Ailanthus altissima (Mill.) Swingle

Tree-of-heaven

Family: Simaroubaceae
Range: Throughout the United States except Montana, North Dakota, South Dakota, and Wyoming.
Habitat: Disturbed places, roadsides, urban waste areas, landscaped sites, and many natural communities, including riparian areas, grassland, and woodland. Tolerates shade, many types of pollution, and harsh soil conditions, including acidic soils of mine spoils and phosphorus-poor soils. It can grow in most environments, including pavement cracks.
Origin: Native to China and introduced to North America as a landscape ornamental, as a food plant for a certain type of silkworm, and as a culturally important medicinal plant of Chinese immigrants.
Impacts: Forms dense thickets that compete with native vegetation and reduce wildlife habitat, particularly in riparian areas. Often considered a tree-fall hazard around homes and buildings, and the roots can damage pavement, roads, and foundations. May have allelopathic properties that inhibit the germination of other plants. Although not considered toxic, handling tree-of-heaven foliage can cause contact dermatitis in sensitive individuals, and the pollen is a common allergen.
Western states listed as Noxious Weed: California
California Invasive Plant Council (Cal-IPC) Inventory: Moderate Invasiveness

Tree-of-heaven is a fast-growing deciduous tree to nearly 70 ft tall, with large, pinnate-compound leaves. The leaves have an unpleasant skunky odor, especially when crushed. The tree produces a long, deep taproot with many creeping roots that sucker freely. Creeping roots may extend to about 50 ft in all directions.

Trees are dioecious (male or female), with females producing a winged fruit called a samara. Fruits mature in late summer and disperse from fall through the following spring with wind, water, and possibly birds. Most seeds probably fall close to the parent plant. Female trees typically begin to produce fruits at several years of age. One tree can produce 325,000 seeds or more annually, a large proportion of which are viable. Seeds generally survive about 1 year under field conditions and usually do not develop a persistent seed bank. Seedlings typically do not survive in shaded understory conditions. In addition to seed, plants reproduce vegetatively from creeping roots. Root sprouts tolerate shade better than seedlings, and new trees more often develop from the roots of established trees. New shoots can sprout up to 50 ft away from the parent tree and often grow more than 3 ft per year under favorable conditions. Individual trees typically have a life span of 30 to 50 years.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand pulling can remove seedlings, but once underground creeping roots have developed, this technique is generally not effective. For saplings or small trees, a weed wrench or other woody weed extractor can be used. Care must be taken to extract the entire root or stump sprouting will occur. Best results are achieved when soil is moist.
Cultural	A heavily shaded environment will reduce the establishment of tree-of-heaven.
Biological	No biological control agents have been released for the control of tree-of-heaven.

CHEMICAL CONTROL

The following specific use information is based on published papers and reports by researchers and land managers. Other trade names may be available, and other compounds also are labeled for this weed. Directions

for use may vary between brands; see label before use. Herbicides are listed by mode of action and then alphabetically. The order of herbicide listing is not reflective of the order of efficacy or preference.

