



INVASIVE PLANT SERIES

Invasive Plant Series: Winged Burning Bush

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Description

Winged burning bush, winged euonymus, or simply burning bush (*Euonymus alatus*) is a medium-size deciduous shrub native to China, Japan and Korea but is widely planted in the United States. Winged burning bush has been planted in the US since the 1860s, primarily as an ornamental shrub due to its bright red fall foliage. Reports of this species escaping cultivation and establishing in natural areas, such as woodlands, prairies and other uncultivated areas, emerged in the 1970s in the Northeast and Midwest US. The species is now considered invasive in most of the eastern US, including Indiana. Despite its demonstrated invasiveness, it remains one of the most popular landscaping shrubs sold by nurseries and retailers throughout many parts of the US. (Figure 1). Winged

burning bush can tolerate a wide range of sites and soil conditions. It grows in full sun and tolerates full shade under forest canopy. Fruits produced on the shrubs are eaten by birds, which then drop the seed from nearby perches, spreading the shrub into neighboring natural areas. Significant invasions of winged burning bush with high densities of large shrubs and numerous seedlings beneath the parent plants occur in some Indiana hardwood forests. A drive across the landscape in autumn will often reveal winged burning bush in woodlands spreading from nearby ornamental plantings.

Winged burning bush is a deciduous shrub with a spreading crown, growing up to 20 feet tall. Leaves and branches are arranged oppositely (Figure 2).

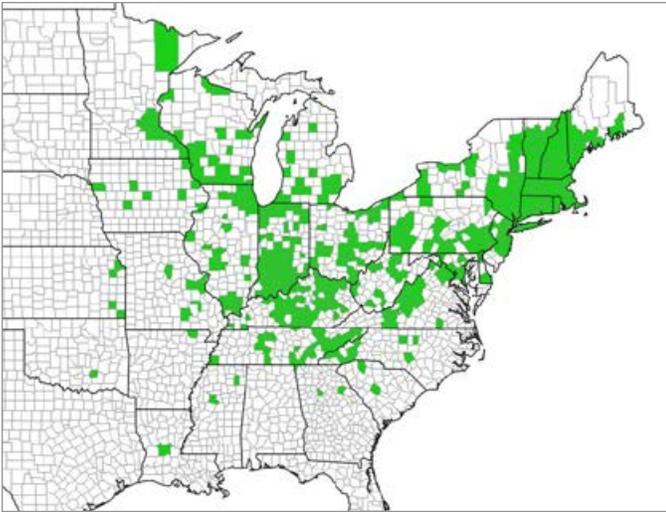


Figure 1. Confirmed distribution of winged burning bush in the eastern US. Additional populations may exist but have not been reported. *Source: EDDMaps*



Figure 3. Tan corky wings on winged burning bush. *Lenny Farlee, Purdue University*



Figure 2. Opposite leaf arrangement and green new twigs of winged burning bush. *Lenny Farlee, Purdue University*



Figure 4. Fall foliage coloration, opposite leaf arrangement and corky tan wings on winged burning bush. *Lenny Farlee, Purdue University*

Twigs and branches may have tan corky ridges or wings, as the common name implies (**Figure 3**). The corky wings are not present on all specimens. Young branches are normally green or gray-green in color, becoming brown on some older stems. Leaves are variable in size, from $\frac{3}{4}$ to 2 inches long, and generally widest in the middle with a strong taper to each end. The opposite leaf arrangement with leaves positioned mostly on a horizontal plane gives the branches a distinctive appearance resembling rungs on a ladder. Leaves turn a vibrant red in autumn for plants in full sunlight but may be shades of magenta or pink in shaded areas (**Figure 4**). Flowers develop in spring to early summer and are 4-petaled, greenish-yellow

and inconspicuous. The flowers are perfect, so one plant can produce fertile seed. The fruit appears in September and October and is a red to purple capsule that splits to reveal red to orange fleshy seeds (**Figure 5**). The viability of seed in the soil may be only one or possibly two years, but definitive information is not available. The root system is fibrous and may extend deeply into the soil (**Figure 6**).

