



Cumberland Town Forest Invasive Species Fact Sheets and Control Methods



2013

AUTUMN OLIVE

invasive
fact sheet



© Chris Evans/River to River CWMA

Autumn olive is a sun-loving shrub that invades Vermont's open woodlands and fields. This plant is **easy to identify in the fall** when the red berries are most colorful.

The Problem

- ◆ Autumn olive (*Elaeagnus umbellata*) is a prolific fruit producer. Single shrubs have been observed to bear up to 80 lbs. of fruit per growing season.
- ◆ Due to its large size, Autumn olive interferes with natural succession by creating dense shade that prohibits native plants from growing.
- ◆ The nitrogen-fixing capabilities of this species can interfere with the nitrogen cycle of native communities.
- ◆ Autumn olive was historically planted along roadsides and in abandoned fields as an ornamental and wildlife food plant, this characteristic makes Autumn olive an aggressive and competitive threat in open communities.



© Chris Evans/River to River CWMA



Autumn olive

red, silver speckled berries



silvery - white scales



nitrogen fixing root nodules



© Pennsylvania Dept. of Conservation and Natural Resources

© James H. Miller/USDA

© Leslie J. Mehrhoff/IPANE

AUTUMN OLIVE



Mechanical removal:

Hand pull: Any time of year when the ground is soft, especially after a rain, hand pull small plants by the base of the stem. Be sure to pull up the entire root system. Hang from a branch to prevent re-rooting. For larger plants, use a Weed Wrench™. Continue to monitor the area every year for new seedlings.

Cut stump: Repeated pruning of established plants to ground level without subsequent herbicide application is not effective for autumn olive control. Each re-growth results in a thicker stem base and denser branches.

Chemical removal:

Cut stump: Cut the plant 4 inches above the ground. Use a drip bottle to apply a 18-21% glyphosate solution to the stump within one hour of cutting. This is best done in late summer through winter when plants are transporting resources to their root systems.

Low volume foliar spray: This method is used for dense populations and best left to a contractor. During the summer months, July to August, spray a 2% glyphosate solution on the entire leaf surface of the plant. In order to avoid drift to native plants, spray only on calm days.

Safe Chemical Application

- ✓ **Develop an Integrated Plant Management approach.** Use chemical control as only ONE piece of your prevention and management strategy.
- ✓ **The label found on the herbicide container is the law.** It indicates the concentrations to use, what protective clothing to wear, how to apply the product, and what environmental and human health hazards are associated with the chemical.
- ✓ **Use aquatic formulations within 10 feet of water.** You need a permit to apply herbicides in wetlands. You cannot apply herbicides within 100 feet of a well-head. Contact VT DEC at 802-241-3761 for more information.
- ✓ **You need to be certified to apply herbicides on land that you do not own.**
- ✓ **Hire a contractor to manage large infestations.** A good contractor will have the knowledge to help create an effective management plan. For a list of certified contractors, contact the VT Department of Agriculture at 802-828-3482.



Non-invasive Alternatives



© Phyllis Weyland

russet buffaloberry
Shepherdia canadensis



© S&A. Wasowski

winterberry
Ilex verticillata



red chokeberry
Photinia pyrifolia

JAPANESE BARBERRY

invasive
fact sheet



© Leslie Mehrhoff/IPANE

Japanese barberry invades Vermont's forests and fields. The plants are **easy to see in the fall** when their red berries are most colorful.

The Problem

- ◆ Japanese barberry can quickly colonize a forest. Birds and small mammals feast on the fruits and drop them, starting new populations. The plants also reproduce vegetatively. Individual stems reach toward the ground and 'layer,' developing new plants.
- ◆ It can grow so thickly in woodlands that few native shrub and tree seedlings or herbaceous plants survive.
- ◆ Barberry infestations can lead to increases in rates of Lyme disease. Ticks like to hang out on the tips of shrubs, waiting for mammals to pass by. Mice populations — an alternate host for Lyme disease — thrive in the thorny Barberry stands.
- ◆ Japanese barberry (*Berberis thunbergii*) is sold in different ornamental varieties such as 'Aurea' with gold leaves or 'Crimson Pygmy' with purple leaves. Though these cultivars look different from the green-leaved Japanese barberry that is found in forests, studies show that these ornamental varieties are all capable of producing offspring with green leaves.



JAPANESE BARBERRY



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Non-invasive Alternatives



smokebush
Cotinus obovatus



winterberry
Ilex verticillata



fothergilla
Fothergilla major

BITTERSWEET

invasive
fact sheet



© Stacey Leicht/IPANE

Asiatic bitter-sweet invades Vermont's forests and fields. It is easy to see in the fall when its red and yellow fruit lines its vines.

DID YOU KNOW?

The leaf shape and fruit color of Asiatic bitter-sweet (*Celastrus orbiculatus*) have a very similar appearance to the native Vermont vine, American bitter-sweet (*Celastrus scandens*). The best way to distinguish between the two plants is by the location of the flowers and fruits on the stem. On the invasive Asiatic bitter-sweet, they are scattered along the entire stem (above), while on the native American bitter-sweet, they are found at the terminal end of each stem (below).



Asiatic
bittersweet



American
bittersweet

Photos © IPANE



Asiatic bitter-sweet



light green, alternate leaves that spiral around stem

woody stem

fruit: yellow outer cover with inner red flesh



© Leslie Mehrhoff/IPANE

BITTERSWEET



Mechanical control:

For small plants: Hand pull entire plants, including all roots and runners. Place everything into a plastic bag for disposal.

For large plants: Cut climbing or trailing vines close to root collar. Repeat every two weeks.

Chemical control:

Foliar spray: This method is best used for dense populations. In the fall, when native plants are losing their leaves, spray a 2% glyphosate or triclopyr solution on the entire leaf surface of the plant. In order to avoid drift to native plants, spray on calm days.

Cut stump: Cut plant 4 inches from ground in fall. Treat stumps with a triclopyr herbicide. Glyphosate-based products are not strong enough for this plant.

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DO NOT COMPOST THIS PLANT! Plant fragments can re-sprout.



Non-invasive Alternatives

© Joseph A. Marcus/Lady Bird Johnson Wildflower Center



trumpet vine
Campsis radicans

© Joseph A. Marcus/Lady Bird Johnson Wildflower Center



Virginia creeper
Parthenocissus quinquefolia

trumpet
honeysuckle

*Lonicera
sempervirens*



© Joseph A. Marcus/Lady Bird Johnson Wildflower Center

American
bittersweet

*Celastrus
scandens*



© Native Plant Nursery/nativeplant.com

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802-229-4425 x120
www.vtinvasives.org

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BLACK SWALLOW-WORT

invasive
fact sheet



UGA5275015
© Leslie Mehrhoff/IPANE

Black swallow-wort invades Vermont's fields and roadsides. The plants are **easier to see in late summer** when dying plants turn golden yellow.

The Problem

- ◆ Black swallow-wort (*Vincetoxicum nigrum*) can colonize two ways, wind borne seeds which can travel for miles or by rhizomes (underground stems) that sprout into new plant clumps and form extensive patches.
- ◆ These extensive patches of swallow-wort grow over other, often native, vegetation, blocking light and creating tangled thickets.
- ◆ Since this plant is a member of the milkweed family, Monarch butterflies often lay their eggs on swallow-wort seed pods. But swallow-wort is poisonous to monarchs and its larvae die either when they feed or by starving to death.
- ◆ Old field habitats of goldenrod and grasses can be replaced almost exclusively by swallow-wort, completely changing their physical structure, possibly impacting nesting birds in the process.



© Wisconsin DNR



Black swallow-wort

opposite dark green leaves

twining vine

dark purple flowers

closed seed pod

open seed pod

© Stephen Darbyshire

© Elizabeth Czarapata

© Richard A. Casagrande

© Leslie Mehrhoff/IPANE

BLACK SWALLOW-WORT



Mechanical removal:

Fruits can be manually removed and carried off-site to prevent seed dispersal, but this practice is time-consuming and must be continued until no more pods are produced and the plants reach the end of the growing season. It is more effective to remove the entire plant by mowing or pulling as it takes the plants a long time to recover and they often cannot do so in time to produce more seeds that season. Mowing is best for preventing seed production. However mowing does present the same rapid re-sprouting problem as manual pulling. Mowing frequently (one to two visits per season) just as the pods are beginning to form is ideal to prevent seed production.

Digging up root crowns is more effective than hand pulling alone. The stem tends to break easily above the root crown if pulled while the root crown itself is held tenaciously in place by the fibrous root system and can readily resprout if the stems are cut or broken. If the root crown is pulled up, it must be removed from the site and/or destroyed because broken root crowns tossed on the ground have been observed to re-grow.

