

National Pest Alert

Spotted Lanternfly

Lycorma delicatula (White, 1845) (Hemiptera: Fulgoroidea: Fulgoridae)

Origin and Distribution

The spotted lanternfly is an invasive sap-feeding planthopper, first discovered in the United States in Berks County, Pennsylvania in 2014. Field observations indicate that the tree of heaven, *Ailanthus altissima*, is an important host plant; however the spotted lanternfly is known to feed on a wide range of hosts including wild and cultivated grapes, stone fruits, willow, and various hardwoods. This species is thought to be native to China, and has spread to other Asian countries. In 2004, it was first detected in Korea, where its populations expanded and it became an economically important pest of grapevines and fruit trees. In Korea, it damaged plants directly by phloem feeding, but also caused indirect damage due to mold that grew on honeydew excretions deposited on the leaves and fruits of host plants. It was recorded utilizing 67 host plant species in Korea, many of which also occur in the U.S. Given the wide range of hosts it feeds upon, the spotted lanternfly poses a serious economic threat to multiple U.S. industries, including viticulture, fruit trees, ornamentals and timber.

Life Cycle and Identification

The spotted lanternfly population overwinters as egg masses and has a one year life cycle. In Pennsylvania, the first nymphs hatch in late April to early May and are less than ¼ inch long. Nymphs develop through four stages, all of which are wingless and incapable of flight. The first three nymphal stages are black with white spots and appear “tick-like.” Fourth instars develop red patches on the body and are over ½ inch long. Adults begin to appear in mid-July and are approximately one inch long and ½ inch wide, with wings folded. The forewing is gray with black spots near the base, and the tips are black with a dense series of lighter gray crossveins. The hindwings are bright red at the base, and have an adjacent region that is black



Early instar nymphs (1st through 3rd) feeding on grape



Profile of adult SLF on grape

with a white band. The abdomen is yellow with black bands down the center.

Third and fourth instars and adults migrate to tree of heaven as a preferred host. Adults mate in late summer to early fall in Pennsylvania and form large congregations. Although these have been observed on grapevine, willow, maple, and other tree species, they most commonly occur on tree of heaven. Females lay eggs from late September through October and dozens of egg masses can be found near adult aggregations. Eggs are deposited on tree trunks, limbs, and loose bark as well as any smooth surface, including stone, vehicles, trash barrels, outdoor furniture, and other man-made structures. Newly laid egg masses have a gray, mud-like covering, which can become dry and cracked over time. Old egg masses appear as four to seven columns of seed-like eggs, 30–50 eggs in total, approximately one inch long.



Egg masses of *L. delicatula* covered by waxy deposits

and appear “tick-like.” Fourth instars develop red patches on the body and are over ½ inch long. Adults begin to appear in mid-July and are approximately one inch long and ½ inch wide, with wings folded. The forewing is gray with black spots near the base, and the tips are black with a dense series of lighter gray crossveins. The hindwings are bright red at the base, and have an adjacent region that is black



Four nymphal instars of *L. delicatula*

Pennsylvania Department of Agriculture

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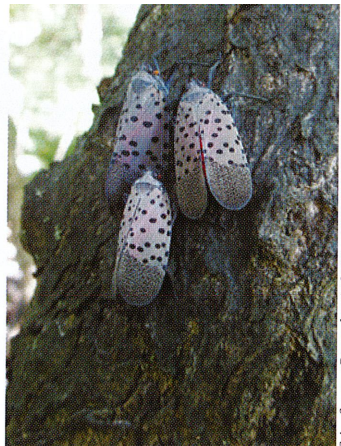


United States
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Sooty mold growing on the surface of a grape leaf



Three adult spotted lanternfly



Adults aggregating/feeding on a tree of heaven

Potential Spread and Impact

Given that egg cases are deposited on such a wide variety of surfaces, this is the life stage that may have the greatest potential for spread via accidental transport to new areas. As of December 2016, the spotted lanternfly has been detected only in the southeastern region of Pennsylvania, specifically in areas surrounding Berks County.

Nymphs are flightless and may pose less of a threat for spread. However, they have been observed feeding upon over 30 species of host plants in Pennsylvania, demonstrating the spotted lanternfly is mobile and capable of dispersing to some degree as immatures. The primary host, tree of heaven, is itself an introduced invasive species that occurs throughout much of the U.S. It is considered an edge species and grows quickly in disturbed sites, including along roadways and powerline corridors. As such, corridors of tree of heaven may provide opportunities for spotted lanternfly to spread.