Indiana has three native euonymus species that could be confused with winged euonymus. The most likely encountered is eastern burning bush or wahoo (*Euonymus atropurpureus*), which is a shrub or small tree. Wahoo often has larger leaves and longer leaf



Figure 5. Fall foliage and fruit on winged burning bush. Note that not all twigs will have the corky tan wings. *Lenny Farlee, Purdue University*



Figure 8. Fall foliage of American burning bush or wahoo. *T. Davis Sydnor, The Ohio State University, Bugwood.org*



Figure 6. Fibrous root system of winged burning bush. *Lenny Farlee, Purdue University*



Figure 9. Fruit of American burning bush or wahoo. *T. Davis Sydnor, The Ohio State University, Bugwood.org*



Figure 7. Summer fruit, leaves and twigs of native American burning bush or wahoo. Note the white lines running along the twigs. *Lenny Farlee, Purdue University*

stems than winged burning bush and a more erect form. Flowers of wahoo are maroon and evident in June or July. The fruit are pink 4-lobed capsules splitting to reveal red-orange fruit (**Figures 7, 8 and 9**).

Running euonymus or running strawberry bush (*Euonymus obovatus*) is a perennial groundcover (barely reaching up to a few feet tall) found throughout most of Indiana, except the southwest corner. Leaves tend to be wider toward the tip (or apex) and similar in size to wahoo. The flowers appear in May and are five-petaled and green to pinkish-yellow. The fruit is a three-lobed warty pink capsule with red seeds exposed when the capsule splits (**Figures 10 and 11**).



Figure 10. Running strawberry bush foliage. *Chris Evans, University of Illinois, Bugwood.org*



Figure 12. Strawberry bush or brook euonymus fruit and foliage. *Karan A. Rawlins, University of Georgia, Bugwood.org*



Figure 11. Running strawberry bush groundcover. *Chris Evans, University of Illinois, Bugwood.org*



Figure 13. Strawberry bush or brook euonymus flowers and foliage. *Karan A. Rawlins, University of Georgia, Bugwood.org*

Strawberry bush or brook euonymus (*Euonymus americanus*) is a small shrub found in a few counties in the southern quarter of Indiana. This species is found mostly on moist to wet woodland sites. Leaves are variable in shape and size with very short leaf stems. Flowers are 5-petaled and greenish-pink, and they appear in May. Fruit is a warty pink capsule that splits to reveal orange-red fleshy seeds in the fall (Figures 12 and 13).

Distribution

Based on the current confirmed distribution and its common use as a landscape plant, this species has likely escaped cultivation in most, if not all, Indiana counties (Figure 1).

Impact

The ability of winged burning bush to spread via seeds dispersed by birds, survive and produce seed in shaded environments, and gradually increase density and distribution in forests presents a threat to the native diversity and productivity of natural habitats in Indiana. Besides seed production, winged burning bush stands can increase in density by layering, where a branch comes in contact with the soil and roots (Figure 14). Research has shown that high deer population levels promote the establishment and spread of some invasive plant species, including winged burning bush. Deer preferentially browse on desirable native plants while avoiding winged burning bush, giving it an additional advantage



Figure 14. An uprooted winged burning bush has produced new roots along the stem where it made ground contact. *Lenny Farlee, Purdue University*

over native plants. Identification and management of winged burning bush are important activities to protect natural areas from damaging invasions. Awareness of the damaging invasive nature of winged burning bush may encourage the use of native species of shrubs as a replacement for this aggressive plant. Do not plant winged burning bush, and remove and replace them with non-invasive plants in landscaping.

Management

Recommendations for controlling winged burning bush continue to be developed. Successful control of many invasive plant species, including winged burning bush, often involves using a combination of methods, which are determined by target plant size, location, season, and other biologic and logistic considerations. The following control recommendations are based on trials and control operations performed by Purdue Forestry and Natural Resources forest managers. It should be noted that the variability of conditions encountered when treating invasive plants can lead to variability in the effectiveness of control techniques. Keeping good records on application techniques and conditions can help you refine your management approach.

Prevention: Do not plant winged burning bush. Remove winged burning bush in your landscaping and replace with native or non-invasive landscape plants. Encourage neighbors, communities, and commercial plant outlets to discontinue planting and selling this plant. Remove plants that are producing seed to prevent additional spread.

