Invasive Species Profile: Tree-of-Heaven (*Ailanthus altissima*)

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Native Range: China, Taiwan, North Korea
U.S. Introduction: 1784, in Philadelphia, PA
Life Cycle: perennial tree
Means of Spreading: seeds; suckers along roots
Commercially Available: no
Control Method: hand-pull seedlings, herbicide applications for saplings and mature trees
Good Alternative Species: staghorn sumac (*Rhus typhina*); American hackberry (*Celtis occidentalis*)

Comments: Tree-of-heaven is an invasive species topping the list of botanical misnomers! At first, this ornamental tree might seem like a landscaper's dream as it easily and quickly grows in many different soil types and climates. It even tolerates city life and urban pollution. Reaching 70 feet or so, they are valued as a hardy shade tree. Their wood can be fashioned into furniture, steamer baskets (mostly in its Chinese homeland), and charcoal. A moniker like "tree-of-heaven" further promoted this species into widespread usage starting in the 1800s.

Into the 20th century, people recognized some of *Ailanthus*' positive aspects to be a double-edged sword. Without too many pests or other biological controls, that fast growth in numerous habitats is now considered weedy. The roots can penetrate concrete structures, such as building foundations and sewer pipes—a big problem in cities! Suckers spring up along the roots. Its dense coverage outcompetes native plants. Cutting *Ailanthus* back is like trying to decapitate the mythical Hydra: instead of killing it, chopping stimulates even more growth! If that vegetative expansion was not enough, the female trees generate seed masses that spread to other areas; the wing-like flanges help winds to disperse these fruits. Furthermore, *Ailanthus* has allelopathic properties, meaning that it secretes toxins into the soil to ward off competing plants from forming too closely or too densely. Trees that grow fast and multiply rapidly often live a short life and, averaging only 50 years, *Ailanthus* adheres to that generalization. Invasiveness aside, a big question as to why anyone would want a tree-of-heaven revolves around the vile stench it emits when branches break or foliage gets crushed. The pungent odor, resembling rotting garlic pastries, is absent from finished wood products.

Hand-pulling seedlings is one method of controlling *Ailanthus*. Since cutting back stems stimulates its regenerative properties, herbicides are currently the best way to kill the mature trees. In Fairfax County parks, only trained staff and county contractors treat these trees, so report these *Ailanthus* locations to the Invasive Management Area Program Manager, Patricia Greenberg (patricia.greenberg@fairfax-county.gov), or use https://www.eddmaps.org/ outside of county parks. The trees growing by Crooked Creek Park are slated for herbicide application this year. Last year, one of these mature *Ailanthus* trees had a sticky trap on it (Figure 2)—a monitoring station for another, newer invasive species: the spotted

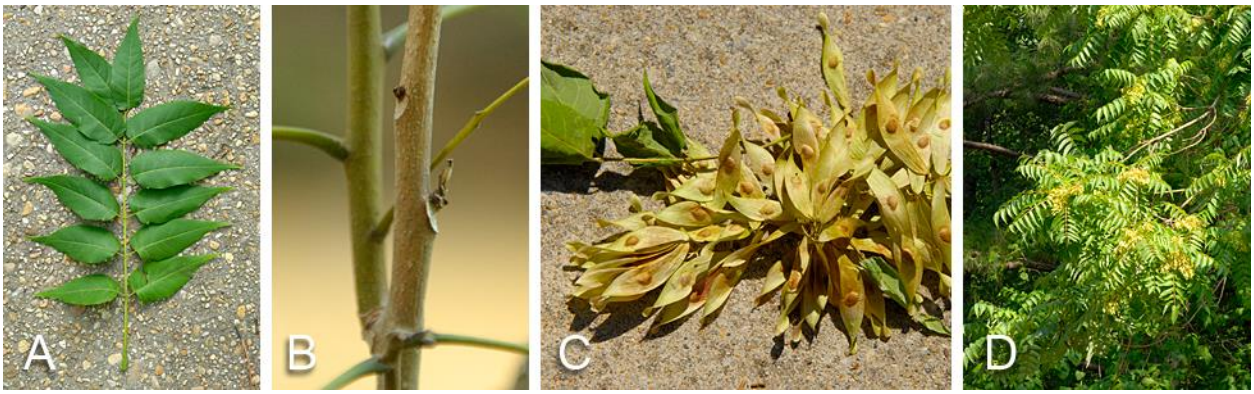

Figure 1. Features characterizing tree-of-heaven include large, compound leaves (A), prominent leaf scars on branches (B), and winged fruits on female plants (C). Seed masses can weigh down branches (D).

