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Controlling Non-Native Plants in Ohio Forests: Callery Pear

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Callery pear (*Pyrus calleryana*), often referred to by the cultivar name “Bradford pear,” is native to Asia. Its seed was initially brought to the United States in the early 20th century to serve as genetic material for breeding fire blight resistance in native pears in the Pacific Northwest. By 1950, Callery pear was recognized for its horticultural potential, especially its production of showy white flowers in early spring (Figure 1). Over time, many different cultivars of Callery pear were developed and planted across the United States (Jackson et al., 2020).

Callery pear was widely planted due to an initial belief that it was incapable of producing viable seeds. This was due to the first cultivar introduced to the United States, *Pyrus calleryana* (Bradford pear), which produced pollen incompatible with itself that could not produce viable seeds. However, the rise and use of different cultivars—and widespread planting—led to the Callery pear producing viable seeds (Culley & Hardiman, 2009). In recent years, Callery pear seedlings have appeared in many natural ecosystems across the Eastern United States (Culley & Hardiman 2007). While Callery pear is now common across Ohio, it invades relatively open areas such as roadsides and right-of-way areas (Figure 2). The ability of Callery pear to aggressively spread into natural ecosystems and

outcompete native tree species has led to many states, including Ohio, banning the planting of the tree (Ohio Laws & Administrative Rules, 2023).

A common issue associated with Callery pear is that older trees tend to break apart during windstorms, heavy snow, or ice. This is a result of the common growth pattern of Callery pear to initiate multiple branches at a single node which creates competition among branches. These competing branches form very tight V-shaped crotches between branches, resulting in weak points in the tree (Figure 3). It is recommended to remove Callery pear trees from locations where branches can easily accumulate ice and snow (e.g., under roof eaves), as well as from locations where broken branches pose a potential threat to people or property.



Figure 1 (click to enlarge). Callery pear. Photo by Andrew J. Londo.



Figure 2 (click to enlarge). Ohio roadside with flowering Callery pear visible in early spring. Photo by Jim Downs.

Identification

Callery pear leaves are simple, alternate, shiny green, 2-3 inches long, and have slightly toothed leaf margins (Figure 4). White, five-petaled flowers with black spots appear in early spring (Figure 5). These flowers give the Callery pear tree a distinctive rotting-fish smell.



Figure 3 (click to enlarge). Callery pear with branch failure. Photo by Jim Downs.

Fruits are small, hard, and greenish-yellow with whitish spots. The fruits are inedible for humans but become palatable to birds after freezing. While edible to wildlife, Callery pear fruits provide little nutritional value compared to other native species (Missouri Department of Conservation, 2024). The tree's young bark is smooth with spur shoots present on twigs that contain numerous lenticels. In winter, the terminal buds are often large ($\frac{1}{4}$ – $\frac{1}{2}$ inches long) and are covered in light-brown, wooly hairs. Bark becomes grayish-brown with shallow furrows and scaly ridges over time (Figure 6).

Control Methods

It is recommended that Callery pear trees be removed when possible. This can be difficult due to their thorny branches and habit of growing in dense groups as they spread across a landscape. While trees can be cut down, it is essential that as much of the root system be removed or killed as is possible.

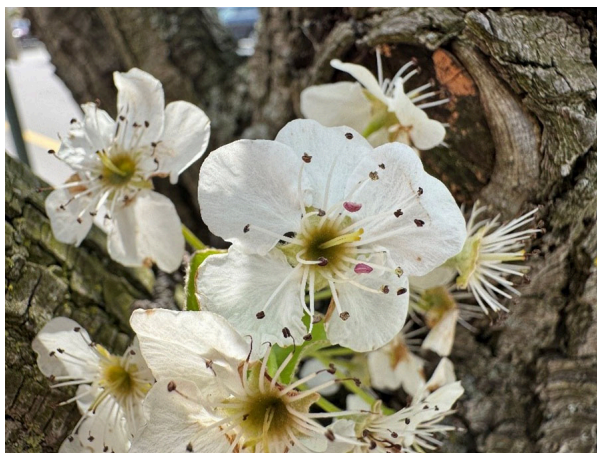
Root removal may be possible with smaller trees or those in landscapes, but the best way to ensure that the roots are dead is through the application of an herbicide.

Depending upon the size of plants, size of infestation, time of year, and experience level of the applicator, a variety of treatment options exist for controlling unwanted Callery pear. As always, when attempting to control non-native invasive species, a plan should be made to evaluate the effectiveness of treatments and determine if additional control measures are warranted. [Controlling Undesirable Trees, Shrubs, and Vines in Your Woodland](https://ohioline.osu.edu/factsheet/f-45)

(ohioline.osu.edu/factsheet/f-45) provides a detailed description of control methods.



