PennState College of Agriculture - Mitigation Guidelines & Chart

“Tree-of-Heaven is a highly invasive plant, with prolific root sprouting, and a foul odor. The compound leaves can be mistaken for staghorn sumac, black walnut, and hickory, but while the leaflets of native trees have serrated teeth, the Tree-of-Heaven edges are smooth. The bark is brownish-green turning light brown to gray as it ages, is smooth and resembles the skin of a cantaloupe. At the base of the long fronds are protruding bumps called glandular teeth, that when crushed give off a strong, offensive odor. These plants can grow into large trees as high as 80 feet.

Tree-of-heaven is dioecious, meaning a tree is either male or female, and typically grows in dense colonies, or “clones.” All trees in a single clone are the same sex. Female trees are prolific seeders with the potential to produce more than 300,000 seeds annually. The single-seeded samaras are wind dispersed. Established trees continually spread by sending up root suckers that may emerge as far as 50 feet from the parent tree. A cut or injured tree-of-heaven may send up dozens of stump and root sprouts. Sprouts as young as two years are capable of producing seed.

Seedlings can be pulled by hand before the taproot develops, but any piece of root remaining can sprout. It is best to treat with an herbicide first, wait for symptoms to develop (approximately 30 days), and then cut. Target the roots with systemic herbicides applied in mid-to-late summer (July to onset of fall color) when the tree is moving carbohydrates to the roots. Herbicide applications made outside this late growing season window will only injure aboveground growth.

Following treatment, repeated site monitoring for signs of regrowth is critical to prevent reinfestation. Apply herbicides to foliage, bark, or cuts on the stem. Cut stump herbicide applications do not prevent root suckering and should not be utilized. For most treatments we recommend using herbicides containing the active ingredients glyphosate or triclopyr because they have practically no soil activity and pose little risk to nontarget plants through root uptake.

Foliar herbicide sprays are used where tree height and distribution allow effective coverage without unacceptable contact with nearby desirable plants. Treatments are applied in mid-to-late growing season. For dense or extensive infestations, treat initially with a foliar application to eliminate the small, low growth. Then follow up with a bark or hack-and-squirt application on the remaining larger stems. The initial foliar application will control most of the stems, while the follow-up stem treatment controls missed stems or those too tall for adequate coverage.

Basal bark applications provide a target-specific method for treating tree-of-heaven that are generally less than 6 inches in basal diameter. Using a low-volume backpack sprayer, a concentrated mixture of herbicide containing the ester formulation of triclopyr in oil is applied from the ground line to a height of 12 to 18 inches, completely around the stem. To maximize translocation to the roots, apply herbicides from mid to late summer.

Hack-and-squirt herbicide applications are highly selective with a concentrated herbicide solution applied to downward-angled cuts in the stem. For effective hack-and-squirt applications, apply the herbicide solution to cuts spaced evenly around the stem. Leaving uncut living tissue between the hacks allows the herbicide to move to the roots. Again, make applications in mid-to-late summer. Well-established tree-of-heaven stands are only eliminated through repeated efforts and monitoring.”

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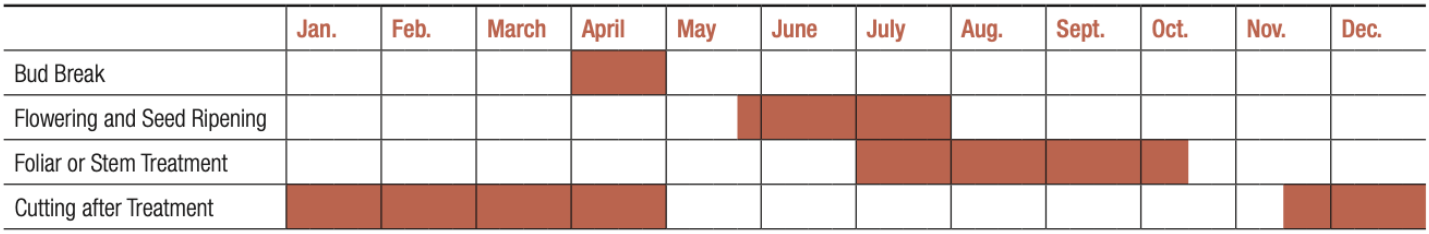
Management Calendar

The management calendar for tree-of-heaven emphasizes late season treatment to maximize control of the roots.



Treatment and Timing

Prescriptions for controlling tree-of-heaven stress proper timing of operations to maximize injury to roots. Improper timing will result in treatments that provide "top kill" (shoot injury) but little control of the roots. 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 Application	July 1 to onset of fall color	Rodeo (glyphosate) plus Garlon 3A (triclopyr 3 lb/gal) or Vastlan (triclopyr 4 lb/gal)	3 quarts/acre plus 2 quarts/acre or 1.5 quarts/acre	The combination of glyphosate and triclopyr provides a broad-spectrum treatment that is effective against tree-of-heaven and other woody species that should also be targeted during the operation. This is a nonselective mixture, but it has little soil activity and poses little risk to nontarget organisms through root uptake. Garlon 3A and Vastlan are both triclopyr formulations but have different active ingredient concentrations. A surfactant (e.g., Alligare 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	July 1 to onset of fall color	Pathfinder II or Garlon 4 Ultra (triclopyr ester)	Ready-to-use or 20% by volume, 1:4 in basal oil	Pathfinder II is a ready-to-use oil-based formulation of triclopyr used for basal bark applications. Treat stems up to 6 inches in basal diameter by wetting the entire circumference of the lower 12 to 18 inches, without runoff; apply a shorter band to small-diameter stems. This technique is best suited for treating small infestations or as a follow-up to treat surviving stems after a foliar application. If stems are larger than 6 inches in basal diameter use hack-and-squirt.
Hack and Squirt	July 1 to onset of fall color	Rodeo (glyphosate) or Garlon 3A (triclopyr 3 lb/gal) or Vastlan (triclopyr 4 lb/gal)	Use either product undiluted or 1:1 with water	Glyphosate or triclopyr in water 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 solution 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.
Cut Stump	N/A			If cutting tree-of-heaven for immediate safety reasons, do so and treat the stump. However, cut stump herbicide applications are not recommended because they do not provide effective control of roots. Stump treatments will keep the stump free of sprouts, but they will not prevent root suckering. When tree removal is necessary, it is best to treat with one of the above-mentioned herbicide applications first, wait for symptoms to develop (generally 30 days), and then cut.