

The Next Landscape Invader: Arborists Prepare for Spotted Lanternfly (*Lycorma delicatula*)

By Michael J. Raupp

Arrival and Spread

In what has become a never-ending stream of invasive species landing in the United States, a new arrival, the spotted lanternfly, was first detected in Berks County, Pennsylvania, in 2014. This region was made famous two decades ago with the arrival of the infamous brown marmorated stink bug (*Halyomorpha halys*) in neighboring Lehigh County. How spotted lanternfly arrived in the U.S. is not clear, but like many recent invaders, this one is an excellent stowaway and likely arrived as an egg mass on a shipment of stone goods from Asia. In addition to its native China, the spotted lanternfly is invasive in Korea, Taiwan, and Vietnam.

Since its discovery in Pennsylvania, the bug has been detected in New Castle County, Delaware, in 2017, and in Delaware County, New York, and Frederick County, Virginia, in the winter of 2018. First discovered in one

small area of Berks County, spotted lanternfly has spread rather slowly throughout much of southeastern Pennsylvania, but it appears to be gaining momentum, and the following Pennsylvania counties are under quarantine for this pest: Berks, Bucks, Chester, Lehigh, Montgomery, Northampton, Monroe, Carbon, Schuylkill, Lebanon, Lancaster, Delaware, and Philadelphia.

What is the Lanternfly?

Spotted lanternfly is not a fly at all. Spotted lanternfly belongs to a group of insects known as fulgorids, part of a large clan of insects called the Hemiptera, a coterie of other sap-feeding plant pests that includes aphids, soft scales, mealybugs, and whiteflies. The common name, lanternfly, was applied to some fulgorids with the mistaken belief that their large heads were luminescent. Like the aforementioned plant pests, lanternflies pierce plants with soda-straw-like mouthparts, tap into the vascular tissue, and remove sap.

In the case of the spotted lanternfly, nutrient rich phloem is their target. Both adults and the youngsters, called nymphs, remove large quantities of phloem sap from the tree as they feed. The excess is excreted from their rear end as a sugary waste product called honeydew. And herein lies the problem: more than 70 species of ornamental trees, fruit-bearing trees, and vines (e.g., grapes) serve as hosts for spotted lanternflies. Hundreds of these rascals have been observed feeding on a single plant, where they rain copious amounts of honeydew on vegetation and objects below.

As with honeydew from soft scales and aphids, the honeydew excreted by lanternflies fouls foliage. This honeydew means **fruit-making** leaves are sticky and the fruit itself becomes unmarketable, thus presenting a huge economic problem for growers of apples, cherries, peaches, and grapes. And as with other phloem feeders, honeydew serves as a substrate for the growth of fungus known as sooty mold, which further disfigures leaves and fruit. Sweet honeydew and its fermentation products also attract a variety of stinging insects, like yellow jackets and wasps, adding a new source of concern for folks with



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Spectacularly beautiful but nonetheless harmful, spotted lanternflies provide yet another challenge in the never ending battle with invasive species.



lanternflies feeding on their trees. Vast numbers of probing mouthparts may cause direct injury to plants as well. In some reported cases, lanternflies have been so numerous that their feeding caused wilting and dieback of branches.

Tree-of-Heaven Strikes Again

In addition to creating headaches for fruit growers, spotted lanternflies have been reported on several native and non-native ornamental plants and street trees common to North America, including maples, birches, walnut, magnolia, tulip tree, black locust, mulberry, sycamore, lilac, apple, cherry, peach, evodia, poplar, willow, *Styrax*, zelkova, Virginia creeper, and grape.

However, one plant that seems especially important to their biology is Tree-of-Heaven (*Ailanthus altissima*), an invasive and urban colonist made famous by novelist Betty Smith (*A Tree That Grows in Brooklyn*, 1943). Tree-of-Heaven is a widely distributed invader of disturbed habitats and is a favored host for another insect invader from Asia, the brown marmorated stink bug. Spotted lanternflies laden with eggs also find Tree-of-Heaven a preferred host for egg laying. Adults and nymphs sucking sap of Tree-of-Heaven are thought to imbibe toxic alkaloids from their host, thereby making themselves toxic. This is problematic when lanternflies infest vineyards and taint grapes grown for fresh market or wine.

The toxicity of this pest has appeared elsewhere, too. Lanternflies' proclivity to feed on toxin-laden plants has been exploited in Eastern cultures for medicinal purposes. In a recent conversation, I learned that pets that had eaten lanternflies became ill. The literature provides similar accounts of birds vomiting after consuming lanternflies.

And although the spotted lanternfly has been mentioned as a possible biological control agent for Tree-of-Heaven, there are no reports of lanternflies limiting the spread of the invasive tree. Interestingly, the bugs' fondness for *Ailanthus* makes Tree-of-Heaven an excellent sentinel plant, one that should be inspected to detect incipient infestations of the lanternfly. On a recent trip through southeastern Pennsylvania, three stops along the interstate highway yielded positive detections of spotted lanternfly on roadside Tree-of-Heaven.

Seasonal History



The spotted lanternfly has a single generation in its native range, and the same holds true for infested areas within the United States. Winter is spent as eggs. The female lanternfly deposits eggs in rather nondescript batches of 30–50, cloaked with a gray, waxy, mud-like cover roughly one inch long that turns brown with age. Beneath the cover, seed-like eggs are deposited in four to seven parallel rows per mass. These egg masses are often laid on tree trunks and branches but have also been discovered on substrates such as stones, vehicles, and lawn furniture. It's easy to see how this bug might have arrived undetected with a shipment of goods from a foreign land.



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Later in spring and summer, nymphs turn red and black with white spots. Hundreds are sometimes seen aggregating on tree trunks to feed.

