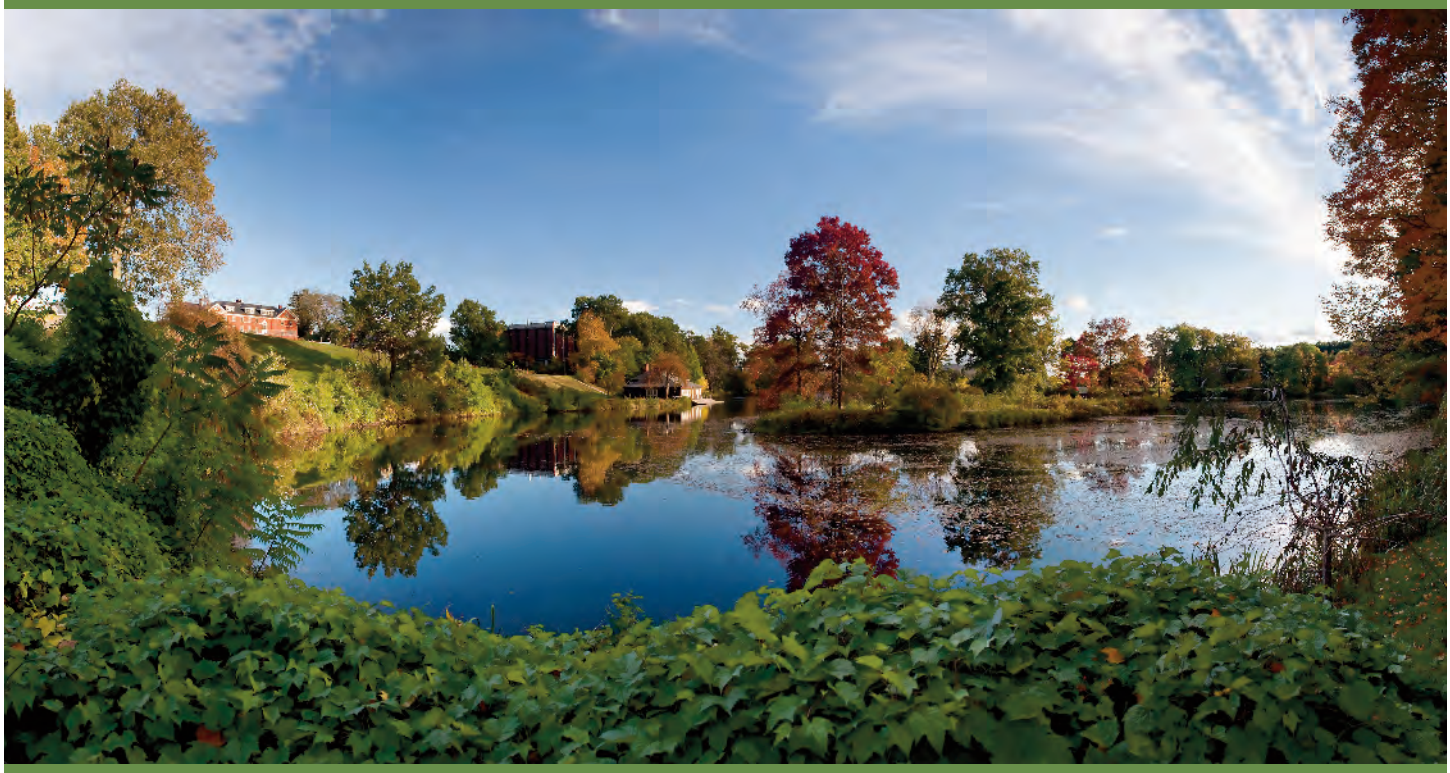
Making Room for Native Plants and Wildlife

A Guide to Invasive Species in the Mill River Watershed



NEW ENGLAND
WILD
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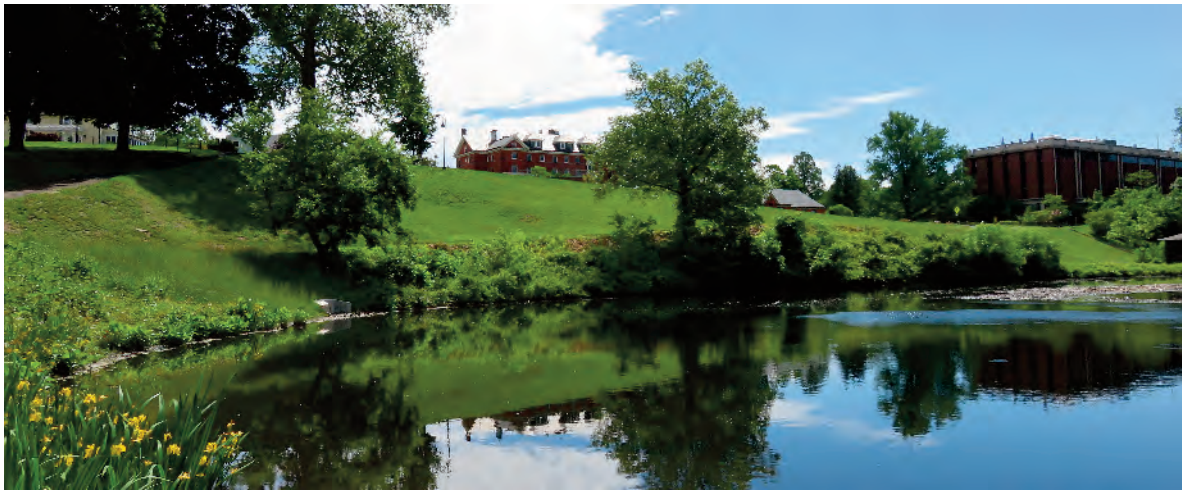

Introduction

This guide was created by New England Wild Flower Society, with financial support from Smith College, for use by members of the Mill River Greenway Initiative (MRGI), a group of local citizens working to protect the watershed, preserve its cultural artifacts, enhance its biological health, and encourage recreational activity.