Chemical removal:

Foliar spray treatments are shown to be superior to cut-stem treatments. Herbicide choice for foliar spray treatments will depend on site conditions. In degraded patches with little desirable vegetation, glyphosate may be preferred. At sites with desirable grasses that should be conserved, triclopyr ester would be the herbicide of choice. Follow up treatments will be required. In situations where spraying is impractical, cut-stem applications with follow up treatments should be effective. Repeated follow-up

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herbicide treatments are necessary for effective control. These herbicides should be applied when plants are actively growing, after flowering has begun. Only when the plants flower will they be large enough to receive enough spray on the exposed leaf surface to deliver a killing dose to the roots.



PALE SWALLOW-WORT

- ◆ Pale swallow-wort (*Vincetoxicum rossicum*) has not yet reached Vermont but it has been reported in all bordering states.
- ◆ This plant can be distinguished from black swallow-wort by its flowers which are lighter in color and have longer, thinner petals.
- ◆ Both species exhibit same habitat and reproductive methods.

black swallow-wort



pale swallow-wort

© Leslie Mehrhoff/IPANE



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802-229-4425 x120
www.vtinvases.org



BUCKTHORN

invasive
fact sheet



© Leslie Mehrhoff/IPANE

Buckthorn replaces native trees and shrubs in Vermont's forests and fields. It is easy to see in the fall when its dark blue berries cover the tree's branches.



© 2006 Jenn Forman Orth



common buckthorn
glossy buckthorn

common buckthorn (*Rhamnus cathartica*)



orange
tissue



opposite, toothed leaves with "u" vein

glossy buckthorn (*Rhamnus frangula*)

alternate
glossy
leaves



unripe
red
berries

Photos © John Randall/The Nature Conservancy

The Problem

- ◆ Birds and mammals feed on buckthorn berries during the winter, aiding in the dispersal of seeds. While buckthorn may benefit from this behavior, the feeding animals do not. Buckthorn berries contain emodin, a natural laxative, that prevents mammals from digesting sugars found in the berries, like this Eastern chipmunk shown above.
- ◆ Like many other invasive trees and shrubs, buckthorn leafs out early and retains its leaves into late fall, giving it a much longer advantageous growing season than native plants.
- ◆ Buckthorn can increase the amount of nitrogen in the soil, impacting the composition of native species that can grow in the area.

BUCKTHORN



Integrated Invasive Plant Management

Most landowners have more than one invasive plant species on their property. Before you head for the clippers, develop a management plan. A well-developed plan that is specific to your property will help you save time and money, increase long-term effectiveness, and reduce the spread of invasives.

- ✓ **Create land management goals.** Determine what natural features you are most interested in protecting and what wildlife management, forestry activities or trail building goals you have for the next 5–20 years, and what you want the land to be like in 200 years.
- ✓ **Map the invasive species on your property and the surrounding area.** Look for invasive plants along logging roads and trails, and other openings in the forest canopy. Roughly map the species that you find, and convey a sense of the size and density of the populations.
- ✓ **Practice Early Detection and Rapid Response (EDRR).** Each year, walk your entire property. Look for and remove new occurrences of invasive species. Stay up to date on what invasive species are coming into your area.
- ✓ **Consider available resources and develop a timeline.** Be realistic with the time and money you have and set goals accordingly. Based on what resources you have available, time your work accordingly.
- ✓ **Determine a weed- or site-led management approach.** *Site-led management* is designed for the landowner interested in protecting a particular resource or natural feature from encroachment. *Weed-led management* approaches the problem from a single-species perspective. Your approach may change from one part of your property to another, depending upon the species present, natural features, vegetation types, and land management goals.
- ✓ **Integrate invasive species prevention and management into all of your land management activities.** Certain land management activities may spread invasive species. Predict what activities (e.g. logging, construction of trails, roads or buildings) will cause future problems and take necessary precautions. For example, after spending time in an area that has invasive plants, check clothing for seeds and remove soil from shoe soles. Require that any logging, mowing or excavation equipment that comes on your property is weed-free. Monitor new plantings, whether within designed landscapes or natural settings, for invasives that may have been present in imported soil. Before doing a cut in a timber stand, remove all invasives. Ask your forester to incorporate invasive plant management into your land management plan.

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Safe Chemical Application

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- ✓ **Develop an Integrated Plant Management approach.** Use chemical control as only ONE piece of your prevention and management strategy.

BURNING BUSH

invasive
fact sheet



© Daniel Dietz/The Nature Conservancy

Burning bush invades Vermont's forests and fields. It is **easy to see in the fall** when its leaves turn bright red.

 burning bush

 yellow flower

 red fruit

 winged stem

 red fall foliage

 finely toothed, opposite leaves

© Leslie Mehrhoff/IPANE

© Leslie Mehrhoff/IPANE

© The Nature Conservancy

© Barry Rice/The Nature Conservancy



© Barry Rice/The Nature Conservancy

DID YOU KNOW?

Burning bush (*Euonymus alatus*) spreads from yards to forests and fields after birds consume the fruit and carry the seeds across long distances. Fruits left uneaten fall to the ground, creating a “seed shadow” around the plant’s base.



© Leslie Mehrhoff/IPANE

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BURNING BUSH



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Non-invasive Alternatives



highbush blueberry
Vaccinium corymbosum



fothergilla
Fothergilla major

red
chokeberry

*Aronia
arbutifolia*



© Stefan Bloodworth/Lady Bird Johnson Wildflower Center

witch-
hazel

*Hamamelis
virginiana*



© Albert F.W. Vick/Lady Bird Johnson Wildflower Center



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BUSH HONEYSUCKLE

invasive
fact sheet



© Leslie Mehrhoff/IPANE

Bush honeysuckle invades Vermont's forests and fields. It is **easy to see in May and June** when its yellow, white or pink flowers are in bloom.

The Problem

- ◆ When songbirds build nests in non-native honeysuckle they suffer a higher predation rate than when their nests are built in native shrubs such as arrowwood (*Viburnum dentatum*). This is because honeysuckle stems are sturdier and closer to the ground — raccoons, skunks and other predators can easily scramble up the stems.
- ◆ Forest regeneration is severely impacted by honeysuckle infestations. The shrubs form dense colonies in the understory, outcompeting native shrubs and trees.
- ◆ Sunlight can no longer reach the forest floor, reducing the diversity and abundance of native wildflower and fern populations.



© James Leupold/USF&WS

bush honeysuckle

thin-petaled flowers

© John Randall/The Nature Conservancy

hollow stem pith

© Gary Fewless/University of Wisconsin-Green Bay

red fall berries

© John Randall/The Nature Conservancy

opposite, oval leaves

BUSH HONEYSUCKLE



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Non-invasive Alternatives



© Mrs. W.D. Bamsford/Lady Bird Johnson Wildflower Center

ninebark
Physocarpus opulifolius



© Stefan Bloodworth/Lady Bird Johnson Wildflower Center

winterberry
Ilex verticillata

black
chokeberry

*Aronia
melanocarpa*



© David G. Smith/delawarewildflower.org

Virginia
rose

*Rosa
virginiana*



© Albert F.W. Vick, Jr./Lady Bird Johnson Wildflower Center

COMMON REED

invasive
fact sheet



© Nava Tabak/IPANE

Common reed grows in Vermont's wetlands and marshes, and along river and lake shores. This plant is **easy to see in August** when its flower stalks are in bloom.

The Problem

Common reed (*Phragmites australis*) replaces native grasses, sedges and herbaceous plants. It provides poor quality habitat for insects, birds and amphibians. Fish populations that reproduce in wetlands and marshes inundated with phragmites suffer higher egg and juvenile mortality. The plant also exudes allelopathic compounds from its roots, causing root death of nearby native plants.



common reed



broad, flat green leaves

purple flowers in tassels on top of stems



tall grass, reaching 13 feet in height

© Stacey Leicht/IPANE



EXOTIC

NATIVE

Learn to distinguish native and exotic phragmites at www.invasiveplants.net/phragmites.

