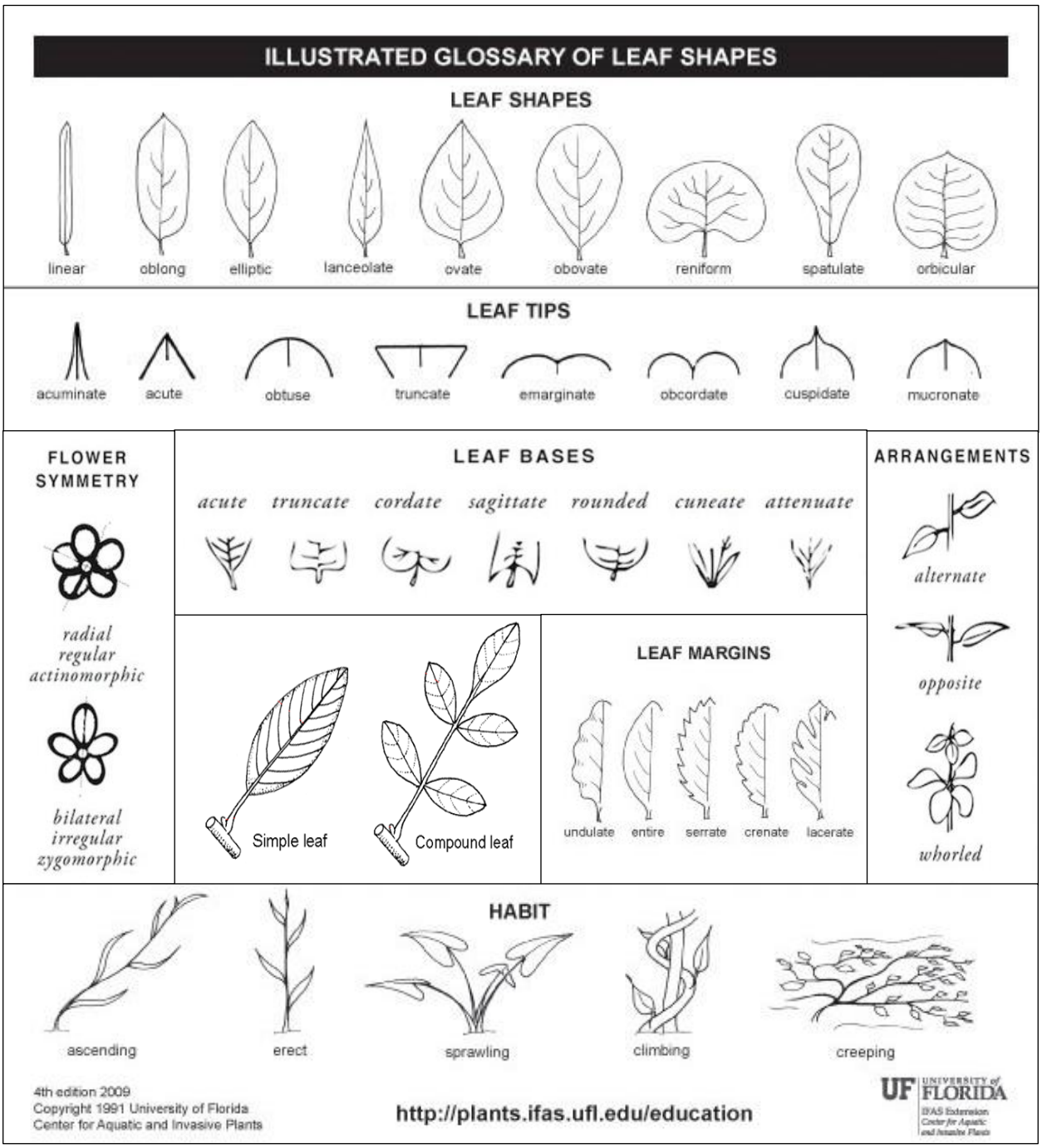
Tarps placed to solarize plants.

