

## Furiously Aggressive Invasive TREE-OF-HEAVEN, AILANTHUS, PARADISE TREE Poisons the Soil, Wrecks Fields and Forests



*Tree-of-heaven grows here in a fencerow. Note the orange and creamy-yellow, showy seed clusters on these female trees.*

### The Culprit

Some folks who are victims of tree-of-heaven's crimes against their land jokingly call it the "tree from hell". Paradise tree is the name used most often in rural Virginia. These names reflect the tree's upturned branches, which point to heaven, though some say the tree got this name because the flowers and leaves "stink to high heaven." It is also called stinking sumac and ailanthus. The scientific name is *Ailanthus altissima*.

A serious agricultural weed, tree-of-heaven is fast-growing and weak-wooded, and often forms dense thickets. It destroys the value of pasture, hayfields, woodlands, and timber because it out-competes desirable plants by poisoning the soil with toxins exuded from its roots and fallen leaves. If it grows near buildings, its roots can penetrate sewer lines and foundations.

Handling the leaves and branches of tree-of-heaven can cause a skin rash and the copious amount of pollen from male trees can cause allergies. Avoid breathing the smoke from burning ailanthus wood as it may be toxic.

Tree-of-heaven is an important host for the spotted lantern fly (SLF), an invasive insect recently found in Virginia, which poses a serious threat to commercial vineyards and orchards. SLF is a messy nuisance on shade trees in home landscapes. Best to eradicate ailanthus to discourage this new insect pest!

Imported from China and planted in a Philadelphia garden in 1784, tree-of-heaven was commonly available in nurseries by the mid-1800's. It soon escaped cultivation and today this prolific tree infests 30 states in the East and West.

### Known Hangouts

This weed tree can invade almost any place seeds land, especially disturbed soil. It aggressively invades fields, hedge- and fencerows, roadsides, forest edges and openings, young

forests, disturbed areas such as clear-cut wood lots, spaces in forests where large trees die or are cut, and powerline right of ways. In urban areas, tree-of-heaven sprouts in sidewalks, walls, alleys, and parking lots.

### Modus Operandi

Tree-of-heaven does not wait for an invitation to invade natural areas. It enters where it is not welcome by two aggressive methods: producing huge amounts of seed and sprouting from its vigorous root system. Once it has crashed the party, it poisons the soil with toxins that kill desirable plants.

A mature female tree is estimated to produce 300,000 to 350,000 wind-dispersed seeds. Hundreds of seedlings can pop up in recently planted fields and hayfields, and in established fields and meadows, if a mature, female tree-of-heaven grows nearby. If a tree is cut to the ground, it refuses to die, and fights on by sending up rapidly-growing suckers from its wide-spreading roots. These suckers can form a dense stand of trees in no time.

### Positive Identification

Tree-of-heaven can reach 80 feet and has an irregular, open branching pattern. Trunk bark is pale tan or gray and may be slightly striped; it is smoother than the bark of most native trees. The bold-textured, feather-shaped leaves are 1 to 4 feet long and are composed of 10 to 41 leaflets. The leaves alternate along stout branches and the leaflets are also arranged in an alternate pattern along the midrib. The edges of the leaflets are smooth, except for one or more small notches or teeth near their bases. Small bumps or glands are visible on these teeth, which is helpful in making an accurate identification.

Male and female flowers occur on separate trees and form large, showy, yellowish-green clusters at the branch tips. Seed clusters on female trees are eye-catching. They begin creamy-yellow and ripen to yellow-green or red-brown. Individual fruits in the clusters are single seeds enclosed in a twisted papery covering. Seed clusters lose their color in winter and remain on the leafless tree for many months.



Left: *Tree-of-heaven* flower cluster. Right: Seed clusters.

## Mistaken Identity

Several native trees and shrubs, such as black walnut, ash, staghorn sumac and smooth sumac, resemble tree-of-heaven. All have large, feather-shaped leaves with many leaflets. You can identify these trees by studying their branch and leaf patterns, the teeth along their leaf edges, and their bark texture.