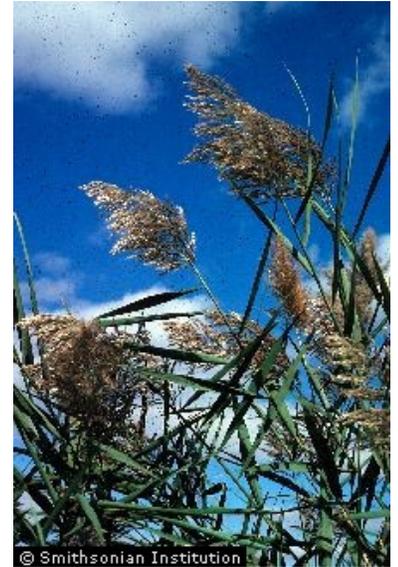
© Bernett Blosssey/Cornell University

COMMON REED



Mechanical control

- ✓ Caution!! Since common reed is a grass, cutting several times during a season at the wrong times may increase stand density.
- ✓ Hand-cut individual stems at the end of July when most of the plant's food reserves are in the aerial portion of the plant, before the flowers produce seed. Plants should be cut below the lowest leaf, leaving a 6 inch or shorter stump. Hand-held cutters, gas-powered hedge trimmers and weed whackers with a circular blade are particularly efficient. You can also cut and mulch dead stems in winter to remove them and promote germination of other species. Repeat in second year and then every three to five years.
- ✓ Cut stems can be composted or allowed to decay in a dry area.
- ✓ Some patches may be too large to cut by hand, but repeated cutting of the perimeter of a stand can prevent vegetative expansion. Mow large stands of common reed annually between June and July to reduce plant vigor and stem density. Common reed will spread by seed or root pieces, so be sure to thoroughly clean all mowing equipment after its use to prevent the reed's spread.
- ✓ After cutting, lay a sheet of black plastic over the area. Use sand bags or bricks to secure the edges and keep covered for a year. Check for new growth around the plastic.



© Smithsonian Institution

R.A. Howard @ USDA-NRCS PLANTS Database

Chemical control

- ✓ **For small infestations:** Cut the plants back in the winter. In late summer, cut stems of common reed and drip an 18-21% glyphosate solution into the stem.
- ✓ **For larger infestations:** Cut the plants back in the winter. In late July or early August, when the plants are flowering, use a car wash mitt to wipe a 2% glyphosate solution onto the entire plant. Repeat in following years as necessary.

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GARLIC MUSTARD

invasive
fact sheet



© IPANE

Garlic mustard invades Vermont's forests and wet meadows. This plant is easy to see in April and May when its white flowers are blooming.

DID YOU KNOW?

Garlic mustard (*Alliaria petiolata*) was first planted in Long Island, New York in 1868 as an edible garden plant. It was commonly kept as a potted herb whose prolific seeds were dispersed by wind to nearby fields and forests. The flavor of its leaves is true to this plant's name. Young, tender leaves can be substituted as a tangy salad green or as an addition to basil leaves in your favorite pesto recipe.



© Emily Boedecker/The Nature Conservancy



garlic mustard

© Daniel Dietz/The Nature Conservancy



new growth with leaves low to ground and no tall stalk



purple stems of young plants

delicate white flowers

heart-shaped, toothed leaves of older plants



© Leslie Mehrhoff/IPANE

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www.nature.org/vermont/weeds

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GARLIC MUSTARD

invasive
fact sheet



garlic mustard

*For safe and legal herbicide application:

- Read the herbicide label. The label is the law.
- If you are treating large stands of an invasive, or working on public lands, it is highly recommended to hire a licensed herbicide applicator.
- Private citizens can legally apply non-restricted use herbicides on land on which they own. All others need to become certified applicators or hire someone that is certified.
- If you have questions about herbicide use, contact the VT Agency of Agriculture at 802-828-2431.
- If you are working in or near a waterway or wetland, contact the VT Department of Environmental Conservation at 802-241-3761.



For small infestations:

Hand pull plants in the spring before they flower. Pull slowly, grasping plants at the stem base. Make sure you remove the “S”-shaped tap root. Put all plant parts into a plastic bag to decompose.



© Candice Black/The Nature Conservancy

For large infestations:

A glyphosate herbicide*, such as Round-Up® or Rodeo®, can be sprayed on remaining green leaves in the late fall when *all* other plants are dormant.

DO NOT COMPOST THIS PLANT! Plant fragments can re-sprout.



non-invasive alternatives

© Stefan Bloodworth/Lady Bird Johnson Wildflower Center



foam flower
Tiarella cordifolia

© Stefan Bloodworth/Lady Bird Johnson Wildflower Center



blue phlox
Phlox divaricata

Canada
anemone

*Anemone
canadensis*



© Mrs. W.D. Bransford/Lady Bird Johnson Wildflower Center

white
boneset

*Eupatorium
perfoliatum*



© Mrs. W.D. Bransford/Lady Bird Johnson Wildflower Center

Wise On Weeds!

For more information on invasives, contact
The Nature Conservancy, Montpelier, Vermont
802-229-4425 x120 or go to www.vtinvasiveplants.org or
www.nature.org/vermont/weeds

The Nature
Conservancy 
Protecting nature. Preserving life.™

BUCKTHORN

invasive
fact sheet



© Leslie Mehrhoff/IPANE

Buckthorn replaces native trees and shrubs in Vermont's forests and fields. It is easy to see in the fall when its dark blue berries cover the tree's branches.



© 2006 Jenn Forman Orth



common buckthorn
glossy buckthorn

common buckthorn (*Rhamnus cathartica*)



orange
tissue



opposite, toothed leaves with "u" vein

glossy buckthorn (*Rhamnus frangula*)

alternate
glossy
leaves



unripe
red
berries

Photos © John Randall/The Nature Conservancy

The Problem

- ◆ Birds and mammals feed on buckthorn berries during the winter, aiding in the dispersal of seeds. While buckthorn may benefit from this behavior, the feeding animals do not. Buckthorn berries contain emodin, a natural laxative, that prevents mammals from digesting sugars found in the berries, like this Eastern chipmunk shown above.
- ◆ Like many other invasive trees and shrubs, buckthorn leafs out early and retains its leaves into late fall, giving it a much longer advantageous growing season than native plants.
- ◆ Buckthorn can increase the amount of nitrogen in the soil, impacting the composition of native species that can grow in the area.

BUCKTHORN

Integrated Invasive Plant Management



Most landowners have more than one invasive plant species on their property. Before you head for the clippers, develop a management plan. A well-developed plan that is specific to your property will help you save time and money, increase long-term effectiveness, and reduce the spread of invasives.

- ✓ **Create land management goals.** Determine what natural features you are most interested in protecting and what wildlife management, forestry activities or trail building goals you have for the next 5–20 years, and what you want the land to be like in 200 years.
- ✓ **Map the invasive species on your property and the surrounding area.** Look for invasive plants along logging roads and trails, and other openings in the forest canopy. Roughly map the species that you find, and convey a sense of the size and density of the populations.
- ✓ **Practice Early Detection and Rapid Response (EDRR).** Each year, walk your entire property. Look for and remove new occurrences of invasive species. Stay up to date on what invasive species are coming into your area.
- ✓ **Consider available resources and develop a timeline.** Be realistic with the time and money you have and set goals accordingly. Based on what resources you have available, time your work accordingly.
- ✓ **Determine a weed- or site-led management approach.** *Site-led management* is designed for the landowner interested in protecting a particular resource or natural feature from encroachment. *Weed-led management* approaches the problem from a single-species perspective. Your approach may change from one part of your property to another, depending upon the species present, natural features, vegetation types, and land management goals.
- ✓ **Integrate invasive species prevention and management into all of your land management activities.** Certain land management activities may spread invasive species. Predict what activities (e.g. logging, construction of trails, roads or buildings) will cause future problems and take necessary precautions. For example, after spending time in an area that has invasive plants, check clothing for seeds and remove soil from shoe soles. Require that any logging, mowing or excavation equipment that comes on your property is weed-free. Monitor new plantings, whether within designed landscapes or natural settings, for invasives that may have been present in imported soil. Before doing a cut in a timber stand, remove all invasives. Ask your forester to incorporate invasive plant management into your land management plan.

Mechanical removal:

Hand pull: Any time of year when the ground is soft, especially after a rain, hand pull small plants by the base of the stem. Be sure to pull up the entire root system. Hang from a branch to prevent re-rooting. For larger plants, use a Weed Wrench™. Continue to monitor the area every year for new seedlings.

Cut stump: Cut plants back any time of year. Wrap a few layers of burlap or thick plastic over the stump and tie tightly with twine. You will need to check stumps periodically and cut back any new growth.

Chemical removal:

Cut stump: Cut the plant 4 inches above the ground. Use a drip bottle to apply a 18-21% glyphosate solution to the stump within one hour of cutting. This is best done in late summer through winter when plants are transporting resources to their root systems.