Making Room for Native Plants and Wildlife: A Guide to Invasive Species in the Mill River Watershed, is designed to help homeowners, land stewards, and conservation volunteers identify and control common terrestrial exotic invasive plants in Northampton's Mill River Watershed. It also provides native alternatives for the home landscape.

Backyards, as well as public open spaces such as city parks and town forests, serve as valuable habitat for wildlife, insects, and native plants. By removing invasive plants and planting and promoting native ones, you can provide food, shelter, and breeding places for New England's hundreds of species of butterflies, moths, bees, birds, and small mammals. Use this guide to help create a biologically diverse backyard, garden, park, or conservation area.

What are invasive plants?

Invasive plants, sometimes shortened to "invasives," are non-native (exotic) species that cause economic or environmental harm by displacing native plants and the habitat they provide for native wildlife and insects. (In this booklet, "species" includes all synonyms, subspecies, varieties, forms, and cultivars of that species unless otherwise determined by scientific evaluation.)

These are plants that have been imported, sometimes accidentally, from Europe and Asia. They establish and spread rapidly here because the plants, pests, and animals of their native range are not present to keep them in check.

Invasive species compete directly with native plants for moisture, sunlight, nutrients, and space. Some studies also suggest that the fruits of invasives are less nutritious than those of native plants, and, like junk food, require wildlife to feed more often. Invasives also draw pollinators away from native plants and out-compete and eventually eliminate the native host plants for beneficial insects like the monarch butterfly.

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Invasive species also are highly successful because most of them produce large numbers of seeds that are dispersed over long distances by wind, water, or wildlife. They also thrive in soil disturbed by construction. With more development of roads and buildings, open spaces shrink, and invasive species are able to dominate the disturbed places and spread into undeveloped land.

The best way to prevent invasives from becoming established is to not plant them. Many of the species now known to be invasive were imported as ornamental plants and sold in nurseries. Depending on state regulations, it may still be legal for nurseries in other states to sell invasive species that are outlawed here. (Click here for Massachusetts' list of prohibited plants.) When in doubt, or when ordering online, buy only plants native to this region.

Where invasive plants are already established, this guide will help you choose appropriate ways to control and dispose of them through these three steps:

1. Correctly identify the plant
2. Identify your goals and priorities for management
3. Choose the best control method for the situation, such as location, time of year, the extent of the plant's spread, and other factors. Each method requires commitment and persistence.

Invasive Plant Control Basics

Most plants can be controlled by three basic strategies:

1. Mechanical (hand-pulling, digging, smothering, mowing or weed whacking)
2. Chemical
3. Biological

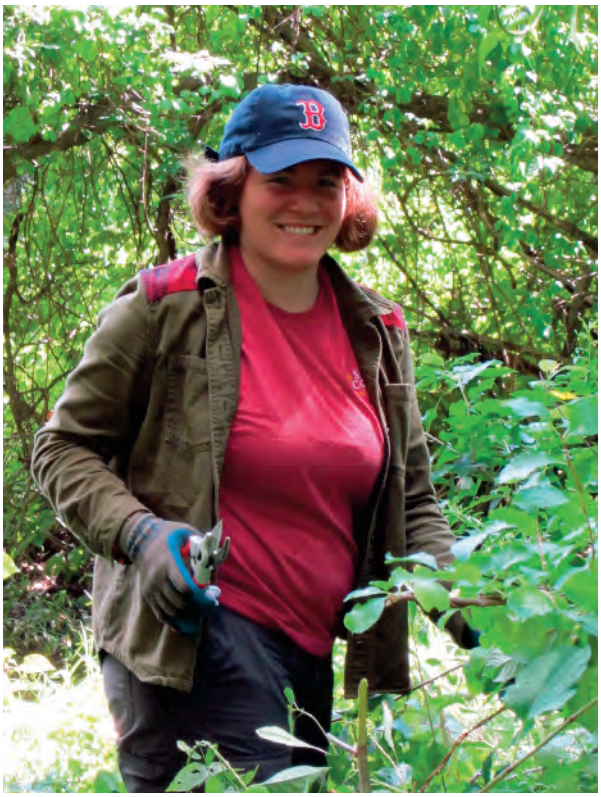
Mechanical control requires only a handful or tools and works best for small sites with shallow-rooted herbaceous (non-woody) or young woody plants. Caution: Hand-pulling and digging disturb the soil, and invasives can readily recolonize those places. Make sure to check the site for new seedlings several times a sea-

son. To avoid spreading invasive seeds, remove or mow plants before they flower. Some plants also spread from cut fragments, so be sure to clean up pieces on the ground, especially after weed whacking or mowing.

Chemical control uses systemic herbicides to kill plants at their root system using one of two chemical compounds: glyphosate (the active ingredient in Round-up® and Rodeo®) or triclopyr (the active ingredient in Brush-B-Gone® and Garlon®). Herbicides can be applied to plant leaves (foliar application), cut stems, basal bark, or bark that has been frilled (cut with overlapping strokes encircling the trunk or stem). These two herbicides consist of nontoxic compounds that when combined, become toxic to plants. Both types bind with soil and break down rapidly into nontoxic compounds.

Glyphosate will affect (poison) all types of plants. Triclopyr affects only broadleaf species and does not harm monocots (grasses, orchids, lilies, etc.).

Buy the liquid concentrates whenever possible, because pre-mixed solutions consist mostly of inactive ingredients. For more information in herbicides and their use, contact: Massachusetts Department of Agriculture



Before using Herbicides Remember to:

1. Read and follow directions on the label, which usually advise not to apply within a certain number of hours before rain is predicted.

2. Wear recommended protective gear (pants, long-sleeved shirt, gloves, safety glasses, etc.).

3. Keep people and pets out of treated areas for 24 hours.

Important note: Surfactants are chemicals that enable herbicides to stick to leaves. Most, but not all herbicides come with a surfactant mixed in. Because some surfactants are toxic to amphibians and other aquatic life, be sure to read the product label for restrictions about use near wetlands.

