MANAGEMENT OF

INVASIVE PLANTS IN WISCONSIN

A3924-33

Tree-of-heaven
(Ailanthus altissima)

Brendon Panke and Mark Renz

Invasive plants can thrive and aggressively spread beyond their natural range, disrupting ecosystems. The *Management of Invasive Plants in Wisconsin* series explains how to identify invasive plants and provides common management options. Management methods recommend specific timings for treatment, as well as expected effectiveness. For more information, go to: fyi.uwex.edu/weedsci/category/invasive-plants-of-wisconsin.

Tree-of-heaven is a rapidly-growing tree that can reach 80′ tall with trunk diameters of 1–2′. It has smooth stems with pale gray bark and light brown twigs. Leaves and male flowers have a strong odor reminiscent of rancid peanut butter.

Legal classification in Wisconsin: Restricted

Leaves: Alternate, pinnately compound, 1–4′ long. Composed of 11–25 leaflets. Each leaflet has a smooth margin, except near the base where there is one or more teeth with glands.

Flowers: Late spring. Small, yellow-green with 5–6 petals in dense, terminal inflorescences that are 8–16″ long. Male and female flowers are borne on separate plants (dioecious).

Fruits and seeds: Fruit are 1.5″ long and green turning pink to tan. The fruit are papery and have two wings extending from a seed at their center. The fruit develop on female plants from late summer to early fall and can remain on the tree through winter.

Roots: Perennial taproots and lateral roots, which are both capable of generating shoots. Taproots typically grow 6′ deep, whereas lateral roots can spread up to 90′, depending on the location.

Similar species: Native sumacs (*Rhus*) and trees like ash (*Fraxinus*), hickory (*Carya*), black walnut, butternut, and pecan (*Juglans*) can be distinguished from tree-of-heaven by having completely toothed (serrated) leaf margins. Tree-of-heaven can be further distinguished by the odor of the leaves and male flowers.

Ecological threat:

- Invades fields, forest edges and openings, and disturbed areas such as abandoned lots, roadsides, fencerows, and cracks in pavement. It is especially prevalent in urban areas where it has been planted abundantly.
- Seed can persist in woodland areas and germinate when light levels increase, usually because of disturbance.

Non-chemical control

Removal

Effectiveness in season: 90–100%
Season after treatment: 70–90%

Pulling and digging up seedlings when soil conditions are amenable are effective single plant control. The entire root must be removed since root fragments can resprout. Root suckers and shoots are not good targets for pulling or digging since they are attached to an existing root system and are difficult to remove.

Mowing

Effectiveness in season: 50–70%
Season after treatment: 50–70%

Mowing or cutting is not usually recommended as tree-of-heaven can resprout vigorously from the stump or rhizomes. Mowing or cutting small or young infestations can be effective if repeated for many years in heavily shaded habitats. Cutting female trees before seeds are present can prevent seed production, but additional control is required to reduce population size. Mowing has been most successful when combined with a herbicide treatment. If seeds are present when mowed, avoid movement off site

UW Extension Cooperative Extension
NPM

unless material can be transported without spreading fruit to other locations.

Prescribed burning

Effectiveness in season: 50–70%
Season after treatment: < 50%

Spring burns can kill germinating seedlings and remove above-ground growth of established plants, depending on fire intensity. After the fire, established plants will quickly resprout; this management method is not recommended unless integrated with other techniques. Fire alone may increase tree-of-heaven populations. A handheld propane torch can be effective for treating seedlings.

Chemical control

Foliar

Apply directly to individual plants or broadcast across an infested area. Broadcasted foliar applications are typically the most cost-effective treatment in dense infestations. Use lower rates on smaller plants and less dense populations and higher rates on larger plants and denser populations.

glyphosate*

Effectiveness in season: 50–70%
Season after treatment: < 50%

Common name: Roundup

Rate:
broadcast: 1.5–3 lb a.e./A
spot: For a 3 lb a.e./gal product. 1–2% (0.03–0.06 lb a.e./gal)