Although adults are capable of flight, they are relatively weak flyers, relying instead on strong jumping to evade danger. Mated females pose a high risk for establishing new populations by accidental transportation on vehicles, such as open bed trucks, and introduce their offspring to new areas. Infested municipalities are under a quarantine that covers all living life stages of the pest and its conveyances.

Trees of heaven fed upon by congregations of adults may exhibit weeping of sap along the trunk as well as build ups of honeydew excrement. Black sooty mold fungus grows on the honeydew on the tree as well as on surrounding soil and understory plants. Weeping sap and/or honeydew build ups attract ants, bees, wasps, hornets, and flies.

Management

Management efforts are targeted at multiple life stages of the spotted lanternfly. Egg masses can be scraped off of surfaces where they are found. Brown sticky bands are effective in catching nymphs on trees. Adults are controlled using a combination of *Ailanthus* host

reduction and establishment of trap trees treated with systemic insecticide, which has shown to be capable of removing significant numbers of adults in the population.

Reporting

Early detection is vital to the control of spotted lanternfly. If you find an insect or egg case that you suspect is a Spotted Lanternfly, you should collect it and immediately report it to authorities. Place the insect or egg case into a container of alcohol to kill and preserve it. Egg cases can also be collected into a ziplock bag and killed with hand sanitizer. It is important to record where you found the insect and include the following information for each sample collected: date; substrate found on (e.g., species of tree, or for egg case, structure it was found on); collector's name; phone number; collection location including state, county, and address or nearest intersection; GPS coordinates, if available.

To report the finding in Pennsylvania, report it to the Pennsylvania Department of Agriculture by emailing to: Badbug@pa.gov. Outside of Pennsylvania, call the Invasive Species Hotline: 1-866-253-7189, report to Badbug@pa.gov or contact your local Extension office.

For more information on this pest, its management and quarantine in Pennsylvania, please see agriculture.pa.gov/protect/plantindustry/spotted_lanternfly/ or ncipmc.org/action/alerts/spotted_lanternfly.php.

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Time to use management practices.

SPOTTED LANTERNFLY MANAGEMENT CALENDAR

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
Destroy egg masses												
Destroy most <i>Ailanthus altissima</i> trees ¹												
Treat most <i>Ailanthus</i> trees with herbicide ^{2,3}												
Use sticky bands to destroy nymphs												
Treat <i>Ailanthus</i> trap trees with systemic insecticides ³												
Registered contact insecticides may be effective ³												
Avoid moving gravid (fertilized) females ⁴												
Avoid moving viable egg masses ⁴												

PEDOMINANT LIFE STAGE PRESENT- (one generation per year in Pennsylvania in 2015 and 2016)

eggs												
nymphs												
adults												

¹ Destroying all *Ailanthus* trees (Tree of Heaven) may result in spotted lanternfly moving to surrounding plants and increase the pest pressure on them. It is recommended about 15% of *Ailanthus* trees are left alive to serve as trap trees to attract the spotted lanternflies. Leave only male trees if possible.

² *Ailanthus* trees will re-sprout vigorously from cut stumps and roots, unless they are treated with a systemic herbicide. Repeat applications of herbicide may be necessary.

³ ALWAYS READ HERBICIDE AND INSECTICIDE LABELS AND FOLLOW THE DIRECTIONS

⁴ Before you move outdoor items from the quarantine area, check for spotted lanternfly egg masses, adults, and nymphs and destroy them. Use the checklist at http://www.agriculture.pa.gov/Protect/PlantIndustry/spotted_lanternfly/Documents/SLF%20Checklist%2011-12-2014.pdf

People are looking for specific approaches to pest management to minimize off-target exposure to pesticides. This type of strategy is known as Integrated Pest Management (IPM). The Pennsylvania Department of Agriculture (PDA) has been using an IPM strategy for spotted lanternfly infestations, and landowners may consider using the same IPM strategy on their properties, or hiring a professional service to do it.