Foliar Applications:

• Excellent for large monocultures or plants that are hard to remove mechanically
• Best for locations where accidentally killing neighboring plants is not a concern
• Most effective when plants are actively growing and flowering
• Some studies have found a greater effect by cutting plants to ground, allowing them to resprout and treating the resprouts.
• Herbicide mixture should contain 1–5% of the active ingredient.

Cut-Stem Treatment on Solid Stems:

• Typically used on woody plants one-inch or more in diameter
• Very targeted and can be highly successful in a single treatment
• Best done in autumn (September through mid-November)
• 25%–40% active ingredient solution should be used for all cut-stem treatments.
• Stems should be cut level (flat, not at an angle) and treated as soon as possible after cutting

Cut-Stem Treatment on Hollow Stems:

• Effective on Japanese knotweed, or any hollow-stemmed invasive
• Best done just prior to flowering and on hot, humid days
• Cut stems halfway between two of the swollen leaf nodes
• Using a needle or nozzle, inject a 25%–40% solution of glyphosate into the exposed chamber of the stem.
• After cutting the stems, remove the cut-off pieces and dry or incinerate them. (Japanese knotweed reproduces vigorously from stem fragments.)

Frill Treatment:

• Typically used on large woody specimens four or more inches in diameter.

• Produces a standing dead tree/shrub which can either be viewed as wildlife habitat or a hazard.
• Make alternating slashes in bark of specimen to be removed. Do not girdle ! (Girdling completely removes pieces of the trunk from the cuts, but frilling means cutting into the wood and leaving the chips in place.)
• Spray 25%-40% herbicide solution into slashes. Let soak in for 5 minutes. Re-apply.
• Best done late August through end of October
• May require two to three years of repeated treatment, depending on plant's size

Biological control uses plants' natural enemies to keep populations in check. In Massachusetts, biocontrols are only available for purple loosestrife and mile-a-minute vine at this time, but others may be available in the future. For more information on biocontrols, contact Massachusetts Department of Fish and Game or Department of Agriculture.

Disposing of Invasive Species

When doing invasive plant control, have a strategy up front for disposing of whatever you cut down, mow, or pull. Plant parts that can't re-sprout, such as woody stems and herbaceous plants without seed heads, can be left to dry and compost on the site.

Materials that can re-sprout, such as Japanese knotweed stems or roots, must be burned or bagged and disposed of in a landfill.

The same thing applies to plant parts with seed: All seed heads and even soil containing seeds must be bagged and disposed of in a landfill.

For more information on disposing of invasive plants, visit:
CIPWG Invasive Plant Disposal
UNH Cooperative Extension Invasive Plant Disposal

Get rid of:

Amur corktree

(Phellodendron amurense)

Make room for:

Native forest canopy trees such as native hickory (*Carya* spp.) and oak (*Quercus* spp.), which produce more nutritious food for wildlife including deer, black bear, squirrels, fox, raccoons, waterfowl, and turkeys.

Amur corktree is a deciduous tree native to eastern Asia and introduced as an ornamental plant in the United States, where it prefers moist, well-drained soils in forest edges, forests, and forest understory. Mature trees grow 35 to 50 feet high and nearly as wide.

What to look for:

Compound leaves, 12 to 20 inches long, with five to 13 oppositely arranged leaflets, dark green on top and pale green below. The bark of mature trees is gray, thick, corky, and deeply furrowed. Clusters of maroon to yellow-green flowers bloom from late spring through early summer. Numerous fleshy, dark-purple, pitted fruits form in early fall and persist through winter.

How to be sure:

Scrape the bark. Corktree leaves resemble those of native sumac (*Rhus glabra, R. hirta*) and ash (*Fraxinus* spp.), but the bright yellow color of the corktree's inner bark sets it apart. Also, as a member of the citrus family, its leaves and fruit give off a resinous odor, especially when bruised.

How it spreads:

Planted as a street and landscape tree, corktree produces seeds prolifically. New plants eventually spread to disturbed forests and other wooded areas, forming dense stands and shading out native tree seedlings.

What to plant instead:

Native species that produce food for wildlife, including oak, hickory, butternut (*Juglans cinerea*), and smooth and staghorn sumac (*Rhus glabra, R. hirta*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants				foliar 1-3% triclopyr herbicide			cut-stem 25-40% triclopyr herbicide		

Get rid of:

Asian bittersweet

(Celastrus orbiculatus)

Make room for:

Mature forest trees and native American bittersweet (*Celastrus scandens*), which is declining throughout New England and endangered in Rhode Island and Massachusetts

Asian bittersweet is a woody, climbing perennial vine native to East Asia that grows in a variety of habitats and can climb more than 60 feet into the tree canopy, overtopping and girdling mature trees

What to look for:

Glossy round or oval leaves with wavy edges. Greenish flowers and red, berry-like fruits in yellow capsules grow in arrays (clusters) along the stems.

How to be sure:

The native bittersweet species grows flowers and fruit only at stem tips. Also, leaves of Asian bittersweet are no more than twice as long as they are wide, while American bittersweet leaves are longer and narrower (twice as long as wide), tapered at the end, and have fine-toothed edges.

How it spreads:

Vigorous growth, prolific seed production, and underground rhizomes that form new stems allow this plant to out-compete other species in shared habitats. Seeds also travel in the droppings of birds and small mammals. Because Asian bittersweet is used to create decorative wreaths, people can start new infestations by discarding them outdoors.

What to plant instead:

Wild honeysuckle (*Lonicera dioica*), trumpet honeysuckle* (*Lonicera sempervirens*), Virginia-creeper (*Parthenocissus quinquefolia*). For wreath making, substitute native grape vines (*Vitis* spp.) and the bright-red fruits of common winterberry (*Ilex verticillata*).

**for garden use only*

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			hand pull or uproot young plants		foliar 1-3% triclopyr herbicide			cut-stem 25-40% glyphosate herbicide			
								cut-stem 25-40% triclopyr herbicide			

Get rid of:

Autumn olive

(Elaeagnus umbellata)

Make room for:

A diversity of native shrubs and grasses that support wildlife like the rare vesper sparrow which feed and nest in grasslands

Widely planted throughout the eastern United States to stabilize soil and provide wildlife food and habitat, autumn olive is a drought-tolerant, deciduous shrub native to Japan that can grow up to 20 feet high and 30 feet wide.