Timing: Apply when target species is actively growing and fully leafed out.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since glyphosate is not selective. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

imazapyr*

Effectiveness in season: 50–70%
Season after treatment: 50–70%

Common name: Arsenal

Rate:
broadcast: 64–96 fl oz/A (1–1.5 lb a.e./A)
spot: 0.5–1% (0.01–0.02 lb a.e./gal)

Timing: Apply when target species is actively growing and fully leafed out.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since imazapyr is not selective and can remain in the soil for several months to more than a year, depending on application rate. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

picloram + 2,4-D*

Effectiveness in season: 50–70%
Season after treatment: 50–70%

Common name: Grazon
Some products containing picloram are restricted-use in Wisconsin.

Rate:
broadcast: 32–64 fl oz/A (picloram: 0.14–0.3 lb a.e./A + 2,4-D: 0.5–1 lb a.e./A)
spot: Equivalent to broadcast rates.

Timing: Apply when target species is actively growing and fully leafed out.

Caution: Do not apply directly to water or to areas where surface water is present. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Remains in the soil for more than one year, depending on application rate, and has the potential to contaminate surface runoff water during this timeframe. Maintenance of a vegetative buffer strip is recommended between the areas this product is applied and surface water features. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants. Do not compost treated plants since herbicide can persist through composting process.

triclopyr*

Effectiveness in season: 70–90%
Season after treatment: 50–70%

Common name: Garlon 4

Rate:
broadcast: 128–256 fl oz/A (4–8 lb a.e./A)
spot: 1.5–2% (0.06–0.08 lb a.e./gal)

Timing: Apply when target species is actively growing and fully leafed out.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

Cut stump

Cut a stem of a plant near the base and apply herbicide to the cut surface that remains rooted in the ground. Apply as soon as possible after cutting, but no later than one hour after cutting. Do not use this method if there is heavy sap flow or if snow covers the cut surface. Use lower rates on smaller plants and higher rates on larger plants.

dicamba*

Effectiveness in season: 90–100%
Season after treatment: 70–90%

Common name: Banvel

Rate: 25–50% (1–2 lb a.e./gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil) or both. Consult the label to determine the appropriate carrier.

Caution: Do not apply directly to water or

to areas where surface water is present. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants. Rates > 16oz/A (0.5 lb a.e./A) may cause stunting and discoloration of sensitive grasses, such as smooth brome.

glyphosate*

Effectiveness in season: 90–100%
Season after treatment: 70–90%

Common name: Roundup

Rate: For a 3 lb a.e./gal product. 20–50% (0.6–1.5 lb a.e./gal)

Timing: Apply any time of year.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since glyphosate is not selective. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

imazapyr*

Effectiveness in season: 90–100%
Season after treatment: 70–90%

Common name: Stalker

Rate: 6–13% in water (0.12–0.25 lb a.e./gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil). Consult the label to determine the appropriate carrier.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since imazapyr is not selective and can remain in the soil for several months to more than a year, depending on application rate. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

***Active ingredient (a.i.)**

triclopyr*

Effectiveness in season: 90–100%
Season after treatment: 70–90%

Common name: Garlon 4

Rate: 20% in oil (0.8 lb a.e./ gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil). Consult the label to determine the appropriate carrier.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

Hack-and-squirt

Using a hand axe, make cuts every 3–4" around the trunk at 6–18" above the ground at the same level and apply solution into the cut area. Cover cut area with herbicide. Do not use this method if there is heavy sap flow. Use lower rates on smaller plants and higher rates on larger plants. Aqueous herbicide formulations are recommended for hack-and-squirt applications.

dicamba*

Effectiveness in season: 50–70%
Season after treatment: 70–90%

Common name: Banvel

Rate: 25–50% in water (1–2 lb a.e./gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil). Consult the label to determine the appropriate carrier.