IPM Strategy for the Spotted Lanternfly:

1. Locate *Ailanthus altissima* trees on the site. For reasons not understood, spotted lanternfly seem to prefer some individual *Ailanthus altissima* trees over others. Try to identify the specific *Ailanthus* trees that are most attractive to the insects, based on how many are feeding on them. For information on how to identify *Ailanthus altissima* and how to control it, see this fact sheet: <https://pubs.ext.vt.edu/420/420-322/420-322.html>.
2. Destroy approximately 85% of the *Ailanthus altissima* trees, leaving only a few that are most attractive to the insect. They will serve as "trap" trees. It is recommended that you try to kill all the female *Ailanthus altissima* trees, because they produce seed and contribute to the spread of this invasive tree.

Be careful handling *Ailanthus altissima* wood, leaves, and branches. Exposure to chemicals in the sap of this tree can cause headaches, nausea, and possible heart problems. Wear gloves and protect yourself from exposure.

When you cut down *Ailanthus altissima* trees, they will sprout profusely from the stumps and roots and can grow back in a few years. Because they regenerate so easily, it is highly recommended that you treat the stumps with a herbicide to kill them and prevent them from sprouting new shoots.

Herbicides that are labelled for this use usually contain one of the following active ingredients: triclopyr, dicamba, imazapyr or glyphosate. Use the herbicide carefully and according to the label directions. Methods for using herbicides to kill *Ailanthus altissima* trees include foliar sprays, basal bark applications, and a method called frill application or "hack and squirt." For more information about these methods go to <https://extension.psu.edu/herbicides-and-forest-vegetation-management>. Whatever method you choose, remember that you will have dead

Ailanthus trees which may eventually have to be removed.

3. Treat the remaining *Ailanthus altissima* trees with a systemic insecticide that will move throughout the tree. The insecticide must be applied according to the label and at the right time of year for the trees to absorb it. When spotted lanternflies feed on correctly treated trees, they will die. Systemic insecticides that are labelled to treat ornamental trees usually contain the active ingredients dinotefuran or imidacloprid. The PDA is using dinotefuran in their IPM strategy.

Treating only a few trap trees with a systemic product can reduce the amount of insecticide released into the environment and may help conserve beneficial insects.

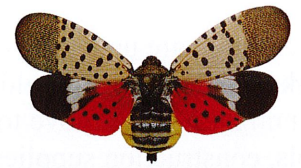
Prepared by: Emelie Swackhamer, Horticulture Extension Educator, Montgomery County, December, 2017.

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Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

Where trade names appear, no discrimination is intended, and no endorsement by Penn State Extension is implied.

This publication is available in alternative media on request.



How You Can Comply with the Spotted Lanternfly Quarantine Regulations

There is a new invasive insect in southeastern Pennsylvania, *Lycorma delicatula*, commonly known as the spotted lanternfly (SLF). This insect has the potential to be harmful to grapes, stone fruit, and trees. To try to limit the spread of SLF, the Pennsylvania Department of Agriculture (PDA) has established a quarantine order in counties where SLF already exists. All residents and businesses must comply with the regulations.

The PDA has the authority to fine anyone who willfully violates the quarantine order.

Here are some tips to help you avoid spreading SLF and be in compliance with the regulations.

- 1. Learn about which counties are included in the quarantine order. The area of the quarantine will continue to change as new discoveries are made.** As you move into and out of the quarantined area, you must make sure that you are not transporting any living life stages of the SLF to new areas which are not yet included in the quarantine. If you believe you have discovered SLF in any area outside of the current quarantined area, report your discovery to the PDA by sending a picture to badbug@pa.gov or calling 1-866-253-7189. The most recent quarantine map can always be found at this site: http://www.agriculture.pa.gov/protect/plantindustry/spotted_lanternfly/Pages/default.aspx
- 2. Learn about what SLF looks like in every stage of its development throughout the year.**



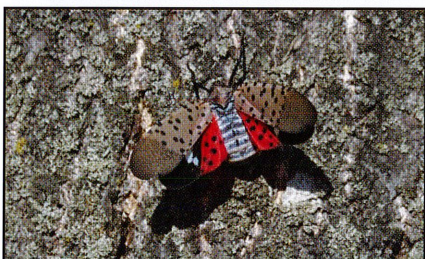
The young nymphs are black with white spots and can be present from May until October.



The older nymphs are black and red with white spots and can be present from June until October.



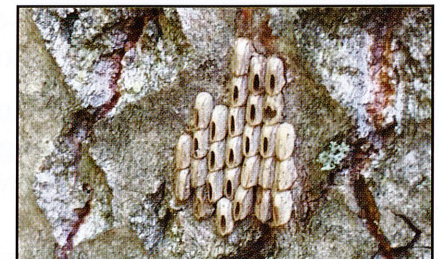
The adults (shown at rest) can be present from July until late December. The adults are 1 to 1 1/4 inches long.