*Figure 4 (click to enlarge). Callery pear leaves.
Photo by Andrew Londo.*



*Figure 5 (click to enlarge). Callery pear flowers.
Photo by Jim Downs.*

Figure 7 provides information on ideal and acceptable times of year to conduct herbicide treatments for Callery pear along with select physiology information.

Mechanical Control

Hand-pulling of Callery pear seedlings (usually less than 2 feet tall) can be a practical control option for areas with small seedlings. Hand-pulling is most effective during times of the year when the entire root system can be successfully removed from the soil. This is best achieved when the soil is moist or saturated with water.

Cutting seedlings and saplings without applying herbicide to the remaining stump will result in regrowth, especially if the plant is growing in an area exposed to abundant sunlight. Controlling seedlings and saplings through cutting alone requires multiple rounds of cutting over several years. The control of larger diameter stems through cutting alone is generally not advisable due to the prolific regrowth and sprouting ability of Callery pear.



Figure 6 (click to enlarge). Bark of Callery pear. Photo by Jim Downs.

Foliar Application

Most effective strategies to control Callery pear require an herbicide application. Since Callery pear can grow in a variety of habitats, it is not only important but also a legal requirement that the herbicide is labeled for use in that particular site due to environmental concerns. An appropriate herbicide product and rate should be used to thoroughly cover the leaves, but not to the

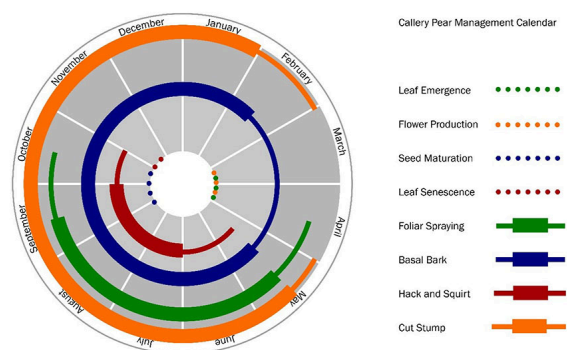


Figure 7 (click to enlarge). Callery Pear Management Calendar. Solid bars indicate the ideal time of year for treatment with thin solid bars indicating the acceptable times of year for treatment. Dotted lines indicate the expected

point of excess runoff. This strategy can be an effective treatment to control small

time of year for selected tree attributes. Graphic by Jim Downs.

Callery pear trees (under 4 feet in height) (Figure 8). Applying foliar herbicides to taller plants can result in overspray, impacting non-target foliage and presenting safety challenges to the applicator.

Foliar applications can be successfully made any time after leaves have fully developed but before they begin to turn color in the autumn. Taller specimens may first be cut down and allowed to initiate new growth. Once the new growth has reached 1–2 feet in height, a foliar application can be made. Depending upon the root reserves of the cut specimen, it may resprout multiple times following the foliar applications. Table 1 provides a detailed description of foliar herbicide options and application guidelines. In streamside locations or other areas near bodies of water, an herbicide labeled for aquatic use is required by law.

Table 1. Herbicide recommended for foliar treatment to Callery pear. Apply solution of herbicide in water as directed on label. Apply when leaves are green and actively growing.

Herbicide Common Name	Example Brand Names	Comments
Glyphosate	For upland, non-aquatic sites: Imitator Plus, Glyphosate 4 Plus, Roundup, Roundup Pro, or other glyphosate products with 41%–54% active ingredient.	Use 2%–3% (vol/vol) or 2.6–3.8 fluid ounces in enough water to make 1 gallon of spray mixture.
	For stream sides or other sites near water: Accord, Aquaneat, Rodeo, Roundup Custom or other glyphosate	Use 2%–3% (vol/vol) or 2.6–3.8 fluid ounces. in enough water to make 1 gallon of spray mixture.

	products with 41%–54% active ingredient that are labeled for use in or near aquatic sites.	Add a nonionic surfactant.
Triclopyr	*Element 3A, *Garlon 3A, *Tahoe 3A, *Triclopyr 3, *Triclopyr 3A, *Vastlan	Use 2%–3% (vol/vol) or 2.6–3.8 fluid ounces in enough water to make 1 gallon of spray mixture. Add a nonionic surfactant.
**Imazapyr	Arsenal AC, Imazapyr 4 SL, Polaris AC Complete	Use 0.5%–1% (vol/vol) or 0.7–1.3 fluid ounces in enough water to make 1 gallon of spray mixture. Add a nonionic surfactant.
* Label with the signal word “Danger” or “Warning” due to potential eye damage.		
** Imazapyr products are phytotoxic in small amounts and have soil activity that can cause injury to non-target plants.		

Basal Bark Application

This control technique can be effective for controlling larger trees. It consists of spraying the lower 12–18 inches of the uncut stem with an herbicide and oil-based carrier (Figure 9).



