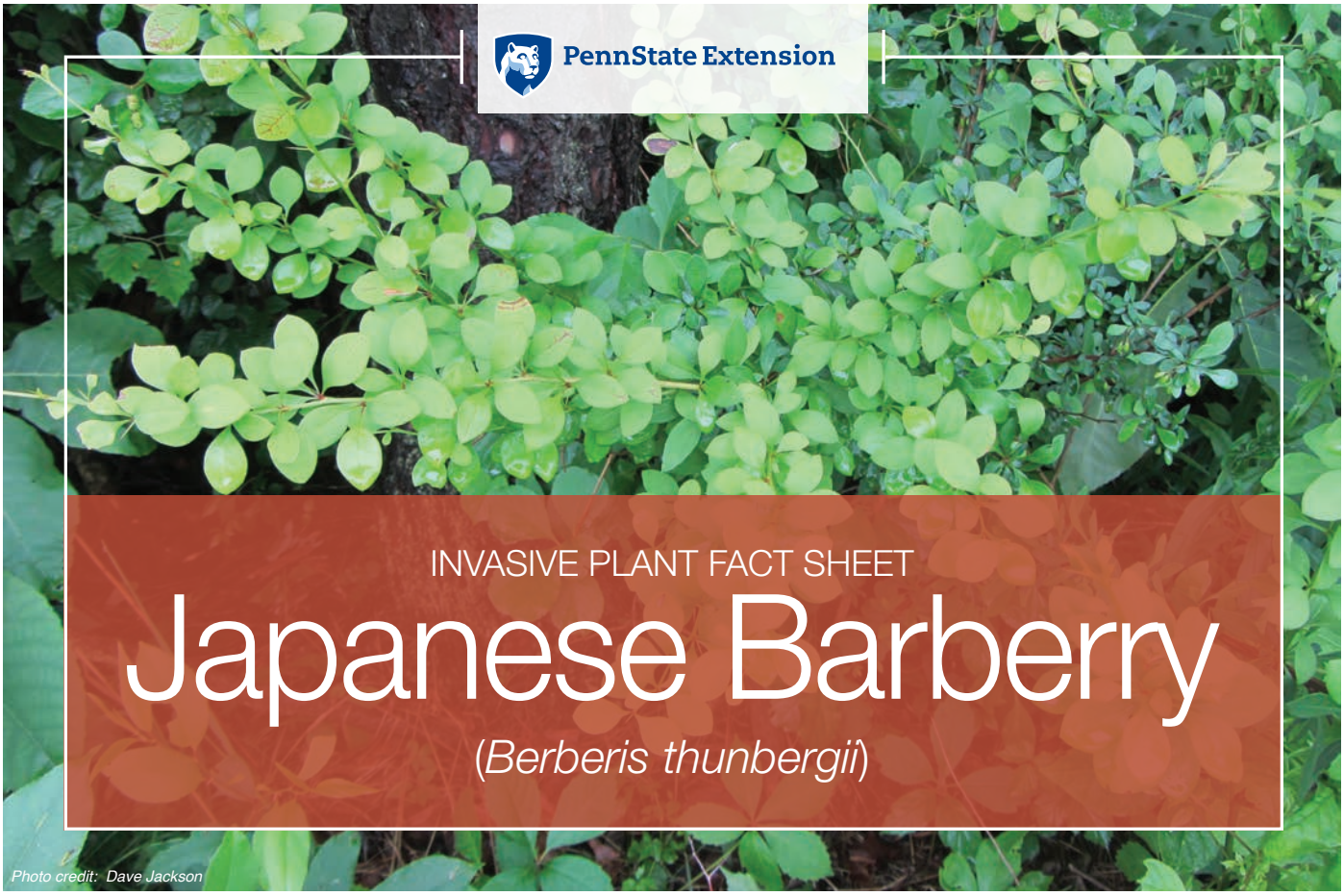


Background

Japanese barberry (*Berberis thunbergii*) is an ornamental shrub that was first imported into the United States in 1875. It can now be found from Maine to North Carolina and as far west as Iowa. Japanese barberry was historically used in living fences for livestock and for herbal medicines but is now used primarily as an ornamental hedge plant and is still sold in nurseries and garden centers.

Description

Size: Compact and dense, the shrub rarely exceeds 4 feet in height. It will root where its drooping branches touch the ground, a process called layering. While these remain a part of the parent plant, a single individual can become quite wide through layering.

Flowers: Spring blooms appear in clusters of two to four, are creamy yellow, and have six petals.

Fruit: Emerging in summer, the oval, bright red berries last through winter. They can hang singly or in clusters of up to four, with each berry being ¼ inch long.