In spring, as temperatures warm, eggs hatch and tiny nymphs begin to suck up plant sap. Four nymphal stages feed throughout the spring and summer, and adults appear in mid-summer and linger into autumn when eggs are laid. Body colors of nymphs is first black and later red, speckled with white spots. Adults are moth-like, with brownish forewings bespectacled with dark spots, and dazzling hindwings sporting red, black, and white with dark spots. The bright colors of the adult are thought to warn predators of the noxious nature of the insect.

What's Being Done?

To date, more than 1.5 million spotted lanternflies have been killed by volunteers in Berks and surrounding counties. At present, a quarantine to stop its spread to new areas and to slow its spread within the quarantined area has been placed around municipalities in thirteen counties in southeastern Pennsylvania, as well as portions of Delaware and Virginia.

The quarantine in Pennsylvania restricts the movement of:

*Any living stage of the spotted lanternfly, *Lycorma delicatula*. This includes egg masses, nymphs, and*

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This female lanternfly, with an abdomen full of eggs, will soon deposit them in an egg mass on the tree.

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It's easy to see how the non-descript egg masses of the spotted lanternfly, like this one on the bole of a tree, sneak past human detection and move about the world. If you discover an egg mass, nymphs, or adult spotted lanternflies, report these to your University Extension Service or State Department of Agriculture.

adults. Brush, debris, bark, or yard waste; landscaping, remodeling or construction waste; logs, stumps, or any tree parts; firewood of any species; grapevines for decorative purposes or as nursery stock; nursery stock; crated materials; outdoor household articles including

recreational vehicles, lawn tractors and mowers, mower decks, grills, grill and furniture covers, tarps, mobile homes, tile, stone, deck boards, mobile fire pits, any associated equipment and trucks or vehicles not stored indoors.

Delimiting surveys are being conducted to determine the distribution of the bug, and attempts are underway to destroy the pest where it is found. Initially, Pennsylvania received nearly USD \$1.5 million of federal aid to conduct research, implement control, and develop outreach programs. In February 2018, the USDA announced that an additional \$17.5 million dollars would be committed to stopping the spread of the spotted lanternfly in Pennsylvania.

Intervention is implemented in a variety of ways. Homeowners can scrape egg masses from trees before they hatch in spring. Sticky barrier bands placed around the trunks of trees can help prevent wandering lanternfly nymphs from ascending trees that seems to be a regular part of their host selection behavior (brown-colored sticky bands are more effective in trapping nymphs than those of other colors).

Fortunately, several insecticides labeled for use on ornamental trees and shrubs have proven effective in killing lanternfly nymphs and adults in research programs conducted in Korea. Some of these compounds, including pyrethrum and neem extracts, are also found in products on the EPA's reduced-risk list and the list of products used for organic food production created by the Organic Materials Review Institute. These active ingredients should be used whenever possible to minimize risk to the environment and non-target organisms, including pollinators and natural enemies.

In Asia, a host of predators and parasitoids attack spotted lanternfly and keep populations of lanternflies at bay in their native range. Scientists from the USDA have already ventured to Asia to search for natural enemies of the spotted lanternfly that might be candidates for importation and release to help combat this invader. As of yet, the impact of indigenous natural enemies on this pest in the invaded range are unknown. However, one parasitic wasp that attacks eggs of gypsy moth has been found to attack eggs of spotted lanternfly as well.

Due to the intimate association between Tree-of-Heaven and spotted lanternfly, some growers are removing Tree-of-Heaven from wooded edges near their orchards and tree nurseries. Arborists may wish to have a discussion with their clients, particularly those with fruit trees or grapes, regarding the removal of *Ailanthus* on, or adjacent to, their properties.

What can arborists and private citizens do to help? Now that spring has finally arrived and summer is nigh, egg masses will have hatched in May and young nymphs will be present on boles of trees and other objects in the landscape. Trees listed as hosts for egg masses in the United States include many native species: *Acer rubrum*, *Fagus*

grandifolia, *Quercus montana*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Prunus serotina*, as well as several non-native ones where egg masses were found in Asia: *Ailanthus altissima*, *Acer palmatum*, *Betula platyphylla*, *Syringa vulgaris*, *Prunus serrulata*, *Prunus × yedoensis*, *Tetradium daniellii*, *Populus* spp., *Salix* spp., and *Zelkova serrata*.

As for online resources, the Pennsylvania Department of Agriculture has established a remarkable web site to assist citizens with identification of this new pest, learning how to destroy egg masses, and for reporting sightings in general. If you discover an egg mass, nymphs, or adult lanternflies, report these to your University Extension Service or State Department of Agriculture.

In an ever-changing world, where a global economy has resulted in a global biota, arborists are likely to be the first ones to discover new invaders as they arrive and spread. You are the boots on the ground and have a role to play in detecting and limiting the spread of the unrelenting legions of invasive species.

Additional Reading (general)

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The ability of Tree-of-Heaven to colonize highly disturbed and disregarded landscapes, like this truck stop on a major interstate highway, provides opportunity for populations of spotted lanternflies to build completely unnoticed and to stowaway on vehicles parked nearby. Dozens of lanternflies dotted the trunks of these trees.

Pennsylvania

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frequently appears on television and radio. His most recent book, 26 Things That Bug Me, published by ISA, introduces youngsters to the wonders of insects, while Managing Insects and Mites of Woody Plants: An IPM Approach, a standard for arborists is in its third printing and is available through TCIA. His research and outreach are supported through grants from TREE Fund, and the USDA–SCRI and USDA–McIntire–Stennis Programs. Visit his websites (www.bugoftheweek.com and YouTube Bug of the Week).

Factual details in this article came can be attributed in part to Dara et al. (2015) and Swett Walker (2018).

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More information on spotted lanternfly, including how to report sightings can be found within the additional reading resources.