Tree-of-heaven leaves are not toothed, except for one or two distinctive notched teeth at the base of each leaflet. Walnut and smooth and staghorn sumac leaves have small teeth along the entire length of the leaflets' edges. (Winged sumac has distinctive leaves with a "winged" midrib, so is easily identified.) Ash leaves are not toothed and are arranged directly opposite each other on the branches with leaflets opposite each other on the midrib. Tree-of-heaven leaves and leaflets may be either alternate or sub-opposite, meaning they do not line up exactly opposite each other. alternate. The bark on tree-of-heaven is relatively smooth; walnut and ash have rough, dark bark with ridges and furrows. Smooth and staghorn sumacs have upright clusters of yellow or red flowers. Smooth sumac blooms at the same time as tree-of-heaven; staghorn sumac blooms later.

Seedlings and young plants of all these look-alikes are difficult to distinguish. Tell tree-of-heaven from the others by its notched leaf bases, by the rancid peanut-butter odor of its crushed leaves and stems, and by the reddish new leaves.



Left: Leaflets of tree-of-heaven have small notches at their bases and the leaflets are alternate. Right: Leaflets of staghorn sumac have teeth along all the edges and the leaflets are opposite each other.

## Search & Destroy Strategy

Look for large and small trees in forests and along fences and roadsides. Search for seedlings and saplings near female trees and search for root sprouts near seemingly-dead trees. Control methods vary depending upon tree size. It's best to target large female trees first to halt further seed dispersal. Battling tree-of-heaven is difficult, because the weed tree produces abundant seedlings and it forms a thicket of vigorous resprouts if the entire root system is not killed by removal efforts. In battling tree-of-heaven, herbicides, used properly in several methods, are the most reliable way to kill seedlings, and both small and large trees. Follow up all treatments with a foliar herbicide on resprouts, suckers and new seedlings.

**Biological Control:** A verticillium fungus wilt disease that affects ailanthus is being studied at Virginia Tech and may be available as an injectable biological control in the near future.

**Manual & Mechanical:** Hand-pull seedlings when soil is moist; remove all roots. Suckers resemble seedlings, but are attached to large roots and break if pulled, leaving an aggressively re-sprouting root system. Use a foliar spray on these.

**Foliar Spray:** A broad-leaf or broad-spectrum herbicide sprayed on seedlings and on leaves of small trees is an effective control method. Foliar spray should also be applied to any resprouts that occur after cut-stumping or hack-&-squirting.



Tree-of-heaven seedlings invading a hayfield.

For currently approved herbicide recommendations, check the Virginia Department of Forestry chart *Non-Native Invasive Plant Species Control Treatments*, which you can download from the Blue Ridge PRISM website.

**Basal Bark:** For trees with trunks less than 6 inches in diameter, instead of a foliar spray, use a basal treatment from late winter until spring and from June 15 to early winter. Spray a complete circle of a concentrated, recommended herbicide that is diluted in mineral oil onto the lowest 12 inches of the trunks.

**Hack & Squirt:** Kill larger trees by making cuts with a hatchet into sapwood at about waist height, leaving 2 inches between cuts. Spray a concentrated, recommended water-soluble herbicide into the cuts immediately after you make them. (If you make continuous cuts the roots are likely to send up suckers.) This is best done from early summer until early winter because then the herbicide moves readily into the roots.

**Cut Stump:** Use good judgment and caution when cutting large tree-of-heaven. After cutting, immediately apply a concentrated, recommended, water-soluble herbicide to the outer 2 inches of the stump's circumference. The best time to cut-stump is early summer to early winter. Depending upon a tree's potential hazard if it falls, you might kill it first with the hack-&-squirt method then cut the tree soon after it dies.

### TREE-OF-HEAVEN LOOK-ALIKES

Tree Species	Leaf Margin	Pattern	Bark
<b>Tree-of-Heaven</b>	smooth	sub-opposite	smooth
<b>Ash</b>	smooth	opposite	rough
<b>Staghorn Sumac</b>	toothed	opposite	smooth
<b>Smooth Sumac</b>	toothed	opposite	smooth
<b>Walnut</b>	toothed	alternate	rough