What to look for:

Leaves are long and narrow (two to four inches long and about 1.5 inches wide), medium green on top, and covered with silvery scales underneath. Tapering to a blunt point, the leaves often have wavy edges. Cream-colored, fragrant, tubular flowers bloom April to May. In the fall, olive-shaped fruit appears, changing from silvery gray-green to bright red flecked with silver.

How to be sure:

Flip over the leaf to see if silvery scales are present. (This trait and others are shared by Russian olive, a similar invasive species.) Twigs sometimes end in prominent thorns. The bark of older plants is gray, rough, and sometimes shaggy.

How it spreads:

Prolific fruits—up to 8 pounds per plant, per season—attract birds and animals, which then scatter seeds in droppings. Shrubs also spread by suckering. It inhibits competing species by forming dense thickets that shade them out, and its nitrogen-fixing ability can change the growing conditions required by native plants.

What to plant instead:

Arrowwood (*Viburnum* spp.), chokeberry (*Aronia* spp.), elderberry (*Sambucus* spp.), hawthorn (*Crataegus* spp.), inkberry (*Ilex glabra*), pink azalea (*Rhododendron periclymenoides*), American hornbeam (*Carpinus caroliniana*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide	

Get rid of:

Black locust

(Robinia pseudoacacia)

Make room for:

Native legume species like yellow wild indigo (*Baptisia tinctoria*), which is an important food source for frosted elfin butterfly caterpillars, a rare butterfly of Massachusetts; or other riparian trees like American sycamore (*Platanus occidentalis*) or silver maple (*Acer saccharinum*)

Black locust is a fast-growing deciduous tree native to the southeastern United States. Growing up to 40 to 100 feet high, it prefers sunny pastures, roadsides, and forest edges. It also has been widely planted as a street tree.

What to look for:

Young trees have paired thorns and smooth, greenish-brown bark that becomes thick, scaly, and dark brown with age. Alternate leaves consist of seven to 21 oval leaflets that form a feather-like pattern. In spring, clusters of fragrant white flowers dangle from the tips of new shoots. Flat, bean-like pods, each three to four inches long, contain four to eight bean-like seeds.

How to be sure:

Check the leaves: Species similar to black locust include honey locust (*Gleditsia triacanthos*) and common prickly-ash (*Zanthoxylum americanum*). Leaves of honey locust are doubly compound, unlike black locust's singly compound leaves. Common prickly-ash has toothed leaflets and red buds, vs. the smooth-edged leaflets and white buds of black locust.

How it spreads:

Trees drop seed pods but spread primarily though vigorous root suckering, forming rapidly sprouting groves of connected clones that displace native species. Black locust also fixes nitrogen in the soil, potentially altering the conditions preferred by native plants. The attractive flowers also draw pollinators away from native plant species.

What to plant instead:

American sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), elm (*Ulmus* spp.), American basswood (*Tilia americana*), yellow birch (*Betula alleghaniensis*), black tupelo (*Nyssa sylvatica*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants			foliar 1-3% triclopyr herbicide						
								cut-stem 25-40% triclopyr herbicide			

Watch out for thorns!
Cut, untreated stems will vigorously resprout, worsening infestations. Be sure to destroy plants by removing the entire root system or by following up with an herbicide treatment.

Get rid of:

Black swallowwort

(Cynanchum louiseae)

Make room for:
Sun-loving wildflowers like native milkweeds, which feed monarch caterpillars and adult butterflies of other species, bees, and other insects

Native to Eurasia, black swallowwort is a twining, herbaceous perennial vine, typically three to six and a half feet long, that thrives in sunny fields, yards, and roadsides, where it rapidly crowds out native plants.

What to look for:
Stems are free of branches and covered with downy hairs. Shiny green leaves grow on short stalks in an opposite pattern, typically one and a half to three inches long, narrowly oval to heart-shaped, with sharply pointed tips. From June to September, six to 10 small flowers on short stalks grow in clusters at the leaf axils. Each flower has five triangular, deep-purple petals. The fruits are slender pods similar to milkweed pods that open along a seam when ripe to release flat seeds, each with a downy parachute. New plants grow slowly and produce seed only after growing for several years.

How to be sure:
This plant does not look similar to any New England native vine species. It does closely resemble a related, equally invasive exotic species, pale swallow-wort (*Cynanchum rossicum*), most readily distinguished by its flowers, which are pink to maroon to yellow-white, with slightly larger lobes. Both pale and black swallowwort should be destroyed.

How it spreads:
Black swallowwort forms dense patches that crowd out native plants and multiplies primarily through its wind-borne seeds. Swallowworts are extremely toxic to livestock and many insects, including monarch butterfly larvae, which occasionally lay their eggs on swallowwort leaves by mistake. Large stands diminish insect abundance and diversity, which has cascading effects on the entire food chain.

What to plant instead:
Gray goldenrod (*Solidago nemoralis*), common grass-leaved-goldenrod (*Euthamia graminifolia*), smooth American-aster (*Symphyotrichum laeve*), butterfly milkweed (*Asclepias tuberosa*), common milkweed (*Asclepias syriaca*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants, be sure to remove entire root crown; smother small infestation with plastic				foliar 1-3% glyphosate herbicide during flowering		collect and dispose of seed pods			

Swallowwort can be difficult eradicate to therefore it's important to catch and control infestations early.

Get rid of:

Border privet

(Ligustrum obtusifolium, L. ovalifolium, L. vulgare, L. sinense)

Make room for:

Native dogwood, blueberry, huckleberry, serviceberry, sweet pepperbush

Native to Asia and Europe, privets are upright, deciduous or semi-evergreen shrubs that grow approximately 10 by 10 feet when not trimmed into hedges. They form dense thickets that invade floodplains, fields, disturbed forests, and forest edges. It can be hard to tell these four species apart, especially when not in bloom.