lanternfly (*Lycorma delicatula*). Native to southeast Asia, spotted lanternfly's (SLF) first American sighting was in Pennsylvania in 2014. Its first Virginia discovery was three years ago in the city of Winchester. As of 2020, the closest it has come to the D.C. area is Clarke County, VA. SLF both ingest significant amounts of sap out of many different tree species and defecate undigested sap called honeydew. Honeydew buildup creates a perfect environment for opportunistic yeasts and fungi, like sooty mold, to grow. Sooty mold is one of the major causes of agricultural crop loss due to the SLF. Accumulation of the sugary waste around the base of trees can also attract ants and wasps. SPF coevolved with and prefer to feed on *Ailanthus*, despite the tree's chemical defenses, and the tree can tolerate feeding damage from SLF. Controlling the host tree population may help manage the invasive insect. To the chagrin of many beekeepers, European honeybees drink the lanternflies' honeydew, adding impurities to the nectar-based honey. Lanternfly honeydew from *Ailanthus* sap imparts a strange flavor to the honey. More on SLF follows this article and is reprinted with permission.

Figure 2. Using the *Ailanthus* as a lure, the trap captures any SLF drawn to the tree at this monitoring station.

Researchers recently identified a fungal species, *Verticillium nonalfalfae*, that appears to be a Mid-Atlantic native and kills *Ailanthus*. While this fungus naturally infects *Ailanthus*, it is not completely controlling the invasive tree on its own. Best results occur when applying the *Verticillium* inoculum to cuts on the trunk. Initial experiments show promise that this pathogen will be a good biological control against *Ailanthus*.

Folks wanting a majestic shade tree have many native alternatives for tree-of-heaven, such as American hackberry (*Celtis occidentalis)*, chestnut oaks (*Quercus montana*), and pignut hickories (*Carya glabra*). Black walnuts (*Juglans nigra*) develop into grand shade trees with feathery, compound leaves similar to *Ailanthus*, but their allelopathy restricts some garden plants beneath the dripline. Fast-growing natives include river birches (*Betula nigra*) and Virginia pines (*Pinus virginiana*). Staghorn sumac (*Rhus typhina*) is a native tree with leaf and branch structure similar to *Ailanthus*. Other sumacs worth considering include the aromatic (*R. aromatica*) and winged (*R. copallinum*) species.

For more information on tree-of-heaven:

https://www.invasive.org/browse/subinfo.cfm?sub=3003
https://www.fairfaxcounty.gov/publicworks/sites/publicworks/files/assets/documents/pdf/publications/maedn_handout_h.pub_.pdf
http://www.dof.virginia.gov/infopubs/Control-and-Utilization-of-Tree-of-Heaven-2019-03_pub.pdf
https://www.nature.org/en-us/about-us/where-we-work/united-states/indiana/stories-in-indiana/journey-with-nature--tree-of-heaven/
https://extension.psu.edu/tree-of-heaven
https://www.nationalgeographic.com/animals/environment/article/tree-of-heaven-invasive-species-could-fungus-save-the-day

Spotted lanternfly material is at:

https://www.fairfaxcounty.gov/publicworks/trees/spotted-lanternfly
https://extension.psu.edu/spotted-lanternfly
https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/spotted-lanternfly/spotted-lanternfly
https://ecosystems.psu.edu/research/centers/private-forests/news/tree-of-heaven-and-the-spotted-lanternfly-two-invasive-species-to-watch

On the lookout for Spotted Lanternfly

Inset photo (right): Emilie Swackhammer, Pennsylvania State University, bugwood.org

The spotted lanternfly (*Lycorma delicatula*) is an invasive plant pest that was introduced to the United States in 2014. It was found in Winchester, Virginia in January 2018.

A quarantine is now established but there may be populations outside of the quarantine area that have not yet been found.

It feeds on more than 70 different species of plants including the invasive tree-of-heaven (*Ailanthus altissima*). This insect is of interest to managers to contain new populations as early as possible.

What do I do if I find one?

All photos : Lawrence Barringer Pennsylvania Dept of Agriculture, bugwood.org

- Try to capture it in a bag, jar or lidded container and store in the freezer.
- Take a few good pictures, noting the identifying features.
- Note the location where you may have seen the insect.
- Call Fairfax County Urban Forest Management Division at 703-324-1770, TTY 711 or email at pestmail@fairfaxcounty.gov
- An urban forester will reach out to you for more information.

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