Common oil-based carriers:

- diesel

- kerosene
- fuel oil
- methylated seed oil

Figure 8 (click to enlarge). Foliar application of an herbicide mixed with blue dye to aid in visibility. Photo by Jim Downs.

The lower portions of the stem should be completely covered but not to the point of runoff. Since the bark of large Callery pear stems can be thick, the treatment of stems greater than 6 inches in diameter may prove unsuccessful. Care should be taken to avoid over-spraying, as improper application can lead to negative effects for non-target plants. The addition of a dye to the herbicide solution, increases visibility and can aid the applicator in correctly applying the herbicide. An ideal time of year for basal bark application is from late spring to early fall, though this treatment method may be conducted any time of year if the ground is dry and not frozen. Table 2 provides a detailed description of basal bark herbicide application options.

Table 2. Herbicide recommended for basal spraying to Callery pear.

Herbicide Common Name	Example Brand Names	Comments
Triclopyr	Element 4, Garlon 4, Garlon 4 Ultra, Relegate, Remedy Ultra, Triclopyr 4	Use 20%–30% (vol/vol) or 26–38 fluid ounces in enough oil carrier to make 1 gallon of spray mixture.
**Imazapyr	Chopper, Stalker, Polaris SP	Use 6%–8% (vol/vol) or 8–10 fluid ounces in enough oil carrier to make 1 gallon of spray mixture.
** Imazapyr products are phytotoxic in small amounts and have soil activity that can cause injury to non-target plants.		

Cut-Stump Application

This method involves cutting the tree’s trunk close to the ground and applying herbicide to the cut surface of the stump, and sometimes the bark. It is critically important to

minimize overspray and keep the herbicide solution on target to help avoid non-target effects. This is an effective treatment method for medium to large trees—especially trees too large to be effectively treated with basal bark or foliar applications. Either water-based or oil-based herbicides can be utilized for this treatment; however, their application techniques are different.

When applying a water-based herbicide, only the outer cambium layer and sapwood should be treated. By concentrating the application to living tissue, the herbicide will

be translocated more effectively to the root system. To be effective, this water-based application must be conducted within a few minutes of cutting the trunk.

Oil-based applications are not nearly as time-sensitive but should be completed prior to the stump resprouting. A proper treatment technique for an oil-based herbicide is treating the sapwood, cambium, and outer bark surface down to the ground level (Figure 10). For smaller stumps, the entire exposed surface may be treated. These applications can be made any time of year if the stumps are dry and not frozen; however, control is often most effective from late spring through early fall. Table 3 provides a detailed description of cut-stump application herbicide options.



Figure 9 (click to enlarge). Basal bark application of herbicide mixed with blue dye to aid in visibility. Photo by Jim Downs.

Table 3. Herbicide recommended for cut stump treatment to Callery pear.

Herbicide Common Name	Example Brand Names	Comments

Glyphosate	For upland, non-aquatic sites: Imitator Plus, Glyphosate 4 Plus, Roundup, Roundup Pro, or other glyphosate products with 41%–54% active ingredient.	Use 20%–50% (vol/vol) or 26–64 fluid ounces in enough water to make 1 gallon of spray mixture. Apply immediately after cutting.
	For stream sides or other sites near water: Accord, Aquaneat, Rodeo, Roundup Custom or other glyphosate products with 41%–54% active ingredient that are labeled for use in or near aquatic sites.	Use 20%–50% (vol/vol) or 26–64 fluid ounces in enough water to make 1 gallon of spray mixture. Apply immediately after cutting.
2,4-D + Picloram	Pathway, Tordon RTU	These are ready-to-use products. Apply immediately after cutting.
Triclopyr	*Element 3A, *Garlon 3A, *Tahoe 3A, *Triclopyr 3, *Triclopyr 3A, *Vastlan	Apply undiluted immediately after cutting.
	Element 4, Garlon 4, Garlon 4 Ultra, Relegate, Remedy Ultra, Triclopyr 4	Use 20%–30% (vol/vol) or 26–38 fluid ounces in enough oil carrier to make 1 gallon of spray mixture.
Imazapyr**	Arsenal, Chopper, Polaris SP	Use 6%–8% (vol/vol) or 8–10 fluid ounces in enough oil carrier to

	make 1 gallon of spray mixture.
* Label with the signal word “Danger“ or “Warning“ due to potential eye damage.	
** Imazapyr products are phytotoxic in small amounts and have soil activity that can cause injury to non-target plants.	

Hack-and-Squirt Application

This method involves applying herbicide into the main stem of the tree through evenly spaced, downward-angled cuts using an axe, hatchet, or other similar cutting tool (Figure 11). The number of cuts needed will be based upon the size of the stem, type of herbicide, and the concentration of the herbicide being applied. Care should be taken to leave uncut living tissue between the cuts, as this allows the herbicide to move to the roots (Jackson, 2019). The ideal time of year for this application is from July through mid-October. Because the herbicide is applied to only a small area, this method minimizes the potential for nontargeted plant impacts. However, nontarget vegetation may be impacted if they are connected to the treated plant through underground root grafts. Table 4 provides a detailed description of hack-and-squirt application herbicide options.