Leaves contain chemicals that are toxic to herbivores, both foliage and berries are toxic to humans. Leaves also repel leaf-feeding insects, including important native species.

What to look for:

Simple, oblong leaves grow in opposite pairs on smooth, brown to gray stems. Leaves are one to two inches long, with smooth edges. Both the leaf tip and base are rounded or blunt, dark green on top and lighter underneath. Fragrant white flowers appear from April to June, growing in short, dense panicles at the ends of twigs. Small green fruits (less than 1/4 inch in diameter) follow in July, turning a shiny dark purple or black, with a waxy white bloom. Fruits stay on the plant through the winter.

How to be sure:

Check the leaves—privets' are smooth-edged, unlike the toothed leaves of some viburnum species and the deeply veined leaves of dogwoods, which bear similar fruits.

How it spreads:

Privets form dense thickets that shade out native shrubs and herbaceous plants. Privets can regenerate from root and stump sprouts but primarily spread through seeds distributed by birds.

What to plant instead:

Spicebush (*Lindera benzoin*), dogwoods (*Swida* spp.) and chokeberry (*Aronia* spp.).

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide	

Get rid of:

Burning bush

(Euonymus alatus)

Make room for:

Native shrubs with colorful fall foliage like highbush blueberry and witchhazel

A deciduous, bushy shrub native to northeastern Asia, burning bush grows eight to 10 feet tall, with broad, corky tan ridges (wings) along the green branches, and crimson fall foliage.

What to look for:

Leaves have toothed edges and taper at both ends, attaching to short stalks. Small, inconspicuous, yellow-green flowers appear late April to June. Red-purple fruits split open to reveal up to four dangling, red-orange seeds. Though it grows in a variety of conditions and soil types, burning bush prefers moist, well-drained soils.

How to be sure:

The ridges or wings on young branches primarily distinguish this plant. Although burning bush resembles large-leaved species of blueberries (*Vaccinium* sp.), especially in fall foliage color, blueberries have alternate leaves, while burning bush leaves are opposite.

How it spreads:

A popular ornamental shrub, burning bush is still sold the nursery trade and spreads through seeds dispersed by birds that eat the fruit.

What to plant instead:

highbush blueberry (*Vaccinium corymbosum*), nannyberry (*Viburnum lentago*), witherod (*Viburnum nudum*), dogwoods (*Swida* spp.), elderberry (*Sambucus* spp.), witchhazel (*Hamamelis virginiana*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide	

Get rid of:

European buckthorn

(Rhamnus cathartica)

Make room for:
Native shrubs of meadows and forest edges, such as native viburnums, highbush blueberry, and other fruiting woody plants.

Common buckthorn is an upright, deciduous small tree or shrub, native primarily to Europe and northwest Asia, six and a half to 20 feet high. After settlers introduced it as hedging in the early 1800s, buckthorn blanketed open meadows with dense thickets. The plant also serves as a host for crown rust, a fungal disease that threatens oats.

What to look for:
Smooth branches usually have shoots tipped with stout spines. The tapered oval leaves grow in opposite pairs an inch and a half to three inches long. They have minutely toothed edges and strongly up-curved veins along the sides, and stay on the plant late into the autumn. Clusters of fragrant, yellow-green flowers appear near the bases of leaf stalks in spring. Round fruits, dark-purple to black, appear in fall and often remain into the winter.

How to be sure:
Scrape the bark to check for distinctive orange sapwood (inner bark). Common buckthorn can be mistaken for its invasive cousin, glossy false buckthorn (*Frangula alnus*), which also should be controlled.

How it spreads:
Birds and small mammals eat the fruit and spread seeds over long distances. Seeds may stay viable in the soil for up to six years. Common buckthorn also can grow back after being cut or burned.

What to plant instead:
Shadbush, a.k.a. serviceberry (*Amelanchier canadensis*), chokeberry (*Aronia* spp.), native hawthorns (*Crataegus* spp.), dogwood (*Swida* spp.), witchhazel (*Hammamelis virginiana*), native hollies (*Ilex* spp.), spicebush (*Lindera benzoin*), highbush blueberry (*Vaccinium corymbosum*), and viburnums including arrowwood (*Viburnum dentatum*), nannyberry (*V. lentago*), and witherod (*V. nudum*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide	

Get rid of:

Exotic bush honeysuckles

(Lonicera spp. *[L. maackii, L. morrowii, L. tatarica, L. xbella])*

Make room for:

American honeysuckle (*Lonicera canadensis*), whose flowers provide nectar to hummingbirds and fleshy fruits feed many forest bird species.

Exotic bush honeysuckles in the Northeast are upright, deciduous shrubs that can reach 15 feet in height, forming dense thickets in forest edges, abandoned fields, pastures, roadsides, and disturbed forests.

What to look for:

Thornless, light-tan twigs produce opposite leaves with short stalks, often elliptical, with pointed tips. Bark on mature plants is gray and shaggy. Fragrant, pink or white tubular flowers grow in pairs along the branches May through June, producing small round berries (red or orange) along the stem in fall.

How to be sure:

Cut open the stem: exotic bush honeysuckles have hollow, dark-pithed stems while native species have solid stems with white pith. The leaves of invasive honeysuckles also appear earlier and remain later in the fall than the natives'.

How it spreads:

Dense stands eventually crowd and shade out native species, which are also suppressed by an allelopathic chemical released by the invasive honeysuckles. Birds and small mammals eat the prolific berries and spread seeds in their droppings.

What to plant instead:

American honeysuckle (*Lonicera canadensis*), bush-honeysuckle (*Diervilla lonicera*), highbush blueberry (*Vaccinium corymbosum*), serviceberry (*Amelanchier* spp.), chokeberry (*Aronia* spp.), sweet pepper bush (*Clethra alnifolia*), spicebush (*Lindera benzoin*), eastern leatherwood (*Dirca palustris*), clammy azalea (*Rhododendron viscosum*), flowering raspberry (*Rubus odoratus*)

Lonicera maackii

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide	

Lonicera morrowii

Lonicera tatarica

Lonicera xbella

Get rid of:

Garlic-mustard

(Alliaria petiolata)

Make room for:

Spring-flowering woodland wildflowers and insects including the rare mustard white butterfly (*Pieris oleraceae*), which depends on native mustards for food and egg-laying.