Low volume foliar spray: This method is used for dense populations and best left to a contractor. In the fall, when native plants are losing their leaves, spray a 2% glyphosate or triclopyr solution on the entire leaf surface of the plant. In order to avoid drift to native plants, spray only on calm days.

Safe Chemical Application

- ✓ **The label found on the herbicide container is the law.** Read this label in its entirety. It will teach you what concentrations to use, what protective clothing to wear, how to apply the product, and what environmental and human health hazards are associated with the chemical. Improperly used herbicides can cause both short- and long-term health and environmental problems. More is not better! Pesticide labels can be found at <http://www.msds.com/>.
- ✓ **Use aquatic formulations within 10 feet of water.** You need a permit to apply herbicides in wetlands. You cannot apply herbicides within 100 feet of a wellhead. Contact VT DEC at 802-241-3761 for more information.
- ✓ **You need to be certified to apply herbicides on land that you do not own.**
- ✓ **Hire a contractor to manage large infestations.** A good contractor will have the knowledge to help create an effective management plan. For a list of certified contractors, contact the Department of Agriculture at 802-828-3482.
- ✓ **Develop an Integrated Plant Management approach.** Use chemical control as only ONE piece of your prevention and management strategy.

KNOTWEED

invasive
fact sheet



© Leslie Mehrhoff/IPANE

Japanese knotweed invades the banks of Vermont's rivers, streams and lakes. It is **easy to see in August** when its white flowers bloom.



© John Randall/The Nature Conservancy



Japanese knotweed



© Leslie Mehrhoff/IPANE

lacy white flowers trailing down stem

new growth looks like red asparagus stalks

rounded, heart-shaped leaves



© John Randall/The Nature Conservancy

The Problem

- ◆ While bees are attracted to knotweed flowers, the plant is untouched by most native insects. As knotweed populations replace native trees, shrubs, grasses and sedges, native insect populations are reduced. Insect populations are a primary food source for fish, birds and mammals.
- ◆ River shores that are populated by native vegetation are less susceptible to erosion. A combination of native plants has a more complex root structure and can retain soil.
- ◆ Knotweed can re-sprout from a small piece of the rhizome (root) or stem. New colonies are easily established on rivers or from contaminated soils used for road repair or construction projects.

KNOTWEED



Mechanical removal:

Cut stalks at least once per month throughout the growing season. Use a scythe, loppers or even a lawn mower, depending upon the ground surface you are working on. Repeat cuts for five years. Do not replant until the knotweed is under control and the plants are much smaller and have lost their vigor. Replant with good sized natives.

Chemical removal:

For small infestations: Cut stalks of knotweed in late June. Cut again after August 1 and drip a 18-25% glyphosate herbicide* solution into the stems. An injector gun can also be used for application.

For larger infestations: Cut the plants back in June. In late summer, when other populations are flowering, use a low-volume foliar spray of 3-8% glyphosate. Spray only on non-windy days and in patches that are absent of native species. Any time you are near water, use aquatic formulations. The following year, spot-treat remaining plants.

Knotweed Management Tips:

- **Have a strong will! Knotweed is notoriously difficult to remove.**
- **Small parts of the rhizome (root) or stalk can re-sprout and start new colonies.**
- **Small patches can be successfully eradicated, but it takes years of persistent effort.**
- **Organize a group of volunteers that can work together on larger patches.**
- **When possible, bag cut plants. Let rot in the bag for a year before disposing of the bags in a landfill.**
- **If bagging is not possible, pull plants into a pile and cover with a tarp to rot.**
- **When working near a body of water, pull back cut plants above the flood lines.**

DO NOT COMPOST THIS PLANT! Plant fragments can re-sprout.

Safe Chemical Application

- ✓ **The label found on the herbicide container is the law.** Read this label in its entirety. It will teach you what concentrations to use, what protective clothing to wear, how to apply the product, and what environmental and human health hazards are associated with the chemical. Improperly used herbicides can cause both short- and long-term health and environmental problems. More is not better! Pesticide labels can be found at <http://www.msds.com/>.
- ✓ **Use aquatic formulations within 10 feet of water.** You need a permit to apply herbicides in wetlands. You cannot apply herbicides within 100 feet of a wellhead. Contact VT DEC at 802-241-3761 for more information.
- ✓ **You need to be certified to apply herbicides on land that you do not own.**
- ✓ **Hire a contractor to manage large infestations.** A good contractor will have the knowledge to help create a good management plan. For a list of certified contractors, contact the Department of Agriculture at 802-828-3482.
- ✓ **Develop an Integrated Plant Management approach.** Use chemical control as only ONE piece of your prevention and management strategy.



The Nature Conservancy, Montpelier, Vermont
802-229-4425 x120
www.vtinvasives.org



LOOSESTRIFE

invasive
fact sheet



© IPANE

Purple loosestrife invades Vermont's fields, marshes and bogs. It is easy to see in the summer when its showy magenta blooms are at their peak.



© Leslie Mehrhoff/IPANE



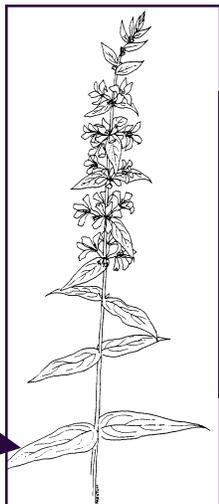
purple loosestrife



magenta flowers



opposite, long, narrow leaves



© Judy Preston/The Nature Conservancy

growth in dense stands of stems

© Leslie Mehrhoff/IPANE

The Problem

- ◆ As the leaves of purple loosestrife (*Lythrum salicaria*) decompose in water, they secrete high levels of tannic acid. Research shows that American toad (*Bufo americanus*) tadpoles suffer higher mortality rates in this highly acidic environment.
 - ◆ Each purple loosestrife plant can produce 1,000,000 seeds, 97% of which are viable.
- ◆ Wetlands filled with purple loosestrife stands do not contain the grasses, sedges, aquatic vegetation and native shrubs that were once there. Purple loosestrife does not support as many insect species as native plants. Native birds can no longer find the food sources or quality nesting habitat that they could once find in the wetland.



© Department of Fisheries and Oceans Canada

LOOSESTRIFE

invasive
fact sheet



purple loosestrife

For small infestations:

- Hand pull individual plants by grasping each stem at its base and pulling slowly to remove all the root.
- Break off flower heads before they go to seed.
- Put the discarded vegetation into a plastic garbage bag to decompose.

For large infestations:

When funding allows, the Vermont Department of Environmental Conservation's Water Quality Division releases beetles near large patches of loosestrife. Call 802-241-3777 to report locations of loosestrife or learn more on-line at www.vtwaterquality.org.



Galerucella spp.

© Vermont Department of Environmental Conservation

DO NOT COMPOST THIS PLANT! Plant fragments can re-sprout.



Non-invasive Alternatives



joe pye-weed
Eupatorium maculatum

© Mrs. W.D. Branstford/Lady Bird Johnson Wildflower Center



blazing star
Liatris spicata

© Stefan Bloodworth/Lady Bird Johnson Wildflower Center

purple
coneflower

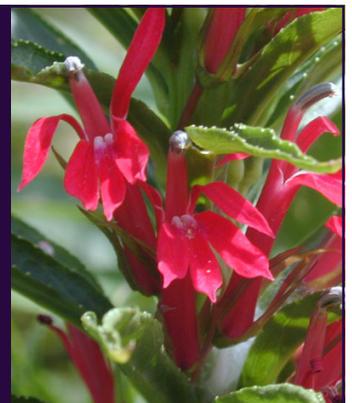
*Echinacea
purpurea*



© Joseph A. Marcus/Lady Bird Johnson Wildflower Center

cardinal
flower

*Lobelia
cardinalis*



© Joseph A. Marcus/Lady Bird Johnson Wildflower Center

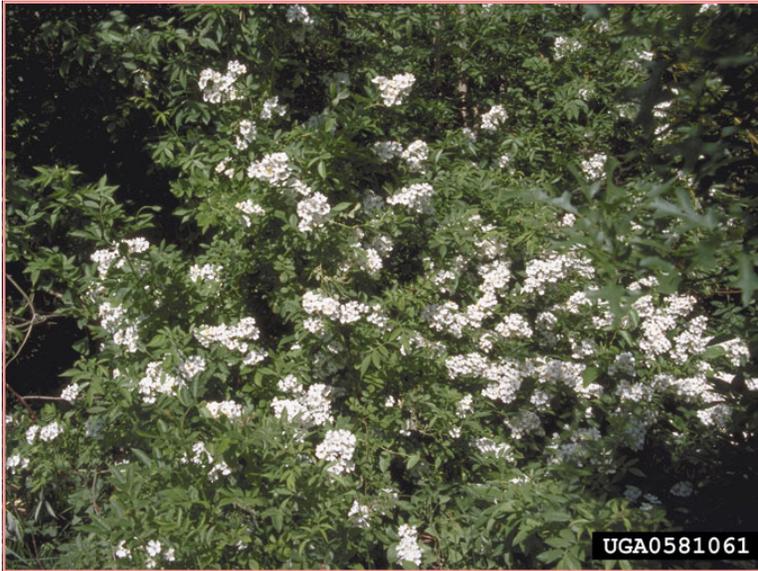
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Protecting nature. Preserving life.™

MULTIFLORA ROSE

invasive
fact sheet



© Jill M Swearingen, USDI National Park Service

Multiflora rose invades Vermont's forests and fields. The plants are **easy to see in early summer** when their fragrant white to pink flowers appear.