Figure 10 (click to enlarge). Cut-stump application with an oil-carried herbicide mixed with blue dye. Photo by Jim Downs.

Table 4. Herbicide recommended for hack and squirt treatment to Callery Pear.

Herbicide Common Name	Example Brand Names	Comments
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Triclopyr	*Element 3A, *Garlon 3A, *Tahoe 3A, *Triclopyr 3, *Triclopyr 3A, *Vastlan	Leave 3–4 inches between the center of each hack. Apply 1 milliliter of undiluted herbicide per hack.
2,4-D + Picloram	Pathway, Tordon RTU	Apply undiluted with 1 milliliter in each cut with 2–3 inch intervals between hack edges.
**Imazapyr	Arsenal, Chopper, Polaris SP	Use 8–12 fluid ounces in enough water to make 1 gallon of spray mixture. Apply 1 milliliter of spray per hack with hacks no more than 1 inch between edges of hacks.
	Arsenal AC, Imazapyr 4 SL, Polaris AC Complete	Use 4–6 fluid ounces in enough water to make 1 gallon of spray mixture. Apply 1 milliliter of spray per hack with 2–3 inches between edges of hacks
* Label with signal word “Danger” or “Warning” due to potential eye damage.		
** Imazapyr products are phytotoxic in small amounts and have soil activity that can cause injury to non-target plants.		

Herbicide labels must be followed. Not only are labels the law, but following the label also maximizes the potential for safe and successful control. New Callery pear trees may enter woodlands and other natural areas from existing dormant seeds within the soil seedbank, wind, or songbirds. Additionally, in managed areas, treated stems may

resprout. A plan for monitoring treated areas should be followed for at least two years to achieve complete control.

Herbicides, like all pesticides, are approved (labeled) for specific uses by the United States Environmental Protection Agency (USEPA). Approved locations, uses, and application methods are listed and described on the pesticide label. The herbicides listed in this fact sheet were appropriately labeled at the time of publication. Because pesticide labels may change at any time, always verify that a particular herbicide is labeled for the intended use. At the time of this writing, copies of most herbicide labels and safety data sheets could be obtained online at the [crop data management system website](http://cdms.net) (cdms.net). Other labels are available through the individual manufacturer's website. Ohio State University Extension does not endorse any of the products mentioned and assumes no liability resulting from the implementation of these treatments.



Figure 11 (click to enlarge). Hack-and-squirt application of herbicide. Photo by Jim Downs. Alt. Text: Overhead close-up view of downward-angled cut into the side of a tree.

Replacement Trees

It is recommended that only native species be used when replacing trees. This is especially true of non-native, invasive species such as the Callery pear. Possible native replacement trees based on general planting location can be found in Table 5.

Table 5. Native trees to replace Callery pear based on planting location in Ohio*

Common Name	Scientific Name	Stream Edge	Open Lawn	Tree Lawn
Basswood	<i>Tilia americana</i>	X	X	X

Black Cherry	<i>Prunus serotina</i>		X	X
Blackgum	<i>Nyssa sylvatica</i>	X	X	X
Black Maple	<i>Acer nigrum</i>	X	X	
Black Walnut	<i>Juglans nigra</i>		X	X
Cucumber magnolia	<i>Magnolia acuminata</i>		X	X
Eastern Redbud	<i>Circus canadensis</i>		X	X
Flowering Dogwood	<i>Cornus florida</i>		X	X
Hackberry	<i>Celtis occidentalis</i>	X	X	X
Kentucky coffeetree	<i>Gymnocladus dioica</i>		X	X
Ohio Buckeye	<i>Aesculus glabra</i>			
Pin Oak	<i>Quercus palustris</i>	X	X	X
Red Maple	<i>Acer rubrum</i>	X	X	
Red Oak	<i>Quercus rubra</i>		X	X
River Birch	<i>Betula nigra</i>	X	X	X
Scarlet Oak	<i>Quercus coccinea</i>		X	X

Serviceberry	<i>Amelanchier spp.</i>		X	X
Sweet Gum	<i>Liquidambar styraciflua</i>	X	X	X
Sugar Maple	<i>Acer Saccharum</i>	X	X	X
Thornless Honey locust	<i>Gleditsia triacanthos inermis</i>	X	X	X
Yellow-Poplar	<i>Liriodendron tulipifera</i>		X	X
White Oak	<i>Quercus alba</i>		X	X
Adapted from (Sydnor et al., 2005; Sydnor & Cowen, 2000).				

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