Native to Europe, garlic mustard is an upright, herbaceous biennial plant that grows from a few inches to three feet high; prefers moist, shaded forests and floodplains; and spreads to roadsides and other places with disturbed soils.

What to look for:

Dark-green, kidney- or heart-shaped leaves with scalloped or toothed edges and deep veins that give leaves a wrinkled appearance. First-year plants are a few inches tall, nonflowering, with four to eight leaves per rosette that stay green all winter. Second-year plants bloom in early spring through early summer, producing small, white flower clusters atop stalks as high as three and a half feet. Leaves of second-year plants are more triangular and smaller near the top of the stalk. Flowers turn into slender seed pods in late spring.

How to be sure:

Crush the leaves. Garlic mustard leaves produce a strong, garlicky odor.

How it spreads:

One plant disperses up to 7,900 seeds, which travel on fur, boots, clothing, mowers, and so on. Some studies show that garlic mustard also releases chemicals that inhibit the growth of native plants and interfere with beneficial fungi in the soil that support them.

What to plant instead:

Native mustards such as two-leaved toothwort (*Cardamine diphylla*), wild ginger (*Asarum canadense*), foam-flower (*Tiarella cordifolia*), red columbine (*Aquilegia canadensis*), yellow forest violet (*Viola pubescens*)

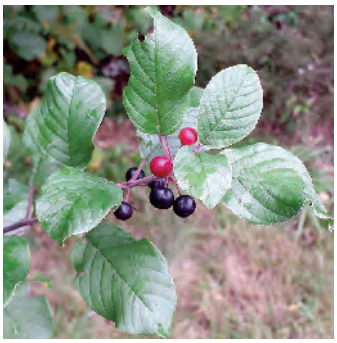
When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull second-year plants							foliar 1-3% glyphosate herbicide		

Get rid of:

Glossy buckthorn

(Frangula alnus)



Make room for:

Woody native plants of open fields and forest edges, including Canadian serviceberry (*Amelanchier canadensis*), chokeberry (*Aronia* spp.), hawthorn (*Crateagus* spp.), witchhazel (*Hammamelis virginiana*), and assorted viburnums, dogwoods, and hollies.

Glossy buckthorn is a deciduous small tree or multi-stemmed shrub native to Europe, North Africa, and Central Asia that grows up to 20 tall. It is moisture tolerant and prefers open, sunny conditions such as abandoned fields, vacant lots, and wetland.

What to look for:

Glossy buckthorn has dark-green oval leaves that taper on each end. They are shiny above and smooth or slightly hairy beneath, turn greenish-yellow in the fall, and stay on the plant late. Bark is smooth, grayish-brown, sometimes with shallow fissures on larger stems. Roots are red, and the inner bark (sapwood) is yellow. Yellow-green flowers bloom in clustered arrays (umbels) from May to September, after the leaves come out. Large (.25 inch in diameter), round berries appear in late summer, ripening from red to black. Flowers and fruits can be present simultaneously on the same plant.

How to be sure:

The inner bark or sapwood is a distinctive yellow color which is easily exposed by scraping with a knife. Glossy buckthorn is often confused with invasive common buckthorn (*Rhamnus cathartica*) and native alder buckthorn (*Rhamnus alnifolia*).

How it spreads:

Frangula alnus spreads most prolifically through bird droppings. Like the fruit of *R. catharica*, the berries contain a laxative that stimulates nearly continuous dispersal. One medium- to full-sized glossy buckthorn could potentially produce between 430 and 1,560 offspring a year. Seeds remain viable in the soil for two or more years.

What to plant instead:

The native species listed above, plus spicebush (*Lindera benzoin*), highbush blueberry (*Vaccinium corymbosum*), arrowwood (*Viburnum dentatum*) , nannyberry (*V. lentago*), and withe-rod (*V. nudum*).

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide		cut-stem 25-40% glyphosate herbicide			

Get rid of:

Japanese barberry

(Berberis thunbergii)

Make room for:
Native tree seedlings, shrubs, and understory wildflowers like yellow lady's-slipper (*Cypripedium parviflorum*), which is rare in Massachusetts and of regional conservation concern.

Japanese barberry is a dense, deciduous, spiny shrub native to Japan that typically grows from two to three feet high. It thrives in shady forest understories as well as in open pastures and wetlands.

What to look for:
Thin, arching branches grow in a zigzagged pattern. Branches (stems) are brown and deeply grooved with slender, sharp spines at each node, from which the leaves also emerge. Leaves are smooth-edged, typically about a half-inch long, and oval or spatula shaped. They cluster in tight bunches along the stem. From April to May, clusters of small, pale-yellow flowers dangle along the underside of the entire stem, followed by elongated, bright-red berries, which remain through the winter.

How to be sure:
Japanese barberry does not resemble any New England native species, and the plant it most closely resembles, common barberry (*Berberis vulgaris*), is also an invasive exotic species that should be destroyed. Unlike the Japanese species, common barberry has finely toothed leaves, and much denser clusters of flowers and berries.

How it spreads:
Birds eat the berries and scatter seeds through their droppings. Seeds have a high estimated germination rate of nearly 90 percent. The plant also spreads via creeping rhizomes, and branches sometimes root where they touch the ground. Japanese barberry also leafs out earlier than native species, and deer don't eat it. These advantages allow Japanese barberry to outcompete native plants and tree seedlings, forming dense stands and limiting the diversity of native forest plants.

What to plant instead:
New Jersey tea/New Jersey redroot (*Ceanothus americanus*), huckleberry (*Gaylussacia baccata, G. bigeloviana, G. frondosa*), lowbush blueberry (*Vaccinium angustifolium*), maple-leaved viburnum (*Viburnum acerifolium*), skunk currant (*Ribes glandulosum*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants			foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide			

Get rid of:

Japanese honeysuckle

(Lonicera japonica)

Make room for:
Native sun-loving trees, shrubs, wildflowers, and grasses.

