Maine Invasive Plants Field Guide

Maine Natural Areas Program
Department of Agriculture, Conservation and Forestry

*i*MapInvasives

Sharing information for strategic management

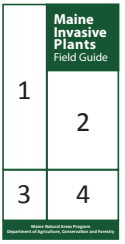
*i*MapInvasives is an online mapping tool for landowners, citizen scientists, and natural resource professionals. It's free, it's simple to use, and it can help you keep track of what species are in your area or under management on your property. Your entries also help scientists understand invasive species distributions.

For more information,
visit the *i*MapInvasives website.

imapinvasives.org

Cover Photos

1. **Black swallowwort**
2. **Shrubby honeysuckles**; Leslie J. Mehrhoff, University of Connecticut, Bugwood.org | 5479291
3. **Japanese stiltgrass**; Leslie J. Mehrhoff, University of Connecticut, Bugwood.org | 5483888
4. **Purple loosestrife**; Leslie J. Mehrhoff, University of Connecticut, Bugwood.org | 5479671



MIPFG-2019

Maine Invasive Plants
Field Guide

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maine.gov/dacf/mnap

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GRAPHIC KEY

COMMON NAME

(Alternate name)

Botanical name

Status in Maine

RANKING

CATEGORIES

ACKNOWLEDGEMENTS

This field guide was a true team effort.

Nancy Olmstead and Mary Yurlina are the lead authors, and Lisa St. Hilaire helped with editing, formatting, and gathering photographs.

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MAINE WOODLAND OWNERS

Maine Woodland Owners' mission is to promote stewardship of Maine's small woodland resources, provide information for better forest management, and advocate for Maine's small woodland owners.

mainewoodlandowners.org

The Maine Department of Agriculture, Conservation and Forestry (DACF) is the State of Maine's support center for Maine's many land-based, natural resource interests. DACF supports natural resources including Maine agriculture, forests, outdoor recreation and public access. The Maine Natural Areas Program (MNAP), within DACF, works to ensure the maintenance of Maine's natural heritage for the benefit of present and future generations. MNAP serves Maine's citizens as the most comprehensive source on the State's important natural features, and provides objective information to help land managers make informed decisions.

maine.gov/dacf
maine.gov/dacf/mnap

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What Is an Invasive Plant?

Invasive plants are more than just weeds. Any plant can be a weed if it grows where it is not wanted. Invasive plants are those which are not native to a region, and which cause harm to the environment, human health, or human economic resources (e.g., agriculture or forestry). Within this framework, this guide focuses on terrestrial and wetland species known to invade natural areas of Maine or New England.

New England has a long history of plants being introduced from elsewhere – about 30% of the ~3,500 plant species known here are not native. However, only about one in ten of those non-native, naturalized species becomes invasive, causing harm to natural areas, human health, or economic resources.

Because these species are new to our area, native plant-eaters such as caterpillars, other insects, and deer generally do not eat them. In addition to this advantage, some invasive plants leaf out earlier than natives, keep photosynthesizing later into the fall, and/or change soil chemistry to favor their own growth at the expense of native plants. These competitive advantages allow invasive plants to pour their energy into making lots of flowers, fruits, and seeds. Unfortunately, invasive plant seeds move around via songbirds, game birds like turkeys, wind, and water. People also move invasive plants (seeds, plant parts like rhizomes, or entire plants), usually accidentally on equipment, in soil/fill, or with ornamental plantings. Seeds and plant parts can also move around via the movement of flood water.

Why Are Invasive Plants a Problem?

Invasive plants can crowd out native plants in the forest understory, preventing growth of native trees, shrubs, and herbs. Other invasive plants form monocultures in salt marshes, excluding salt-marsh-nesting birds. Riverbank forests, often home to rare plants and heavily used by wildlife, suffer greatly from invasion by plants like Japanese knotweed which can form dense stands, altering the habitat in significant ways. In forests and fields, thickets of Japanese barberry and shrubby honeysuckles create favorable habitat for disease-carrying ticks. For all of these reasons and more, invasive plants are a serious threat to Maine's natural areas. The good news is that there is much we can do to stop and reverse the damage.

What Can We Do About Invasive Plants?

First, we can learn to recognize them. Even if you've never paid much attention to plants before, with some practice, you can learn which ones are the invaders and keep an eye out for them on your property, on public land where you hunt, fish, and recreate, and even along the roadways. You can use the online mapping tool, iMapInvasives, to note locations of invasive plants – for more information, see ***i*mapinvasives.org**.

Second, we can choose to plant native species on our own properties. This is a simple but important point – our kids and wildlife will benefit from a healthier system if we choose to keep it native.

Third, we can remove invasive plants already present on our properties or on our public lands. You can work with your local conservation commission to organize a work day at your Town Forest or other public recreational area, or work with your local land trust to help them address invasive plants on properties in your area. Be sure to correctly dispose of invasive plants – see the Disposal Guidance section at the back of this guide. Follow all label directions and herbicide rules when applying herbicides; see the Herbicide Guidance section for descriptions of techniques.

Lists of Invasive Plants in Maine

The Maine Department of Agriculture, Conservation and Forestry (DACF) maintains two lists of terrestrial and wetland invasive plants. The Maine Natural Areas Program maintains an advisory list of invasive plants, and the Horticulture Program maintains a list of invasive plants which are prohibited from sale in Maine. These lists are available on the DACF website. The plants in this field guide are a subset of the two lists.

Status and Rankings Presented in this Guide

A plant's status in Maine at the time of publication was determined from county-level distribution maps, authors' personal knowledge of the species, and reports from credible botanists. Invasiveness rankings come from a peer-reviewed, scientific literature evaluation overseen by the Terrestrial Invasive Plant Scientific Advisory Committee convened by DACF. Both measures are subject to change over time. Readers should seek the most up-to-date information from the DACF website* and trusted plant distribution maps such as *i*MapInvasives** and GoBotany.***

Native Alternatives to Invasive Plants

DACF maintains several websites with information about good landscaping plants to use on your property. Please visit the DACF Horticulture Program website to access this information. There are many beautiful, beneficial native plants, or well-behaved non-native plants, to use instead of invasive plants.

*** maine.gov/dacf**

**** *i*mapinvasives.org**

***** gobotany.newenglandwild.org**

A Note About Agricultural Systems

This Field Guide presents species which are known to cause harm to natural areas such as wetlands and forests. This is not a comprehensive guide to species of concern in agricultural settings such as row crops, pastures, or hayfields. Although some of the species included here are a problem on agricultural lands, there are other invasive plants, as well as native and non-native weeds, which are of equal or greater concern in these settings – for help with those species, please contact your local Cooperative Extension office.*

Aquatic Invasive Plants

Aquatic invasive plants such as Eurasian milfoil are a threat to Maine lakes, ponds, rivers, and streams. Identification of these species is addressed in other guides available from the Maine Department of Environmental Protection (Maine DEP) **or the Lake Stewards of Maine – Volunteer Lake Monitoring Program. Suspected invasive aquatic plants should be reported to the Maine DEP, and control efforts should be coordinated with Maine DEP staff.

Herbicide Recommendations

Use of herbicides in Maine is regulated by the Maine Board of Pesticides Control (BPC),*** and may be subject to town ordinances. Before using any herbicide, make sure it is currently registered for use in Maine and that herbicide use is allowed in your town. When applying an herbicide, the applicator must follow all the label directions. The label is the law. Many herbicide application situations require a licensed pesticide applicator; refer to the Managing Invasive Plants section at the back of this field guide for details.

*** extension.umaine.edu/county-offices/**

**** maine.gov/dep**

***** maine.gov/pesticides**

SEVERELY INVASIVE

CANADA THISTLE

Cirsium arvense

Status in Maine: widespread

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Description: A creeping perennial herb, 2-5' tall, and member of the aster family. **Leaves:** Alternate, oblong, to 8", base sessile to stem clasping; margins variable, entire to deeply lobed, often wavy or crinkled looking, and very spiny. **Flowers:** Each "flower" is a compound head of ~50 flowers. Plant is mostly dioecious. Flower heads are ~½" diameter, ~1" long, and flask shaped. Several pale lilac to pinkish-purple flower heads per branching stem. Flower bracts are not spiny. **Fruit/seeds:** Each tiny, tan-colored achene has a long feathery pappus with branched hairs. **Stem:** Hollow, subtly ribbed, with few hairs. Freely branching toward top. **Root:** Has both a deep taproot (~3'), and spreading horizontal rhizomes.

Native range: Eurasia. **How arrived in U.S.:** Introduced to Canada in the 1600s as a contaminant in crop seeds.

Reproduction: Formidable capacity by both rhizomatous spread and seed production. With ~40 flower heads per plant, each plant can produce roughly 1,500 seeds. Its plumose pappus aids long distance seed dispersal. Seeds can remain viable for decades in the soil. Horizontal roots produce numerous shoots and can spread several meters in a season. Small fragments of stem or root can generate new plants.

Habitat: Disturbed sites, roadsides, agricultural areas, stream banks, floodplains, logging roads and landings. Shade intolerant.

Similar native species: Swamp thistle (*Cirsium discolor*) has larger flower heads. Leaves are more deeply lobed than Canada thistle, and not as spiny.

CANADA THISTLE

Similar non-native species: Bull thistle (*Cirsium vulgare*) is typically a larger, more robust plant, with spiny stem and a long spine on leaf midrib. Flower heads are ~2".

Control methods: Suppression can be achieved by repeated mowing (several times per season for several years), pulling, and/or cutting that exhausts the plant and eliminates seed production. Wear protective gear since the spines are sharp! Mechanical actions that result in fragmented shoots and roots are not recommended as these can create new plants if conditions are favorable. Sheep and goats are said to graze it when plants are young. Different ecotypes of Canada thistle have differing responses to herbicides, and the plants substantial below-ground biomass means that more than one application may be needed per growing season. One study found good control when the plant was cut in late July and then treated with glyphosate about a month later when in a rosette stage. Late summer or fall herbicide treatments seem to be the most effective. ***Consult a professional for large infestations.***

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SEVERELY INVASIVE

COMMON REED

(Phragmites)

Phragmites australis

Status in Maine: widespread

Description: Very tall (6-13') perennial grass growing in dense stands. **Leaves:** Alternate, entire, yellow-green to greenish blue, widest in middle, tapering toward pointed tip, very long (~8-15"). **Flowers/seeds:** "Fluffy" seed heads start brown-purple, then fade to light tan over the fall, persisting through winter. **Stem:** Round, hollow, with nodes where leaves meet the stem. Dead, tan stalks persist through winter. **Rhizome:** Dense mat of coarse interconnected roots and shoots.

Native range: Europe. **How arrived in U.S.:** Probably via ship ballast water.

Reproduction: By seed, or by fragments of rhizome dispersed in fill or by water. There are reports of seed banking but length of time is unknown. It can sprout from any rhizome fragment.

Habitat: Open wetlands and wet ditches. Especially damaging in salt marshes and freshwater marshes. It also frequently grows in roadside ditches and swales.

Similar native species: Native *Phragmites americanus* can be difficult to distinguish from the invasive *P. australis.* The native, which is infrequent in Maine, typically grows in small, diffuse stands (not dense) and is comparatively short at ~6'. Also, the middle and upper internodes of *P. australis*

are dull, ridged, and tan during growing season, while *P. americanus* has smooth, lustrous, red-brown to dark red-brown middle and upper internodes. The native typically grows in fens and tidal marshes, not in disturbed areas.

Similar non-native species: No other non-native grass is so tall. Escaped *Miscanthus* ornamental grasses are showy but do not normally occur in wetlands.

Control methods: Small patches (<50' radius) can be cut repeatedly throughout the growing season, as often as once every two weeks, for multiple years (~5-10 years), depleting root reserves and preventing flowering. This method requires diligence. Larger patches are very difficult to control manually without a persistent, reliable labor source. Herbicides are effective (though follow-up is needed). ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."*** The cut-drip method is preferred in small stands (<1 ac) as it is the most precise treatment: bundle and tape 5-10 stems (masking tape works well), cut live stems late in the growing season, then spray or drip aquatic-formulation glyphosate, with tracer dye, onto cut surface. Foliar application of aquatic-formulated glyphosate can also be effective. If possible, follow up by conducting a controlled burn in the spring following the herbicide application; this can remove old thatch and encourage native plant regeneration.

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VERY INVASIVE

DAME'S ROCKET

Hesperis matronalis

Status in Maine: widespread

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Description: Short-lived, perennial herb 2-4' tall, commonly to 3', in the mustard family. **Leaves:** In the first year and in the spring of later years, plants form basal rosette leaves which are oval-elliptical, tapered at both ends, toothed, and up to 6" long. Stem leaves are alternate, toothed, lance-shaped, 2-6" long, and mostly lack petioles. All leaves are hairy. **Flowers:** 4-petaled, ¾-1" wide, in shades of white to purple to pink, with a tubular base. Branching clusters of flowers are high on the plant and bloom over several weeks. **Fruit/seeds:** Long, thin pods form after flowering (2-5" long, <¼" wide). Pods split open when dry in late summer and fall, releasing many tiny, dark brown seeds. **Stem:** Covered in fine hairs.

Native range: Europe. **How arrived in U.S.:** Introduced to North America as an ornamental. Spread widely in wildflower seed mixes.

Reproduction: By seed. Seeds are reported to remain viable in the soil for years.

Habitat: Disturbed sites, roadsides, forest edges, wet meadows, and riparian areas. Moderately shade tolerant.

Similar native species: Fireweed (*Chamerion angustifolium*) has a taller, more spike-like inflorescence, and leaves of fireweed are only minutely toothed or entire.

Similar non-native species: Garden phlox (*Phlox paniculata*) is similar at first glance when in flower, but phlox

DAME'S ROCKET

species always have 5 flower petals and opposite leaves. Common soapwort (*Saponaria officinalis*) is another potential lookalike with 5 flower petals and opposite leaves. Hairy willow-herb (*Epilobium hirsutum*) has pink flowers with 4 notched petals, opposite leaves, and its fruit pods split to reveal long white hairs on its seeds.

Control methods: Small numbers of plants can be hand pulled or dug up, when soil is moist, preferably before they start to produce seeds. Monitor and repeat for several years until tap roots are exhausted. Dispose in trash if flowers or seeds are present, or burn. Larger infestations can be treated with a foliar application of a triclopyr herbicide in spring/early summer (before flowering) or a glyphosate herbicide in late summer/early fall. Avoid foliar herbicide application during flowering as beneficial insects could be visiting. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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SEVERELY INVASIVE

FLOWERING RUSH

Butomus umbellatus

Status in Maine: localized

Description: Perennial, herbaceous, emergent aquatic plant, 3-5' tall (~3' above water). Conspicuous when in flower. **Leaves:** Sword-like, long linear, ± flattened or weakly triangular in cross section, spongy, typically 3-5' long. **Flowers/seeds:** Umbel-like terminal inflorescences, with 20-50 flowers, on a tall, thick, round stem as tall or taller than the leaves. Pale pink flowers are 6-petaled and ~¾-1" wide. Each flower can produce up to 200 seeds. **Root:** Fleshy rhizomes that fragment easily. Field identification can be challenging; some populations do not produce flowers and some inhabit deeper water where they have a submerged form with longer, flatter leaf blades and no flowers.

Native range: Europe & Western Asia. **How arrived in U.S.:** As an ornamental.

Reproduction: Potentially up to four ways, including by seed, vegetative bulbils on flowers (similar to those on garlic scapes), vegetative bulblets on rhizomes, and rhizome fragments. The ability of populations to flower and reproduce sexually depends on their founding genome. Regardless, the plant spreads rapidly by rhizome growth and small fragments of carbohydrate-rich rhizome can easily float away to invade new sites.

Habitat: Fresh water lakes and ponds, ditches, canals, slow moving streams, and rivers. Although typically found in shallow water, which is what has been observed for Maine, it has been found elsewhere growing in a fully-submerged form in channels up to 20' deep.

FLOWERING RUSH

Similar native species: There are several native emergent plants with large sword-shaped leaves including sweetflag (*Acorus americanus*), some of the bur-reeds (*Sparganium* spp.), and native irises (*Iris* spp.). It is difficult to distinguish these species unless they are flowering or fruiting. Emergent bur-reeds have keeled (weakly V-shaped) leaves that grow alternately along the stem (vs. basal leaves in flowering rush). Sweetflag and iris leaves are flat in cross section with a noticeable mid-rib (vs. weakly triangular in flowering rush). Vegetative flowering rush is difficult to detect when mixed in with cattails (*Typha* spp.).

Similar non-native species: The non-native sweetflag (*Acorus calamus*) has flat leaves.

Control methods: Early detection and careful manual eradication are critical for control. Repeated cutting below water level throughout the growing season should eventually deplete energy reserves. Raking of plants is NOT advised. Excavation of the entire plant can work, but all parts must be collected, and special care must be given to prevent rhizome fragments and bulblets from escaping. Plant parts and especially rhizomes should be thoroughly dried and killed. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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SEVERELY INVASIVE

GARLIC MUSTARD

Alliaria petiolata

Status in Maine: localized

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Description: Erect, biennial herb. First year plants grow as low rosettes; second year plants grow leafy flowering stems up to 3' tall. **Leaves:** First year leaves are coarsely toothed and kidney shaped, 1-4" long, and form a basal rosette that overwinters. Second year leaves are alternate and coarsely toothed, varying from more kidney-shaped leaves toward the ground to more triangular leaves higher up on the stem. Crushed leaves smell like garlic. **Flowers/seeds:** Abundant ¼" white, 4-petaled flowers, produced from late April-June in its second year. Skinny seed capsules 1-2½" long split open in mid to late summer releasing tiny black seeds, several hundred per plant on average. **Root:** Tap root is white and is often S-shaped near the stem.