Caution: Do not apply directly to water or to areas where surface water is present. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants. Rates > 16oz/A (0.5 lb a.e./A) may cause stunting and discoloration of sensitive grasses, such as smooth brome.

glyphosate*

Effectiveness in season: 70–90%
Season after treatment: 70–90%

Common name: Roundup

Rate: For a 3 lb a.e./gal product. 50–100% (1.5–3 lb a.e./gal)

Timing: Apply any time of year.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since glyphosate is not selective. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

imazapyr*

Effectiveness in season: 50–70%
Season after treatment: 70–90%

Common name: Arsenal

Rate: 6–9% in water (0.12–0.2 lb a.e./gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil). Consult the label to determine the appropriate carrier.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since imazapyr is not selective and can remain in the soil for several months to more than a year, depending on application rate. Overspray or drift to desirable plants should be avoided since even minute

quantities of the spray may cause severe injury to plants.

picloram*

Effectiveness in season: 50–70%
Season after treatment: 70–90%

Common name: Tordon K
Some products containing picloram are restricted-use in Wisconsin.

Rate: 50% (1 lb a.e./gal)

Timing: Apply any time of year, except during drought conditions.

Caution: Do not apply directly to water or to areas where surface water is present. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Remains in the soil for more than one year, depending on application rate, and has the potential to contaminate surface runoff water during this timeframe. Maintenance of a vegetative buffer strip is recommended between the areas picloram is applied and surface water features. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants. Do not compost treated plants since herbicide can persist through composting process.

triclopyr*

Effectiveness in season: 50–70%
Season after treatment: 70–90%

Common name: Garlon 3A

Rate: 100% (4 lb a.e./gal)

Timing: Apply any time of year.

Remarks: Use 0.5 mL of undiluted product per cut.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

Basal bark

Apply herbicide in a ring around the entire stem. Applications should be made at least 6″ wide (6–18″) to the base of a woody stem. Ideal for stems ≤ 6″ in diameter. Do not use this method if there is heavy sap flow or if snow or vegetation block the target area. Use lower rates on smaller plants and higher rates on larger plants. Oil-based herbicide formulations are recommended for basal bark applications.

imazapyr*

Effectiveness in season: 70–90%
Season after treatment: 70–90%

Common name: Stalker

Rate: 6–9% in oil (0.12–0.2 lb a.e./gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil). Consult the label to determine the appropriate carrier.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Applications can result in bare ground since imazapyr is not selective and can remain in the soil for several months to more than a year, depending on application rate. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

triclopyr*

Effectiveness in season: 70–90%
Season after treatment: 90–100%

Common name: Garlon 4

Rate: 20–30% in oil (0.8–1.2 lb a.e./ gal)

Timing: Apply any time of year.

Remarks: Products containing this active ingredient can have different instructions for mixing. Labels will recommend mixing the product in a water- or oil-based carrier (e.g., basal bark oil). Consult the label to determine the appropriate carrier.

Caution: Use product labeled for aquatic use if potential exists for solution to contact surface waters. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Overspray or drift to desirable plants should be avoided since even minute quantities of the spray may cause severe injury to plants.

This series of fact sheets was created in cooperation with University of Wisconsin-Extension Team Horticulture.

This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Award No. 2009-45060-06000.

Authors: Brendon Panke is an associate research specialist and Mark Renz is an assistant professor of agronomy, College of Agricultural and Life Sciences, University of Wisconsin-Madison, and Cooperative Extension, University of Wisconsin-Extension. Cooperative Extension publications are subject to peer review.

University of Wisconsin-Extension, Cooperative Extension, in cooperation with the U.S. Department of Agriculture and Wisconsin counties, publishes this information to further the purpose of the May 8 and June 30, 1914, Acts of Congress. An EEO/AA employer, the University of Wisconsin-Extension, Cooperative Extension provides equal opportunities in employment and programming, including Title IX and ADA requirements. If you need this information in an alternative format, contact Equal Opportunity and Diversity Programs, University of Wisconsin-Extension, 432 N. Lake St., Rm. 501, Madison, WI 53706, diversity@uwex.edu, phone: (608) 262-0277, fax: (608) 262-8404, TTY: 711 Wisconsin Relay.

This publication is available from your county UW-Extension office (www.uwex.edu/ces/cty) or from Cooperative Extension Publishing. To order, call toll-free: 1-877-947-7827 (WIS-PUBS) or visit our website: learningstore.uwex.edu.