The Problem

- ◆ Multiflora rose (*Rosa multiflora*) can form impenetrable thickets that exclude native plant species.
- ◆ Birds eat the fruits and disperse the seeds which are still viable after passing through the digestive tract.
- ◆ Arching canes that reach the ground can take root and form new plants.
- ◆ This plant has a wide tolerance of soil, moisture, and light conditions. It has the ability to thrive in dense woods, open fields, prairies, pastures, and is readily found along stream banks and roadsides.
- ◆ Seed bank can remain viable for 10-20 years creating the need for a long-term management plan.



© Steve Baskauf

MULTIFLORA ROSE



Mechanical removal:

- Young plants can be pulled by hand.
- Frequent, repeated cutting or mowing at the rate of three to six times per growing season, for two to four years, has been shown to be effective in achieving high mortality of multiflora rose.
- In high quality natural communities, cutting of individual plants is preferred to site mowing to minimize habitat disturbance.

Chemical removal:

Cut stump: Cut the plant 4 inches above the ground. Use a drip bottle to apply an 18-21% glyphosate solution to the stump within one hour of cutting. This is best done in late summer through winter when plants are transporting resources to their root systems.

Low volume foliar spray: This method is used for dense populations and best left to a contractor. Thoroughly wet all leaves with an herbicide in water with a surfactant as follows: while in bloom—Escort[®] at 1 ounce per acre (0.2 dry ounces per 3-gallon mix); Aug-Oct—Arsenal AC[®] as 1% solution (4 oz per 3-gallon mix) or Escort[®] at 1 oz per acre (0.2 dry oz per 3-gallon mix); May-Oct—repeated applications of a glyphosate herbicide as a 2% solution in water (8 oz per 3-gallon mix), a less effective treatment that has no soil activity to damage surrounding plants. In order to avoid drift to native plants, spray only on calm days.

Safe Chemical Application

- ✓ **Develop an Integrated Plant Management approach.** Use chemical control as only ONE piece of your prevention and management strategy.
- ✓ **The label found on the herbicide container is the law.** It indicates the concentrations to use, what protective clothing to wear, how to apply the product, and what environmental and human health hazards are associated with the chemical.
- ✓ **Use aquatic formulations within 10 feet of water.** You need a permit to apply herbicides in wetlands. You cannot apply herbicides within 100 feet of a wellhead. Contact VT DEC at 802-241-3761 for more information.
- ✓ **You need to be certified to apply herbicides on land that you do not own.**
- ✓ **Hire a contractor to manage large infestations.** A good contractor will have the knowledge to help create an effective management plan. For a list of certified contractors, contact the VT Department of



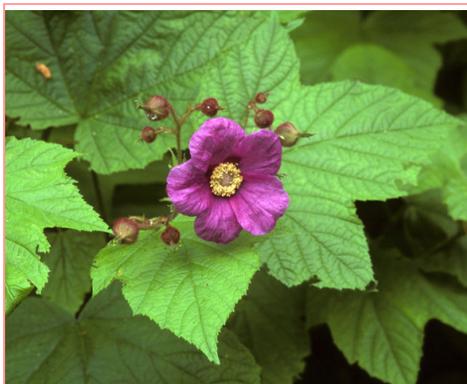
Non-invasive Alternatives

© S&A. Wasowski, TWC



climbing prairie rose
Rosa setigera

© S&A. Wasowski, TWC



purple-flowering raspberry
Rubus odoratus

© S&A. Wasowski, TWC



chokecherry
Prunus virginiana

NORWAY MAPLE

invasive
fact sheet



© Leslie Mehrhoff/IPANE

Norway maple invades Vermont's forests. It is easy to see in the fall when its leaves turn a golden yellow color.

The Problem

- ◆ Unlike native tree species, Norway maple hosts very few native caterpillars, reducing an important food source for bird populations
- ◆ Native mammals do not recognize Norway maple seeds as a food source, further reducing native tree populations.
- ◆ Norway maple (*Acer platanoides*) provides breeding habitat for another highly invasive species, the Asian long horned beetle (*Anoplophora glabripennis*), an insect that threatens to significantly reduce North American hardwood forest stands. Research shows female beetles will live longer and produce more fertile eggs on non-native Norway maples than on native red maples (*Acer rubrum*).



© Leslie Mehrhoff/IPANE



NORWAY MAPLE



Mechanical removal:

Hand pull: Any time of year when the ground is soft, especially after a rain, hand pull small plants by the base of the stem. Be sure to pull up the entire root system. Hang from a branch to prevent re-rooting. For larger plants, use a Weed Wrench™. Continue to monitor the area every year for new seedlings.

Cut stump: Cut plants back in the fall or winter. Wrap a few layers of burlap or thick plastic over the stump and tie tightly with twine or rope. Check covered stumps periodically and cut back any new growth.

Chemical removal:

Cut stump: Cut the plant 4 inches above the ground. Use a drip bottle to apply a 18-21% glyphosate solution to the stump within one hour of cutting. This is best done in late summer through winter when plants are transporting resources to their root systems.

Low volume foliar spray: This method is used for dense populations and best left to a contractor. In the fall, when native plants are losing their leaves, spray a 2% glyphosate solution on the entire leaf surface of the plant. In order to avoid drift to native plants, spray only on calm days.

Safe Chemical Application

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- ✓ **You need to be certified to apply herbicides on land that you do not own.**
- ✓ **Hire a contractor to manage large infestations.** A good contractor will have the knowledge to help create an effective management plan. For a list of certified contractors, contact the VT Department of Agriculture at 802-828-3482.



Non-invasive Alternatives



© www.grownative.org

red maple
Acer rubrum



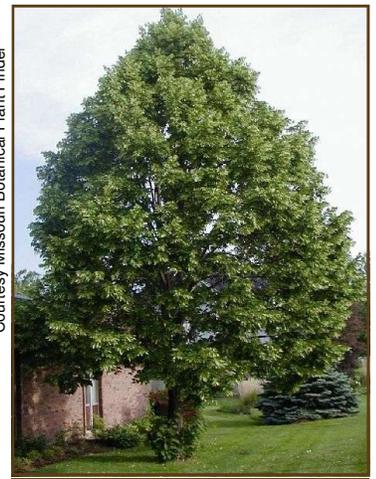
© John Seiler/Virginia Tech Dendrology

sugar maple
Acer saccharum



© John Seiler/Virginia Tech Dendrology

white ash
Fraxinus americana



Courtesy Missouri Botanical Plant Finder

American basswood
Tilia americana



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Control Methods



2013

Managing Invasive Plants

Methods of Control

by Christopher Mattrick

They're out there. The problem of invasive plants is as close as your own backyard.

Maybe a favorite dogwood tree is struggling in the clutches of an Oriental bittersweet vine. Clawlike canes of multiflora rose are scratching at the side of your house. That handsome burning bush you planted few years ago has become a whole clump in practically no time ... but what happened to the azalea that used to grow right next to it?

If you think controlling or managing invasive plants on your property is a daunting task, you're not alone. Though this topic is getting lots of attention from federal, state, and local government agencies, as well as the media, the basic question for most homeowners is simply, "How do I get rid of the invasive plants in my own landscape?" Fortunately, the best place to begin to tackle this complex issue is in our own backyards and on local conservation lands. We hope the information provided here will help you take back your yard. We won't kid you—there's some work involved, but the payoff in beauty, wildlife habitat, and peace of mind makes it all worthwhile.