Native range: Europe. **How arrived in U.S.:** Brought by European settlers for food.

Reproduction: By seed dispersed via water, gravity, or in mud or animal fur. After cold stratification, most seeds germinate the first spring (April). Those that do not can remain viable for up to 6 years.

Habitat: Shade tolerant and adaptable. Floodplains, upland forests, and disturbed edges.

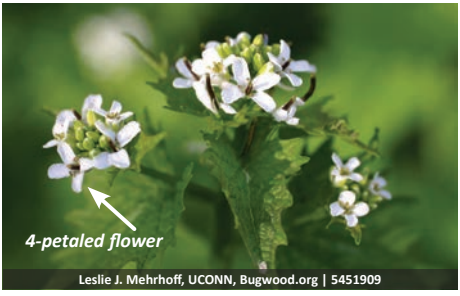
Similar native species: Violets (*Viola* spp).

Similar non-native species: Ground ivy (*Glechoma hederacea*) and other introduced mustards.

Control Methods: Plant is edible and easy to hand pull, especially from moist ground. Second-year plants that have begun to flower should be bagged for disposal as seeds can

GARLIC MUSTARD

still mature. Weed torch, weather permitting, is another effective option. Larger populations can be mowed in late spring; repeat for 3-5 years to deplete the seed bank. First-year rosettes can be controlled with a solution of triclopyr ester formulation or glyphosate; second year plants must be sprayed well before seed set. This plant flowers early in the spring with the flush of other invasive plants like barberry and honeysuckles. Be prepared for an early intervention to control seed set.



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VERY INVASIVE

GIANT HOGWEED

Heracleum mantegazzianum

Status in Maine: localized

WARNING: Avoid contact with plant sap.

Description: A very tall (over 8' and sometimes as tall as 15+'), monocarpic perennial herb; member of the carrot family. Plants require 3-5 years to reach maturity and flower. **Leaves:** Enormous (lower leaves can reach 5' wide), alternate, ternately or pinnately lobed, and deeply toothed. Bristly hairs cover the leaf underside, leaf stem and plant stalk. **Flowers:** Terminal compound umbel with many small white flowers, up to 2½' across and may produce smaller satellite umbels on other branches. **Fruit/seeds:** Elliptical, flat, dry fruits; narrowly winged; ~½" long. **Stem:** Hollow, ridged stem (2-4" diam.), covered with purple blotches and bristles. **Root:** Sturdy 2' long taproot. **WARNING:** ***Sap contains a chemical that causes severe dermatitis when skin is exposed to sun. Sap can also cause eye injury, including blindness. Wear safety gear when working with this plant and avoid contact with sap.***

Native range: Caucasus region of Eurasia. **How arrived in U.S.:** Introduced in the early 1900s as an ornamental.

Reproduction: By seed. One plant can produce 5,000 to as many as 100,000 seeds. Plant dies after flowering. Long distance dispersal is possible by water (seeds float for hours) and by humans collecting its ornamental seed heads. It has a short term persistent seed bank.

Habitat: Disturbed sites, roadsides, waste areas, agricultural areas, stream banks. Some tolerance to shade as well as salt spray.

GIANT HOGWEED

Similar native species: Giant hogweed is easily twice as big as its native lookalikes. Cow parsnip (*Heracleum maximum*) has fuzzy fine hairs on stem. Angelica (*Angelica atropurpurea*) has a smooth, waxy, green-purple stem and globe-shaped inflorescences.

Similar non-native species: Wild parsnip (*Pastinaca sativa*) is much smaller, has ribbed stems and yellow flowers. Another hogweed, *Heracleum sphondylium*, is half as large, hairier, with less purple spotting.

Control methods: Digging, gouging, or rototilling that severs the root crown from the tap root will kill the plant. Mowing has not been proven effective. Because of its enormous taproot, multiple applications of triclopyr to leaves and stems during the growing season may be needed. Glyphosate applied when leaf buds begin to appear on the root crown is also effective. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies." Control upstream populations first.*** **REMEMBER TO WEAR PROTECTIVE GEAR AROUND THIS PLANT.**

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SEVERELY INVASIVE

GIANT KNOTWEED

Fallopia sachalinensis

Status in Maine: localized

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Description: Robust, perennial herb to 12' tall, commonly to 8'. **Leaves:** Simple, alternate, entire, longer than wide (6-12" long), tapering to the tip, and with a heart-shaped base. **Flowers:** Clusters of tiny white flowers arranged in spikes toward the ends of the stems, late summer in Maine. **Fruit/seeds:** Tiny (<¼") with thin "wings" to enable wind and water dispersal. **Stem:** Straight, 1-2" diameter, round, hollow, with swollen nodes where leaves meet the stem. Dead, leafless stalks persist through winter. **Root:** Spreading horizontal rhizomes.

Native range: Eastern Asia. **How arrived in U.S.:** Introduced to North America as an ornamental.

Reproduction: Mostly by fragments of living stem or rhizome. Fertile seeds are sometimes produced, and all seed should be treated as potentially viable. Can sprout from any stem node or rhizome fragment.

Habitat: Disturbed sites, roadsides, agricultural areas, stream banks, floodplains, and logging roads and landings. Shade intolerant.

Similar native species: None in our area.

Similar non-native species: Japanese knotweed (*Fallopia japonica*) is typically shorter than giant knotweed and has smaller leaves with flat bases that are almost as wide as long. The two species hybridize (*Fallopia* x *boehemica*) and can back-cross. Japanese knotweed and the hybrid are also invasive.

GIANT KNOTWEED

Control methods: New patches (<20 stems) can be cut or dug repeatedly throughout the growing season, as often as once/week, for several years until roots are exhausted. Great care must be taken to dispose or burn the rhizomes as any fragment can start a new plant. Larger patches cannot be controlled manually without a persistent, reliable labor source. Smothering with heavy black landscaping cloth, old carpet, or erosion control fabric can be successful but requires biweekly maintenance and must be repeated for up to 10 years. Herbicides are effective. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."*** For small patches, use stem injection or cut-drip applications of glyphosate. Be sure to dispose of cut stems carefully. For large patches, cut or mow when plants are 3' tall, then apply glyphosate as foliar spray when plants have re-grown to 3-5' tall later in the same growing season, or apply to uncut, mature stems just before flowering. Avoid application of foliar herbicide during flowering as bees are attracted to this species. Follow-up will be needed in almost all circumstances.

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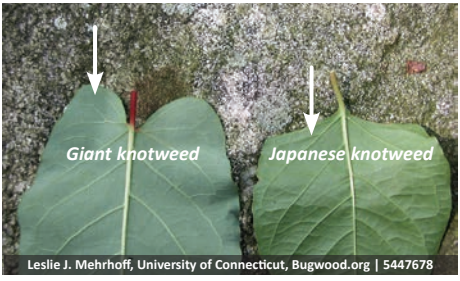

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SEVERELY INVASIVE

GOUTWEED

(Bishop's weed)

Aegopodium podagraria

Status in Maine: widespread

Description: Herbaceous, perennial ground cover, 1-2' tall, with many common names. **Leaves:** Compound with variable triternate leaflets; pointed leaflets have serrate margins. Most leaves are basal with long petioles. Wild type is a medium green color while the variegated form is pale bluish green with white margins. **Flowers/seeds:** Typical carrot family flowers; 2-5" diameter umbels of tiny white flowers atop 2-3' stalk. Plants require at least partial sun to flower. Seeds are brown, small and flat. **Roots:** Fleshy long white rhizomes, like quackgrass (*Elymus repens*).

Native range: Europe & Northern Asia. **How arrived in U.S.:** As an ornamental.

Reproduction: While research shows that goutweed's insect pollinated flowers can produce viable seed, seedlings are rarely encountered. Its branching network of rhizomes allows it to grow aggressively away from plantings or colonize a new site via contaminated soil.

Habitat: Moist soil and light shade are preferred garden spots, but goutweed is content in many habitats. It typically enters forests from runaway plantings or via fill contaminated with rhizome fragments.

Similar native species: Golden alexanders (*Zizia aurea*) has somewhat similarly shaped leaves but yellow flowers. Anisewood and sweet-cicely (*Osmorhiza* spp.) also have somewhat similarly shaped leaves but are anise-scented,

GOUTWEED

fruit (seeds) are elongated, and leaves and stems often have hairs. Neither of these species grows with the dense habit of goutweed.

Similar non-native species: Other weedy members of the carrot family.

Control methods: Hand-pulling will not extract the deeply growing rhizomes so digging tools are required. Dispose of rhizomes in bags in trash to prevent spread. Repeated excavation will be required. Mowing can slow the spread, but is unlikely to exhaust large patches. Poor results are reported for covering with tarps and plastic sheeting. Goutweed is a tenacious ground cover and an excellent candidate for a systemic herbicide application (glyphosate or triclopyr solution). Apply as a foliar spray during the growing season. Good results have been reported for mowing first and then spraying the leafy regrowth. Multiple treatments may be required.

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SEVERELY INVASIVE

JAPANESE KNOTWEED

(Mexican bamboo)

Fallopia japonica

Status in Maine: widespread

Description: Robust, very tall (to 10') perennial herb growing in dense stands. **Leaves:** Simple, alternate, entire, flat at base and abruptly tapering to pointed tip, ~6" long and 3-4" wide. **Flowers:** Small, white, abundant, in small spikes along stems, late summer in Maine (late July or August). **Fruits:** Small (< ½") with thin "wings" to enable wind dispersal. **Stem:** 1-2" diameter, round, hollow, with swollen nodes where leaves meet the stem. Dead, brown-red stalks persist through winter.

Native range: Eastern Asia. **How arrived in U.S.:** As an ornamental; also for fodder and erosion control.

Reproduction: Mostly by fragments of living stem or rhizome. Fertile seeds are sometimes produced, and all seed should be treated as potentially viable. Can sprout from any stem node or rhizome fragment.

Habitat: Open uplands, riverbanks, lakeshores, forest edges, disturbed areas within the forest. Extremely adaptable, tolerant of dry to seasonally saturated soils. Especially problematic along larger rivers where spring flooding transports live rhizomes downstream.

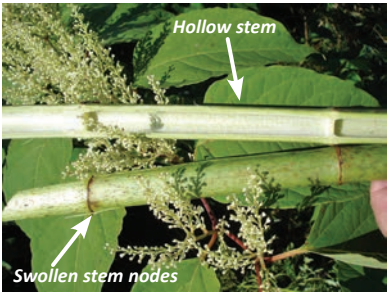
Similar native species: None in our area.

Similar non-native species: Giant knotweed (*Fallopia sachalinensis*) is typically taller than Japanese knotweed (to 12') and has larger leaves with heart-shaped bases that taper more gradually toward the tip. The two species

JAPANESE KNOTWEED

hybridize (*Fallopia* x *boehemica*), and can back-cross. Giant knotweed and the hybrid are also invasive.

Control methods: New patches (<20 stems) can be cut repeatedly throughout the growing season, as often as once/week, for several years until roots are exhausted. Larger patches cannot be controlled manually without a persistent, reliable labor source. Smothering with heavy black landscaping cloth, old carpet, or erosion control fabric can be successful but requires biweekly maintenance and must be repeated for up to 10 years. Herbicides are effective. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."*** For small patches, use stem injection or cut-drip applications of glyphosate. Be sure to dispose of cut stems carefully. For large patches, cut or mow when plants are approximately 3' tall, then apply glyphosate as foliar spray when plants have re-grown to 3-5' tall later in the same growing season, or apply to uncut, mature stems just before flowering. Avoid application of foliar herbicide during flowering as bees are attracted to this species. Follow-up will be needed in almost all circumstances.



SEVERELY INVASIVE

JAPANESE STILTGRASS

Microstegium vimineum

Status in Maine: not yet detected

Description: Herbaceous, annual grass, 1-3' tall, with a branching habit. Plant resembles a small, delicate bamboo. **Leaves:** Alternate, pale green, ½" wide and 2-4" long with a stripe of reflective hairs on the midrib of the upper leaf surface. **Flowers/seeds:** Flower heads develop late in the season (September) and contain 1-3 flower spikes, resembling crabgrass. Each plant can shed hundreds of yellow-reddish elliptical seeds before dying in late fall.

Native range: Southeast Asia. **How arrived in U.S.:** In packing grass for Asian porcelain.

Reproduction: Produces new plants only by seed, which is viable 3-5 years. New shoots can grow from stem nodes during growing season.

Similar native species: Grasses can be difficult to identify without training. There are a number of species with either similarly shaped leaves or similarly shaped inflorescences as Japanese stiltgrass, but not both. Virginia cutgrass, also known as whitegrass (*Leersia virginica*), has both similar leaves and a similar inflorescence. However, Virginia cutgrass has a hairy ring around the stem nodes (vs. none on Japanese stiltgrass), and it lacks the shiny hairs on the leaf midrib.

Similar non-native species: As with the native grasses, there are likely some species of non-native grasses with either leaves or inflorescences that look like Japanese stiltgrass.

JAPANESE STILTGRASS

Control methods: Plants are shallow rooted and easy to hand pull if the patches are small. Mowing before seed set is effective (before August). Grass-specific herbicides (clethodim, quizalofop, P-ethyl, sethoxydim) are very effective. Foliar applications of glyphosate are effective. Imazapic is also effective in combination with glyphosate, but this should be used only via consultation with a licensed applicator due to the residual soil activity of this type of herbicide. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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SEVERELY INVASIVE

ORNAMENTAL JEWELWEED

(Himalayan balsam, Pink jewelweed)

Impatiens glandulifera

Status in Maine: localized

Description: Herbaceous annual, up to 6½' tall. **Leaves:** Simple, long tapering, pointed, 2-9" long, and serrate; occurring opposite or in whorls of 3. **Flowers:** Conspicuous, large (1-2"), bilaterally symmetrical, pink to purple flowers are helmet shaped and appear from midsummer into fall. This species may attract bee pollinators away from native plants. **Fruit:** Green seed pods are ¾-1½" long, taper at both ends, and contain 4-16 seeds. Like other "touch-me-nots" in the genus *Impatiens*, ripe pods explode when disturbed, ejecting seeds as far as 15' from the plant. **Stem:** Sturdy, hollow, and smooth; greenish to red.

Native range: Pakistan, India and Nepal. **How arrived in U.S.:** As an ornamental.

Reproduction: By seed. Seeds require cold stratification and are viable for about 2 years. Seeds from riparian populations can easily move downstream in sediments and soil from eroded river banks. Fallen plants can sprout roots from nodes along stem.

Habitat: Prefers moist soils, but can grow in a wide range of soils and at higher elevations. Common in riparian zones (stream and river shores), swales, and wet ditches along roadsides.

Similar native species: Spotted jewelweed (*Impatiens capensis*) and pale touch-me-not (*Impatiens pallida*) are considerably smaller, have alternate, coarsely toothed, oval leaves, and orange and yellow flowers, respectively.

ORNAMENTAL JEWELWEED

Similar Non-native species: Hairy willow-herb (*Epilobium hirsutum*) could possibly be confused at a quick glance; it is a tall herb with pink flowers, but the flowers are radially symmetrical (vs. bilaterally symmetrical in jewelweed), and the stems are profusely hairy.

Control methods: Hand pull, weed-whack, or mow before flowering. Note that stems not uprooted can re-grow from nodes and still produce flowers and seeds. Monitor weed-whacked or mowed sites and repeat treatment as needed to prevent flowering. Sheep and cattle will graze it. Pulled plants with flowers should be bagged as trash because seed pods can continue to develop if plants are left on the ground. Fallen plants can also sprout shoots and roots from the stem. Foliar spray of glyphosate is effective when applied before flowering. If a population is in a grassy area, use triclopyr, as it will not kill grasses. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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SEVERELY INVASIVE

PERENNIAL PEPPERWEED

(Perennial pepperwort)

Lepidium latifolium

Status in Maine: localized

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Description: Perennial, multi-stemmed herb, 1-5' tall. **Leaves:** Basal leaves are stalked, up to 12" long and 3" wide. Stem leaves are significantly smaller, alternate, and lanceolate to oblong. Edges are entire to weakly serrate. Sessile or stalked. **Flowers:** Small, 4-petaled white flowers occur in dense clusters near stem tips from summer to fall. **Fruit:** Very small pods, 1/10" long; each pod contains 2 seeds. **Roots:** Base of stem is semi-woody; roots form woody crown at soil surface. Roots can both creep and grow deep, depending on soil type. New plants can arise from small sections of root.

Native range: Southeastern Europe, Southwestern Asia. **How arrived in U.S.:** Contaminant in agricultural seeds.

Reproduction: Mostly by seed, but also vegetatively by root fragments.

Habitat: Commonly found in meadows, wetlands, streams and river shores, sandy beaches, dunes, and salt marshes. Tolerates a wide range of soil types and moisture, including flooding. Studies indicate it can act as a salt pump, pulling up salt ions from deep soil layers and depositing them on the surface. Changes in topsoil salinities can dramatically alter species composition and diversity.

Similar native species: None.