Herbicide: Herbicides are one of the most effective methods in controlling invasive plants. Herbicides can only be applied by licensed applicators as required by the state, in order to ensure that herbicides are used sparingly, and the correct herbicide is used in the appropriate environment and on the appropriate plant(s). BLT supports the use of herbicides in a targeted, direct-contact manner. BLT prefers to use herbicides only for stump treatments or direct plant contact application. BLT will refrain from spraying unless deemed necessary for gaining control of an infestation. Director of Land Stewardship, Kelly Barber, has several years of direct experience with herbicide application and its ecologically responsible use.

Plant Identification

Key Plant Features and Terminology

It is vital that no plant is harassed or removed without positive identification as an invasive species. The goal of invasive plant management is to encourage the growth of native species. Removing native species, even accidentally, will allow invasive plants to capitalize on the disturbed area.



Autumn Olive
Elaeagnus umbellata

Other common names: Japanese Silverberry
Origins: Japan
Plant Form: Shrub
Deciduous/Evergreen: Deciduous
Leaf/Branch Arrangement: Alternate
Key Features:

- **Buds:** Look like small coffee beans
- **Leaves:** Dark green with undulating edges, underside of leaves are light and shimmer when they catch the sun
- **Bark:** Young twigs or shoots are grey but sometimes copper in color; Older bark is grey with brown vertical fractures; Can have thorn-like spines
- **Flowers:** Small clusters of pale flowers with four petals
- **Fruit/Seed:** Small, bright red berries in autumn; edible to humans. Berries are very small and brown in the summer
- **Advantage(s) over Native Plants:** Flowers and fruits prolifically – one shrub can produce thousands of berries. Berries are attractive to and dispersed by birds. Drought tolerant and can grow in a variety of soil and moisture conditions. Nitrogen-fixing capabilities, giving it a competitive advantage in nutrient-poor soil. Forms a dense, shaded understory layer, displacing native species and preventing them from receiving sunlight.

Glossy Buckthorn
Rhamnus frangula

Other common names: glossy false buckthorn
Origins: Europe
Plant Form: Shrub
Deciduous/Evergreen: Deciduous
Leaf/Branch Arrangement: Alternate
Key Features:

- **Buds:** Rounded bean with tiny fuzz
- **Leaves:** Dark green in obovate or elliptical shape with entire margins sometimes with a pointed tip
- **Bark:** Smooth grey-brown with speckled lenticels; new growth has a reddish tint
- **Flowers:** small, yellow-green umbels with 1-8 flowers
- **Fruit/Seed:** Small, red, fleshy berries that darken to a deep purple/black color
- **Advantage(s) over Native Plants:** Highly moisture tolerant and can grow in various types of soil. Capable of forming a dense shrub layer and forming monocultures outcompeting native plants for space or light, leading to a decrease in native biodiversity.


Plant Form


Young Bark


Buds


Fall Leaves


Leaves


Flowers


Mature Bark


Leaves

Oriental Bittersweet
Celastrus orbiculatus

Origins: East Asia
Plant Form: Woody vine
Deciduous/Evergreen: Deciduous
Leaf/Branch Arrangement: Alternate
Key Features:

- **Buds:** Small lumps
- **Leaves:** Small, simple elliptical or round leaves with serrated edges, sometimes has a pointed tip
- **Bark:** Striated brown bark that turns grey as it ages, new growth is green and smooth
- **Flowers:** Clusters of 2-3 small greenish-white flowers that are not very showy
- **Fruit/Seed:** Yellow berries that split open when ripe to reveal bright red arils.
- **Advantage(s) over Native Plants:** Covers, shades, and outcompetes native plants. Climbs up trees and into the canopy taking up space and blocking light which prevents them from photosynthesizing and may lead to death. Adds weight to branches, breaking them.