Control: Manual and Mechanical – Pulling small burning bushes is a viable control technique for small infestations. Pulled burning bushes lying on the ground may re-root from the stems or roots at ground contact points, so hang pulled burning bushes in vegetation or on fallen trees to prevent re-rooting (**Figure 14**). You may also chip or burn the pulled plants. Other mechanical techniques, such as cutting and grinding, that leave the root system in place will typically result in re-sprouting unless herbicides are used to kill the roots. If use of herbicides is not an option, using grasping jaws, levers, or other equipment to pull the plant and root system could be used to control larger plants. Dispose of the plants in a way that prevents re-rooting.



Figure 15. A forest area shortly after a prescribed fire. The heat of the fire can top-kill larger winged burning bush, but they normally re-sprout. Small winged burning bush seedlings may be killed by prescribed fires. *Lenny Farlee, Purdue University*

Prescribed Fire – Prescribed fire has shown some promise in controlling small burning bush seedlings (**Figure 15**). Winged burning bush often has a large population of seedlings regenerating under mature plants. These plants may be hidden under other vegetation, so foliar (chemical) control of these seedlings is difficult without killing most other plants on site. Prescribed fires may provide a means to control these seedlings without applying herbicides. Larger burning bush plants generally re-sprout after fires, so follow-up management like herbicide application may be needed. Prescribed fire should only be used by those trained and experienced in fire management.

Chemical – Controlling plants producing seed is normally high-priority when initiating an invasive plant species control program. Reducing the production and spread of seed is a first step to controlling the plant population. Seed-producing winged burning bush tend to be large plants, so foliar applications of herbicide may not be practical. The recommended method of controlling large or seed-producing burning bush is cutting, followed by stump herbicide treatment, or basal bark treatment.



Figure 16. Cut stump herbicide application. *Purdue University*

Cutting burning bush may be done with chainsaws, brush saws, or other cutting tools. Cut stems near the ground and treat the cut stumps with herbicide to prevent re-sprouting. Apply the herbicide within a few minutes of cutting. Water-based herbicides like glyphosate may not penetrate if the stump is allowed to dry and seal the vascular tissue. It is also difficult to relocate small

stumps. Spray the edge of the stump at and inside the bark to place herbicide on the actively growing parts of the plant stem (**Figure 16**). Cut stump treatments are effective during most of the year but should be avoided in the spring when sap is actively running up from the roots. This sap movement may wash the herbicide out of the application area.

Basal bark applications use an appropriate herbicide in an oil carrier applied to the base of the shrub stems. No cutting is required. The herbicide and oil mixture is applied with a sprayer or other applicator starting at about 15-18 inches above the ground and extending to the ground line. Apply slowly and allow the mixture to spread across the stem to prevent over-application and excessive runoff onto soil. This application technique is typically more expensive per treated plant, due to the amount of herbicide and oil carrier used, but it is useful for scattered plant populations, as no cutting tools are needed. Oil carriers used for basal bark applications include commercially available basal oil, diesel, kerosene, and fuel oil. Refer to your herbicide label to confirm the type of oil to use with a particular product. We recommend using a basal oil for applicator safety and best results. Basal bark applications can be made through most of the year, including the spring. Avoid using basal bark applications when temperature exceeds 85 degrees F, as herbicide and oil can volatilize, moving off the target plant and potentially damaging non-target plants. Also, avoid extremely cold periods with temperatures below 30 degrees F. Do not apply when bark is wet or snow is on the ground.

The following herbicide solutions can be used for both basal bark and cut-stump applications:

- 15% Triclopyr ester + 3% imazapyr + 82% basal oil
- 20% Triclopyr ester + 80% basal oil
- Ready To Use Triclopyr ester products

Other herbicides to apply to cut stumps include 50% glyphosate (Roundup®, Ranger Pro®, Razor Pro®, Gly Star Plus®, Accord®, and many others containing 41% to over 50% active ingredient), or 50% triclopyr amine (Garlon 3A, Vastlan), both mixed with water. Picloram, available as Tordon RTU or Pathway, is a ready-to-use herbicide for cut-stump and girdling treatments. Picloram can also cause damage to non-target plants when application rates are high. Tuliptree (*Liriodendron tulipifera*) is particularly susceptible to damage from Picloram.