Similar non-native species: Other weedy mustards, though in general they are much smaller. Superficially, the

PERENNIAL PEPPERWEED

clusters of small white flowers on tall stalks of common valerian (*Valeriana officinalis*), Queen Anne's lace (*Daucus carota*), or angelicas (*Angelica* spp.) may resemble perennial pepperweed, but leaves are very different.

Control methods: Plants may be difficult to hand pull, depending on depth of rootstock. Root fragments can regenerate. Sheep grazing is effective in infestations mixed with other plants. High volume foliar applications of glyphosate result in fair to poor control in dense stands; consider spring grazing or mowing dense patches and then applying herbicide to re-growth. Best application time for herbicides is flowerbud to early flowering stage. Herbicides with more residual activity, such as imazapyr, imazapic, or metsulfuron methyl can increase efficacy, but should be prescribed and applied only by a licensed applicator, with care to minimize damage to non-target plants. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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VERY INVASIVE

PURPLE LOOSESTRIFE

Lythrum salicaria

Status in Maine: widespread

Description: Robust, perennial herb 4-6', base of mature plant feels woody. **Leaves:** Simple, opposite or whorled, lanceolate to oblong, entire, sessile. **Flowers:** In long, crowded spikes, deep pink-purple, 5-7 petals, ½-¾" wide, mid to late summer in Maine. Asynchronous flowering - bottom of spikes open first. **Fruit:** Brown, dry capsules persist on stem. **Stem:** Four-angled.

Native range: Europe and Asia. **How arrived in U.S.:** As an ornamental, and as contaminant in ballast, livestock bedding, and possibly wool.

Reproduction: By seeds, which are viable for several years. Seeds are readily transported by water and can float for up to three days, or they may hitchhike on wildlife or in soil or fill.

Habitat: Wetlands, rivershores, lakeshores, and wet open areas such as roadsides, agricultural swales, and powerline corridors. Tolerates saturated conditions (organic/peat) and damp mineral soils. Most prolific in full sun, will survive in partial shade.

Similar native species: Fireweed (*Chamerion angustifolium*) also has spikes of pink-purple flowers, but the flowers are large (~1") and 4-petaled. Fireweed has alternate leaves and tends to grow in uplands. Blue vervain

PURPLE LOOSESTRIFE

(*Verbena hastata*) has spikes of blue-purple flowers and opposite leaves, but the leaves are toothed and the flowers are very small (<⅛") and consistently have 5 petals.

Similar non-native species: None in our area.

Control methods: Small plants or isolated individuals may be dug up by the roots when the soil is moist, but re-sprouting may occur. Persistent cutting or pulling multiple times during the growing season over several years (before flowering) may kill the plant, but diligence is required (at least 3x/year for 3 years is recommended). Herbicides are effective as foliar applications (aquatic glyphosate solution) or cut-drip applications (aquatic glyphosate applied immediately after cutting). Foliar applications of aquatic triclopyr can control loosestrife while avoiding harm to grasses and sedges. Cut-drip applications report less success than foliar applications and are extremely tedious and time-consuming. Regardless of the method chosen, cutting and bagging any flower heads is suggested since this is a prolific seed-producer. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

SEVERELY INVASIVE

REED CANARY GRASS

Phalaris arundinacea

Status in Maine: widespread

Description: Robust, perennial grass, 2-6' tall, commonly to 4'. **Leaves:** Alternate, ⅛-¾" wide, and 4-8" long, gradually tapering to a point. Leaves are flat, with a rough texture, and come off the stem at a 45-degree angle. Transparent, ~¼" ligule occurs where the leaf sheath meets the stem. **Flowers/seeds:** 3-8" long inflorescences are formed high above the leaves. They begin as slender spikes in early summer, and become somewhat open-spreading when flowering. Color changes from green to purplish to tan as seeds mature. **Stem:** Hairless, sometimes hollow, ~⅛" diameter. **Root:** Sturdy, creeping rhizomes.

Native range: There are native ecotypes of this grass in North America, but the invasive strain is of Eurasian origin. **How arrived in U.S.:** Planted for forage and erosion control on wet pastures and fields. There are also ornamental varieties including one with white-stiped leaves which occasionally naturalizes.

Reproduction: Spreads by seed and vegetatively by rhizomes. Seeds are likely spread via movement of water.

Habitat: Stream and river banks, lakeshores, marshes, ditches, and roadsides. Found in wet soils but not usually in standing water. Only moderately shade tolerant; prefers full sun.

Similar native species: It is not possible to separate the native and non-native strains of reed canary grass without

REED CANARY GRASS

molecular techniques, however the invasive strain grows aggressively in areas with a history of human disturbance, forming large stands. Canada bluejoint (*Calamagrostis canadensis*) is similar and often grows in dense stands in wetland habitats. It has narrower inflorescences, leaves, and stems than reed canary grass.

Similar non-native species: Orchard grass (*Dactylis glomerata*) has narrower leaves (⅛-⅓" wide) and grows in tufts or small clusters as opposed to the spreading habit of reed canary grass.

Control methods: Hand pulling or digging is only practical for small patches. For larger infestations, mowing, if possible, can reduce or eliminate seed production and perhaps lower density over time. Prolonged flooding can kill reed canary grass, but may also kill desirable vegetation if present. Fire can be successfully used to remove the dense reed canary grass litter/thatch build-up. Litter build-up can prevent native species from establishing in areas previously dominated by reed canary grass, so even if treatments to kill the grass are successful, additional work may be needed to achieve a desired condition. Aquatic formulations of glyphosate are somewhat effective, but follow-up will be required, including repeat applications in many cases. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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INVASIVENESS **UNCLEAR**

WALL LETTUCE

Mycelis muralis

Status in Maine: localized

Description: Erect herbaceous annual, occasionally biennial, 2-3' tall. **Leaves:** Basal and lower stem leaves 2-7" long with deeply cut lobes, and a base that clasps the stem. Middle and upper stem leaves decrease in size and have fewer lobes. **Flowers/seeds:** Flower heads ½" wide, with 5 yellow ray florets (appearing like petals), arranged in a loose panicle with stalks roughly perpendicular from the stem. Plants flower in late summer in Maine. Seed is a small, black-beaked achene tipped with a white collar of bristles. **Stems:** Hairless, sometimes purple tinged; sap milky.

Native range: Europe. **How arrived in U.S.:** Uncertain; possibly brought by settlers as a medicinal herb or potherb.

Reproduction: By seed. Self-fertile. Each plant may produce 500 (in shade) to over 11,000 seeds (full sun). Seed bank longevity is thought to be limited. Seeds are wind dispersed, like dandelions.

Habitat: Forests, woods and woodland clearings, rock outcrops and walls, stream valleys, and springs. Tolerates shade. Amenable to a wide range of soil conditions.

Similar native species: Other "lettuce" species (*Lactuca* spp.). Panicled hawkweed (*Hieracium paniculatum*) has unlobed leaves and more yellow florets per flowerhead. Rattlesnake-roots (*Nabalus* spp.) have white flowers.

WALL LETTUCE

Similar non-native species: Prickly lettuce (*Lactuca serriola*), cultivated lettuce (*Lactuca sativa*), smooth hawkweed (*Crepis capillaris*), wall hawkweed (*Hieracium murorum*), and common nipplewort (*Lapsana communis*).

Control methods: Like garlic mustard, this annual is easy to pull by hand. Wear gloves as the milky sap may irritate the skin. Bag plants for disposal if seed heads are developing; otherwise pile or compost them. Larger populations can be mowed in late spring; repeat for 3 years to deplete seed bank. Plants can also be grazed. A foliar glyphosate herbicide application is effective for severe infestations but must be applied before seed is set (ideally before flowering).

SEVERELY INVASIVE

WAVYLEAF BASKETGRASS

Oplismenus hirtellus ssp. *undulatiflolius*

Status in Maine: not yet detected

Description: Perennial, trailing grass with stems ~8-11" long. **Leaves:** Alternate, deep green, ~½+" wide and 1½-4" long, long-tapering to a point, with distinctive ripples or "waves" in the leaf surface. Leaf sheaths are hairy. **Flowers/seeds:** Flower stalks develop late in the season (September-November), with numerous spikelets alternate along the stalk. Spikelets have long, fine bristles, which become sticky when seeds are mature. **Stem:** Noticeably hairy. Can root from lower stem nodes.

Native range: Southeast Asia and southern Europe.
How arrived in U.S.: Unclear, perhaps accidentally as a contaminant with other materials.

Reproduction: Expands quickly within a site via stolons. May be pollinated by wind, also likely self-fertile. Long-distance dispersal via sticky seeds which can adhere to fabric, skin, shoes, tires, animals, pets, etc.

Habitat: Moist forests, floodplain forests, forest edges. Shade tolerant; intolerant of full sun.

Similar native species: Grasses can be difficult to identify without training, but the wavy or ribbed leaves of wavyleaf basketgrass are distinctive. Deer-tongue panicgrass (*Dichanthelium clandestinum*) has hairy stems and wide leaves, but grows in a more upright, clumping form, and lacks ribbed leaves. Northern long-awned wood grass (*Brachyelytrum aristosum*) is found in moist forests but is upright (not creeping), and its leaves are longer, have a rough texture, and lack waves/ribs.

WAVYLEAF BASKETGRASS

Similar non-native species: Japanese stiltgrass (*Microstegium vimineum*) has a hairy, shiny midrib on the upper leaf surface and its leaves are not wavy like wavyleaf basketgrass.

Control methods: Plants are shallow rooted and easy to hand pull if the patches are small. For larger infestations, glyphosate is effective as a foliar spray. Grass-specific herbicides (e.g., clethodim) are also effective and may reduce damage to native plants. Follow-up will be required. Avoid working in wavyleaf basketgrass patches after seeds have ripened in the fall, as the sticky seeds can easily be spread by personnel working on site and then traveling elsewhere. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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INVASIVENESS **UNCLEAR**

WHITE SWEET CLOVER

Melilotus albus

Status in Maine: widespread

Description: Tall (3-6'), freely branching, biennial herb; member of the legume (pea) family. **Leaves:** Alternate, compound with three leaflets, with ~1" long petioles and ~½" long, narrow stipules. Leaflets are oblong to ovate, ~1" long; finely toothed. Leaves become sparse on the upper stem. **Flowers:** Small, white "pea" flowers, grouped in 2-8" elongated spikes of 30-80 flowers. **Fruit/seeds:** Small pods (~¼"), each containing 1-2 seeds. Dried pods, when separated from raceme, have a small hook, which can aid in dispersal. Tan seeds are longer than wide. **Stem:** Erect, round. **Root:** Sturdy, long taproot, 2-4' long, with fibrous lateral roots and bacterial nodules, and a root crown. One plant can produce multiple stems.

Native range: Asia, Europe, and Northern Africa. **How arrived in U.S.:** Introduced in the 18th century, probably as livestock fodder and honeybee forage. Still widely planted for soil reclamation and in agriculture as a nurse crop, green manure, livestock fodder, and bee forage.

Reproduction: By seed. One plant can produce several thousand seeds; can be dispersed long distances by animals and water. Plants produce both ready-to-germinate and hard (water resistant) seeds, resulting in seed banks. Seeds can remain viable 14+ years in soil.

WHITE SWEET CLOVER

Habitat: Disturbed sites, roadsides, waste areas, floodplains, riverbanks, old fields. Species is a nitrogen fixer, able to colonize poor soils.

Similar native species: None.

Similar non-native species: Yellow sweet clover (*Melilotus officinalis*) is nearly identical but has slightly larger, yellow flowers. The two species are considered one by some taxonomists.

Control methods: Frequent mowing is effective at greatly reducing seed production in its second year. Establishing perennial plant cover, e.g., a native grass sward, has been shown to remove white sweet clover from the habitat within a couple of years. Chemical methods can be used to provide faster control of infestations. Triclopyr provides better control than glyphosate. First year plants can be controlled with a foliar application of a triclopyr ester formulation. Second year plants must be sprayed well before seed set.

Bob Moosman, MaineDOT

INVASIVENESS **UNCLEAR**

WILD CHERVIL

Anthriscus sylvestris

Status in Maine: localized

Description: A biennial herb, and member of the carrot family. Typically at least 3' tall; it has been described as Queen Anne's lace on steroids. **Leaves:** Alternate, compound and fern-like. Hairy sheath present where petiole attaches to stem. **Flowers:** Small, white, 5-petaled, and occur on 3" wide flat umbels. **Fruit/seeds:** Each flower forms 2-pointed seed pods, ¼" long, that turn dark brown. **Stem:** Hollow, furrowed; hairy; becoming smooth at the top of plant. **Root:** Thick, tuberous. Tap root can extend to 6'. Produces vegetative buds on axillary roots.

Native range: Eurasia. **How arrived in U.S.:** Introduced in the early 1900s in ornamental seed mixes, possibly to recreate the look of British hedgerows.

Reproduction: Primarily by seed. The plant dies after flowering, which it does early in New England (May/June). Dispersal agents include vehicles, especially mowing equipment, and wind. Persistent seed banks are not known. It also produces lateral root buds that can break off and form new plants. Cutting stimulates root bud production.

Habitat: Disturbed sites, roadsides, waste areas, agricultural areas, stream banks, and floodplains. Prefers moist, fertile soil.

Similar native species: Chinese hemlock-parsley (*Conioselinum chinense*)—yes, this is native— is usually smaller, leaves are lacier with fewer leaflets that are more finely dissected. Seeds pods are not pointed. Chinese

WILD CHERVIL

hemlock-parsley typically grows on floodplains and in swamps.

Similar non-native species: Queen Anne's lace (*Daucus carota*) is hairy throughout; its umbel has a small purple floret in the center and long, curved bracts at its base. Poison hemlock (*Conium maculatum*) is smooth-stemmed.

Control methods: Livestock will graze it when plants are young. Hand pulling is not recommended. The long tap root holds the plant in place and pulling results in broken stems, which encourages vigorous re-sprouting from the crown. Mowing 3-6 times per season will suppress seed production. Multiple tillage over two years followed by sowing the infested areas with competitive species like perennial grasses and goldenrods can provide long term results. Wild chervil exhibits herbicide resistance. Glyphosate is effective on growing plants in the rosette stage, but a concentrated solution should be used. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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INVASIVENESS **UNCLEAR**

WILD PARSNIP

Pastinaca sativa

Status in Maine: widespread

WARNING: Avoid contact with plant sap.

Description: Tall (3-5'), biennial herb; member of the carrot family. Entire plant is smooth, hairless, and bright yellow-green. **Leaves:** First year plants form basal rosettes of pinnately compound leaves (to 16" long, 6" wide) with long petioles. Leaflets are variably lobed with coarsely toothed margins. Upper leaves on flowering plants are much smaller. **Flowers:** Flat topped umbels (3-8" across) of small yellow flowers. **Fruit/seeds:** Elliptical, flat, dry fruits; winged; ~¼" long. **Stem:** Green, smooth and ridged. **Root:** Cylindrical taproot, few side roots. **WARNING:** ***Wild parsnip sap contains a chemical that causes dermatitis when skin is exposed to sun. Wear safety gear when working with this plant and avoid contact with plant juices. As a contaminant in forage crops, it reduces both weight gain and fertility in livestock.***

Native range: Eurasia. **How arrived in U.S.:** Escaped from cultivation as a root crop.

Reproduction: By seed. One plant can produce a few thousand seeds. The plant dies after flowering. Wind is the primary dispersal agent, followed by surface water. Seeds commonly spread in mulch hay and straw. It also spreads along transportation corridors, where seeds are moved by vehicles, mowers, and other equipment.

Habitat: Disturbed sites, roadsides, waste areas, agricultural fields, stream banks. Shade intolerant.

WILD PARSNIP

Similar native species: American cow-parsnip (*Heracleum maximum*) is much larger and has white flowers. Golden Alexanders (*Zizia aurea*) is a shorter plant, with smaller yellow umbels, and fewer leaflets. Purplestem angelica (*Angelica atropurpurea*) has a smooth, waxy, green-purple stem and globe-shaped white-flowered inflorescences; sea coast angelica (*Angelica lucida*) is similar, and grows in coastal areas.

Similar non-native species: Wild chervil (*Anthriscus sylvestris*) has fern-like, cut leaves throughout and white flowers. Common hogweed (*Heracleum sphondylium*) is a smaller version of giant hogweed; white flowers.

Control methods: Digging, gouging, or rototilling that severs the root crown from the taproot will kill the plant. Precisely timed mowing that occurs after flower heads form but before seeds enlarge will end the plant and the seed crop. Chemical methods can provide effective control. Spray a foliar glyphosate solution on rosettes in fall or spring, or to bolting or flowering plants. **REMEMBER TO WEAR PROTECTIVE GEAR AROUND THIS PLANT**.

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SEVERELY INVASIVE

YELLOW IRIS

(Yellow flag)

Iris pseudacorus

Status in Maine: localized

Description: Robust, perennial monocot forb. **Leaves:** Sword-like, flattened, with parallel venation; ¾-1¾" wide and up to 3½' long. They arise fan-like from thick rhizomatous rootstock. **Roots:** thick rhizomes with black sap. **Flowers:** Large yellow flowers have three drooping sepals with brown markings, 3-4" diameter. 2-10 per stalk. Blooms May through July. **Fruit:** Large 1½-4" seed capsules. Two rows of flat, disc-shaped seeds line each of the three chambers inside the capsule.

Native range: Europe, Western Asia, North Africa. **How arrived in U.S.:** As an ornamental.

Reproduction: By rhizome fragments and seed. Dry rhizomes remain viable for months. Individual rhizomes may live 10 years. Seeds float, longevity is not known. 20% of seeds dispersed in October will germinate the next spring.