PLAN OF ATTACK

Three broad categories cover most invasive plant control: mechanical, chemical, and biological. Mechanical control means physically removing plants from the environment



Spraying chemicals to control invasive plants.

through cutting or pulling. Chemical control uses herbicides to kill plants and inhibit regrowth. Techniques and chemicals used will vary depending on the species. Biological controls use plant diseases or insect predators, typically from the targeted species' home range. Several techniques may be effective in controlling a single species, but there is usually one preferred method—the one that is most resource efficient with minimal impact on non-target species and the environment.

MECHANICAL CONTROL METHODS

Mechanical treatments are usually the first ones to look at when evaluating an invasive plant removal project. These procedures do not require special licensing or introduce chemicals into the environment. They do require permits in some situations, such as wetland zones. [See sidebar on page 23.] Mechanical removal is highly labor intensive and creates a significant amount of site disturbance, which can lead to rapid reinvasion if not handled properly.

Pulling and digging

Many herbaceous plants and some woody species (up to about one inch in diameter), if present in limited quantities, can be pulled out or dug up. It's important to remove as much of the root system as possible; even a small portion can restart the infestation. Pull plants by hand or use a digging fork, as shovels can shear off portions of the root system, allowing for regrowth. To remove larger woody stems (up to about three inches in diameter), use a Weed Wrench™, Root Jack, or Root Talon. These tools, available from several manufacturers, are designed to remove the aboveground portion of the plant as well as the entire root system. It's easiest to undertake this type of control in the spring or early summer when soils are moist and plants come out more easily.



Using tools to remove woody stems.



Volunteers hand pulling invasive plants.

Suffocation

Try suffocating small seedlings and herbaceous plants. Place double or triple layers of thick UV-stabilized plastic sheeting, either clear or black (personally I like clear), over the infestation and secure the plastic with stakes or weights. Make sure the plastic extends at least five feet past the edge of infestation on all sides. Leave the plastic in place for at least two years. This technique will kill everything beneath the plastic—invasive and non-invasive plants alike. Once the plastic is removed, sow a cover crop such as annual rye to prevent new invasions.

Cutting or mowing

This technique is best suited for locations you can visit and treat often. To be effective, you will need to mow or cut infested areas three or four times a year for up to five years. The goal is to interrupt the plant's ability to photosynthesize by removing as much leafy material as possible. Cut the plants at ground level and remove all resulting debris from the site. With this treatment, the infestation may actually appear to get worse at first, so you will need to be as persistent as the invasive plants themselves. Each time you cut the plants back, the root system gets slightly larger, but must also rely on its energy reserves to push up new growth. Eventually, you will exhaust these reserves and the plants will die. This may take many years, so you have to remain committed to this process once you start; otherwise the treatment can backfire, making the problem worse.

CHEMICAL CONTROL METHODS

Herbicides are among the most effective and resource-efficient tools to treat invasive species. Most of the commonly known invasive plants can be treated using only two herbicides—glyphosate (the active ingredient in Roundup™ and Rodeo™) and triclopyr (the active ingredient in Brush-B-Gone™ and Garlon™). Glyphosate is non-selective, meaning it kills everything it contacts. Triclopyr is selective and does not injure monocots (grasses, orchids, lilies, etc.). Please read labels and follow directions precisely for both environmental and personal safety. These are relatively benign herbicides, but improperly used they can still cause both short- and long-term health and environmental problems. Special aquatic formulations are required when working in wetland zones. You are required to have a state-issued pesticide applicator license when applying these chemicals on land you do not own. To learn more about the pesticide regulations in your state, visit or call your state's pesticide control division, usually part of the state's Department of Agriculture. In wetland areas, additional permits are usually required by the Wetlands Protection Act. [See sidebar on page 23.]

Foliar applications

When problems are on a small scale, this type of treatment is usually applied with a backpack sprayer or even a small handheld spray bottle. It is an excellent way to treat large monocultures of herbaceous plants, or to spot-treat individual plants that are difficult to remove mechanically, such as goutweed, swallowwort, or purple loosestrife. It is also an effective treatment for some woody species, such as Japanese barberry, multiflora rose, Japanese honeysuckle, and Oriental bittersweet that grow in dense masses or large numbers over many acres. The herbicide mixture should contain no more than five percent of the active ingredient, but it is important to follow the instructions on the product label. This treatment is most effective when the plants are actively growing, ideally when they are flowering or beginning to form fruit. It has been shown that plants are often more susceptible to this type of treatment if the existing stems are cut off and the regrowth is treated. This is especially true for Japanese knotweed. The target plants should be thoroughly wetted with the herbicide on a day when there is no rain in the forecast for the next 24 to 48 hours.

Cut stem treatments

There are several different types of cut stem treatments, but here we will review only the one most commonly used. All treatments of this type require a higher concentration of the active ingredient than is used in foliar applications. A 25 to 35 percent solution of the active ingredient should be used for cut stem treatments, but read and follow all label instructions. In most cases, the appropriate herbicide is glyphosate, except for Oriental bittersweet, on which triclopyr should be used. This treatment can be used on all woody stems, as well as phragmites and Japanese knotweed.

For woody stems, treatments are most effective when applied in the late summer and autumn—between late August and November. Stems should be cut close to the ground, but not so close that you will lose track of them. Apply herbicide directly to the cut surface as soon as possible after cutting. Delaying the application will reduce the effectiveness of the treatment. The herbicide can be applied with a sponge, paintbrush, or spray bottle.



Cut stem treatment tools.

For phragmites and Japanese knotweed, treatment is the same, but the timing and equipment are different. Plants should be treated anytime from mid-July through September, but the hottest, most humid days of the summer are best

for this method. Cut the stems halfway between two leaf nodes at a comfortable height. Inject (or squirt) herbicide into the exposed hollow stem. All stems in an infestation should be treated. A wash bottle is the most effective application tool, but you can also use an eyedropper, spray bottle, or one of the recently developed high-tech injection systems.

It is helpful to mix a dye in with the herbicide solution. The dye will stain the treated surface and mark the areas that have been treated, preventing unnecessary reapplication. You can buy a specially formulated herbicide dye, or use food coloring or laundry dye.

There is not enough space in this article to describe all the possible ways to control invasive plants. You can find other treatments, along with more details on the above-described methods, and species-specific recommendations on The Nature Conservancy Web site (tncweeds.ucdavis.edu). An upcoming posting on the Invasive Plant Atlas of New England (www.ipane.org) and the New England Wild Flower Society (www.newfs.org) Web sites will also provide further details.



Hollow stem injection tools.

Biological controls—still on the horizon

Biological controls are moving into the forefront of control methodology, but currently the only widely available and applied biocontrol relates to purple loosestrife. More information on purple loosestrife and other biological control projects can be found at www.invasiveplants.net.

DISPOSAL OF INVASIVE PLANTS

Proper disposal of removed invasive plant material is critical to the control process. Leftover plant material can cause new infestations or reinfest the existing project area. There are many appropriate ways to dispose of invasive plant debris. I've listed them here in order of preference.

- 1. Burn it**—Make a brush pile and burn the material following local safety regulations and restrictions, or haul it to your town's landfill and place it in their burn pile.
- 2. Pile it**—Make a pile of the woody debris. This technique will provide shelter for wildlife as well.
- 3. Compost it**—Place all your herbaceous invasive plant debris in a pile and process as compost. Watch the pile closely for resprouts and remove as necessary. Do not use the resulting compost in your garden. The pile is for invasive plants only.



Injecting herbicide into the hollow stem of phragmites.

4. Dry it/cook it—Place woody debris out on your driveway or any asphalt surface and let it dry out for a month. Place herbaceous material in a doubled-up black trash bag and let it cook in the sun for one month. At the end of the month, the material should be non-viable and you can dump it or dispose of it with the trash. The method assumes there is no viable seed mixed in with the removed material.

Care should be taken in the disposal of all invasive plants, but several species need extra attention. These are the ones that have the ability to sprout vigorously from plant fragments and should ideally be burned or dried prior to disposal: Oriental bittersweet, multiflora rose, Japanese honeysuckle, phragmites, and Japanese knotweed.

Christopher Mattrick is the former Senior Conservation Programs Manager for New England Wild Flower Society, where he managed conservation volunteer and invasive and rare plant management programs. Today, Chris and his family work and play in the White Mountains of New Hampshire, where he is the Forest Botanist and Invasive Species Coordinator for the White Mountain National Forest.



Controlling Invasive Plants in Wetlands

Special concerns; special precautions

Control of invasive plants in or around wetlands or bodies of water requires a unique set of considerations. Removal projects in wetland zones can be legal and effective if handled appropriately. In many cases, herbicides may be the least disruptive tools with which to remove invasive plants. You will need a state-issued pesticide license to apply herbicide on someone else's property, but all projects in wetland or aquatic systems fall under the jurisdiction of the Wetlands Protection Act and therefore require a permit. *Yes, even hand-pulling that colony of glossy buckthorn plants from your own swampland requires a permit.* Getting a permit for legal removal is fairly painless if you plan your project carefully.