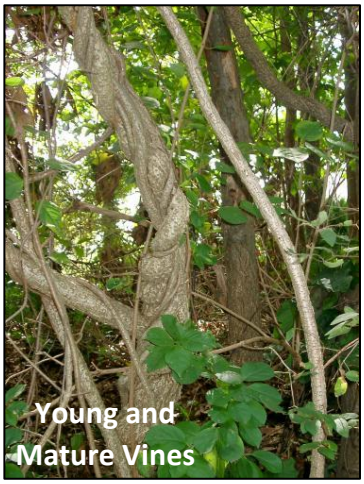

Plant Form


Leaves


Flowers


Berries


Leaves


Young and Mature Vines


Mature Vine wrapping around Tree

Common Reed
Phragmites australis

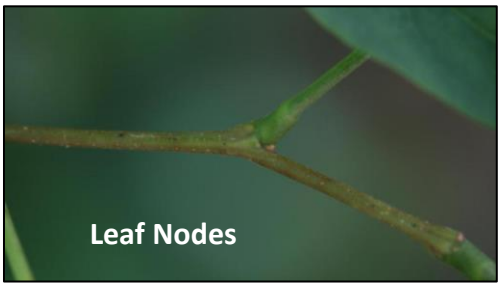
Origins: Europe
Plant Form: Grass
Deciduous/Evergreen: N/A (herbaceous)
Leaf/Branch Arrangement: Alternate
Key Features:

- **Young Shoots:** Purple-brown seed plumes, slender green stem.
- **Mature Stalks:** Lower leaves will fall off the now tan stem.
- **Leaves:** Long, smooth leaves extend straight up from the main stalk
- **Flowers:** Dense, fluffy plumes that turn tan in the winter
- **Fruit/Seed:** Little purple seeds are encased in the plumes.
- **Advantage(s) over Native Plants:** Forms dense stands that are destructive to wetland habitats and poses a significant fire hazard when dry.

Black Locust
Robinia pseudoacacia

Origins: Southeast United States
Plant Form: Tree
Deciduous/Evergreen: deciduous
Leaf/Branch Arrangement: Alternate
Key Features:

- **Buds:** Subtle knobs between thorns
- **Leaves:** Pinnately compound with an odd number of dark green, oblong leaflets
- **Bark:** Brown, deeply furrowed with flat ridges; saplings are smooth and green with large spikes
- **Flowers:** White, pea-like flowers mature into flat pods in the fall
- **Fruit/Seed:** 4-8 reddish-brown seeds in each pod
- **Advantage(s) over Native Plants:** Large fibrous root system that can form monocultures. Possesses nitrogen fixing abilities.

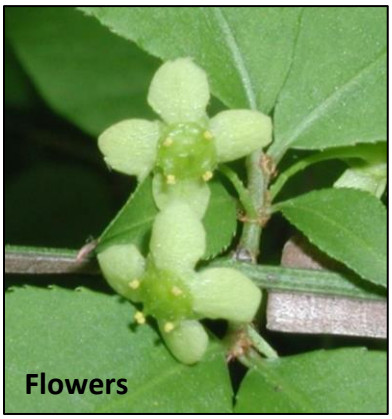


Winged Burning Bush
Euonymus alatus

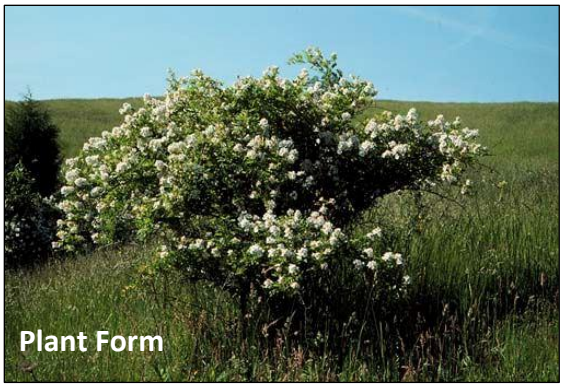
Other common names: winged *Euonymus*, burning bush

Origins: East Asia
Plant Form: Shrub
Deciduous/Evergreen: Deciduous
Leaf/Branch Arrangement: Opposite
Key Features:

- **Buds:** Shaped like a spearhead with overlapping scales
- **Leaves:** Dark green elliptic leaves with serrated edges; turn bright red and purple
- **Bark:** Brown and green branches with papery wings
- **Flowers:** Small, four-parted flowers
- **Fruit/Seed:** Red-purple capsules that split open to reveal orange arils
- **Advantage(s) over Native Plants:** Forms dense thickets that displace native vegetation. Virtually no natural predators feeding on or killing the bush.