Habitat: Wetlands. Prefers nutrient rich soil. Plant is sometimes used on purpose in remediation to trap sediments and heavy metals. Occurs beside ponds and lakes as well as in freshwater, salt, and brackish tidal marshes. Can grow in open wetlands or under a tree canopy in forested wetlands.

Similar native species: Leaves can be confused with cattail (*Typha* spp.) or native blue flag iris (*Iris versicolor*).

Similar non-native species: Other ornamental irises. Yellow iris is the only completely yellow, large wild iris

YELLOW IRIS

naturalized in North America. Siberian iris has narrower leaves and blue flowers.

Control methods: Cannot be grazed; plants contain glycosides. It can be dug up (wear gloves). Bag and discard plants in garbage. A combination of mechanical and chemical treatment works well. Aquatic-formulated glyphosate is most widely used. Late-season applications are most effective, but if seeds are present, consider manually removing them and disposing in trash to prevent their dispersal, especially along waterways. For small infestations, use a glyphosate solution in a dripless wick applicator and apply to folds of leaves. For larger infestations, foliar applications are effective when applied late in the growing season (after flowering is complete) until just after first fall frost. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

VERY INVASIVE

AUTUMN OLIVE

Elaeagnus umbellata

Status in Maine: localized

Description: Perennial, deciduous shrub, up to 10-15' tall and wide, usually very branched, with silvery and/or brown scales along twigs. Some plants bear 1"+ woody spines. **Leaves:** Simple, alternate, tapered at both ends (distal end may be blunt-tapered), 1-3" long, leaf edges entire but crinkly/wavy. Lower surface with silvery and brown scales (use hand lens or may be visible with naked eye). **Flowers:** Fragrant, white to cream to light yellow. Tubular base with 4 pointed petals. Occur in small clusters along twigs at leaf bases, May-June in Maine. **Fruit:** Roundish, <½" wide, can be slightly longer than wide, light colored scales on surface, start brown and mature through yellow, orange, to red around September.

Native range: China, Korea, Pakistan and Japan. **How arrived in U.S.:** As an ornamental; also for food and cover for wildlife.

Reproduction: By seed. Birds and mammals consume fruits and disperse seed. Longevity in seed bank is not known. Plants are mostly dioecious but there are occasional exceptions with male and female flowers on the same plant.

Habitat: Commonly found in old fields, roadsides, forest edges, and fragmented forests. Not tolerant of wet soils. Prefers sun but will germinate in partial or full shade, though growth and reproduction may be slowed. Autumn olive is a nitrogen-fixing species and can therefore colonize very low-nutrient soils.

AUTUMN OLIVE

Similar native species: Could be confused with shrubby willows, but those lack silvery and brown scales on twigs and leaves, and have very different flowers and fruit.

Similar non-native species: Shrubby honeysuckles also have round, red fruits, but leaves are opposite and more clearly oval (less tapered at ends), and lack scales. Russian olive is similar but not naturalized in Maine.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or burning of the root crown multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Goats and sheep will browse it but repeated, heavy damage over multiple years is required to kill established shrubs. Herbicides are effective as foliar applications (glyphosate or triclopyr solution), cut-stump application (glyphosate or triclopyr solution applied immediately after cutting except in early spring), or basal bark application any time of year (triclopyr ester in bark oil).

SEVERELY INVASIVE

BURNING BUSH

(Winged euonymus)

Euonymus alatus

Status in Maine: widespread

Description: Perennial, deciduous shrub, broadly branched, up to ~15' tall, forms dense thickets. Stems frequently have corky "wings." **Leaves:** Simple, opposite, roughly elliptical, tapered at both ends, usually 1-2" long, finely toothed. Vivid red fall color. **Flowers:** Small (~¼"), 4-petaled, light yellow to light green, in small clusters coming off the twig on 1-3" stems. Blooms in late spring. **Fruit:** In early fall, a capsule of red-orange seed surrounded by two purple fleshy coverings which split open. Fruit may remain on plant into the winter.

Native range: Northeastern Asia. **How arrived in U.S.:** As an ornamental.

Reproduction: By seed and vegetatively. The fruit is eaten and dispersed by birds. There is currently no data on seed banking. Plants can expand vegetatively from root sprouts, especially if damaged.

Habitat: Forests, forest edges, old fields, open areas. Shade-tolerant, will germinate, grow, and reproduce under a full forest canopy. Tolerant of moist to well-drained soils

Similar native species: Several heath shrubs (e.g., blueberries, huckleberry) turn bright red in fall, but these lack corky wings on branches and have alternate, usually entire leaves.

Similar non-native species: European spindle-tree (*E. europaeus*) has pink seed coverings over its reddish seeds, and has less oval, stouter leaves. Wintercreeper (*E.*

BURNING BUSH

fortunei) looks similar but is usually a climbing vine and is infrequently naturalized in New England. Japanese barberry can turn red in fall but has leaves in alternate nodes along the stem and sharp spines at the base of leaves. None of these have corky wings on the twigs like burning bush.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Herbicides are effective as foliar applications (glyphosate solution) or cut-stump applications (glyphosate or triclopyr solution applied immediately after cutting except during early spring).

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SEVERELY INVASIVE

COMMON BUCKTHORN

Rhamnus cathartica

Status in Maine: widespread

Description: Perennial, deciduous shrub or small tree, often multi-stemmed, can be single-trunked, to ~25' tall. Despite name, lacks thorns; has small woody spines (up to ⅞" but usually <½") at the end of most twigs. **Leaves:** Simple, sub-opposite, some more nearly alternate or opposite, elliptical to almost round, toothed, with arching leaf veins, pointed tip, 1-3" long. **Flowers:** Small, white-green, 4-petaled, in clusters at leaf bases along stems, appear in ~June in Maine. **Fruit:** Round, ¼-½" wide, mature from green to a glossy black color in late summer. **Bark:** Mature plants have horizontal, lighter-colored lenticels on brownish-gray bark. Larger plants have orange inner bark.

Native range: Europe and Asia. **How arrived in U.S.:** As an ornamental; wind break and hedge plant.

Reproduction: By seed. Plants are usually dioecious; males do not produce fruit. Fruits are eaten by birds, mice, and deer. Seeds are viable for 2-6 years.

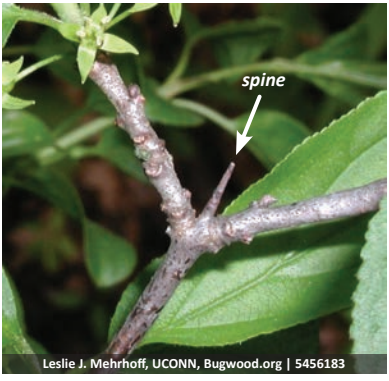
Habitat: Forests, forest edges, old fields, open areas. Shade-tolerant; will germinate, grow, and reproduce under a full canopy. Tolerant of moist to well-drained soil.

Similar native species: Alder-leaved buckthorn (*Rhamnus alnifolia*) has larger leaves that are opposite along the stem, 5-petaled flowers, and is a low shrub (<5') of wetlands. Cherries (*Prunus* spp.) have lenticels but scratched bark or twigs have a characteristic bitter almond smell and leaves are consistently alternate. Winterberry holly (*Ilex verticillata*) has alternate leaves, bright red fruits, and prefers wet soils. None have orange inner bark.

COMMON BUCKTHORN

Similar non-native species: Glossy buckthorn (*Frangula alnus*) leaves are entire, twig ends have no spines, can have both red and black fruit at once, and lacks orange inner bark. Apples (*Malus* spp.) have alternate leaves and leaf venation that is not as pronounced.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required (at least 3x/year for 3 years is suggested). Mowing can prevent seedlings from establishing. Common buckthorn keeps its leaves late into the fall after native plants have dropped theirs. Foliar applications of glyphosate are very effective during this period. Herbicides can also be applied as a cut-stump treatment (glyphosate or triclopyr solution applied immediately after cutting except in early spring), or basal bark treatment anytime (for stems <6" diameter, triclopyr ester in bark oil).



VERY INVASIVE

EUROPEAN BARBERRY

Berberis vulgaris

Status in Maine: localized

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Description: Deciduous shrub growing to 10' tall and 6' wide. **Leaves:** Oval, small (¾" wide to 2" long), with serrate margins. Occur in clusters. **Flowers/seeds:** Bright yellow ⅓" wide flowers grow in striking dangling racemes. Fruit are red-to purple-tinged, oblong berries each containing 1-3 black seeds. European barberry is an alternate host for wheat rust (*Puccinia graminis*), a fungal pest of wheat crops. **Stems:** Large (~1"), 2-3-parted, sharp spines at the nodes, and gray bark with bright yellow wood.

Native range: Asia. **How arrived in U.S.:** Settlers brought it for jams, dyes, and hedges.

Reproduction: By seed and vegetatively; plants produce large numbers of berries that are dispersed by birds and other wildlife. Seeds have high germination rates. Vegetative expansion is through rooting stems and suckering. Long arching stems can take root where they touch soil.

Habitat: Forests, woodlands, shrub thickets, old fields, coastal grasslands, and fencerows. Prefers full sun to part shade.

Similar native species: None.

Similar non-native species: Japanese barberry (*Berberis thunbergii*) has smaller, entire leaves and shorter, single spines at each node. See description in this guide.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist (wear gloves!); larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but

EUROPEAN BARBERRY

diligence is required. Mowing can prevent seedlings from establishing. Flame-weeder (propane torch) can be effective if used in spring and followed-up during the summer to treat survivors. Herbicides are effective as foliar applications (glyphosate solution) or cut-stump applications (glyphosate or triclopyr solution applied immediately after cutting except in early spring). Barberry is one of the first plants to green up in the spring. Early foliar applications of triclopyr can be effective if applied prior to the leaf-out of surrounding native plants.

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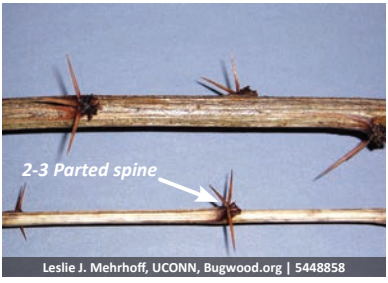

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SEVERELY INVASIVE

FALSE INDIGO

Amorpha fruticosa

Status in Maine: localized

Description: Multi-stemmed, suckering shrub, capable of reaching 12' tall and 15+' wide but usually not that tall in New England. **Leaves:** Alternate, ½-1½' long, pinnately compound, with 11-35 leaflets. Oval leaflets are 1-2" long and have pointed tips. **Flowers:** Small (⅜"), tubular purple flowers with orange anthers are densely arranged in 4-8" terminal spikes. **Fruits:** Small, curved pods, ~⅓" long, each containing 1-2 seeds. Pods are covered with tiny resin glands and are sticky. **Stem:** New twigs are green and pubescent. Bark later becomes gray and smooth. **Roots:** Extensive, woody, branching system. Possesses nitrogen-fixing bacteria in nodules.

Native range: Much of North America, excluding New England and the Pacific Northwest. **How it spread:** In the horticultural trade since colonial times; more recently, has been planted for erosion control.

Reproduction. By both seed and vegetative means. Seed production and viability are high. Seeds spread by water, wildlife, and equipment. Plants stump sprout and spread laterally through root suckers, forming dense thickets. Can regenerate from stem fragments.

FALSE INDIGO

Habitat: Aside from shade intolerance, it is very adaptable, tolerating flooding, drought, poor soils, and salt. Riverbanks, floodplains, tidal zones, and wet woodlands are common habitats in New England.

Similar native species: Can be confused with sumac shrubs (*Rhus* spp.), particularly at a distance. Sumac leaflets are longer and narrower, with toothed margins.

Similar non-native species: Saplings of both black locust (*Robina pseudoacacia*) and honey locust (*Gleditsia triancanthos*), although locust leaves lack pointed tips. Also, false spiraea (*Sorbaria sorbifolia*), which has narrower, pointed, toothed leaflets.

Control methods: Repeated cutting to prevent leaf and flower production will eventually exhaust plant reserves. Flame weeding is not recommended, as it can increase stem numbers. Herbicides are effective as foliar applications (glyphosate or triclopyr solution). Cut-stump application of glyphosate or triclopyr solution applied immediately after cutting is another option, after spring leaf-out. Follow-up will be required. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

SEVERELY INVASIVE

GLOSSY BUCKTHORN

Frangula alnus

Status in Maine: widespread

Description: Perennial, deciduous, shrub or small tree, often multi-stemmed, can be single-trunked, to ~20' tall. Despite name, lacks thorns. **Leaves:** Simple, alternate, elliptical, 2-4" long, and sometimes glossy. Leaves turn yellow in fall and persist on the stems later than most species. **Flowers:** White-yellow, 5-petaled, small, in leaf axils, ~June in Maine (though some may bloom later). **Fruits:** Mature from green to red to purple-black in late summer/ early fall, red and black fruit can co-occur on the same plant. **Bark:** Mature twigs and stems have dark bark with raised, horizontal, light-colored lenticels. **Roots:** Red.

Native range: Europe, Northern Africa, Central Asia. **How arrived in U.S.:** As an ornamental, but also planted for wildlife and revegetation projects.

Reproduction: By seed. Fruits eaten and dispersed by birds and small mammals. Seeds viable at least two years.

Habitat: Forests, forest edges, many types of wetlands. Moderately shade-tolerant; more productive in sun. Tolerates a wide range of soil conditions.

Similar native species: Cherries (*Prunus* spp.) have lenticels but scratched bark or twig has characteristic bitter almond smell and leaves are toothed. Alder-leaved buckhorn (*Rhamnus alnifolia*) has serrate leaf margins. Most dogwood shrubs (*Swida* spp.) have opposite leaves with wide bases, narrow tips, and paired veins that arch toward the tip.

Similar non-native species: Common buckthorn (*Rhamnus cathartica*) has sub-opposite, toothed leaves, and

GLOSSY BUCKTHORN

small woody spines at the ends of branches.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required (at least 3x/year for 3 years is suggested). Mowing can prevent seedlings from establishing. Herbicides are effective as foliar applications (triclopyr or glyphosate solution), cut-stump applications (glyphosate or triclopyr solution applied immediately after cutting except in early spring), or basal bark application any time of year (for stems <6" diameter, triclopyr ester in bark oil). ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

Tom Lee, University of New Hampshire

SEVERELY INVASIVE

JAPANESE BARBERRY

Berberis thunbergii

Status in Maine: widespread

Description: Perennial, deciduous shrub, up to 6' tall and wide, though typically smaller, usually very branched. Branches can root at the tip. Canes have a sharp, ~⅛" spine at each leaf axil. **Leaves:** Simple, alternate, entire, small (to ~1" long), rounded at far end and long-tapering to the base, occurring in groups at nodes along the twig. Leaf out in early spring. Turn red in fall (some planted cultivars turn other colors). **Flowers:** Small (<½" wide), pale yellow, 6-petaled, hang below stem, bloom ~May in Maine. **Fruit:** Oblong red berry, ~⅓" long, hangs below stem, mature in late summer. **Roots:** Root interior is bright yellow.

Native range: Japan and Asia. **How arrived in U.S.:** Introduced as a replacement for common barberry, which is a host for stem wheat rust.

Reproduction: By seed. Birds (especially turkey and grouse) and mammals consume fruits and disperse seed. Seed longevity seems to be short, on order of 1-5 years.

Habitat: Most robust in full sun but will readily germinate, grow, and produce fruits in full shade. Found in forests, forest edges, old fields, as well as disturbed habitats. Tolerates dry to damp soils.

Similar native species: None. The combination of spines, oblong fruit hanging below branches, and unusual leaf size and shape are distinctive. No barberries are native to New England.

Similar non-native species: In fall, red color may be

JAPANESE BARBERRY

reminiscent of burning bush (*Euonymus alatus*), but that species has opposite leaves. European barberry (*Berberis vulgaris*) has toothed leaves and larger spines in groups of 2-3.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist (wear gloves!); larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Flame-weeder (propane torch) can be effective if used in spring and followed-up during the summer to treat survivors. Herbicide is highly effective as a foliar application (glyphosate or triclopyr solution) anytime the plant has leaves, including early in the spring before native species leaf out, thus reducing chance of collateral damage. Cut-stump applications are possible but not recommended due to numerous small stems. For plants too tall to foliar spray, a combination of cutting in year 1 followed by foliar herbicide in year 2 is effective.

VERY INVASIVE

MULTIFLORA ROSE

(Rambler rose)

Rosa multiflora

Status in Maine: widespread

Description: Perennial, deciduous shrub, up to 20' tall, usually very branched, with arching canes that can grow up other plants and into low tree branches. Canes have stout recurved thorns. Thornless varieties exist, but they are uncommon. **Leaves:** Pinnately compound, 5-11 leaflets, each ~1" long, with teeth. Petiole is fringed at the base (stipule) where it attaches to twig; no other rose in Maine has this character. **Flowers:** 5-parted, white to pale pink, ~1" wide, clustered at twig tips, blooms in June in Maine. **Fruit:** ~¼" round to oblong, red, rose "hips" clustered at twig tips.

Native range: Japan and Asia. **How arrived in U.S.:** Rootstock for ornamental roses; also promoted for erosion control and living fences.

Reproduction: By seed and rooting from twig tips. Birds and mammals eat fruits and disperse seed. Seeds viable in soil for up to 20 years.