GROWTH REGULATORS	
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 4.75 to 8 oz product (*Perspective*)/acre **Timing:** Postemergent to foliage of young trees in summer to early fall. **Remarks:** *Perspective* provides broad-spectrum control of many broadleaf species. Although generally safe to grasses, it may suppress or injure certain annual and perennial grass species. Do not treat in the root zone of desirable trees and shrubs. Do not apply more than 11 oz product/acre per year. At this high rate, cool-season grasses will be damaged, including bluebunch wheatgrass. Not yet labeled for grazing lands. Add an adjuvant to the spray solution. This product is not approved for use in California and some counties of Colorado (San Luis Valley).
Triclopyr *Garlon 3A*, *Garlon 4 Ultra*, *Pathfinder II* Aminopyralid + triclopyr *Capstone*	**Rate:** Foliar spot treatment: 1 to 2% v/v solution of *Garlon 4 Ultra* or 1 to 1.5% v/v *Capstone* and water plus 0.5% v/v non-ionic surfactant to thoroughly wet all leaves. Basal cut stump treatment: 20 to 25% *Garlon 4 Ultra* in 80% oil carrier. Cut stump treatment: 20 to 25% *Garlon 3A* in water. Basal bark treatment: 20 to 30% *Garlon 4 Ultra* in 70 to 80% oil carrier, or *Pathfinder II* as a ready-to-use formulation. Stem injection treatment: one cut per every 3 inches of stem diameter, and 1 ml of undiluted *Garlon 3A* added to each cut. For clumps, one hack per every 6 inches of total stem diameter. Treat largest stems. **Timing:** Foliar treatments best when leaves are fully expanded. Cut stump, basal cut stump, basal bark and stem injection treatments can be used anytime, but are best when used in late summer or early fall. **Remarks:** Triclopyr is a selective herbicide for broadleaf species and will not damage desirable grasses growing nearby. Foliar treatment should only be made on small trees, saplings, or seedlings. For cut stump treatments, cut stems horizontally at or near ground level, then immediately apply herbicide solution to cover the outer 20% of the stump face. Coppicing and root suckering typically occur after cutting, but the treatment should control most resprouts. Others have found that stem injection, then cut stump treatment can completely kill tree. Basal bark treatment: spray the lower trunk, including the root collar, to a height of 12 to 15 inches from the ground; the spray should thoroughly wet the lower stem but not to the point of runoff. For stem injection treatments, be sure that each cut goes well into or below the cambium layer. Trees should not be cut for at least 4 months after basal bark and stem injection treatments. A dye can be added to either product. Triclopyr can be applied as a premix with aminopyralid (*Capstone*) at 8 to 9 pt product/acre. Triclopyr can also be mixed with picloram or imazapyr for basal bark treatments (20% *Garlon 4 Ultra* + 5% *Tordon 22K* or 3% *Stalker*). Basal bark applications are made as described for triclopyr. Trees should not be cut for at least one month after treatment. Picloram is not registered for use in California.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** Foliar spot treatment: 2 to 4% solution of glyphosate (*Roundup ProMax* or similar product) and water plus 0.5% v/v non-ionic surfactant to thoroughly wet all leaves. Stem injection treatment: one cut per every 3 inches of stem diameter, and 1 ml of undiluted herbicide added to each cut. For clumps, one hack per every 6 inches of total stem diameter. Treat largest stems. **Timing:** Foliar treatments best when leaves are fully expanded. For stem injection treatments, root injury is increased when applied mid-June to mid-September (fall color). **Remarks:** A nonselective systemic herbicide. Can also be mixed with dicamba to achieve good control with foliar applications. Stem injection and cut stump applications are made as described for triclopyr. Like triclopyr, there is extensive coppicing with a cut stump treatment. Others have found that stem injection with glyphosate, then cut stump treatment can completely kill tree.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Imazapyr *Arsenal*, *Habitat*, *Stalker*, *Chopper*, *Polaris*	**Rate:** Cut stump treatment: 20% *Stalker* or *Chopper* formulation v/v in 80% oil carrier or 20% *Arsenal* or *Habitat* v/v in 80% water carrier. Stem injection treatment: one cut per every 3 inches of stem diameter, and 1 ml of undiluted herbicide (*Arsenal* or *Habitat*) added to each cut. For clumps, one hack per every 6 inches of total stem diameter. Treat largest stems. Basal bark treatment: 20% *Stalker* or *Chopper* formulation v/v in 80% oil carrier.

	Timing: Best when used in late summer to early fall, but before leaf drop. **Remarks:** Soil residual herbicide. May result in bare ground around trees for some time after treatment. Applications are made as described for triclopyr. Imazapyr is the most consistent and best stem treatment for tree-of-heaven.
Metsulfuron *Escort*	**Rate:** 2 oz product/acre for foliar application (1.2 oz a.i./acre) **Timing:** Treatments best when leaves are fully expanded. **Remarks:** Can be tank mixed with glyphosate or triclopyr. Not registered for use in California.

RECOMMENDED CITATION: DiTomaso, J.M., G.B. Kyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.