Multiflora Rose
Rosa multiflora



Origins: East Asia
Plant Form: Shrub
Deciduous/Evergreen: Deciduous
Leaf/Branch Arrangement: Opposite
Key Features:

- **Buds:** reddish-pink little nubs
- **Leaves:** Pinnately compound with 7-9 leaflets, which are oblong with serrated edges
- **Bark:** Stems are red to green with scattered, broad thorns
- **Flowers:** Clusters of radially symmetrical white flowers with 5 petals
- **Fruit/Seed:** small, red elliptic rose hips emerge in the summer and remain through winter
- **Advantage(s) over Native Plants:** Forms dense thickets restricting human, livestock, and wildlife movement and displacing native vegetation

Garlic Mustard
Alliara petiola

Origins: Europe
Plant Form: herb, forb
Deciduous/Evergreen: N/A (herbaceous)
Leaf/Branch Arrangement: alternate
Key Features:

- **Young Shoots:** Kidney-shaped toothed leaves grow radially around the base.
- **Mature (2nd Year) Plants:** Upper leaves are more triangular.
- **Leaves:** Round with heart shaped base in the first year, cordate shaped with toothed edges in the second year; green year-round
- **Flowers:** Small, radially symmetrical white flowers with 4 petals
- **Fruit/Seed:** Long, blunt siliqua contain multiple dark seeds.
- **Advantage(s) over Native Plants:** Invades the understory of a forest and emerges earlier than native plants which shades out native plants. Many insects and primary consumers depend on native plants in the understory, without them the entire ecosystem is damaged.

English Ivy
Hedera helix

Origins: Europe
Plant Form: Woody vine
Deciduous/Evergreen: Evergreen
Leaf/Branch Arrangement: Alternate
Key Features:

- **Buds:** Poke straight up from the vine
- **Leaves:** Dull green with colorlight-colored veins and 3-5 lobes
- **Bark:** Light brown with white speckles
- **Flowers:** Small yellow-green umbels with 5 petals
- **Fruit/Seed:** Clusters of rounded fruit that turns from green to dull purple or black as it matures, contains 2-3 whitish seeds.
- **Advantage(s) over Native Plants:** Produces an adhesive substance that helps it cling to trees. Flourishes in shady and full sun conditions. Climbs into the canopy enveloping branches and twigs and may cause the tree to fall. Spreads rapidly creating a dense blanket and dominating native undergrowth, which may lead to the demise of an entire forest.


Plant Form


Leaves


Berries


Young Vine


Flowers


Mature Vine

Black Swallowwort
Vincetoxicum nigrum


Plant Form

Origins: Europe
Plant Form: Herbaceous vine
Deciduous/Evergreen: Deciduous
Leaf/Branch Arrangement: Opposite
Key Features:

- **Young Shoots:** Elliptic leaves that appear glossy and shiny.
- **Mature Vines:** Will intertwine with itself and any nearby plants.
- **Leaves:** Dark green, ovate shaped leaves with entire margins and a rounded or subcordate base
- **Flowers:** Clusters of 6-10 small, radially symmetrical flowers each with five dark purple petals
- **Fruit/Seed:** Slender, green, spindle-shaped pods containing numerous small brown seeds which have little tufts of white hairs. Pods brown as they mature
- **Advantage(s) over Native Plants:** Can tolerate a wide range of light and moisture conditions. The seeds are light and can spread long distances via wind. The root crown is a dense clump of rhizomes that can regrow even after being cut. Monarch butterflies mistake swallowwort for milkweed and lay their eggs in it, but swallowwort is poisonous causing the larvae die. **It also releases toxins into the soil that prevents** growth of other plants (it is allelopathic).


Flowers


Seed Pod


Mature Seed Pods


Plant Form


Plant Form

Native Plants Commonly Mistaken as Invasive

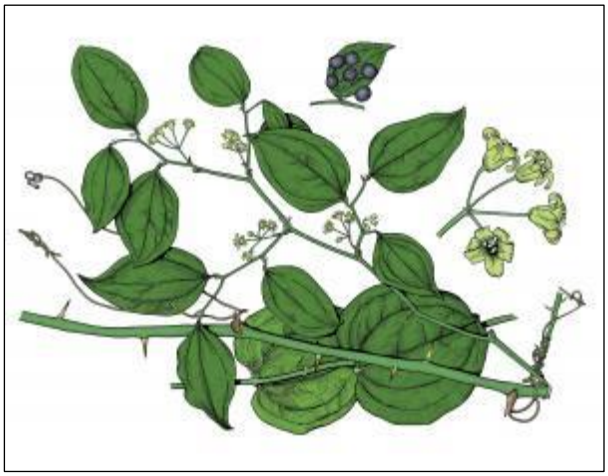
Sometimes plants are mistaken for being invasive but are native and beneficial to the local environment. Just because a plant may appear to be dominating an area does not make it invasive. Here are some examples of commonly mistaken 'invasives':