Habitat: Reaches largest size and fruiting capacity in full sun but is somewhat shade-tolerant. Found in forest edges, old fields, as well as disturbed sites. Can occur in forest interior after disturbance such as timber harvest. Tolerant of dry to moist soils.

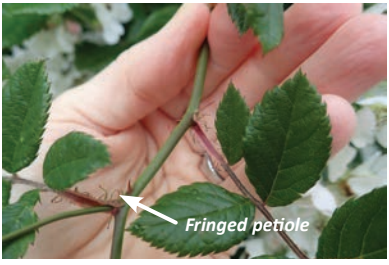
Similar native species: Native roses, but none of our native roses have a fringed base on the leaf petiole. Also, all native roses have pink flowers.

Similar non-native species: Rugosa rose has pink flowers to 2" wide and stems with straight prickles all around. Other horticultural roses escape infrequently and have fewer

MULTIFLORA ROSE

flowers, as well as other prickle arrangements.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist (wear gloves!); larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Goats will browse it but repeated, heavy damage over multiple years is required to kill established shrubs. Herbicides are effective as foliar applications (glyphosate or triclopyr solution), cut-stump application (glyphosate or triclopyr solution applied immediately after cutting except in early spring), or basal bark application any time of year (glyphosate or triclopyr ester in bark oil).



VERY INVASIVE

PRIVETS

Ligustrum obtusifolium, L. vulgare

Status in Maine: widespread

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Description: Spreading multi-stemmed perennial shrub, up to 15' wide and tall; deciduous, semi-evergreen or evergreen. **Leaves:** Opposite, shiny green, oval to elliptical to lanceolate, entire, up to ~2" long, sometimes at right angles to stem. **Flowers/seeds:** Tubular, 4-lobed, ~⅛" long, white. Clusters of flowers form at the end of twigs and in leaf axils, and are usually a few inches long and cone shaped. Forms round fruits up to ¼", green turning blue-black. **Roots:** Shallow, fibrous, and spreading.

Native range: Japan, Europe, and North Africa. **How arrived in U.S.:** As an ornamental. Several species of *Ligustrum* have been developed into many ornamental varieties.

Reproduction: By seed. Mature shrubs can produce hundreds of fruits per year. Fruits persist into winter; birds and other wildlife disperse them. Privet does not form a lasting seed bank. Also spreads vegetatively by stump sprouts and suckering.

Habitat: Bottom-land forests and floodplains, forest edges, open woods, shrub lands, open stream systems, barrens, fence rows, and old fields. Can form dense thickets and monocultures.

Similar native species: Native shrub honeysuckles (*Lonicera canadensis, Diervilla lonicera*) have opposite leaves

PRIVETS

and branching, but have different flowers and fruits.

Similar non-native species: Burning bush (*Euonymus alatus*) shares privet's branch geometry, but has finely toothed pointed leaves, and usually has corky wings on smaller branches. Shrubby honeysuckles (*Lonicera* spp.) have opposite leaves but have paired flowers in the leaf axils.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Goats and sheep will browse it but repeated, heavy damage over multiple years is required to kill established shrubs. Herbicides are effective as foliar applications (glyphosate or triclopyr solution), cut-stump application (glyphosate or triclopyr solution applied immediately after cutting except in early spring), or basal bark application any time of year (triclopyr ester in bark oil).

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SEVERELY INVASIVE

SHRUBBY HONEYSUCKLES

Lonicera spp. *(L. morrowii, L. tatarica, L.* x *bella)*

Status in Maine: widespread

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Description: Perennial, deciduous shrub, up to ~10' tall and wide, usually very branched. **Leaves:** Simple, opposite, oval to egg-shaped, with blunt to pointed tip, 1-2" long, edges entire, may be hairy underneath. Leaves emerge early and are held late. **Flowers:** ~1" wide, paired in leaf axils, fragrant, tubular, creamy white, yellow, or pink. Bilaterally symmetrical, ½" long petals like "arms" extend in several directions. Paired in leaf axils. Appear in May in Maine. **Fruit:** Red, globular, juicy berry, to ~⅓" wide. Ripen by late summer. **Stems:** Larger plants have shaggy bark on lower stem. Larger twigs have hollow pith (tube in twig center, cut with sharp blade to see).

Native range: Asia. **How arrived in U.S.:** As an ornamental and for windbreaks.

Reproduction: By seed. Birds and mammals consume fruits and disperse seed. Seed longevity is not known but likely modest.

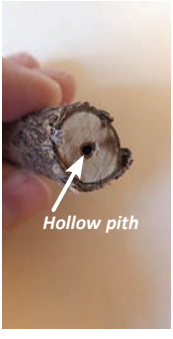
Habitat: Reaches largest size in sun but highly shade-tolerant and capable of invading intact forest understory. Grows in forests, edges, old fields, and roadsides. Tolerant of dry to wet, nutrient-poor soils.

Similar native species: Fly-honeysuckle (*Lonicera canadensis*) and mountain honeysuckle (*Lonicera villosa*) both have similar oval, paired leaves, but have solid pith and tubular flowers with short triangular petals, and are much shorter in height. Bush-honeysuckle (*Diervilla lonicera*) has solid pith and leaves with fine teeth which are long-pointed at the tip. All native honeysuckles (*Lonicera* spp.) have solid pith.

SHRUBBY HONEYSUCKLES

Similar non-native species: The invasive shrubby honeysuckles can be distinguished as follows: *L. morrowii* (white or yellow flowers) is finely hairy on leaf bottoms, *L. tatarica* (pink flowers) mostly lacks leaf hairs, and their hybrid *L.* x *bella* (light pink to white flowers) is somewhat hairy. Common snowberry (*Symphoricarpos albus*), another opposite-leaved shrub, has clusters of small pink flowers and forms large white berries.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or burning the root crown multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Goats and sheep will browse it but repeated, heavy damage over multiple years is required to kill established shrubs. Glyphosate is the most effective herbicide for honeysuckles. They will hold on to their leaves into the fall which makes them susceptible to a foliar glyphosate application after many native species have dropped their leaves. For cut-stump applications use glyphosate applied immediately after cutting except in early spring. Basal bark application is less effective on these species.



VERY INVASIVE

RUGOSA ROSE

(Beach rose)

Rosa rugosa

Status in Maine: widespread

Description: Perennial, deciduous shrub, up to 7' tall. **Leaves:** Pinnately compound, 5-9 oval leaflets, each ~1-2" long, with teeth. Leaves are heavily veined, appearing wrinkled, hence the name "rugose" (wrinkled). **Flowers:** Showy, 5-petaled, usually dark pink (occasionally white or light pink), ~2" wide, in leaf axils, starts blooming in June in Maine. **Fruit:** ~1" round, red, rose "hips." **Stems:** With dense, straight prickles.

Native range: Japan, China, Korea. **How arrived in U.S.:** As an ornamental.

Reproduction: Spreads vegetatively, creating dense thickets by spreading rhizomes. Rhizomes can also float and establish new locations. Also spreads by seed; fruits and seeds float and are transported by water, or spread by birds or small mammals that eat fruits.

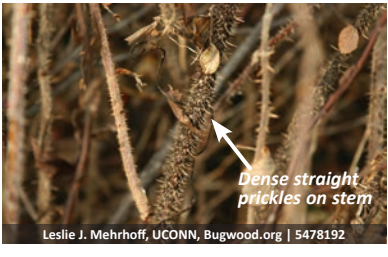
Habitat: Planted in a variety of locations but only seems to invade beach dunes and immediate coastal habitats, perhaps due to dispersal of seeds by tides. Tolerant of salt spray and poor (but well-drained) soils.

Similar native species: No native rose has such large, showy flowers, densely prickly stems, and rugose (wrinkled) leaves.

Similar non-native species: Many ornamental roses have showy flowers but do not escape to minimally managed areas. Rugosa rose is distinctive with densely prickly stems and rugose leaves.

RUGOSA ROSE

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist (wear gloves!); larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Herbicides are effective as foliar applications (glyphosate solution) or cut-stump applications (glyphosate or triclopyr solution applied immediately after cutting except in early spring), though the latter method is tedious due to numerous canes. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***



Leslie J. Mehrhoff, UCONN, Bugwood.org | 5478192

SEVERELY INVASIVE

WINEBERRY

(Wine raspberry)

Rubus phoenicolasius

Status in Maine: not yet detected

Description: Perennial, deciduous shrub with arching, thorny, biennial stems (canes), like many brambles. Branches, petioles, and sepals covered with long glandular red hairs. **Leaves:** Alternate, pinnately compound leaves with 3-5 toothed leaflets. Undersides of leaves appear white due to white, woolly hairs. **Flowers/seeds:** Bristly clusters of ¼-½" flowers, each with 5 very small white petals, produce orange to red edible "berries." A hairy, sticky calyx covers and protects the fruit as it matures.

Native range: Eastern Asia and Japan. **How arrived in U.S.:** Introduced by agronomists to improve commercial *Rubus* breeding stock.

Reproduction: By seed and vegetatively. Flowers are hermaphroditic and self-compatible and are not dependent on pollinators for fruit set. Berries are eaten by a variety of animals, including humans. Also spreads vegetatively, by underground rhizomes and rooting cane tips.

Habitat: Prefers open, moist conditions, but invades a variety of habitats including forest gaps, woodlands, floodplains, shrublands, wet meadows, hedgerows, meadows, old fields, upper beach areas, and burn sites.

Similar native species: Two similar sized *Rubus* species in Maine have reddish berries, red raspberry (*Rubus idaeus*) and flowering raspberry (*Rubus odoratus*). Red raspberry differs in having far fewer prickles/hairs on its stem, typically 5 leaflets, and a more upright habit. Flowering raspberry

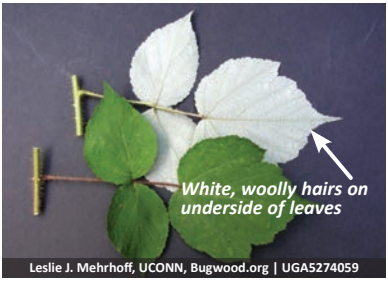
WINEBERRY

differs in having simple, undivided leaves and large pink flowers. Other similarly sized *Rubus* species produce black berries. The reddish hairy, bristly look of wineberry is distinctive.

Similar non-native species: Japanese strawberry raspberry (*Rubus illecebrosus*), a rare escape, has large (~1") bright red fruits and pinnately compound leaves with 5-7 leaflets, and lacks red bristles/hair.

Control methods: Small plants and seedlings may be pulled up by the roots if soil is moist; larger plants can be cut, but re-sprouting will occur. Persistent cutting or mowing multiple times during the growing season over several years may kill the plant, but diligence is required. Mowing can prevent seedlings from establishing. Herbicides are effective as foliar applications (glyphosate solution) or cut-stump applications (glyphosate or triclopyr solution applied immediately after cutting except in early spring).


Leslie J. Mehrhoff, UCONN, Bugwood.org | 5449837



Leslie J. Mehrhoff, UCONN, Bugwood.org | UGA5274059

VERY INVASIVE

AMUR CORKTREE

Phellodendron amurense

Status in Maine: not yet detected

Description: Deciduous, fast-growing tree that reaches reproductive maturity in as little as 3-5 years. 30-45' tall, with spreading branches, short trunk, and thick corky bark; inner bark is bright yellow. **Leaves:** Pinnately compound, opposite to sub-opposite, 10-15" long, each with 5-11 leaflets. Leaflets are oval, pointed, with entire, wavy margins. Crushed foliage smells like turpentine. **Flowers/ seeds:** Dioecious; clusters of inconspicuous yellow-green flowers appear on trees in early summer. **Fruit:** Female trees develop round green drupes that turn black when mature; ¼-½" diameter. Each drupe contains 5 seeds.

Native range: Eastern Asia. **How arrived in U.S.:** As an ornamental.

Reproduction: By seed. Birds are the main dispersers. Seeds are thought to remain viable in the soil for several years. Stumps vigorously re-sprout and attain flower producing capacity quickly.

Habitat: Prefers sun and moist, well-drained soils but can tolerate a range of conditions. It can invade the shady understory of oak dominated forests. Seedlings readily establish under parent trees; dense stands > 36 trees per acre have been observed.

Similar native species: Butternut (*Juglans cinerea*) and staghorn sumac (*Rhus hirta*) both have elongated, pinnately compound leaves, but both differ by having alternate leaf orientation and leaflets that are finely serrate.

AMUR CORKTREE

Similar non-native species: Tree of heaven (*Ailanthus altissima*) has alternate, pinnately compound leaves; leaflets have a couple of blunt teeth at the base. See entry for tree of heaven in this guide.

Control methods: Seedlings can be pulled up; saplings can be pulled with a weed lever or cut, but re-sprouting will occur so follow-up will be necessary. Prioritize eradication of female trees. Larger trees can be cut, but will also re-sprout unless the cut stump is immediately treated with concentrated herbicide (glyphosate or triclopyr). Repeated follow-up cutting can control re-sprouting from cut stumps. Foliar spray can also be effective for seedlings, short saplings, or re-sprouts (glyphosate or triclopyr), as long as you can reach the top of the plant. For stems up to about 4-6" diameter, basal bark treatment can be effective at any time of year (spray lower 18-24" of trunk with triclopyr in penetrating oil).

Troy Kimoto, Canadian Food Inspection Agency, Bugwood.org | 5518014

SEVERELY INVASIVE

BLACK LOCUST

Robinia pseudoacacia

Status in Maine: widespread

Description: Medium to tall (40-100'), fast growing, deciduous tree, native to several southeastern and a few midwestern states. Bark of young trees is smooth green but becomes deeply furrowed and dark brown with age. Large spines grow in pairs on trunks and branches, especially on suckering stems. Wood is dense and prized for its durability. **Leaves:** Alternate, 8-12" long, pinnately compound with oval leaflets up to 1" wide and 2" long. Blue-green, with lighter undersides. **Flowers/seeds:** Typical pea flower in shape, white (rarely pink) with a yellow smudge in the center, ~1" wide, and fragrant; in loose, 8" long racemes that hang in large numbers from branches. Late flowering tree in Maine (mid-June). Fruits are pods, 2-4" long and ½" wide, each containing 4-8 seeds. Dried pods often remain on tree through winter.

Native range: Southeastern U.S., Pennsylvania to Georgia, west to Missouri (Appalachia; Ozark Plateau). **How it spread:** Planted for its durable lumber; also as an ornamental and for soil stabilization.

Reproduction: By seed and by suckers. Flowers require pollinators. Fragrance and nectar make for high rates of visitation. Seed bank longevity is likely high. Suckering can establish large clones.

Habitat: Prefers sun and well-drained soils. Common in disturbed sites and forest edges as well as roadsides, logging roads, hedgerows, and gravel pits. Its association with nitrogen fixing bacteria allow it to invade open canopy plant communities associated with sandy, nutrient poor soils.

BLACK LOCUST

Similar native species: None.

Similar non-native species: Honey locust (*Gleditsia triacanthos*) has bipinnately compound leaves and dense clusters of large, multi-pronged thorns on its branches and trunk. Siberian pea-shrub (*Caragana arborescens*) is much smaller with yellow flowers and no thorns.

Control methods: Seedlings can be hand pulled; saplings can be pulled with a weed lever or cut, but re-sprouting will occur so follow-up will be necessary. Larger trees can be cut, but will also re-sprout unless the cut stump is immediately treated with concentrated herbicide (triclopyr or glyphosate). However, this is not effective in early spring due to sap rising. Repeated follow-up cutting can control re-sprouting from cut stumps, but persistence is required, sometimes for many years. Foliar spray can also be effective for seedlings, short saplings, or re-sprouts (glyphosate or triclopyr), as long as you can reach the top of the plant. For stems up to about 4-6" diameter, basal bark treatment can be effective (spray lower 18-24" of trunk with triclopyr in penetrating oil). In urban or suburban areas where trees provide valuable shade, a phase-out approach with re-planting of native trees may be advisable.

Leslie J. Mehrhoff, UConn, Bugwood | 5453747

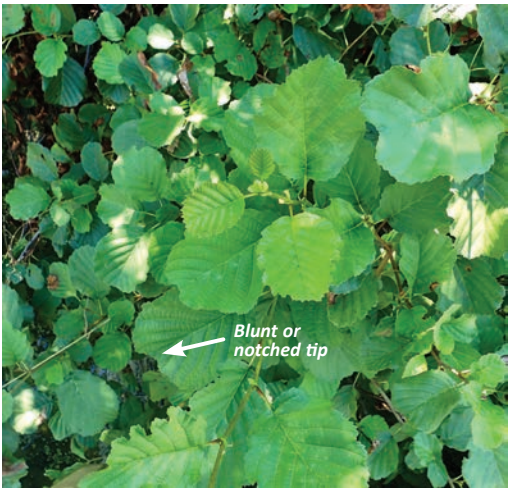

Ohio State Weed Lab Archive, OSU | 1557140

SEVERELY INVASIVE

EUROPEAN ALDER

Alnus glutinosa

Status in Maine: localized



Description: Deciduous, fast growing small tree, 30-50' tall, usually with multiple vertical stems (not leaning or arcing). Bark is a speckled greenish-gray with irregular horizontal lenticels. **Leaves:** Simple, glossy dark green, round to slightly oval, 2-3" wide and 2-4" long, doubly serrate. Often with a broadly blunt or notched tip. Young leaves and buds have sticky resin. **Flowers/seeds:** Monoecious with separate male and female catkins. In fall, female catkins become cone-like woody structures, ¾" long, each containing many tiny flat seeds. **Roots:** Shallow, dense, and with nitrogen fixing nodules.