1. Investigate and understand the required permits and learn how to obtain them. The entity charged with the enforcement of the Wetlands Protection Act varies from state to state. For more information in your state, contact:

ME: Department of Environmental Protection
www.state.me.us/dep/blwq/docstand/nrpapage.htm

NH: Department of Environmental Services
www.des.state.nh.us/wetlands/

VT: Department of Environmental Conservation
www.anr.state.vt.us/dec/waterq/permits/htm/pm_cud.htm

MA: Consult your local town conservation commission

RI: Department of Environmental Management
www.dem.ri.gov/programs/benviron/water/permits/fresh/index.htm

CT: Consult your local town Inland Wetland and Conservation Commission

2. Consult an individual or organization with experience in this area. Firsthand experience in conducting projects in wetland zones and navigating the permitting process is priceless. Most states have wetland scientist societies whose members are experienced in working in wetlands and navigating the regulations affecting them. A simple Web search will reveal the contact point for these societies. Additionally, most environmental consulting firms and some nonprofit organizations have skills in this area.

3. Develop a well-written and thorough project plan. You are more likely to be successful in obtaining a permit for your project if you submit a project plan along with your permit application. The plan should include the reasons for the project, your objectives in completing the project, how you plan to reach those objectives, and how you will monitor the outcome.

4. Ensure that the herbicides you plan to use are approved for aquatic use. Experts consider most herbicides harmful to water quality or aquatic organisms, but rate some formulations as safe for aquatic use. Do the research and select an approved herbicide, and then closely follow the instructions on the label.

5. If you are unsure—research, study, and most of all, ask for help. Follow the rules. The damage caused to aquatic systems by the use of an inappropriate herbicide or the misapplication of an appropriate herbicide not only damages the environment, but also may reduce public support for safe, well-planned projects.



Wildlife Brush Piles



Conservation Practice Job Sheet - Indiana 645

WHAT IS A BRUSH PILE?

The term “brush pile” describes a mound or heap of woody vegetative material constructed to furnish additional wildlife cover. Brush piles can be fashioned in many different ways to meet various cover needs for particular wildlife species.



Mark Bennett, IDNR Division of Fish & Wildlife

Loosely formed brush piles can provide nesting habitat, resting areas, concealment, and protection from predators. Brush piles that are relatively open at ground level, but tightly compacted above, can provide good protective cover against harsh weather conditions. Densely packed piles of logs, rocks, or boulders can provide den sites for additional species of wildlife.

Constructing brush piles on your land can provide cover for ground-nesting birds (such as quail), many songbirds, rabbits, and other small mammals. Landowners should determine what cover types are needed and specifically design brush piles to meet those needs.

PLANNING CONSIDERATIONS

- Place brush piles near wildlife food sources. Good locations include: along forest roads and edges; in woodland openings; along field edges and corners; and beside streams and wetlands. Isolated piles are not likely to be well-used.
- Brush piles can be developed in woodland habitats with the material left from timber harvesting, woodland edge development, forest stand improvement, forest opening development, or firewood cutting.

- Several strategically placed medium-size piles (roughly 10 feet in diameter and 6 feet high) are better than one large one.
- Plant native vines such as Bittersweet, wild grape, or Virginia Creeper as an attractive cover for the brush pile; border with wildflowers; or screen with shrubs. Shrubs can provide additional food and cover.
- Keep brush piles away from houses and lawns to avoid problems with nuisance wildlife.
- Brush piles are flammable. Keep them away from buildings.
- Consider requesting technical assistance from an NRCS, IDNR, or U.S. Fish and Wildlife Service biologist through your local SWCD Office.

BRUSH PILES FOR NESTING, RESTING AND ESCAPE COVER

Predators such as owls, hawks, foxes, coyotes, and domestic pets, can significantly impact rabbit and quail populations when thick, brushy cover is lacking or not well distributed. The well-planned creation and placement of brush piles can often supplement naturally occurring escape cover for these and other wildlife species.

A loosely formed brush pile will encourage plant growth by allowing sunlight penetration. The tangled network of dead branches will eventually be intertwined by a thin to moderately dense stand of grasses and forbs. The end result is excellent resting and escape cover. These same types of brush piles may also be used as nesting sites by songbirds such as the White-throated Sparrow, Song Sparrow, Fox Sparrow, and Brown Thrasher.

The key to forming this type of habitat is to lightly pile branches in such a fashion so that plenty of sunlight reaches the ground. The branches can be



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sparingly piled in a teepee-type fashion or laid against an elevated object, such as a tree stump or fallen log. Discarded Christmas trees (without the tinsel) can be used

in a similar manner. The resulting combination of overhead woody cover mixed with a grass and forb groundcover provides a secure hiding and resting site.

An old, discarded section of woven wire fencing, rolled up to an inner diameter of 1½ to 2 feet and laid on its side, will afford rabbits considerable protection from predators and at the same time allow grasses and forbs to grow up through the openings. Brush piles fashioned in this way take on the characteristics of the “old briar patch” that rabbits find attractive.

Another alternative is to elevate a discarded wooden pallet approximately 8 to 12 inches above ground. Sunlight penetrating through the slats will allow grasses and forbs to grow and provide additional cover.

Placement

Rabbits and quail rarely stray far from good protective cover. This often limits the use of large open spaces that might otherwise serve as important nesting and feeding habitat. By placing brush piles along the edge or scattered throughout large open areas, rabbits and quail are more likely to utilize all available habitat.

General Recommendations

- Good locations to place brush piles include:
 - ⇒ Adjacent to edges of gullies, woodlands, and pastures or hay fields
 - ⇒ Within shrub thickets, fencerows or shelterbelts
 - ⇒ In field corners or other odd areas
- For edge habitats, such as along a woodland, fence row, or gully, one brush pile every 200 to 300 feet will provide adequate cover and travel lanes between food sources.
- In abandoned fields and other early successional habitat, create at least two piles per acre.
- On properties with little natural cover, create three or four brush piles per acre.
- Avoid the bottoms of drainage ways and low spots where standing water or flooding will reduce the usefulness of brush pile for upland wildlife species.

Living Shelters

A brush pile will last longer if constructed of living materials. In addition to providing cover and protection, living brush piles made from partially cut hardwood trees can supply buds, twigs, leaves, and seeds for animals to eat. Red cedar or locust trees can be used as well.

To make a living brush pile, find several (three to five) small hardwood saplings (4 to 8 inches in diameter) located within a few feet from one another. Cut each tree halfway through the trunk about 12 to 18 inches above the ground. Place the cuts on the outside, away from the other trees in the group. Fold the treetop over towards the other trees in the group so it rests on the ground or on top of the other

half-cut trees. Since the tree is not cut all the way through, the tree will stay alive for some time. Pile limbs and brush to reduce any large entrances, particularly near the folded trunks. Avoid covering the tops of the cut trees so they will continue to grow.

BRUSH PILES FOR HARSH WEATHER COVER

Brush piles can help ground dwelling wildlife escape the effects of harsh weather (bitterly cold or extremely hot), snow, and ice. A well-constructed, properly maintained, brush pile can supplement natural cover for 10 to 15 years.

Generally, brush piles of this type should range between 10 to 15 feet in diameter, and 5 to 8 feet in height. The most common design is built using logs (arranged in a tic-tac-toe pattern) for the foundation and covered with brush. Start with the largest material on the bottom to provide hiding space under the pile. Shallow depressions can also be dug before beginning the brush pile to provide more space.

Foundation

Use the largest available materials when constructing the foundation. Logs at least 6 to 10 inches in diameter and 10 to 15 feet in length are recommended. The larger materials at the bottom keep the smaller limbs off the ground, helping to prevent decay.

Start construction by laying logs parallel and 6 to 12 inches apart. Next, place a second layer of logs on top of, and perpendicular to, the first layer (again about 6 to 12 inches apart - see Figure 1). Large, flat rocks can be substituted for the second layer of logs. Repeat this process one or two more times to complete the final tiers. The intent is to

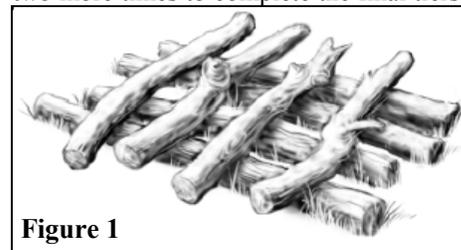


Figure 1

can also serve this purpose.