Poison Ivy - *Toxicodendron radicans*

- Birds rely on its berries during fall migration
- Deer and small mammals eat various plant parts
- Stabilizes pond banks and dunes

Fox Grape – *Vitis labrusca*

- Its flowers are cross pollinated by bees
- Various insects feed off the plant
- Mammals and birds eat the berries
- Because the plant attracts many insects, bug eating birds are drawn in



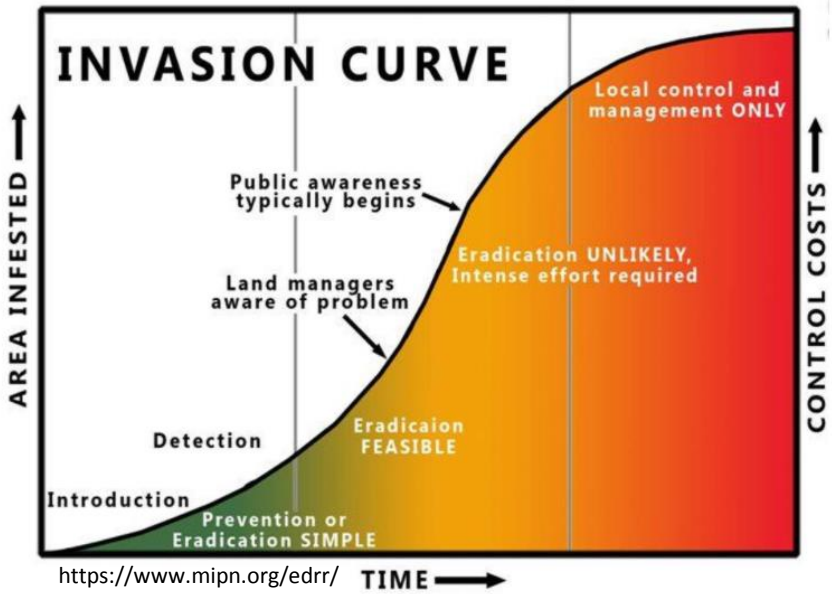
Roundleaf Greenbrier – *Smilax rotundifolia*

aka common greenbrier, catbrier

- Provides cover for small animals and birds
- Eaten by birds, small mammals, and deer

Early Detection and Intervention.

Early detection and Intervention is a federal program intent on discovering invasive plants before they become well-established. Doing so will help diminish damage to ecosystems, prevent the loss of habitat for native plants and animals, and prevent costly natural resource management. The plants covered in this guide are BLT's most frequent targets, but all observed invasive plants are targets. The easiest way to control invasive plants is to prevent invasions in the first place. Realistically, it is impossible to monitor all our properties all the time. Fortunately, invasive plants often undergo a lag period between introduction and complete colonization of a new area. It is then when we intervene to eradicate it before populations become well established.



https://www.mipn.org/edrr/

Invasive Plants on Early Detection and Intervention List[4]:

- Barberry - *Berberis vulgaris*
- Privet - *Ligustrum sinense*
- Cypress spurge - *Euphorbia cyparissias*
- Giant hogweed - *Heracleum mantegazzianum*
- Japanese honeysuckle - *Lonicera japonica*
- Japanese stiltgrass - *Microstegium vimineum*
- Kudzu - *Pueraria montana*
- Mile-a-Minute weed - *Persicaria perfoliata*
- Norway maple - *Acer platanoides*
- Periwinkle - *Vinca minor*
- Porcelain berry - *Ampelopsis brevipedunculata*
- Sheep fescue - *Festuca ovina*
- Spotted knapweed - *Centaurea stoebe*

[4] Information taken from The Massachusetts Invasive Plant Advisory Group's annotated species list 'Likely Invasive', https://massnrc.org/mipag/linvasive.htm

Note: This guide will continue to be added and enhanced as new information is gathered.

Barnstable Land Trust would like to thank all its volunteers for their ongoing work to support the native communities we protect.

