



FACT SHEET: INVASIVE WEEDS

TREE-of-HEAVEN

Tree-of-heaven (*Ailanthus altissima*) also known as ailanthus, Chinese sumac, and stinking sumac is a rapidly growing, deciduous tree native to a region extending from China south to Australia. It was imported into the United States in 1784 by a Philadelphia gardener. Chinese immigrants introduced tree-of-heaven into California in the 1850s. It was initially valued as an urban street tree and was widely planted in the United States particularly around the Baltimore and Washington D.C. area. From these areas tree-of-heaven has spread and become a serious weed in urban, agricultural, and forested areas.



Tree-of-heaven can reach heights of 80 feet and grow to 3 feet in diameter. The tree has smooth grey bark, stout, blunt, chestnut brown twigs, and a long compound leaf ranging in length from 1-4 feet with as many as 30 leaflets. The leaflets are smooth-edged except for 1-3 teeth near the base. Clusters of twisted papery seeds, called samaras, often hang on the trees over winter. The wood is soft, weak, coarse grained, and creamy white to light brown in color. All parts of the tree, especially the flowers, have a strong, offensive odor. Tree-of-heaven is often found growing in clusters as new shoots grow from the roots.



This species is easily confused with some of our native species having compound leaves and many leaflets such as sumac, black walnut, and butternut. The leaf edges of all of these native trees have small teeth while those of tree-of-heaven are smooth. The foul odor produced by the crushed foliage and the scraped bark is also unique to tree-of-heaven.

Adapted to a wide variety of soil conditions, tree-of-heaven quickly colonizes disturbed areas. Having long been established in some urban areas, it is now found growing in fields, roadsides, fencerows, woodland edges, and forest openings. Tree-of-heaven has become an agricultural pest and may occur as seedlings that pop up by the hundreds in recently planted fields, or persistent thickets in rocky, untillable areas. In naturally forested areas, disturbance created by storms, insect infestation, and timber harvesting can open the way for tree-of-heaven to become established, displacing more desirable native trees.



One female tree-of-heaven can produce up to 325,000 seeds in a year. These winged seeds are easily windblown and have a high-germination rate. This allows edge trees to colonize adjacent areas and invade forest interiors when canopy openings occur. Established trees constantly spread by sending up root suckers that may emerge as far as 50 feet from the parent tree allowing them to rapidly dominate sites. Root suckers as young as two years of age are able to produce seed. Tree-of-heaven also produces a toxin in the bark and leaves which acts as a natural herbicide. As the toxin accumulates in the soil it inhibits the growth of other plants. All of these factors combine to make tree-of-heaven a very aggressive invasive plant.

Using only mechanical methods for controlling tree-of-heaven may be counter-productive since the tree responds to cutting and girdling by producing large numbers of stump sprouts and root suckers. Stump sprouts can reach heights of 10 feet in one growing season. An area will need to be mowed numerous times a year for several years to eventually deplete root reserves. Thereafter, periodic mowing can help prevent re-establishment. Hand pulling of young seedlings may be effective when the soil is moist and the entire root system is removed. However, very small pieces of root are capable of generating new shoots.

The most effective approach for controlling tree-of-heaven includes the use of herbicides applied to foliage, stems, or cut surfaces. Foliar sprays are the method of choice where tree height and distribution allow effective coverage without unacceptable contact with nearby desirable plants. Treatments can be applied with equipment ranging from truck-mounted high pressure sprayers to backpack sprayers. It is important to cover all portions of the canopy. Difficulties arise when trying to get adequate coverage of tall plants while protecting surrounding vegetation. To be most effective apply sprays between full leaf out and the onset of fall color. This timing will limit re-sprouting from the root system. Herbicide mixtures containing glyphosate, metsulfuron methyl, triclopyr, dicamba, or imazapyr, alone or in combination, will provide control when applied to the foliage.

Basal bark applications provide a method for treating tall tree-of-heaven with little or no non-target injury. Using a low volume spray wand, the herbicide and oil solution is applied completely around the stem from the ground line up to a height of 12-18 inches. To maximize translocation of product to the roots, applications should be made during the same window as foliar applications. Applications made outside the growing season will kill the stems but often times have little success at completely controlling the roots. Herbicides containing the ester formulation of triclopyr in oil are recommended for this type of application. For well established, high density infestations a combination of foliar and basal bark applications are most effective. The initial foliar application will control most of the stems while the basal bark application is used as a follow-up treatment to control stems that were missed or were too tall for adequate coverage.

Cut surface herbicide applications are highly selective, but labor intensive. It encompasses such application methods as cut stump, hack-and-squirt, and stem injection. These methods can be used on trees of any size and are most effective if applied during periods of active growth when the plants conductive tissue will move the herbicide to the roots. For hack and squirt and stem injection space the cuts so that 1-2 inches of uncut living tissue remains between them. Where trees have to be cut and removed from the site, the preferred approach is to kill the trees prior to cutting. Cutting living trees and treating the stumps will prevent stump sprouts, but will have little impact on root suckers. When treating living cut stumps it is only necessary to treat the outer 1/3 of the cut surface. Herbicides containing glyphosate, triclopyr, imazapyr, or dicamba will provide effective control using cut surface application methods.



Well established tree-of-heaven stands can only be eliminated through repeated efforts and monitoring. Treatments often only reduce the root systems making follow-up measures necessary. Small portions of the original root system that survive can quickly re-establish the stand. Persistence is the key to success.

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