*An adult showing the red underwings when disturbed
(photo credit: Nancy Bosold)*



The egg masses can be on trees, rocks, or any other solid object and can be present from September through May.



The empty remains of the eggs that have hatched can be found at any time of the year.

To see additional pictures of SLF go to:

<https://extension.psu.edu/spotted-lanternfly-what-to-look-for>

- 3. You should avoid parking or storing things under trees in infested areas.** The female SLF often lays eggs on

(continued)

objects that are under the trees she is feeding on. **You should try to change your habits about where you park.** Park vehicles in open fields, away from tree lines, or in a closed garage if possible. You should not store things that you might need to move to outside of the quarantined area under infested trees. These things include firewood, tools, construction supplies, equipment, or any other solid object.

4. Inspect all items that you need to move from within the quarantined area to areas outside the quarantined area. You should remove and destroy any SLF that you find before you move the item. Also check all vehicles, trailers, campers and equipment including around windshield wipers, grills, wheel wells, and truck beds. Inspect plant material, woody debris, lawn furniture, construction supplies, tools, and all solid objects. Remove SLF manually or use a pressure washer. You can destroy mobile stages of SLF mechanically by crushing them. Destroy eggs by smashing them or scraping them into a container of rubbing alcohol.

5. All businesses should consider entering into a compliance agreement with the PDA. A compliance agreement states that you know how to follow the rules of the quarantine order and agree to do all you can to ensure that the items you transport are not carrying SLF. The PDA is maintaining a list of companies who have set up compliance agreements at http://www.agriculture.pa.gov/protect/plantindustry/spotted_lanternfly/Pages/default.aspx, and people check this list to find companies who are in compliance. You will also receive documentation to share with your customers to show that you have a compliance agreement with the PDA. Contact your regional PDA office for more information: <http://www.agriculture.pa.gov/regional-offices/Pages/default.aspx>

6. Use the checklist for residents if you need to move items that are not included in a compliance agreement through a business. This checklist is a legal document to show that you have inspected the item, removed and destroyed any living life stages of SLF and you are in compliance. You can print the checklist, fill it out, sign it and take it with you when you move the item(s).

The checklist is available at this link: http://www.agriculture.pa.gov/Protect/PlantIndustry/spotted_lanternfly/Documents/SLF%20Checklist%2011-12-2014.pdf

7. If you sell plants, you should have them inspected by the PDA and receive a phytosanitary certificate.

Pennsylvania law requires horticultural businesses that produce and/or sell plants to have either a Nursery/Greenhouse License or a Nursery Dealer's License. When you have a license plant inspectors will check your plants and if they are found to be free of pests, you will receive a phytosanitary certificate as proof of this inspection.

<http://www.agriculture.pa.gov/Protect/PlantIndustry/Phytosanitary/Pages/default.aspx>

8. If you sell and/or produce mulch you must use specific practices to ensure it does not harbor SLF. The specific practices are outlined in the fact sheet at this link: <https://extension.psu.edu/spotted-lanternfly-tips-for-handling-yard-waste-in-quarantined-areas>

You should note that the SLF regulations do not apply to grass clippings or autumn leaf collection. We believe that the SLF does not lay eggs on these light weight objects. Clippings and leaves may be moved from the quarantine area if necessary, as long as the truck and/or trailer you are hauling them with has been checked.

The regulations of the spotted lanternfly quarantine order are in place to prevent the SLF from being spread by people. This pest is not just a concern to agricultural and horticultural professionals, it is a community concern. To protect the agriculture industry, we need everyone to be aware of the best practices to avoid spreading SLF and use these practices in their daily activities.

You can see the official quarantine order, a summary in plain language and find more information at this link: http://www.agriculture.pa.gov/protect/plantindustry/spotted_lanternfly/Pages/default.aspx

Additional information is at this link:

<https://goo.gl/kmSy5R>

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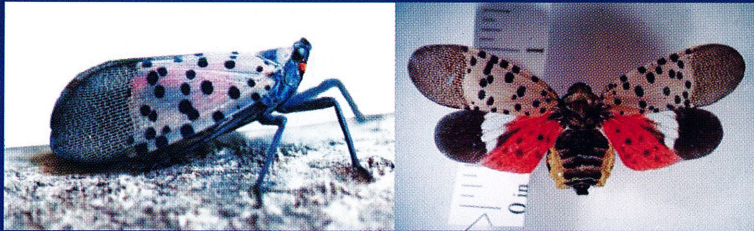
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Checklist for Residents

Living in Spotted Lanternfly Quarantine Areas

IMPORTANT: Before you move outdoor items from the quarantine area, check for spotted lanternfly egg masses, adults, and nymphs. Make sure all items are pest free before you move them. Help keep this pest from spreading.