Thank you.

Glossary

Allelopathic: releases chemicals into the environment where it affects the development and growth of neighboring plants

Alternate: only one leaf attaches to a stem at a point and the direction alternates for leaves along a stem

Biennial: grows vegetatively for the first year, then flowers and dies the next

Biodiversity: the variety of life in a particular habitat or ecosystem.

Compound: a leaf divided into multiple leaflets

Deciduous: a plant that sheds its leaves over the winter and regrows new leaves each year

Early Detection and Intervention: management intervention aimed at locating new individuals, sites, or areas of establishment or spread of invasive alien species with the goal of enabling a rapid response (eradication) to that new invasive alien species

Elliptical: Shaped like an ellipse, generally symmetrical, elongated, and evenly rounded at both ends

Entire: a leaf has no serration or lobing; the edge of the leaf is smooth and continuous when viewed from above

Forb: an herbaceous flowering plant other than grass

Glaucous: dull grayish-green or blue color

Herbaceous: a plant that lacks a persistent woody stem

Herbicide: substance that is toxic to plants, used to destroy unwanted vegetation

Invasive: A nonnative species whose introduction does or is likely to cause economic or environmental harm or harm to human health

Lamina: the flat part of a leaf; the blade, which is the widest part of the leaf

Leaflet: a unit of a compound leaf

Legume: plant family that grows seeds in pods

Lenticel: a slightly raised area in the bark of a stem or root that permits the interchange of gases between interior plants tissues and the surrounding air

Lobe: a usually rounded bump that is slightly divided from the main leaf; sometimes gives the appearance the leaf has a thumb

Monoculture: the cultivation of a single crop in a given area.

Native: plant species naturally occurring in a given range, not introduced to an area by humans

Nitrogen Fixing: the process of converting atmospheric nitrogen into a soluble form usable by plants as fertilizer

Node: place of attachment of leaf to stem

Nonnative: plants that have been introduced from other regions or countries

Opposite: leaves grow in pairs along the stem that attach to the stem at the same point but grow in different directions

Perennial: a plant that will grow and reproduce over more than two growing seasons

Petiole: stalk that extends from the stem to the base of the leaf

Pinnate: arranged on opposite sides of a central stem, i.e., a column of leaflets

Rapid Response: a management intervention aimed at quickly eradicating or controlling new incursions of invasive alien species before they become established or widespread.

Rhizomes: underground stem that grows horizontally that can send up new shoots

Serration: has teeth like points around the edges of the leaf that resemble a serrated knife or a saw

Stand: a large clump of plants of the same species

Stipule: small green appendage usually found at the base of the petiole

Undulating: the leaf edge is wavy and not flat when viewed from the side

Resources

Websites

Invasive Species Database run by USDA and University of Georgia - https://www.invasive.org/101/index.cfm

Mass Audubon Invasive Species Info - https://www.massaudubon.org/learn/nature-wildlife/invasive-plants

Massachusetts Invasive Plant Advisory Group (MIPAG) - https://massnrc.org/mipag/index.htm

MassWildlife Publication on Dangers of Invasive Plant Species - https://www.mass.gov/doc/theinvasive-plant-problem/download

Native Plant Trust Plant Identification Key - https://gobotany.nativeplanttrust.org/

U.S. Department of Agriculture Invasive Species - https://www.invasivespeciesinfo.gov/

United States Environmental Protection Agency - https://www.epa.gov/endangered-species

University of Georgia Invasive Species Map and Database - https://www.eddmaps.org/species/

USDA Database of American Species - https://plants.sc.egov.usda.gov/java/

City of Portland Environmental Service - https://www.portlandoregon.gov/bes/article/330681

Books

Bringing Nature Home - Doug Tallamy

Bark: A Field Guide to Trees of the Northeast - Michael Wojtech

Recognizing Trees of the Northeast - Mark Mikolas

Guide to Invasive Plants in MA - MassWildlife

Wildflowers of New England - New England Wildflower Society

Wildflowers of Cape Cod and the Islands -Kate Carter

Phone Apps

iNaturalist - https://www.inaturalist.org/

PictureThis - https://www.picturethisai.com/

PlantSnap - https://www.plantsnap.com/

PlantNet - https://identify.plantnet.org/

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