Many other options for building brush pile foundations are possible depending upon the materials available.

- A tree stump that is still in place can create an adequate foundation. Place several logs (6 to 10 inches in diameter and 5 to 6 feet long) on top of the stump so that the logs are radiating out from the center (see Figure 2).

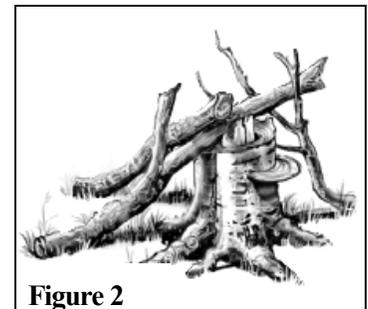


Figure 2

make a pyramid-type structure that has a hollow core. Note that old and discarded fence posts

- Discarded wooden pallets can also make a suitable base. Pallets should be arranged in 4-6 layers (and elevated from the ground using concrete blocks, stones, etc., if available) to form the foundation.
- Small rock piles can be substituted as foundation material. Create rock piles approximately 12 inches apart with each pile about 10 inches high and 12 inches across. Stagger the piles so that they are capable of supporting the next layer of limbs (see Figure 3).
- Consider utilizing old clay tile, 6 to 8 inches in diameter, to create small wildlife tunnels within the foundation.



Brush Covering

Once completed, cover the foundation with larger branches and limbs, placing the smallest stock on top. The cover can consist of small limbs, saplings, old Christmas trees, stumps, or loose brush. Use leaves or pine boughs as a cap if available.

Ideally, the foundation should be covered with 2 to 4 feet of brush. Larger brush piles provide more security for wildlife and will receive more use than smaller piles. Leave openings (6 to 12 inches in width) in the sides at several places for easy wildlife access. Add to the brush pile as new brushy material is available. The older brush will settle as it decays, and new cover must be added as time passes.

When properly constructed, harsh weather brush piles will contain an easily accessible labyrinth of tunnels and cavities at ground level and at the same time provide good overhead shelter from harsh weather. Once again, brush piles should be established throughout the management area to meet wildlife needs.

OTHER CONSTRUCTION OPTIONS

A simple pile of logs, wood slabs, large rocks or boulders can be very attractive to amphibians, reptiles and small mammals, especially when located near or within woodland habitats. Piles of rotting logs or wood slabs not only provide shelter, produce an abundance of food items, but also maintain the moist conditions required by woodland amphibians.

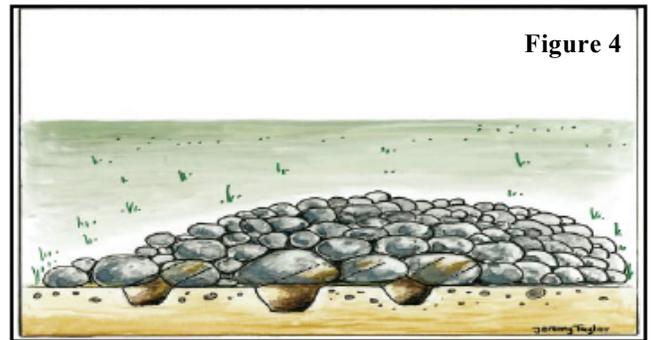
Rock Piles

Amphibians and reptiles such as frogs, lizards, salamanders and snakes will benefit from rock piles. Besides providing shelter and basking areas, the rocks absorb heat during the day and radiate warmth at night.

Rock piles should start with the largest rocks (or boulders) on the bottom of the stack to create hiding places between rocks. Broken slabs of concrete can also be used for the foundation by arranging them loosely to form tunnels and cavities. Digging depressions under large flat rocks can create temporary pools for breeding frogs and salamanders (see Figure 4).

General Recommendations

- Build a mound of rocks and stones of different shapes and sizes, arranging the rock pile in a way that creates openings for shelter.
- Place pieces of chimney tile, old clay field tile or lengths of pipe at the base for entrances and tunnels.
- Add flat rocks on top for amphibians and reptiles.



SPECIFICATIONS

Materials that contain toxic substances (i.e. pressure treated lumber/posts, creosote railroad ties, lead painted surfaces, tires, etc.) shall not be used. These substances can cause wildlife mortality either through contact, consumption, or inhalation.

Site-specific requirements will be listed on the attached specification sheet. Specifications are prepared in accordance with the FOTG Standard 645-*Upland Wildlife Habitat/Management*.

OPERATION AND MAINTENANCE

- Brush piles are not permanent structures. Rot and decay are a normal process of brush piles. As brush piles rot, more insects are attracted, providing additional food for birds and other wildlife. The piles should be inspected yearly to see if the state of decay is such that additional brush is needed, or if a new brush pile should be constructed.
- Fertilizer can be applied to *living* brush piles to encourage other plant growth and to help the half-cut trees stay alive. Scatter about 5 pounds of 12-12-12 fertilizer (or equivalent) on each living brush pile in March or April.

Acknowledgements:

Fig. 1-3: *Wildlife Management for Missouri Landowners* (3rd Ed).
Fig. 4: *Outdoor California*, CA Department of Fish & Game.

Wildlife Brush Pile - Specifications Sheet

NAME: _____ FIELD NUMBER: _____
COUNTY: _____ DATE: _____
TRACT NUMBER: _____ ASSISTED BY: _____
CONCURRENCE OF IDNR DISTRICT BIOLOGIST (recommended): _____

Specific Recommendations

Purpose of Brush Pile: _____

Species to be benefited: _____

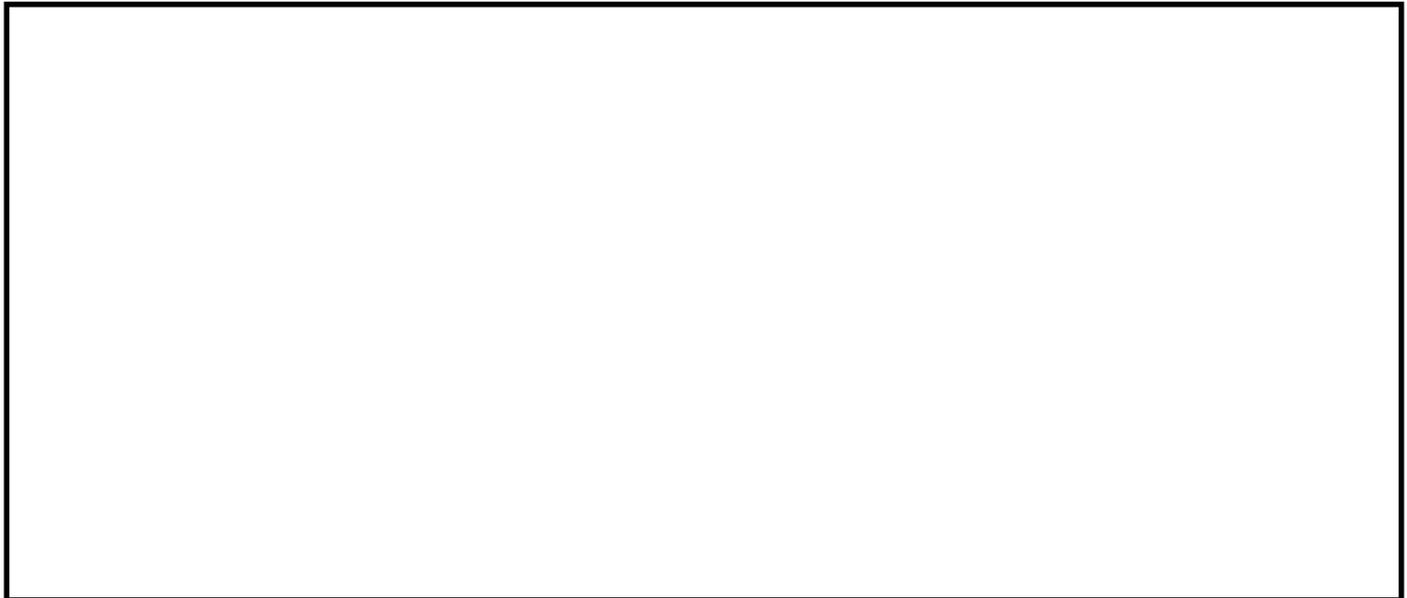
Number and spacing of Brush Piles: _____

Preparation: _____

Lime/Fertilizer Recommendations (if necessary): _____

Additional Operation and Maintenance: _____

Site/Sketch Map



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