Japanese honeysuckle is a perennial climbing vine native to Japan that climbs by twining around the stems of other plants and can grow up to 30 feet long in fields, forest edges, roadsides, and other sunny spaces. This plant is less common than other invasives in the watershed, therefore removal is essential.

What to look for:
Tan stems with corky bark produce opposite leaves, oblong to oval in shape, that remain into late autumn or early winter. Hairy, white to yellow tubular flowers grow in pairs along the branches May through June, followed by shiny, round, bluish-black berries along the stem in fall.

How to be sure:
Check the leaves. Native honeysuckle vines look similar, but their leaves grow on the tips of the vines and unite to encircle the stem. The opposite leaves of Japanese honeysuckle are clearly separate and grow all along the vine.

How it spreads:
Birds eat the berries and spread seed in their droppings. Once established, the vine also spreads aggressively by crowding out native species, damaging its host trees by shading and weighing them down, and strangling young trees and shrubs. As a semi-evergreen, it grows before and after other plants go dormant.

What to plant instead:
Trumpet honeysuckle* (*Lonicera sempervirens*), Virginia virgin's-bower (*Clematis virginiana*), Virginia-creeper (*Parthenocissus quinquefolia*).

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				hand pull or uproot small infestations			foliar 1-3% glyphosate herbicide				
					Mow low to the ground 2x annually						

**for garden use only*

Get rid of:

Japanese knotweed

(Fallopia japonica)

Make room for:

Rare plants of floodplain habitats like green-dragon (*Arisaema dracontium*), Gray's sedge (*Carex grayi*), intermediate spike-sedge (*Eleocharis intermedia*), which provide habitat for wood turtles.

Japanese knotweed is a semi-woody, bushy perennial native to Japan that grows three to 10 feet high. It prefers moist, sunny areas but can tolerate most other conditions, including full shade, high salinity, and drought, making it one of the world's most invasive plants.

What to look for:

Smooth, hollow, stems (often multiple) have a white, waxy lining; red or purple spots; and bamboo-like swellings where leaf stalks emerge. Red shoots turn green as they mature. Broadly oval leaves with pointed tips and distinct stalks alternate along the stem. They are two to six inches long by two to five inches wide. From August to September, tiny, greenish-white flowers grow on upright stalks above the leaves, followed by small, winged fruits containing shiny, black, three-sided seeds.

How to be sure:

Check the leaves and stems. Several native species share the common name "knotweed," but the native species belong to a different genus (*Polygonum*) comprising mostly herbaceous plants and vines. Native knotweeds also are smaller overall, with smaller, narrower leaves. Cultivated varieties that resemble Japanese knotweed share its invasive characteristics and, likewise, should be destroyed.

How it spreads:

Though seeds travel to new locations on wind and water, Japanese knotweed spreads primarily through underground rhizomes, which are strong enough to penetrate foundations, walls, pavement, and drainage pipes. Dense thickets form rapidly, shading out native vegetation. As little as 7g of rhizome can sprout into a new plant, so Japanese knotweed also can travel in soil moved from locations near established colonies.

What to plant instead:

Buttonbush (*Cephalanthus occidentalis*), alder (*Alnus* spp. native to New England), chokeberry (*Aronia* spp. native to New England), and various native woody dogwoods (*Swida* spp.).

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants when soils area moist					foliar 1-3% glyphosate herbicide				
		collect and dispose of any rhizomes or root material					stem injection 25-40% glyphosate herbicide				

Get rid of:

Lesser celandine

(Ficaria verna)

Make room for:

Spring ephemeral wildflowers including American trout-lily (*Erythronium americanum*), blood-root (*Sanguinaria canadensis*), Dutchman's-breeches (*Dicentra cucullaria*), squirrel corn (*Dicentra canadensis*), Carolina spring beauty (*Claytonia caroliniana*), anemone meadow-rue (*Thalictrum thalictroides*)

Native to the riverbanks and lakeshores of Eurasia and northern Africa, lesser celandine is a perennial that was introduced as an ornamental plant throughout the eastern United States. This plant is less common than other invasives in the watershed, therefore removal is essential.

What to look for:

Kidney-to-heart-shaped leaves are dark green, shiny, and almost succulent. Buttery-yellow flowers with eight to 12 petals appear on delicate stalks in early spring. Later, plants often produce white bulbils where leaves meet the stem. Roots form finger-like tubers that produce underground stems, or rhizomes. Small, hairy fruits form round seed heads.

How to be sure:

Check the leaves, count the petals: Lesser celandine resembles marsh marigold (*Caltha palustris*), which shares wetland habitats but has a five-petalled flower and is larger overall. Lesser celandine flowers also look similar to greater celandine (*Chelidonium majus*) and celandine poppy (*Stylophorum diphyllum*), but flowers of both have only four-to-five petals, and their leaves are more deeply lobed.

How it spreads:

Lesser celandine carpets floodplain forests and nearby uplands, displacing native plant species, especially spring ephemerals, which flower at about the same time. Growing vigorously in full sun before trees leaf out, it spreads rapidly through bulblets and rhizomes. Like native ephemerals, lesser celandine dies back in late spring and goes dormant.

What to plant instead:

Native ephemeral wildflowers listed above.

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	foliar 1-3% glyphosate herbicide										
	hand pull or uproot small infestations										

Get rid of:

Mulitflora rose

(Rosa multiflora)

Make room for:

Habitat for golden-winged warbler. This rare bird species prefers forest edges near overgrown fields, where multiflora rose often flourishes at the expense of native shrubs like serviceberry and raspberry.

Native to Japan, multiflora rose is a densely spreading perennial shrub that can grow up to 15 feet tall and also climb into trees like a vine. Preferring sunny to semi-shaded places with well-drained soils, it is adaptable to many other conditions, including early successional forests, forest edges, fields, and roadsides.

