

# Oriental Bittersweet

Oriental bittersweet (*Celastrus orbiculatus*) is an invasive, perennial, woody vine. This article displays images to assist with identification and provides recommendations for control, including a management calendar and treatment and timing table.

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Photo credit: Dave Jackson

## Background

Oriental bittersweet (*Celastrus orbiculatus*) was introduced to the United States in the 1860s from east Asia. This woody, deciduous, perennial vine has since naturalized and become an extremely aggressive and damaging invader of natural areas. Oriental bittersweet chokes out desirable native plants by smothering them with its dense foliage and strangling stems and trunks. In some areas, it forms nearly continuous blankets along entire stretches of woodlands. Despite its aggressive nature and capacity to replace native plant communities, it is still sold and planted as an ornamental.

## Description

### Size

Single vines can reach 60 feet in length, though it will only grow as high as the vegetation it is climbing. As a perennial vine, it puts on yearly growth and can reach diameters of over 10 inches.

### Leaves

Distinctly round with toothed edges, the leaves are alternately arranged along the stem and between 3 and 4 inches in length. In late summer the leaves turn vivid yellow, usually before native plants gain their fall color, making this vine easy to spot from a distance.

### Flowers

Oriental bittersweet is dioecious; pollen and fruit are borne on separate male and female plants. In late spring, the female yellow-green flowers, each less than  $\frac{1}{2}$  inch long, grow from the leaf axils all along the stem in clusters of two or three. The male flowers are not distinct.

## Fruit

Yellow-skinned fruit first appear on female plants in late summer. In fall the yellow skin splits to reveal a bright red center. The fruit is retained on the stem through winter. The conspicuous combination of yellow and red make Oriental bittersweet simple to identify even after leaf drop.

## Stem

Young growth is bright green; larger stems have red-brown bark that has a cracked, fish-netted texture. The smooth stems do not have tendrils, barbs, or aerial rootlets since Oriental bittersweet climbs by twining or winding itself around host plants.

## Look-alikes

American bittersweet (*Celastrus scandens*) is a similar but far less common native species that is listed as rare or vulnerable in several states. American bittersweet leaves are more football-shaped than rounded. Their flowers and fruit also emerge only from the ends of the stems, rather than at each leaf axil, as with Oriental bittersweet. The fruit of American bittersweet also has a bright red covering instead of yellow. While the two species do hybridize where they co-occur, American bittersweet is rare enough that the likelihood of an individual being the nonnative invasive species is high.



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Sprout showing leaves and axial flower buds.



Vine showing bark texture.



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Vine girdling host tree.



Leaves and twining stems.



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Interconnected root sprouts.



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Fruit and fall coloration.

All photos by Dave Jackson

## Dispersal

Oriental bittersweet reproduces by seed and vegetatively by sprouting from an extensive root system. Its conspicuous fruit is spread primarily by birds and persists from late summer through winter. A significant vector of this vine is its continued use as a component of decorative wreaths—its seeds remain viable even after drying and can germinate once the wreath is discarded. Once an individual is established, it spreads by sending up sprouts from its roots. Following cutting, Oriental bittersweet resprouts vigorously from cut stems and roots.

## Site

While Oriental bittersweet prefers full sun, it tolerates dense shade while young. Sprouts growing in shade seek out full sun by climbing nearby vegetation and forming a blanket over the forest canopy. It thrives especially well in moist areas and areas with exposed mineral soil, such as disturbed sites, but it grows in many soil conditions, including sand dunes and bogs.

## Control

Though attacking the root system is the only way to kill the vine, freeing surrounding trees and other vegetation from the weight of the aerial stems by cutting them at ground level is typically the first step in controlling the vine. When mature, one root system may support dozens of stems, many of which may be very small or wrapped around desirable trees, making them impractical to treat with herbicides.

Often, the most feasible approach is to cut the existing stems, forcing the roots and stumps to send up new shoots, and then treat the regrowth with foliar-applied herbicides.

On well-developed vines, most of the leaf area is in the upper canopy of the host tree, out of reach for foliar herbicide applications. Cutting the vines kills the aerial portion and forces the roots to generate new growth. Cutting can be done anytime of year. The "window-cut" method is recommended, where each vine is cut in two places, at the ground and again at eye level. This ensures all vines are located and cut and clears the site at ground level to facilitate follow-up spraying. Do not pull the cut vines from trees; this can further damage host plants and pose safety risks. The dead vines will shed their leaves, dry, and decompose over time, so the weight will no longer be an issue.

Cutting alone is only effective at controlling the vines when resprouts are repeatedly cut until the root system is exhausted. This will take multiple cuttings annually over several growing seasons. Mowing has been shown to encourage root sprouting and may not control the plant even when repeated periodically. Missing even one cutting during this regimen is likely to give the vine a chance to recover and reestablish.

The most practical method to injure the root system of Oriental bittersweet is to treat the regrowth following cutting with a foliar herbicide application. Resprouts provide a smaller and more practical target for follow-up herbicide applications. Ideally, this should be done after the regrowth has had at least eight weeks to sprout. If treated too soon, the new foliage will still be growing aggressively and the herbicide will not move into the root system. All herbicide treatments to vines should be made late in the growing season, no earlier than July 1, to enhance translocation to roots.