Native range: Europe and Western Asia. **How arrived in U.S.:** Planted as a windbreak and for firewood; accidentally used in some wetland restorations (mistaken for native *Alnus incana*).

Reproduction: Primarily by seeds, which are wind and water dispersed. Vegetatively by stump sprouts and suckering.

Habitat: Streamside woodlands, canal banks, pond edges, moist meadows, and other wetland habitats. Can tolerate drier sites but is intolerant of shade. Can form pure stands and thickets in disturbed wetlands. Its association with a nitrogen fixing bacterium allows it to establish on infertile sites.

EUROPEAN ALDER

Similar native species: Similar to all three native alder species: speckled alder (*Alnus incana*), smooth alder (*A. serrulata*), and green alder (*A. viridis*). Native alders are more shrub-like and have many arcing or leaning stems per plant. Native alders also have leaves rounded to acute at the apex vs broadly blunt for European alder.

Similar non-native species: None.

Control methods: Seedlings can be pulled up; saplings can be pulled with a weed lever or cut, but re-sprouting will occur so follow-up will be necessary. Larger trees can be cut, but will also re-sprout unless the cut stump is immediately treated with concentrated herbicide (triclopyr or glyphosate). However, this is not effective in early spring due to sap rising. Repeated follow-up cutting can control re-sprouting from cut stumps. Foliar spray can also be effective for seedlings, short saplings, or re-sprouts (glyphosate or triclopyr), as long as you can reach the top of the plant. For stems up to about 4-6" diameter, basal bark treatment can be effective any time of year (spray lower 18-24" of trunk with triclopyr in penetrating oil). ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

VERY INVASIVE

NORWAY MAPLE

Acer platanoides

Status in Maine: widespread

Description: Deciduous, canopy-height tree, often planted. Cultivars include "Crimson King" which has purple-red color. **Leaves:** Opposite, 5-lobed with pointed tips but without other teeth. Broken petiole oozes white sap–distinguishes this species from native maples. Holds leaves late into autumn. Winter buds are reddish-green and rounded. **Flowers:** Tiny, yellow-green, high in canopy, early spring. **Fruit:** Typical winged maple samara but with a very wide angle. **Bark:** Furrowed, dark gray, not shaggy like mature native maples.

Native range: Europe, Eastern Asia. **How arrived in U.S.:** As an ornamental and shade tree.

Reproduction: By seeds which are dispersed short distances by wind or small mammals; occasional long-distance transport by water might be possible.

Habitat: Forests, forest edges, open and disturbed areas. Extremely shade-tolerant, can germinate and compete under a closed canopy.

Similar native species: Norway maple could be mistaken for sugar maple (*A. saccharum*), but Norway maple has milky petiole sap, furrowed bark, and reddish-green, rounded buds, whereas sugar maple lacks milky sap, has shaggy bark, and has brown, pointed buds.

Similar non-native species: Amur maple (*Acer ginnala*) is a small tree, has a much smaller, narrower leaf shape, and has toothed leaves.

NORWAY MAPLE

Control methods: Seedlings can be pulled up; saplings can be pulled with a weed lever or cut, but re-sprouting will occur so follow-up will be necessary. Longevity of seeds is not known. Larger trees can be cut, but will also re-sprout unless the cut stump is immediately treated with concentrated herbicide (glyphosate or triclopyr). However, this is not effective in early spring due to sap rising. Repeated follow-up cutting can control re-sprouting from cut stumps, but persistence is required, sometimes for many years. Foliar spray can also be effective for seedlings, short saplings, or re-sprouts (glyphosate or triclopyr), as long as you can reach the top of the plant. For stems up to about 4-6" diameter, the basal bark treatment can be somewhat effective any time of year (spray lower 18-24" of trunk with triclopyr in penetrating bark oil). In urban or suburban areas where trees provide valuable shade, a phase-out approach (removing trees gradually over time) with re-planting of native tree species may be advisable.

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SEVERELY INVASIVE

TREE OF HEAVEN

(Ailanthus)

Ailanthus altissima

Status in Maine: localized

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Description: Deciduous, fast-growing, pollution-tolerant tree. Reaches 50-90' tall, but is usually shorter. Short-lived species (30-50 years). Clonal growth can be extensive. Also known as "stink tree," as crushed leaves and pith smell like rancid peanut butter. **Leaves:** Large (1-4'), alternate, pinnately compound (10-41 leaflets). Leaflet margins are smooth with only a couple of glandular teeth at the base. **Flowers/seeds:** Dioecious; large terminal clusters of small yellow-green flowers. Females produce huge numbers of flat winged fruit (samaras) that are wind dispersed. **Bark:** Stems pale gray and smooth, twigs are medium brown.

Native range: China. **How arrived in U.S.:** As an ornamental.

Reproduction: A prodigious seed producer. According to one study, a single tree can produce over 300,000 seeds per year! Seed germination and establishment rates vary and soil seed bank longevity is not long. Asexual reproduction is also robust; clonal growth via root sprouting can quickly colonize a large area.

Habitat: Although best described as an early successional tree of forest ecosystems, Tree of heaven has proven itself rugged and opportunistic and able to grow most anywhere. While commonplace in cities and post-industrial wilds, it is invading high priority conservation forests in other states.

Similar native species: Butternut (*Juglans cinerea*) and staghorn sumac (*Rhus hirta*) have similar elongate, pinnately compound leaves, but differ by having leaflets that are finely serrate. Staghorn sumac also has leaf petioles and stems

TREE OF HEAVEN

covered with dense fine hairs. Ash (*Fraxinus* spp.) leaves are opposite. Hickories (*Carya* spp.) tend to have fewer leaflets and are toothed.

Similar non-native species: Amur cork tree (*Phellodendron amurense*, see entry in this guide) has opposite, pinnately compound leaves and generally has fewer leaflets, corky bark, and berries.

Control methods: Seedlings can be pulled up; saplings can be pulled with a weed lever or cut, but re-sprouting will occur so follow-up will be necessary. Prioritize eradication of female trees. Larger trees can be cut, but will also re-sprout unless the cut stump is immediately treated with concentrated herbicide (glyphosate or triclopyr). Repeated follow-up cutting can control re-sprouting from cut stumps. Foliar spray can also be effective for seedlings, short saplings, or re-sprouts (glyphosate or triclopyr), as long as you can reach the top of the plant. For stems up to about 4-6" diameter, basal bark treatment can be effective any time of year (spray lower 18-24" of trunk with triclopyr in penetrating bark oil). Sap can cause dermatitis and more severe reactions. Wear gloves.

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Jan Samanek, Bugwood.org | 5292047

K. Rawlins, Bugwood | 5408538

SEVERELY INVASIVE

WHITE POPLAR

Populus alba

Status in Maine: localized

Description: Deciduous, fast growing, short-lived tree; prone to stump sprouting and clonal spread. **Leaves:** Alternate, simple, ~4" long, with 3-5 palmate lobes, like a maple leaf. Undersides are covered in dense white hairs. **Flowers/fruit:** Dioecious; most specimens in North America are female. Flowers are green (reddish green in males), arranged in pendant clusters (catkins) several inches long, and appear before bud break. Like other poplars, female catkins become cottony, releasing tiny fluff-covered seeds. **Stem:** White down covers new branch growth. Bark is whitish to pale gray, becoming darker and rough on lower trunk with age. **Roots:** Deep and fibrous. Lateral root suckering can be extensive.

Native range: Central and southern Europe, temperate Asia, northern Africa. **How it arrived in U.S.:** Introduced as a landscape tree; recorded in New England as early as 1785.

Reproduction: Primarily by vegetative means. Lateral roots can cover considerable distances below ground, with suckers emerging over 100' from the parent tree. In some situations, dense colonies can form. Stem and root fragments have also been shown to regenerate the plant. Flowers are wind pollinated, but since males are rare, seed production occurs mainly through hybridization with other poplar species. The

WHITE POPLAR

resulting hybrids can be female, male, or hermaphrodites, and can produce large numbers of viable, wind-dispersed seeds.

Habitat: Commonly found where soils are deep and moist: floodplains, lake shores, swamps, and abandoned farmland.

Similar native species: Quaking aspen (*Populus tremuloides*), eastern cottonwood (*Populus deltoides*), and balsam poplar (*Populus balsamifera*) all lack the silvery white hairs on branches, leaves and buds. These native poplars have un-lobed leaves and pointier, glabrous leaf buds.

Similar non-native species: None.

Control methods: Girdling and cutting promotes vigorous re-sprouting and lateral suckering, so repeated treatments will be necessary. Foliar application of a triclopyr or glyphosate solution is effective on seedlings and small trees. For larger trees, consider the cut-stump method using a more concentrated solution of triclopyr or glyphosate, or, basal bark treatment using a triclopyr ester solution in bark oil.


Robert Vidéki, Bugwood.org | 5398214


Robert Vidéki, Bugwood.org | 5398218

SEVERELY INVASIVE

ASIATIC BITTERSWEET

(Oriental bittersweet)

Celastrus orbiculatus

Status in Maine: widespread

Description: Perennial, deciduous, woody vine. Twines around mature trees and climbs high into the canopy, or sprawls over low-growing vegetation. **Leaves:** Simple, alternate, round to somewhat elliptical, 2-4" long, with wavy or weakly toothed edges, turning yellow in fall. Leaves abruptly pointed at tips or in sun more tapering toward pointed tip. **Flowers:** Green-yellow, 5-petaled, small, clustered in leaf axils, ~June. **Fruits:** Distinctive yellow aril covers orange-red seed. Fruits mature in fall and persist into winter. **Bark:** Light brown with raised tan lenticels. **Roots:** Bright orange.

Native range: Japan, China, Korea. **How arrived in U.S.:** As an ornamental.

Reproduction: By seed and vegetatively. Plants are usually dioecious; males do not produce fruit. Fruits are eaten and dispersed by birds and small mammals, or by careless disposal of bittersweet wreaths. Seeds are viable for about one year. New shoots may sprout from the root crown, and root fragments may also regenerate.

Habitat: Forests, forest edges, woodlands, old fields, beaches, and dunes. Moderately shade-tolerant; more productive in sun. Tolerates dry to moist soils.

Similar native species: American bittersweet (*C. scandens*), uncommon in Maine, is very similar but only has flowers and fruit at vine tips, and usually has leaves twice as long as wide. Grape (*Vitis* spp.) will also grow into tree canopies. Grape bark has a peeling, shredded appearance and leaves

ASIATIC BITTERSWEET

are larger and palmately lobed.

Similar non-native species: None in our area.

Control methods: Very small plants and seedlings may be pulled up by the roots when soil is moist; larger vines can be cut, but aggressive re-sprouting will occur. Cut larger vines at chest height and also at ankle height to prevent new vines climbing up old ones (you can also treat the rooted part of the vine with cut-stem herbicide if desired). Persistent cutting alone, multiple times during the growing season over several years, may kill the plant, but diligence is required (at least 6x/yr for 3 yrs is suggested). Vines can be left to die in the canopy; pulling the vines from the trees can cause additional damage. Mowing can prevent seedlings from establishing. Herbicides are effective as foliar applications (triclopyr solution, foliar glyphosate not as effective on this species), cut-stump applications (glyphosate or triclopyr solution applied immediately after cutting except during early spring), or basal bark application any time of year (for stems <6" diameter, triclopyr in bark oil). For dense thicket-type growth and very large infestations, cut or bush-hog all vines at mid-summer, then foliar spray triclopyr solution the following summer before flowering when plant height is lower and less herbicide is needed.


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SEVERELY INVASIVE

BLACK SWALLOWWORT

(Dog-strangling vine)

Cynanchum louiseae

Status in Maine: localized

Description: Perennial, herbaceous, thin, twining vine commonly to 6' in length. **Leaves:** Opposite, lance to heart shaped, broad at base and tapered to a point, 2½-5" long, up to 3" wide, turn yellow in fall. **Flowers:** 5-pointed, star-shaped, dark purple-brown, ¼" diameter. Appear in loose cymes of 6-10 flowers in leaf axils, May-September. Fly pollinated, nectar smells like rotting fruit. **Fruit:** Slender, 1-3" long, green pods release brown seeds with white silken parachutes, similar to milkweed, that catch the wind. Seeds are polyembryonic, which means one seed can produce multiple seedlings. Germination rate is 30-50%. Seed longevity is not known. **Stems:** Covered in fine, downy hairs. **Roots:** Extensive rhizomatous root system. **Note:** Leaves and roots are toxic to Monarch butterfly larvae. Research indicates that swallowwort roots can change soil conditions through allelopathic extracts and amplified associations with generalist mycorrhizal fungi, which can reduce native plant diversity.

Native range: Europe. **How arrived in U.S.:** As an ornamental.

Reproduction: By seed and vegetatively by trailing stoloniferous stems and rhizomes. Seeds are windblown or can be carried on animal fur or perhaps in soil.

Habitat: Prefers enriched soils and sun but can establish dense stands in a wide range of settings including old fields, stream banks, roadsides, woodlands, and well-drained uplands.

BLACK SWALLOWWORT

Similar native species: No native vines of similar character. Dogbanes (*Apocynum* spp.) may superficially look similar, but are perennial, upright herbs of open areas, with leaves tapering to the base.

Similar non-native species: Pale swallowwort (*C. rossicum*) is also invasive and is very similar; its flowers are light pink-gray-purple rather than the dark purple of black swallowwort. Pale swallowwort is very uncommon in Maine. Treatment methods are the same for both species.

Control Methods: Dig root crowns before seed pods develop. Be sure to remove all roots and dispose in garbage. This is effective in small populations. Mowing encourages vigorous re-sprouting, but multiple mowings before pod production will prevent seed production. Foliar spray of triclopyr before flowering stage (but not too early, plants need to have enough surface area to absorb lethal dose of herbicide), or glyphosate after flowering is initiated. Follow-up spraying will be needed since the dense leaves keep herbicide from reaching enough of the plant for complete control in one application. Small plants regenerating after treatment blend in well with other vegetation – careful scrutiny is needed for detection and further treatment. Some people have skin reactions to this plant; wear gloves.


Leslie J. Mehrhoff, University of Connecticut, Bugwood.org | 5452129

SEVERELY INVASIVE

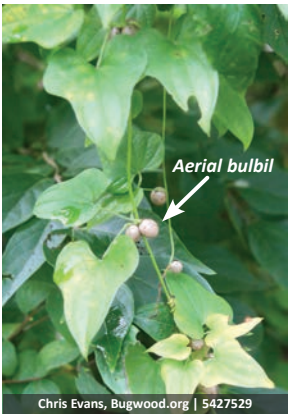
CHINESE YAM

(Cinnamon vine)

Dioscorea polystachya

Status in Maine: not yet detected

James H. Miller, Bugwood.org | 1237002



Chris Evans, Bugwood.org | 5427529

Description: Herbaceous, perennial, creeping and climbing vine. Can climb up to 16' when supported on other plants. **Leaves:** Usually alternate but sometimes opposite at tips of stems. Entire, heart-shaped to somewhat lobed base, with a long tip. Veins radiate from base. Long petioles. **Flowers:** Some sources say it does not flower in North America, others that flowering is rare. Small spikes in leaf axils, with odor like cinnamon. Dioecious. **Fruit/seeds:** Three-angled, membranous capsule. Rarely or never seen. **Bulbils:** Small (to 1"), ovoid, warty, vegetative reproductive propagules like a tiny potato are produced in the leaf axils. **Stem:** Thin, rounded, wiry, hairless. **Root:** Long-lived and can have large (to 3') tubers.

Native range: East Asia. **How arrived in U.S.:** Introduced to North America for ornamental, food, and medicinal purposes.

Reproduction: In North America, exclusively or almost exclusively vegetatively – by spread of bulbils and underground tubers. Water, animals, and gravity can disperse bulbils or tubers.

Habitat: Prefers nutrient rich soils such as floodplains and streambanks. Also grows in fields and roadsides.

Similar native species: Greenbriar or carrion-flower

CHINESE YAM

(*Smilax herbacea*) has opposite leaves and round clusters of tiny flowers which yield blue berries when mature. There is a native wild yam in southern New England (*Dioscorea villosa*), but it lacks bulbils, has unlobed leaves, and its leaves are alternate toward vine tips.

Similar non-native species: Field bindweed (*Convolvulus arvensis*), a weedy vine of open, disturbed areas, has consistently alternate leaves, and showy, white, pink, or red, trumpet-shaped flowers.

Control methods: Repeated cutting or mowing (several times per growing season) that prevents bulbils from forming can exhaust tubers over time, but diligence is required. Digging can be used with new/small infestations; take care not to spread tubers – bag and dispose dug material in trash or by burning. Bulbils can also be picked and disposed or burned to slow the spread. Herbicides can be effective. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."*** Foliar treatment with triclopyr is most effective after leaves are fully developed but before bulbils are formed. A glyphosate herbicide at high concentration can be used later in the season on cut stems, but this will be very tedious if there are many vines.