What to look for:

Long, arching canes are red or light green, hairless and smooth between curved, broad-based thorns. Leaves are alternate and pinnately compound, with five to 11 sharply toothed, elliptical leaflets. Leaves also are dark green above and paler green below. Abundant clusters of fragrant, white to pink flowers bloom from May to June. Individual flowers have five petals and are about an inch across. Clusters of bright-red hips (fruits), less than a quarter-inch in diameter, develop during the summer and ripen from September through October. Fruits may remain during the winter.

How to be sure:

Check the base of the leaf stalk. Many native roses resemble multiflora rose, but multiflora is the only species in New England that has a fringed stipule, a fringed appendage at the base of each leaf stalk.

How it spreads:

Seeds, which can remain viable for years, spread primarily through bird droppings. Tips of branches can also root where they touch the ground and generate a new shoot. Rapidly reproducing, multiflora rose develops into impenetrable, thorny thickets that crowd out native plant species.

What to plant instead:

Virginia rose (*Rosa virginiana*), scarlet hawthorn (*Crataegus coccinea*), intermediate or Canadian serviceberry (*Amelanchier intermedia, A. canadensis*), flowering raspberry (*Rubus odoratus*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
		hand pull or uproot young plants, uproot large plants where possible				foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide	

Watch out for thorns!

Get rid of:

Norway maple

(Acer platanoides)

Make room for:

Native deciduous forest trees, understory shrubs, and spring ephemeral wildflowers. Mature deciduous forests form important habitat for Jefferson and marbled salamanders, both rare in Massachusetts.

Norway maple, native to Europe and western Asia, grows 40 to 60 feet tall, branching to form a broad, leafy canopy. Introduced to the U.S. in the 1700s, it tolerates a wide range of conditions, including moist soils, and is still commercially grown. Individual trees can live up to 150 years, producing countless seeds each year, allowing them to spread rapidly throughout the Northeast and beyond.

What to look for:

Young trees have smooth grayish-tan bark that becomes gray and uniformly furrowed with age. Rounded, reddish leaf buds appear in winter, followed by yellow-green flowers in spring. Dark-green leaves (or dark purple in the ornamental cultivar 'Crimson King') turn yellow in autumn, often bearing the black, circular marks of tar spot, a fungal disease. Norway maple resembles several other maple species, especially sugar maple (*Acer saccharum*). How to be sure: Check the leaves and fruit: Milky sap oozes from broken leaf stalks. The wings of the fruits (samara), meet to form a nearly 180-degree angle. Sugar maple, in comparison, yields clear sap when the leaf stalk is broken, and the samara wings form an approximately 100-degree angle.

How it spreads:

Widely planted as an ornamental and street tree. Trees produce abundant fruits that travel primarily on the wind. Seeds sprout the next spring and grow vigorously in a variety of conditions. As saplings mature, they create dense shade that suppresses native tree and shrub seedlings, ephemeral wildflowers, and other forest understory plants. Norway maple also photosynthesizes nutrients faster than native forest species, giving it competitive advantage.

What to plant instead:

Sugar maple (*Acer saccharum*) or red maple (*Acer rubrum*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		hand pull or uproot young plants				foliar 1-3% glyphosate herbicide		cut-stem 25-40% glyphosate herbicide			

Get rid of:

Porcelain-berry

(Ampelopsis glandulosa)

Make room for:

Sun-loving native shrubs and vines, including wild grapes, whose fruits are a critical food source for birds and mammals.

A woody perennial vine native to Asia, porcelain-berry grows to heights of 10 to 20 feet or more in the canopies of trees and shrubs, preferring full to partial shade on forest borders, stream and pond banks.

What to look for:

Smooth bark and bright-green leaves, two to four inches wide, that have three to five deep lobes and alternate along the stem, with tendrils growing opposite. Petioles, young twigs, and leaf undersides are hairy. Small green flowers appear in dense cymes from June through August. Large, hard berries, slightly flattened on the top, appear in September and October, changing from white to pastel yellow, purple, green, and finally a pastel blue. A large taproot anchors an extensive root system.

How to be sure:

Check the bark. Though porcelain-berry leaves resemble the related native grape (*Vitis* spp.), grape vines have rough, peeling bark and no lenticels, and porcelain-berry has smooth bark with lenticels.

How it spreads:

Seeds spread through the droppings of birds, small mammals, and deer that eat the fruit. The vine also grows rapidly through tree canopies and can sprout from its root system, smothering mature plants and preventing seedlings from taking root.

What to plant instead:

Summer grape (*Vitis aestivalis*), river grape (*Vitis riparia*), Virginia-creeper (*Parthenocissus quinquefolia*), common blackberry (*Rubus allegheniensis*)

When and how to remove:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			hand pull or uproot young plants		foliar 1-3% glyphosate herbicide			cut-stem 25-40% glyphosate herbicide			

Watch for These Other Invasive Plants

Watch for these additional invasive exotic plants and control them whenever possible. Please report plants in **boldface** to EDDMapS, an online Early Detection and Distribution Mapping System for invasives. (To make a report, go to http://www.eddmaps.org/).

- **Asiatic smartweed** (*Persicaria perfoliata*)
- Bishop's goutweed (*Aegopodium podagraria*)
- Common barberry (*Berberis vulgaris*)
- Common reed (*Phragmites australis*)
- Creeping buttercup, spot-leaved crowfoot (*Ranunculus repens*)
- Dame's-rocket (*Hesperis matronalis*)
- **European alder** (*Alnus glutinosa*)
- **Giant cow-parsnip** (*Heracleum mantegazzianum*)
- **Japanese stiltgrass** (*Microstegium vimineum*)
- **Narrow-leaved bitter-cress** (*Cardamine impatiens*)
- Purple loosestrife (*Lythrum salicaria*)
- Reed canary grass (*Phalaris arundinacea*)
- **Wall lettuce** (*Mycelis muralis*)
- **Wine raspberry** (*Rubus phoenicolasius*)
- Yellow iris (*Iris pseudacorus*)

Sources

New England Wild Flower Society gratefully acknowledges the following sources in compiling this guide:

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