Leaves: Growing in clusters, the leaves are distinctly spoon shaped with smooth, or entire, edges. They are thick, leathery, and bright green, but can be tinged with red or purple, and are 1 inch or less in length. They emerge earlier and are held later than the leaves of most native deciduous forest plants. As such, barberries are very easy to find in early spring and late fall.

Stem: Deeply grooved and rusty brown with single spines. The inner bark is a vibrant yellow.

Look-alikes

Native Allegheny barberry (*Berberis canadensis*) and European barberry (*Berberis vulgaris*) both resemble Japanese barberry closely, with the major exception being their spines. Where Japanese barberry has single spines, both of the other species produce three-pronged spines. Both species also have leaves with coarse serrations on the edges.

Dispersal

Japanese barberry spreads by both seed and vegetative means. Its berries—available to birds and mammals from summer through winter, including late winter when many other fruits have already been eaten—are eaten and spread to new areas in animal droppings. Individual plants can spread horizontally by a process called layering, in which roots form when branches are in contact with the ground. New plants created in this way will survive being severed from the parent plant, but are genetically identical.

A. Architecture
B. Spines and leaves on new growth
C. Stem showing inner bark
D. Flower clusters
E. Understory infestation
F. Fall color and fruit

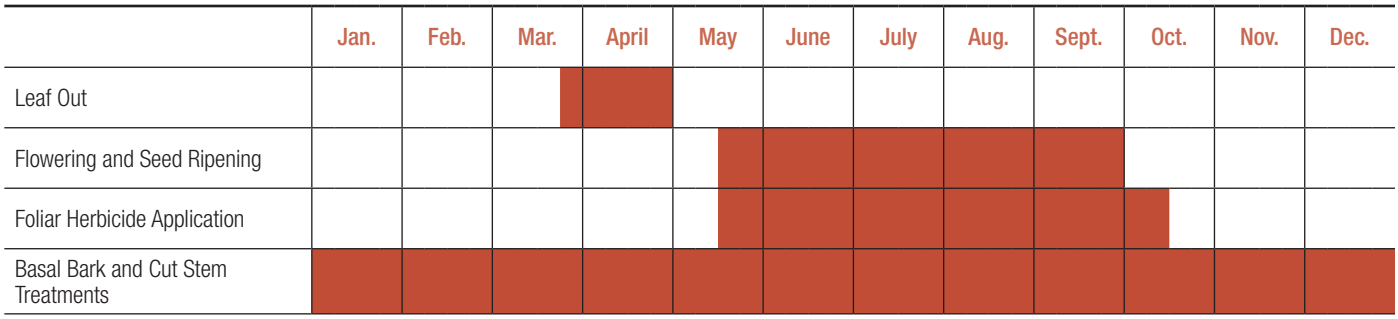
Photos by Dave Jackson, Eric Burkhart

Site

This plant can colonize most sites, displacing a wide range of native species, especially herbaceous spring ephemerals. Highly adaptive, it can grow in sites from full sun to deep shade. Japanese barberry tolerates drought but has also been found growing in wet areas. Given enough individuals in an area, their leaf litter shifts the pH of the soil, making it more basic, thus further excluding many native plant species.

Management Calendar

The management calendar for Japanese barberry is quite flexible because the foliage emerges early and falls late. Stem treatments to intact or cut stems provide a year-round window of treatment opportunity.



Treatment and Timing

Japanese barberry leafs out early and drops its leaves late, providing a long foliar application window. Basal bark and stem 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	Mid-May to onset of fall color	Aquaneat (glyphosate) plus Garlon 3A or Vastlan (triclopyr amine)	3 quarts/acre plus 2 quarts/acre or 1.5 quarts/acre	A combination of glyphosate plus triclopyr is effective against a broad spectrum of woody species. Additionally, this mixture reduces risk to nontargets because it has practically no soil activity and the herbicide products are labeled for aquatic applications. Garlon 3A and Vastlan are both triclopyr amine formulations but have different active ingredient concentrations. 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 plant's bark and when applied during the growing season, 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 excessive runoff.
Cut Stem	Year-round	Pathfinder II or Garlon 4 Ultra (triclopyr ester)	Ready-to-use or 20%, 1:4 in basal oil	Cut stem treatments with oil-based triclopyr ester herbicides are applied to the cut surface as well as the bark of the stem and can be applied anytime after the stems are cut. An oil-soluble colorant should be added to improve tracking, avoid skips, and duplicate treatment.
		Aquaneat (glyphosate) or Garlon 3A or Vastlan (triclopyr amine)	50%, 1:1 mix with water	Unlike the oil-based herbicides, water-based treatments are only applied to the cut surface and must be made immediately after the stems are cut. A water-soluble colorant should be added to improve tracking, avoid skips, and duplicate treatment.