Some triclopyr ester herbicides include Garlon 4 Ultra®, Triclopyr 4® and others containing 60% or more triclopyr ester. Ready-to-use triclopyr ester products include Pathfinder II® with 13.6% triclopyr. Some imazapyr herbicides include Arsenal®, Chopper®, and Stalker®. Avoid using imazapyr, alone or in combination with other herbicides, where treated stem densities are moderate to high. At high application rates, imazapyr can cause non-target tree damage.

Plants less than 5 feet tall may be controlled with foliar applications during the growing season. **Foliar spray** control of burning bush and most woody invasive plants requires nearly complete coverage of the leaf surface area, but not to the point of runoff. Foliar application period is normally June to September. Read the label to determine appropriate application windows, and herbicide mixing and use. Always use surfactants for water solutions. They assist with spread and penetration of the herbicide into the plant. Some examples: Non-ionic surfactants, crop oil, methylated seed oil (MSO). Oils may provide improved control results due to their ability to penetrate waxy leaf surfaces.

Some herbicides to use for foliar applications:

- 3-4% glyphosate concentrate in water plus surfactant. Hard and/or high pH water can reduce the efficacy of glyphosate. Use water conditioners like ammonium sulfate to improve results. Timing: Some evidence indicates early summer is better than fall.
- 4% Triclopyr 4Ultra mixed in water (emulsion)
- 0.08 dry ounces Metsulfuron methyl (Escort XP)/ gal water mixed with 1% glyphosate applied with a backpack sprayer. CAUTION: over-application can cause injury to overstory trees under certain conditions; check the label for application rates and use caution when applying to heavy infestations.
- 1-2% Imazapyr (Arsenal AC). CAUTION: best for low scattered populations. Over-application can cause mortality in overstory trees.

The small seedlings regenerating under mature burning bush plants present some challenges for control, as mentioned earlier. They are often beneath other vegetation, making foliar applications difficult. Operationally, it may work best to control large plants

and return after one to three years with foliar spray to control the seedlings as they emerge from the surrounding vegetation.

If you are planning forest management activities that will provide additional growing space and sunlight to the forest floor, such as a timber harvest or thinning, control invasive species – burning bush, for example – in the area beforehand to avoid increased growth and seed production.

ALWAYS READ AND FOLLOW THE LABEL. The label is the law for pesticide applications. For the safety of the applicator and protection of the site, apply herbicides only as instructed on the label. Always use the personal protective equipment indicated on the label.

Use of dye in herbicide mixes is recommended to help applicators keep track of what has and has not been treated, as well as recognizing contamination of clothing, equipment, or off-target plants.

Be aware of air temperature cautions on the label (too hot or cold).

NOTE: Foliar applications have had mixed results with burning bush, and further research needs to occur to refine prescriptions. Keep records of your applications, including weather conditions, to evaluate and refine your methods.

Controlling invasive plants involves a commitment to repeated treatments and site monitoring. Always inspect your treatment areas to control missed or regenerated plants and evaluate results. Complete control of all invasive plants may not be feasible, but preventing plants from producing seed helps keep populations manageable. Control invasive plant seed production as soon as possible, and before providing additional sunlight through management practices such as timber harvests and forest stand improvement. Keep records to refine your management practices. Persistence and increased efficiency and effectiveness of treatments leads to improved success against invasives.

Additional Information

Purdue FNR Extension winged burning bush videos
<https://www.purdue.edu/fnr/extension/resources/videos/>

Southern Indiana Cooperative Invasive Species Management (SICIM) <http://www.sicim.info/>

Indiana Cooperative Agricultural Pest Survey <http://extension.entm.purdue.edu/CAPS/>

Indiana Invasive Species Council <https://www.entm.purdue.edu/iisc/plants.php>

Midwest Invasive Plant Network (MIPN) Invasive Plant Control Database: <http://mipncontroldatabase.wisc.edu/Default.aspx>

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