

NC STATE EXTENSION

Spotted Lanternfly

Identifying Tree-of-Heaven

Introduction

Tree-of-heaven (TOH, *Ailanthus altissima*) is a non-native, invasive tree from southeast Asia. Introduced to the U.S. in the late 1700s, TOH was widely planted as an urban tree, valued for its rapid growth, upright form, and ability to thrive in poor soils. However, by the mid-1900s, its invasiveness was apparent. With its aggressive spread through both abundant seed production and vigorous root sprouts, it quickly outcompetes native plants and releases chemicals that suppress nearby plant growth. Commonly found along highways, railways, and areas with recent soil disturbance, TOH is classified as an invasive species in 31 states, many of which have banned its sale.

In addition to being invasive, TOH is the preferred host of the spotted lanternfly (SLF). SLF (Figure 1) is an invasive insect native to southeast Asia. Although TOH is not required for survival, SLF that feed on it lay more eggs.



Figure 1. Adult SLF on TOH (A. Ratcliff, NC State)

SLF feeds on the sap of over 100 plants, weakening them, reducing fruit production, and even killing grapevine. In addition, SLF are an extreme nuisance, aggregating in large numbers and producing honeydew, a sticky substance that attracts stinging insects and facilitates the growth of sooty mold. SLF was first detected in North Carolina in 2022 and TOH management is considered a necessary aspect of its management.

TOH Identification

Growth

- Upright form (Figure 2a), sometimes leaning or twisting to find sunlight (Figure 2b)
- Large new growth intervals that remain green for most of the season
- Height: 40 to 80 feet

Bark

- When young, smooth and green
- When mature, brown-grey to black with tan fissures (Figure 3)

Leaves

- 10 to 40 leaflets in pairs along the central stalk and a single terminal leaflet (Figure 4a)
- Leaflet edges smooth
- Leaflets attached to the stalk alternately, not directly paired with each other
- Base of leaflets lobed with protruding glands on the underside (Figure 4b)
- Has a smell described as burnt peanut butter when crushed

Fruits

- Winged fruits called "samaras" with the seed in the center of the wings (Figure 5a)
- Produced in large clumps at the top of the tree (Figure 5b)
- Color varies red to yellow-green, drying to tan
- Retained on trees after leaf-drop (this is when TOH is most easily noticed along roadways)



Figure 2. TOH in full sun (a, R. Bohannon, NC State) and in shade (b, A. Ratcliff, NC State)

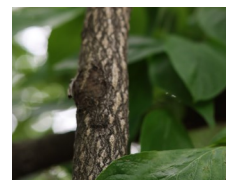


Figure 3. TOH bark (A. Ratcliff, NC State)



Figure 4. TOH leaf details (A. Ratcliff, NC State)



Figure 5. TOH samaras (a, Annemarie Smith, ODNR Division of Forestry, Bugwood.org; b, Cathy Dewitt, CC BY 4.0)

Native Look-Alikes

Several native trees can be mistaken for TOH. Across the board, native tree species have shorter leaves with a smaller maximum number of leaflets. Leaflets have fine, tooth-like serrations and lack lobes and glands. Generally, the bark of native look-alikes is more textured and lacks tan fissures.

Ash

- Four species in NC
- 7-11 leaflets
- Leaflets arranged oppositely on the stem (Figure 7)
- Leaves attached to the tree oppositely
- Samaras have 1 wing



Figure 7. Ash leaf (Michigan Department of Agriculture, Bugwood.org)

Hickory

- Seven species in NC, including pecan
- Hickory: 5-9 leaflets (Figure 8)
- Pecan: 11 to 17 leaflets (Figure 9)
- Leaflets arranged oppositely on the stem
- Leaves attached to the tree alternately
- Fruits are large and oblong



Figure 8. Hickory leaf (Chris Evans, University of Illinois, Bugwood.org)



Figure 9. Pecan leaf (Paul Wray, Iowa State University, Bugwood.org)

Walnut

- Two species in NC
- 11-19 leaflets
- Leaflets arranged oppositely on the stem (Figure 10)
- Leaves attached to the tree alternately
- Crushed stems have a fragrant, sharp, piney-citrusy scent
- Fruits are large and round



Figure 10. Walnut leaf (Paul Wray, Iowa State University, Bugwood.org)

Sumac

- Four species in NC
- 9-11 leaflets
- Leaflets arranged alternately on the stem
- Leaves attached to the tree alternately
- Fruits are a large spike of small, red fruits



Figure 11. Sumac leaf (Andrey Zharkikh, CC BY 2.0)

Control

Identify and **remove** TOH where possible.

Treat stumps with herbicide to control root and stump sprouts. Multiple years of post-cutting control may be necessary.

Cut the tree bark and apply herbicide using the **hack and squirt** method. This method may require multiple applications but is less likely to produce root sprouts.

Notes

Apply all chemical control methods according to the rates, sites, and information on the label. Pesticide labels aren't just guidelines—they're legal requirements. Always read and follow them carefully.

Want to learn more?

Visit

<https://forestry.ces.ncsu.edu/forestry-health/spotted-lanternfly/>

- OR -

Contact your County Extension Agent at

<https://www.ces.ncsu.edu/local-county-center/?ask>

Looking to replace TOH?

Learn more about native tree options at

<https://plants.ces.ncsu.edu/plants/ailanthus-altissima/>

Have you seen SLF?

Submit a sighting to the NCDA&CS Reporting Tool

- OR -

Email badbug@ncagr.gov

Scan to Report Sightings