James H. Miller, Bugwood.org | 5421977

Chris Evans, Bugwood.org | 2120013

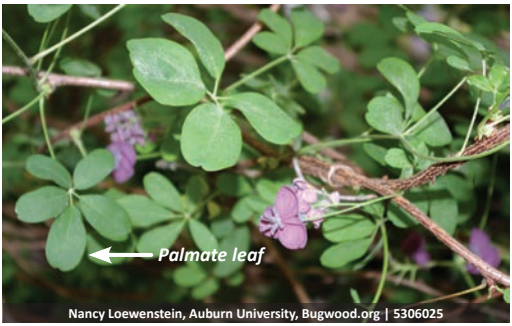
SEVERELY INVASIVE

CHOCOLATE VINE

(Fiveleaf akebia)

Akebia quinata

Status in Maine: not yet detected



Description: Woody, climbing vine, that can also grow as a ground cover. **Leaves:** Alternate, distinctively palmately compound, usually with 5 leaflets; 4-7" across. Oval leaflets are 1¼-4" long and have notched tips. **Flowers:** Produces racemes containing both male and larger female flowers, to 1½" wide, fleshy, pale red to purplish brown. Flowers have a sweet scent described as chocolate-like. **Fruits:** ~4" long, sausage-shaped, pale purple pods. Inner white pulp contains up to 200 seeds. **Stem:** Grayish brown with distinct lenticels; can grow to 40'. **Roots:** Fibrous and shallow.

Native range: Japan, Korea, and China. **How arrived in U.S.:** Introduced in the mid-1800s as an ornamental.

Reproduction. Primarily by vegetative means. Roots can emerge from stem fragments and stem nodes on sprawling vines in contact with soil. Fruits, while not reliably produced in northeastern U.S., are attractive to wildlife and people.

Habitat: Although it prefers moist soils and partial sun, it can tolerate full shade and drought. Riverbanks, woodlands, forest edges, and disturbed areas are its principal habitats. Vines will form dense tangles and overtake other vegetation.

Similar native species: Virginia creeper (*Parthenocissus quinquefolia*), has larger five-fingered leaves, toothed leaflets, and tendrils. Some members of the *Rhododendron* genus (e.g., clammy azalea, *Rhododendron viscosum*) have leaves that may appear as though they are palmately compound like chocolate vine.

CHOCOLATE VINE

Similar non-native species: Wisteria vines (*Wisteria* spp.) can have a similar growth habit and bark, but their leaves are pinnately compound.

Control methods: Vines can be hand pulled, rolled up, and hung to dry or bagged for disposal. Repeated cutting or weed whacking will work although monitoring for regrowth is essential. Because it often grows over desirable vegetation, herbicide application can be difficult. Foliar applications of glyphosate or triclopyr are effective. To kill larger vines growing up trees, cut stems near the ground and immediately apply glyphosate or triclopyr to cut stumps. ***Special rules apply to herbicide use in or near wetlands and waterbodies - see the section in the back of this guide titled "Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies."***

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VERY INVASIVE

HARDY KIWI

(Tara vine)

Actinidia arguta

Status in Maine: localized

Description: Woody, deciduous, climbing vine. **Leaves:** Alternate, simple, with toothed margins. 3-5" long. Petioles are red. **Flowers:** White to pale green; ~1" wide, 1-7 flowers/inflorescence. Male flowers have dark purple anthers. **Fruits:** ~1" long, green, and cylindrical; like a large grape, not fuzzy like the kiwis in grocery stores. Green pulp contains up to 200 seeds. Entire fruit is edible. **Stem:** Pale grayish-brown bark; thin and smooth, becoming flaky with age. Can grow to 50+', overtopping trees. **Roots:** Fibrous and shallow.

Native range: East Asia and Siberia. **How arrived in U.S.:** Introduced in 1877 as an ornamental.

Reproduction: Primarily by vegetative means. Roots emerge from stem nodes on sprawling vines in contact with soil. Hardy kiwi is generally regarded as dioecious, so male and female plants are needed for fruit set. Fruits, while not reliably produced in unmanaged stands, are attractive to wildlife and people.

Habitat: Prefers deep, well-drained soil. It can tolerate partial shade and clay soil. Woodlands, forest edges, and abandoned estates are its principal habitats. Vines will form dense tangles and overtake other vegetation including trees.

Similar native species: American bittersweet (*Celastrus scandens*) has green petioles, furrowed bark (on older

HARDY KIWI

vines), and produces orange, berry-like capsules. Grape (*Vitis* spp.) has darker brown bark with a peeling, shredded appearance, as well as palmately-lobed leaves.

Similar non-native species: Asiatic bittersweet (*Celastrus orbiculatus*) has green petioles and produces many orange, berry-like capsules. The bark of older vines becomes corky and furrowed, unlike that of hardy kiwi.

Control methods: Vines can be hand pulled, dug or machine excavated, depending on size. Because it often grows over desirable vegetation, herbicide application can be difficult. Foliar applications of glyphosate or triclopyr amine are recommended. To kill larger vines growing up trees, cut stems near the ground and immediately apply triclopyr ester to cut stumps. Vines can be left to die in the canopy; pulling vines from the trees can cause additional damage.

SEVERELY INVASIVE

JAPANESE HONEYSUCKLE

Lonicera japonica

Status in Maine: localized

Description: Perennial woody vine; grows in a dense tangle over ground and atop other vegetation. Young stems have fine hairs. **Leaves:** Leaves are simple, 1½-3½" long, oval, and opposite. Occasionally, leaves low on the vine may have rounded lobes. Leaves appear early and remain late in the season, providing a photosynthetic advantage. **Flowers:** Tubular, fragrant, 1-1½" long, creamy white to yellow, with two reflexed lips and long stamens. Occur in pairs between leaves and appear May-June. **Fruit:** Black berries ripening in fall.

Native range: Eastern Asia. **How arrived in U.S.:** As an ornamental; also for erosion control and wildlife cover.

Reproduction: By seed and vegetatively. Fruits are eaten by birds and other wildlife and dispersed in droppings. Spreads vegetatively by underground rhizomes and above ground runners.

Habitat: Disturbed areas such as roadsides, field edges, and floodplains. Windthrows, logging, and insect outbreaks provide entry into woodlands. Tolerates shade, but flowering is diminished. Prefers moist soils. Warmer winters and increased atmospheric carbon dioxide levels may aid in its spread northward.

Similar native species: Wild honeysuckle (*Lonicera dioica*), a rare species in Maine, has hairless vines and perfoliate leaves at the vine tip.

Similar non-native species: Trumpet honeysuckle (*Lonicera sempervirens*), a native species of southern New England and the southeast U.S., has hairless vines and perfoliate leaves at the vine tip. Young shrubby honeysuckles could also be mistaken for the vine.

JAPANESE HONEYSUCKLE

Control methods: Hand pull or dig seedlings. If pulling mature plants, consider bagging vines with berries to prevent spreading seed. Because it holds its leaves into fall, a late season foliar glyphosate solution can be applied when surrounding plant species are dormant. A glyphosate or triclopyr solution can be applied to cut stems outside of early spring, as long as ground is not frozen.

VERY INVASIVE

MILE-A-MINUTE VINE

(Devil's tearthumb)

Persicaria perfoliata

Status in Maine: not yet detected

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Description: Vigorous herbaceous, annual vine. **Leaves:** Alternate, triangular, 1-3" long. Round, leaf-like structures called ocrea surround the stem at the base of the petiole. **Flowers:** Racemes of small, pale green, apetalous flowers are inconspicuous, and form from July to October. **Fruits:** Fleshy fruits the size of peas eventually turn blue when ripe. **Stem:** Glaucous green with numerous sharp barbs; up to 15-25' long. **Roots:** Fibrous and shallow.

Native range: India, China, Japan, Eastern Asia. **How arrived in U.S.:** Contaminant in imported nursery stock.

Reproduction: By seed, primarily self-pollinating. Blue fruits are eaten by birds and other wildlife. Fruits can float for 7-9 days and disperse long distances in streams and rivers. Seeds remain viable in the seed bank for several years.

Habitat: Open stream corridors, woodland edges, fence rows, recently cut timberlands, ditches, roadsides, and other disturbed areas. Favors moist soils and full sun. Vines will form dense tangles and overtake other vegetation.

Similar native species: Halberd leaved tear-thumb (*Polygonum arifolium*) leaves are more narrowly triangular, and none perfoliate (surrounding the stem). Greenbriar (*Smilax* spp.) leaves are ovate, vine is stout, and thorns are large ~½". Fringed bindweed (*Fallopia cilinodis*) lacks barbs.

Similar non-native species: Black bindweed (*Fallopia convolvulus*) lacks barbs.

MILE-A-MINUTE VINE

Control methods: Vines can be pulled and rolled up in late spring and early summer before fruit formation (wear gloves!). Repeated mowing or weed whacking is also effective. Because it often grows over desirable vegetation, herbicide application can be difficult. Foliar applications of glyphosate or triclopyr prior to flowering stage can prevent this annual plant from producing large amounts of seed. ***Imazapic or other herbicides with residual soil activity can be helpful for heavy infestations and seed bank control; such efforts should always involve a licensed professional applicator since soil-active herbicides can cause unexpected damage to non-target plants. Therefore, caution and professional experience are required.***

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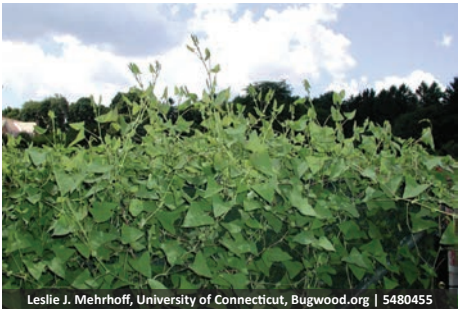
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SEVERELY INVASIVE

PORCELAINBERRY

(Amur peppervine)

Ampelopsis glandulosa

Status in Maine: localized

Description: Deciduous, perennial, woody climbing vine, reaching 15-20'. **Leaves:** Alternate, variably shaped, 3-5 lobes, to 5", similar to grape, its relative. Undersides are shiny white; margins have coarse teeth. Tendrils at leaf base help vine climb over other plants. **Flowers/seeds:** Small, greenish yellow flowers, in umbels/clusters. Attractive, speckled ¼" wide berries ripen to turquoise, blue, pink and purple. Each contains 2-4 seeds. **Stem:** Smooth, dotted with lenticels.

Native range: Eastern Russia, China, Korea, Japan. **How arrived in U.S.:** As an ornamental.

Reproduction: Primarily by seed, but also vegetatively through root fragments, cuttings, and suckers. Primarily bird dispersed.

Habitat: Prefers moist (but not permanently wet) soils and full to partial sun. Pond margins, stream banks, hedgerows, shrublands, floodplains, and open woodlands. Climbs up and over trees and shrubs, hastening their decline.

Similar native species: Grapes (*Vitis* spp.) have tan pith while Porcelainberry has white. Grape bark has a shredded appearance. Virginia creeper (*Parthenocissus quinquefolia*) has palmately compound leaves (5 leaflets), dark blue berries, and holdfasts on its tendrils.

Similar non-native species: Boston-ivy (*Parthenocissus tricuspidata*); leaves are usually simple with three deep

PORCELAINBERRY

pointed lobes, but may be compound (3 leaflets). It has dark blue fruit on red stems and tendrils with holdfasts.

Control methods: Small plants and seedlings may be pulled up by the roots when soil is moist; larger vines can be cut, but re-sprouting will occur. Cut larger vines at chest height and also at ankle height to prevent new vines climbing up old ones. Persistent cutting multiple times during the growing season over several years may kill the plant, but diligence is required (at least 3x/year for 3 years is suggested). Vines can be left to die in the canopy; pulling them down may cause damage. Mowing can prevent seedlings from establishing. Herbicides are effective as foliar applications (triclopyr solution, glyphosate not as effective on this species), cut-stump applications (triclopyr solution applied immediately after cutting except during early spring), or basal bark application any time of year (to 2-3' long section of base of vine, triclopyr ester in bark oil).

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MANAGING INVASIVE PLANTS

GENERAL MANAGEMENT PRINCIPLES

Integrated Pest Management (IPM)

The principles of IPM will benefit both you and your property in the long run. IPM is defined as 5 key steps:

1. **Identify your pest.** This guide will help you understand the biology of the invasive plant(s) you are managing.
2. **Establish a threshold to determine when to treat the invasive plant.** Keep in mind that Early Detection and Rapid Response is the best approach for any newly invading plant.
3. **Monitor the pest population.** This is essential after any treatment since there are no "silver bullets" in control of invasive plants.
4. **Select an appropriate control strategy.** Control can be cultural (tilling a field, allowing animals to graze), mechanical (mowing, cutting, or pulling), biological (release of native enemies – note this requires state and federal permits), or chemical (herbicides). Often, the best method is a combination of the above techniques. For example, one could mow a dense stand of invasive plants, then apply a low volume foliar herbicide treatment the following year (using a selective herbicide to promote grasses or softwoods to occupy the site). This approach would involve mechanical and chemical control techniques.
5. **Finally, repeatedly evaluate your results and improve on your techniques the following year.**

Prevent New Introductions

Practice Integrated Pest Management by preventing problems before they take root. Take care whenever equipment or materials come to your property. Logging, earth-moving, or farm equipment, animal feeds, mulch, and even compost can carry invasive plant seeds or

viable plant fragments. Ask for equipment to be cleaned at the last job site before it comes to your property. Check areas where erosion control materials were laid down to make sure nothing undesirable is sprouting. Familiarize yourself with the invasive plants in this field guide and take notice of plants you don't recognize. Staff from the Maine Department of Agriculture, Conservation and Forestry-Natural Areas Program, your Soil and Water Conservation District, a local Natural Resources Conservation Service office, your Maine Forest Service District Forester, or the local land trust can help you identify suspicious plants. Don't hesitate to take pictures and send them to an expert for identification.

Identify and Assess

Identify which invasive plants occur on your property and assess their extent and reproductive status. Search field edges, woods roads, old log landings, cellar holes, old fields, wetland edges, and recently-harvested areas to assess the extent of any infestations. Mapping tools such as the free, online program iMapInvasives can help you get a handle on what plants you have, where they are, and how abundant they are. It is essential to understand what plants are present, and where, so that you can prioritize your control efforts. In addition, the landscape context surrounding your property plays a role: what invasive plants are common in your area? Which are unusual?

Prioritize

Unless you are lucky enough to have only a few individual invasive plants, you will most likely have to prioritize your control efforts, rather than trying to "do everything." Setting realistic, achievable goals is essential. If your property sits in a badly invaded landscape, it may be unrealistic to try to eradicate invasive plants. Eradication is not the only good goal. A strategy that works to suppress and/or contain invasive plants may be more appropriate. Consider what your goals are for different areas of the property. Are there

important wildlife habitats or unusual plant communities you wish to particularly protect? Valuable timber stands? Do you have only a few plants of some species, but large infestations of others? If you have only a couple of individuals of one species, get rid of them first before tackling the species which is more widespread. Set clear goals to help track your progress.

Control

Once you have prioritized, choose a treatment approach and take action on your priority areas and/or species. Commonly-used techniques include manual pulling, mechanical cutting or uprooting with a tool, herbicide application, or some combination of these methods. Fire and smothering may also provide effective control for some species. See species profiles for examples of proven methods for particular species. Almost invariably, an initial control effort will need to be repeated or followed up with a second and possibly third effort. ***There are no silver bullets in this business – plan for repeat treatments.***

Monitor and Replant

Once you have treated and followed-up your initial treatment with a second or third treatment, monitoring is essential to protect your investment of time and resources. Many invasive plant species create a substantial seed bank, so new seedlings are likely to grow once the parent plants are removed. In addition, new propagules may be introduced to an area by animals, the movement of water, or the transport of other materials like soil and vegetation. Monitoring of areas previously treated should be on-going, ideally at least once a year.

If you are treating to eradicate invasive species from an area, it is beneficial to replant that area with native vegetation once the infestation has been well-controlled. Garden clubs, local nurseries, or other local businesses, organizations, or concerned community members may be willing to provide financial, material, and/or labor support for planting projects.

MANUAL/MECHANICAL TREATMENT PRINCIPLES

- To eliminate seed production, finish manual removal treatments before flowering begins. This may require multiple treatments for some species if stems are only cut, not pulled or dug.
- Remove as much of the roots as is possible. To avoid excessive soil disturbance, pull or dig when soil is moist.
- Smooth disturbed soil and cover with duff or, if possible, re-plant with native plants.
- Pile extracted vegetation on site and monitor for re-sprouts and seedlings (see Disposal Guidance section for more on this topic).
- Removal of vegetation within the Shoreland Zone (generally 250 feet from waterbodies and wetlands) is governed by town Shoreland Zoning Ordinances. There are limits to how much vegetation can be removed. Some exemptions may apply for invasive plants, but a revegetation plan must be in place. **Contact your town Code Enforcement Officer, or in the Unorganized Territories, contact the Maine Land Use Planning Commission: 207-287-2631.**
- Any vegetation removal that causes soil disturbance near a wetland or waterbody, and any removal of vegetation from within a wetland or waterbody, may require a Permit By Rule from the Maine DEP. **Contact the Maine DEP: 207-287-7688.**

HERBICIDE GUIDANCE

State Laws: Applicator Licensing, etc.

The Maine Board of Pesticides Control (BPC, contact details below) licenses applicators and oversees the use of all pesticides, which include herbicides, in the state of Maine. **A license is required to apply herbicide when:**

- the application is for hire; or

- the applicator is using state or federally restricted pesticides; or
- the land being treated is open to the public (even if a fee is charged); or
- the area is near a wetland or waterbody (additional rules apply).

Unlicensed individuals may make label-compliant applications:

- on land they own or lease;
- using general use ("over-the-counter") pesticides;
- on terrestrial sites;
- on property which is not open to the public.