If you find any of these life stages of the Spotted Lanternfly, remove, devitalize, place in a sealed bag, and dispose of bag in the garbage.



Adult Spotted Lanternfly, present in autumn months.



Spotted Lanternfly nymphs, present in spring and summer months.



Spotted Lanternfly egg masses are laid on most surfaces in autumn and are present throughout the winter months.

By signing this checklist, I am confirming that I have inspected my vehicle and those items I am moving from the Spotted Lanternfly quarantine area, and do not see any egg masses or insects in or on anything I am moving.

Signature _____ Address _____ Date _____

Please sign, date, and keep this checklist in your vehicle with you – use it each time you need it.

For more information, visit the Pennsylvania Department of Agriculture website:
www.agriculture.pa.gov/Protect/PlantIndustry/spotted_lanternfly

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Check before you move

Recreational or Camping Items

- | | | |
|--|--|--------------------------------|
| <input type="checkbox"/> Backpacks | <input type="checkbox"/> Ice chests | <input type="checkbox"/> Tarps |
| <input type="checkbox"/> Basketball backboards | <input type="checkbox"/> Motorcycles | <input type="checkbox"/> Tents |
| <input type="checkbox"/> Bicycles | <input type="checkbox"/> Motor homes | <input type="checkbox"/> Other |
| <input type="checkbox"/> Boats/Boat trailers | <input type="checkbox"/> Recreational vehicles | |
| <input type="checkbox"/> Campers | <input type="checkbox"/> Snowmobiles | |

Outdoor Household Items

- | | | |
|--|---|---|
| <input type="checkbox"/> Barrels | <input type="checkbox"/> Propane or oil tanks | <input type="checkbox"/> Storm/Screen doors and windows |
| <input type="checkbox"/> Cardboard or wooden boxes | <input type="checkbox"/> Trash cans | <input type="checkbox"/> Window awnings |
| <input type="checkbox"/> Outdoor poles | <input type="checkbox"/> Refrigerators/Freezers | <input type="checkbox"/> Outdoor furniture |
| <input type="checkbox"/> Plant containers | <input type="checkbox"/> Storage sheds | <input type="checkbox"/> Other |
| <input type="checkbox"/> Firewood | <input type="checkbox"/> Shutters | |

Building Materials

- | | | |
|---|--|--|
| <input type="checkbox"/> Bricks/Cinder blocks | <input type="checkbox"/> Roofing materials | <input type="checkbox"/> Skidsters/Forklifts |
| <input type="checkbox"/> Cement mixing tubs | <input type="checkbox"/> Tools and toolboxes | <input type="checkbox"/> Pipes |
| <input type="checkbox"/> Lumber | <input type="checkbox"/> Workbenches | <input type="checkbox"/> Other |

Yard and Garden Items

- | | | |
|---|---|---|
| <input type="checkbox"/> Dog houses, rabbit sheds, chicken coops, etc | <input type="checkbox"/> Garden tillers | <input type="checkbox"/> Signs and posts |
| <input type="checkbox"/> Barbecue grills | <input type="checkbox"/> Yard decorations | <input type="checkbox"/> Storage sheds |
| <input type="checkbox"/> Carts | <input type="checkbox"/> Garden tools | <input type="checkbox"/> Tractors and trailers |
| <input type="checkbox"/> Cold frames | <input type="checkbox"/> Backhoes | <input type="checkbox"/> Trees, shrubs and plants |
| <input type="checkbox"/> Fencing | <input type="checkbox"/> Lawnmowers | <input type="checkbox"/> Other |

Children's Playthings

- | | | |
|---------------------------------------|---|--------------------------------|
| <input type="checkbox"/> Play houses | <input type="checkbox"/> Bicycles, scooters | |
| <input type="checkbox"/> Kiddie pools | <input type="checkbox"/> Sandboxes | <input type="checkbox"/> Other |