Control

Manual control of barberry is achieved by pulling the whole plant out early in the season before seed set. This can be done either by hand for small sprouts or using an implement such as a hoe or mattock. When pulling barberry by hand, extreme care should be taken because the tips of barberry spines are finer than the point of a hypodermic needle and their silicate composition decomposes very slowly under the skin, making it critical to wear proper protection when handling. It has relatively shallow roots, but resprouting can occur if the entire root system is not removed. Manual removals are best suited to areas with only small barberry populations or areas of special ecological sensitivity. Mechanical mowing or top removal alone will not successfully control the plants since they vigorously resprout. However, mowing can serve as a step prior to herbicide applications to reduce plant size, allowing more efficient applications of herbicide in smaller quantities and with better coverage.

Foliar treatment with a backpack sprayer is the most effective means to treat sites with low to moderate target density. A

useful treatment for barberry suppression is a mixture of glyphosate and triclopyr at a 2:1 ratio. This mix provides a broader control spectrum than either ingredient alone, is nonselective, and poses minimal risk to nontarget plants via root absorption of herbicide. Other formulations containing glyphosate or triclopyr can also be used according to the application specifications on the label. A dye should be included in your mix to avoid overspraying or missing patches.

Stem treatments are effective against Japanese barberry and can be implemented throughout the year, which provides scheduling flexibility. Treatment options include basal bark and cut stem treatments. Basal bark treatments use a concentrated mixture of the herbicide triclopyr in oil applied to the entire circumference of the lower 12–18 inches of the intact stem, depending on its size. If top growth removal is preferred, cut the stems close to the soil line and treat the cut surfaces. Oil-based triclopyr products can be applied anytime after cutting, while water-based glyphosate treatments must be applied immediately after the stems are cut.

A relatively new method being explored for removing Japanese barberry is flame weeding. This is the application of a directed flame, usually using a propane torch, to the base of individual plants. This differs from a broadcast prescribed burn, where all surrounding vegetation would also be burned. While this method is very effective in reducing the size of the shrub, experimentally it has never exceeded 40 percent mortality, compared with 93 percent mortality for foliar-applied triclopyr (Ward et al., 2009, 2010), even with multiple flaming applications. Though more replicated work is needed to demonstrate efficacy, current research has shown that at least two applications are necessary to be successful, with Ward et al. recommending a treatment in early summer and then a follow-up treatment in the fall. The method recommends applying flame to the center stem of the plant until it carbonizes and begins to glow. This treatment has obvious risks and is recommended to be used under conditions where the leaf litter is damp, during periods of rain, or where lighted plants can be quickly doused. Despite the risks, flame weeding can be valuable in areas of ecological sensitivity where herbicide cannot be used.

When addressing barberry populations, as with other invasive shrubs, it is important to consider scale. They persist in an area not because individual plants themselves are especially difficult to kill, but rather due to their prolific seeding and vegetative spreading through layering. In developing your approach to Japanese barberry control, plan to "save the best," or begin work in the least invaded sites and areas where desirable native vegetation is already present. This approach to control will be more successful over a larger scale, not only producing an outcome of higher ecological value, but also creating a much greater sense of accomplishment. Additionally, you are likely to see many other invasive shrub species while treating Japanese barberry. This all-too-common situation is why the use of a broad-spectrum herbicide is advised. Because the plant is readily dispersed by birds, new invasions can and will reoccur, but spot removal of isolated individuals is much easier to accomplish as a regular maintenance activity.

Human Health Concerns

Recent studies have documented a relationship between Japanese barberry and deer ticks (*Ixodes scapularis*). The tick's affinity for barberry may relate to the favorable niche space created by the plant's growth form or architecture, which is very different from most native shrubs. Since barberry is a low, dense shrub, it creates a microclimate habitat favored by ticks, buffering extreme temperature and humidity fluctuations in comparison to relatively taller and less dense native vegetation. Animals, including the primary reservoir of Lyme, the white-footed mouse (*Peromyscus leucopus*), also find refuge under or around barberry, creating a higher density of Lyme-infected ticks. Additionally, the low stature of barberry provides abundant opportunities for ticks to come in contact with humans or other animals. Native shrubs of similar architecture, such as lowbush blueberry (*Vaccinium angustifolium*), are similarly associated with dense tick populations.

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Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

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Produced by Ag Communications and Marketing

Code EE0337 02/20pod