Consult with the BPC to determine licensure requirements for your situation.

Towns may enact pesticide ordinances that can limit the legal use of herbicides. In some cases, you may be required to apply to your town for a waiver to apply herbicides. Review town ordinances before purchasing or using herbicides. The BPC maintains a list of such ordinances on its website.

Maine law provides a right to advance notification of pesticide application in two situations. 1) If you live or work within a certain distance of outdoor areas treated with pesticides, you can ask your neighbor(s) to be notified in advance of applications; see the BPC website for details. 2) The BPC maintains the Maine Pesticide Notification Registry, a list of people who have requested to be notified in advance of pesticide applications near their property. If pesticides are used for non-agricultural applications outdoors within 250 feet of the property boundary, registered abutters must be notified in advance. The registry list is on the BPC website; check it before making any herbicide applications and be sure to notify any listed neighbors as required by law.

The herbicide strategies in this manual are preliminary suggestions; contact a licensed professional if herbicides become a major control strategy. The BPC maintains a list of Maine licensed professionals who apply herbicides

to control invasive plants. Contact the BPC to request a copy of the list or visit the BPC website.

Maine Board of Pesticides Control contact info:

maine.gov/dacf/php/pesticides/

207-287-2731

pesticides@maine.gov

Important Information about Active Ingredients

The two herbicides most commonly used in terrestrial invasive plant control are glyphosate and triclopyr. These are systemic herbicides that are designed to be applied to healthy, living plant tissue. Look at the herbicide label whenever buying pre-mixed products to make sure additional unwanted herbicides are not included.

Glyphosate is non-selective, meaning it will damage both broadleaf plants and grasses. It is relatively short-lived and non-mobile in soil. Many glyphosate formulations are sold "over-the-counter" and do not require special licensing. Glyphosate is a slow-acting herbicide that may take several weeks to translocate completely in the plant (i.e., reach the roots and kill them). For this reason, it is important not to cut down treated plants until they show obvious signs that the treatment has been effective. For woody plants we recommend leaving the plants in place for at least one year.

Triclopyr is a broadleaf, selective herbicide (does not kill grasses) that is somewhat more active in soil. The water-soluble amine formulation is best applied to leaves and cut stems, whereas the oil soluble, ester formulation may be used in basal bark applications. Triclopyr is generally more effective early in the growing season, while glyphosate is more effective later on.

Horticultural vinegar and other similar herbicides, sometimes called "organic," are promoted as alternatives to herbicides like glyphosate and triclopyr.

These “contact” herbicides damage the plant tissue to which they are applied, but are not translocated to roots below ground (versus “systemic” herbicides which are translocated). Contact herbicides may be effective to kill small, herbaceous, annual weeds in a garden or field setting, but will not be able to kill woody, long-lived invasive plants.

There are other active ingredients and herbicide products which are not discussed in detail in this guide but which may be effective for invasive plant control in certain situations. Some herbicides are soil-active and can translocate in soil to cause serious collateral damage to neighboring plants. Others carry more severe cautions regarding health and safety. Consult with a licensed professional to determine the best options for treatment in your situation.

Application Methods

Herbicide is applied to plants in several different ways: to the foliage, to a cut stem, or to the basal bark of woody plants. A dye can be added so that the applicator can see which plants have already been treated.

Low volume foliar or spot-treatment applications use a low concentration of herbicide, but care must be taken to avoid damage to desirable plants during the application. Product should show as drops on most leaves (especially terminal leaves). Do not apply to the point where product is dripping off the plant. Foliar treatments must be done during the growing season, on plants which can be completely sprayed, in temperatures greater than 50˚F but less than 85˚F, when wind speed is low, and when no rain is predicted for the following eight hours. Do not make foliar applications to plants above head height–this creates unsafe conditions for the applicator and will not likely kill the plant since the top of the plant may not be reached. Additionally, in some instances, above-head application may be a violation of law. Backpack sprayers or powered mist blowers are typical equipment; small plants can be sprayed with a hand spray bottle. *To avoid potential harm to pollinators, avoid spraying when plants are flowering*.

Cut-stem applications are suitable for many woody invasive plants as well as some herbaceous species. Do not use this method in early spring when sap flow causes it to be ineffective. In this treatment method, the stem(s) of the plant are cut and treated with a concentrated solution of herbicide (typically 25-50% solution). When using glyphosate or triclopyr amine formulations, applications need to be made immediately after cutting. With triclopyr ester, applications can take place several hours after cutting. Depending on the situation, herbicide may be applied with a spray bottle or sponge-applicator bottle.

Basal bark applications use a penetrating agent to carry concentrated herbicide (similar or lower concentration as cut-stump treatments) through the lower 12-18" of woody stems up to about 6" diameter. This method can be used year-round as long as the lower portions of the trunk are dry and accessible (not covered in snow). Herbicide is typically delivered using a spray bottle or a small hand-pump sprayer with wand applicator.

Pesticide Formulations and Restricted Use Herbicides

Different formulations of each herbicide are available depending on the mode of application and environment. If a surfactant is not already included in the product, one will always need to be added for foliar applications (e.g., Cide-Kick II). Use caution in selecting a surfactant appropriate to the herbicide and site of application.

In addition, certain application methods such as basal bark treatment may require the addition of penetrating bark oil or the purchase of a product specially formulated for this technique (look for "ready to use" on the label).

There are some herbicides which may only be purchased and applied by licensed Maine herbicide applicators; these are called "restricted use" herbicides. All aquatic herbicide formulations (designed to be used in or near wetland areas or waterbodies) are restricted use products in Maine.

Use of Herbicides to Control Invasive Plants in or Near Wetlands and Waterbodies

If you have an infestation of invasive plants in or near a wetland or waterbody, a complex series of rules and regulations may apply. Extra care is required to comply with these rules and regulations, to ensure clean water for people and wildlife. Your extra attention and diligence in these situations is required and appreciated. Near waterbodies or wetlands, the following rules/authorities may apply:

1. A variance from the Maine Board of Pesticides Control (BPC) may be required. Applications within 25 feet of waters or wetlands are legally limited by BPC rules (Chapter 29, Section 6, see BPC website for details). If the area of infestation is larger than 100 square feet, a variance permit will be required. **Contact the Maine BPC: 207-287-2731 or pesticides@maine.gov**
2. If the infested area is a wetland or the edge of a waterbody, the Maine Department of Environmental Protection should be consulted regarding a Waste Discharge Permit (or exemption). Small infestations without standing water may be exempt from this Permit but a specific set of criteria must be followed. **Contact the Maine DEP: 207-287-7688.**
3. If the infestation is within a wetland, a licensed herbicide applicator is required. Since aquatic herbicide formulations are required by Maine DEP when in a wetland, and because aquatic herbicide formulations are restricted use products in Maine, a licensed applicator with the aquatic license category is required.
4. Removal of vegetation within the Shoreland Zone (generally 250 feet from waterbodies and wetlands) is governed by town Shoreland Zoning Ordinances. There are limits to how much vegetation can be removed. Some exemptions may apply for invasive

plants, but a revegetation plan must be in place. **Contact your town Code Enforcement Officer. In the Unorganized Territories, contact the Maine Land Use Planning Commission: 207-287-2631.**

5. Any vegetation removal that causes soil disturbance near a wetland or waterbody, and any removal of vegetation from within a wetland or waterbody, may require a Permit By Rule from the Maine DEP. **Contact the Maine DEP: 207-287-7688.**

DISPOSAL GUIDANCE

Managing invasive plants can generate a lot of biomass that may require special handling to avoid re-infesting the site or introducing viable plant propagules to other sites. The reproductive maturity of the plants being removed must be considered as well as whether the particular species can propagate vegetatively from stem and root fragments. In the latter case, you will need to take extra precautions to make sure all parts of the plant are dead.

In general, avoid moving invasive plant material. It is not always necessary to dispose of plant parts off-site. For example, if the site is infested with long-lived woody shrubs and there is already a seed bank, one could simply leave cut plants on-site to allow them to biodegrade, ensuring roots are not touching the soil. Such a site will need to be monitored anyway for new seedlings so the marginal return on hauling material off-site is low.

The best time to remove invasive plants is before they flower and start producing fruits and seeds. Reproductive parts may be viable even after the plant has been uprooted (e.g., garlic mustard), so you need to become familiar with the species in order to select an appropriate disposal strategy. Another rule of thumb is to minimize the distance that plant materials travel. The more plant materials are moved the greater the risk of spreading the infestation.

General Disposal Techniques

- Air drying plants, especially the roots. Hang or lean plants on other vegetation or structures root side up, or pile with roots up. This method works well for small trees, shrubs and woody vines. Placing plants on a tarp and letting them dry out in the sun for several weeks is another approach.
- Bag and bake, otherwise known as solarization. Pack plant materials into a polyethylene plastic bag and place in sun for a few weeks to heat up and rot. This method works for soft-bodied herbaceous plants. Then, biomass can be disposed of in the trash or composted.
- Garbage collection and transfer stations. These may be options if you have plant materials with viable parts like seeds and fresh roots. However, you should make sure there are no ordinances prohibiting this disposal method in your municipality. Be sure to seal plants securely in thick contractor bags to keep them contained.
- Drowning in a barrel. This is a method for soft-bodied, herbaceous plants. It will take a few weeks, it may not kill seeds, and it will smell bad.
- Composting. Getting compost feedstocks to a high enough temperature to kill seeds and rhizomes is tricky and this method is not recommended for plant materials that may contain viable reproductive parts. It is an appropriate last step for non-seed-bearing plant materials that have been made non-viable through drying or solarization.
- Burning. This is an effective disposal method, especially for brush and woody plant debris. However, burn with caution and in accordance with local ordinances.
- Chipping. Appropriate for woody plants without fruit. If the plants are capable of reproducing vegetatively, monitor the chip pile before using as a compost feedstock or mulch.

Suggested Reading – Disposal

Guidelines for Disposal of Terrestrial Invasive Plants, by Connecticut Department of Energy and Environmental Protection and the University of Connecticut, 2014. http://cipwg.uconn.edu/wp-content/uploads/sites/244/2014/01/InvasivePlantDisposal_2014-01-23.pdf

Guidelines for Disposal of Terrestrial Invasive Plants, by Florida Exotic Pest Plant Council, 2013. http://www.fleppc.org/Publications/Florida_InvasivePlDisposalGuidelines.pdf

Methods for Disposing Non-Native Invasive Plants, by University of New Hampshire Cooperative Extension and others, 2010. http://extension.unh.edu/resources/files resource000988_rep1720.pdf

HABITAT ASSOCIATIONS

To help you focus on invasive plants found in areas you manage, plants are listed here by the broad habitat types they occur in: **open uplands, wooded uplands, open wetlands, and wooded wetlands.** Some invasive plants occur in all four habitats. Uplands have soils that are not saturated or seasonally flooded, while wetlands do have permanently or seasonally saturated soils. Habitats where trees are taller than 10' and cover 30% or more of the area are considered wooded; otherwise habitats are considered open.

Open Uplands

widespread

Asiatic bittersweet
Autumn olive
Black locust
Burning bush
Canada thistle
Common buckthorn
Common reed
Dame's rocket
Goutweed
Glossy buckthorn
Japanese barberry
Japanese knotweed
Shrubby honeysuckles
Multiflora rose
Norway maple
Privets
Purple loosestrife
Rugosa rose
Wild parsnip
White sweet clover

localized

Black swallowwort
European barberry
False indigo
Garlic mustard
Giant knotweed
Japanese honeysuckle
Ornamental jewelweed
Perennial pepperweed
Porcelainberry
Tree of heaven
Wall lettuce
Wild chervil
White poplar

not yet detected

Amur cork tree
Chinese yam
Chocolate vine
Japanese stiltgrass
Mile-a-minute vine
Wineberry

Wooded Uplands

widespread

Asiatic bittersweet
Black locust
Burning bush
Common buckthorn
Dame's rocket
European alder
Glossy buckthorn
Goutweed
Japanese barberry
Japanese knotweed
Multiflora rose
Norway maple
Privets
Shrubby honeysuckles

not yet detected

Amur cork tree
Chocolate vine
Japanese stiltgrass
Mile-a-minute vine
Wavyleaf basketgrass
Wineberry

localized

Black swallowwort
European barberry
Garlic mustard
Giant knotweed
Hardy kiwi
Japanese honeysuckle
Ornamental jewelweed
Porcelainberry
Tree of heaven
Wall lettuce
White poplar

Open Wetlands

widespread

Asiatic bittersweet
Black locust
Common reed
Dame's rocket
Glossy buckthorn
Japanese barberry
Japanese knotweed
Shrubby honeysuckles
Multiflora rose
Privets
Purple loosestrife
Reed canary grass

localized

European alder
False indigo
Flowering rush
Giant hogweed
Ornamental jewelweed
Perennial pepperweed
Porcelainberry
Wild chervil
White poplar
Yellow iris

not yet detected

Japanese stiltgrass
Mile-a-minute vine
Wineberry

Wooded Wetlands

widespread

Asiatic bittersweet
Autumn olive
Black locust
Burning bush
Common buckthorn
Common reed
Dame's rocket
Glossy buckthorn
Goutweed
Japanese barberry
Japanese knotweed
Shrubby honeysuckles
Multiflora rose
Norway maple
Privets
Purple loosestrife
Reed canary grass

localized

Black swallowwort
European alder
European barberry
False indigo
Garlic mustard
Giant hogweed
Giant knotweed
Hardy kiwi
Japanese honeysuckle
Ornamental jewelweed
Porcelainberry
Wall lettuce
White poplar
Yellow iris

not yet detected

Chinese yam
Japanese stiltgrass
Mile-a-minute vine
Wavyleaf basketgrass
Wineberry

GLOSSARY

Achene	Type of simple, dry, one seeded fruit, that does not open to disperse the seed inside. Example: samara fruits of maple trees.
Allelopathic	Release of chemicals to inhibit the growth of nearby plants.
Annual	Plant life cycle in which the plant germinates, grows, flowers, produces seed, and dies all within one year.
Apetalous	Flower that lacks petals.
Aril	A covering on a seed, often fleshy and bright-colored to attract dispersers.
Basal	At the base or bottom.
Biennial	Plant life cycle in which a plant lives for just two years, only flowering in the second year.
Calyx	All the sepals of a flower together.
Catkin	A cone-like reproductive structure found in non-conifers like alders, birches, and hops.
Compound leaf	A leaf that has several distinct parts (leaflets) that are connected to a single petiole.
Cyme	A terminal cluster of flowers, typically flat or round topped.
Dioecious	Unisexual male and female flowers (imperfect flowers) occur on separate plants. Only ~10% of flowering plants are dioecious.

Distal	Situated farthest from point of reference.
Drupe	A fleshy fruit that covers a hard seed (usually one seed only).
Emergent	Aquatic growth habit wherein the plant is rooted underwater but parts rise above the water's surface.
Entire	Leaf margin that is not notched, toothed or lobed.
Forb	A non-grass herbaceous plant.
Glaucous	Covered with a whitish or bluish waxy coating.
Grass	An herbaceous plant in the grass family, with long, narrow leaves and joints where the leaf meets the stem.
Herb	A plant lacking woody above-ground parts which is not a grass.
Leaf axil	The upper angle where a leaf attaches to a stem.
Leaflet	A division of a compound leaf.
Lenticel	A lens shaped, slightly raised area on a stem or trunk.
Ligule	A thin membrane at junction of leaf blade and sheath in grasses.
Monocot	A group of seed plants that have a single cotyledon (seed leaf), and parallel leaf venation.
Monoecious	Both male and female unisexual (imperfect) flowers occur on the same plant.
Natural area	Habitats where human management efforts are infrequent or nonexistent.

Naturalized	A species outside its native range which is able to survive and reproduce without human cultivation.
Panicle	A branching inflorescense.
Pappus	Bristles, scales, or hairs attached to the achenes of plants in the aster family.
Perfect	Co-sexual flowers (aka bisexual or hermaphroditic); each flower has both male and female parts.
Perfoliate	A leaf with its margins surrounding a stem, so it looks like the stem passes through the leaf.
Perennial	Plant which lives for more than two years.
Petiole	Stalk that attaches a leaf to the stem.
Pinnate	A compound leaf in which the leaflets are arranged in two rows on each side of the petiole.
Raceme	Unbranched and elongate inflorescence (flower cluster).
Rhizome / Rhizomatous	Underground mostly horizontal stem which sends up shoots and roots along its length.
Samara	An achene with a papery wing that aids in its dispersal.
Sepals	Modified leaves which are part of a flower, usually the outer-most “ring” underneath petals.
Serrate	Saw toothed (e.g., In a leaf margin).
Sessile	Directly attached; no stalk or petiole.

Shrub	A woody, perennial plant which is many-branched near the ground.
Simple leaf	Undivided, entire or whole.
Stamens	Male or pollen-producing reproductive part of a flower.
Stipule	An appendage at the base of the petiole or leaf.
Stolon / stoloniferous	Above-ground, creeping shoot that generates new stems/shoots.
Sub-opposite	Leaves nearly opposite from each other on a stem; slightly off-set.
Triternate	A compound leaf that is divided into three leaflets and each of those leaflets is further divided into three sub-leaflets.
Umbel	An umbrella-like, disc-shaped inflorescence in which flower stems radiate from a central point or seem to radiate from the central point.
Vegetative	Not bearing any flowers or fruits.

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