Treating stumps after cutting will reduce the amount of regrowth but not eliminate all root sprouts in most instances. Often, the best option is to simply cut all the vines and wait to foliar spray the regrowth. The challenge will be treating the new vines before they get a chance to intermingle with foliage of desirable plants. When spraying foliage, use a mixture of glyphosate and water-based formulations of triclopyr with a surfactant added. This mixture will not only control vine regrowth but can also be used to treat other invasive plants encountered during the operation.

Directly treating all vines on a well-developed infestation with stem treatments (e.g., hack and squirt or basal bark) is challenging and often impractical if the vines are tightly wrapped around desirable trees, as accidental application to the host tree is possible. Basal bark treatments are effective on stems under 6 inches in diameter. When making basal bark applications, use an oil-soluble triclopyr ester product and avoid getting spray solution on the bark of desirable trees and shrubs. Applying large amounts of concentrated triclopyr ester solutions to vines near the base of desirable trees poses a potential risk of injury if picked up through their roots and should also be avoided.

Stems at least 1 inch in diameter and larger that aren't tightly twined around desirable trees can be treated using the hack-and-squirt method. This method is a highly targeted approach that uses a minimal amount of herbicide. A hatchet is used to make downward-angled cuts in the stem at a convenient height. Using a handheld sprayer, apply the water-based herbicide solution, saturating the cuts but avoiding runoff. To facilitate translocation to roots, space the cuts no more than 1 inch apart and do not girdle the stem.

Established root systems can be parent to many stems that can blanket trees with their rapid growth. Gaps created by broken limbs or downed trees open the canopy, releasing sunlight to the forest floor and providing favorable habitat for Oriental bittersweet to thrive. As described in prescriptions to address other invasive plant invasions, the best approach to combat this habit is to "save the best." In other words, plan to work from the least to the most invaded areas or in areas where there is desirable native vegetation. This will maximize uninhabited acreage, which is not only of higher ecological value but also creates a much greater sense of accomplishment. Because Oriental bittersweet seeds are dispersed by birds, new invasions can and will occur. Spot removal of isolated individuals must be a part of any long-term invasive plant control program.

## Management Calendar

The management calendar for Oriental bittersweet emphasizes injuring the root system with late season foliar herbicide applications. This may need to follow a cutting of the existing vines to force new, low-growing regrowth. Treating stumps at the time of cutting is an option but may not be practical.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bud Break												
Flowering and Seed Ripening												
Foliar Herbicide Application												
Window Cutting												
Basal Bark, Cut Stump, and Hack-and-Squirt Treatments												

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## Treatment and Timing

Prescriptions for controlling invasive Oriental bittersweet emphasize cutting the aerial growth to facilitate late season foliar herbicide treatments to injure the root system. Hack-and-squirt, basal bark, and stump treatments can be made anytime the weather permits.

Product names reflect the current Pennsylvania state herbicide contract; additional brands with the same active ingredients are available.

Treatment	Timing	Herbicide	Product Rate	Comments
Foliar	July 1 to onset of fall color	Rodeo (glyphosate) plus Garlon 3A or Vastlan (triclopyr)	3 quarts/acre plus 2 quarts/acre or 1.5 quarts/acre	Apply this treatment to isolated low-growing vines or regrowth following cutting once enough foliage is present to ensure sufficient herbicide translocation to roots. Waiting at least 8 weeks after initial cutting is typically sufficient. Rapidly growing shoots should be treated before they start twining around desirable trees and shrubs. A surfactant (e.g., CWC 90) needs to be added. If using a different glyphosate product, be sure to check the product label to see if a surfactant is needed; some come premixed.
Basal Bark	Year-round	Pathfinder II or Garlon 4 Ultra (triclopyr ester)	Ready-to-use or 20%, 1:4 in basal oil	Oil-based herbicides penetrate the vine's bark and travel systemically through the plant. Basal bark applications wet the entire circumference of the lower 12 to 18 inches of the stem. Aim for full coverage on stems without creating runoff. This is an efficient treatment for treating a few large-diameter vines (less than 6 inches). Basal bark applications should not be made in settings where spray solution will contact stems of desirable plants. Triclopyr has the potential to cause injury through root pickup, so avoid treating in areas where large numbers of vines exist in the root zone of desirable trees.
Cut Stump	Year-round	Pathfinder II or Garlon 4 Ultra (triclopyr ester)	Ready-to-use or 20%, 1:4 in basal oil	Cut stump treatments with oil-soluble triclopyr ester herbicides are applied to the cut surface and the sides of the stump and can be applied anytime after the stems are cut. An oil-soluble dye should be added to improve tracking and avoid skips and duplicate treatments.

<b>Cut Stump</b>	Year-round	Aquaneat (glyphosate) or Garlon 3A or Vastlan (triclopyr)	50%, 1:1 mix with water	Unlike the oil-based herbicides, water-based treatments are only applied to the freshly cut surface and must be made immediately after the stems are cut. A water-soluble colorant should be added to improve tracking and avoid skips and duplicate treatments.
<b>Hack and Squirt</b>	Year-round	Aquaneat (glyphosate) or Garlon 3A or Vastlan (triclopyr)	50%, 1:1 mix with water	Glyphosate or water-based formulations of triclopyr are effective for hack-and-squirt treatments. It is essential to space the cuts, leaving intact bark between them. If the stem is completely girdled, the herbicide cannot translocate to roots. A simple guideline for the number of hacks is one per inch of diameter, with a minimum of two. Spray herbicide mixture into hacks immediately using a squirt bottle, filling the cuts. This treatment is best suited for low stem numbers and stems at least 1 inch in diameter.

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