



# Spotted Lanternfly

*Lycorma delicatula*  
Winter/Spring/Summer 2018



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Discovered in Berks County in  
September 2014

- The report detailed damage to  
*Ailanthus altissima* (Tree of  
Heaven) by an unknown insect

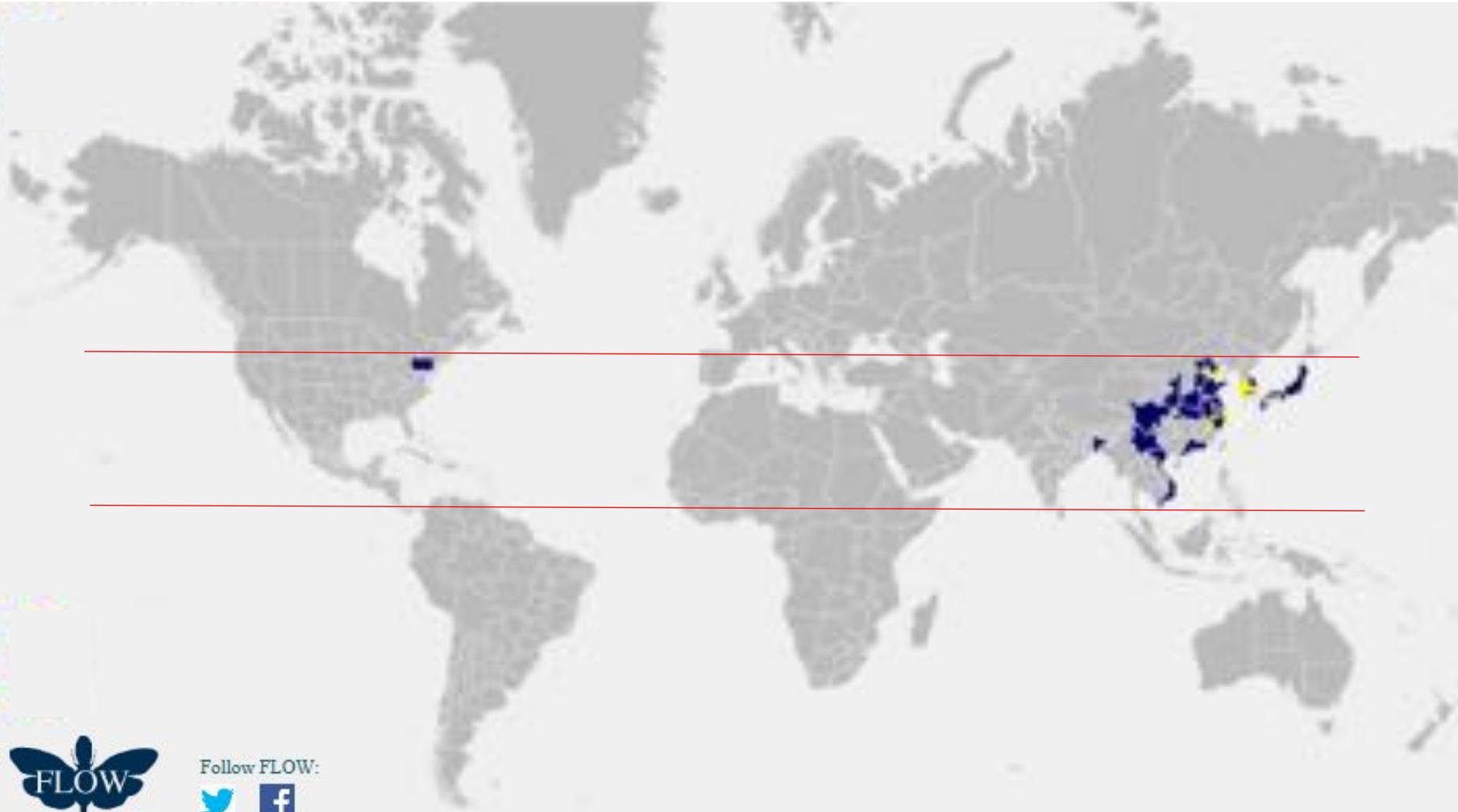
Estimated arrival in PA was  
during 2012

Native to parts of Asia

Recently introduced to South  
Korea, Japan, and Pennsylvania



# Spotted Lanternfly in Pennsylvania



Follow FLOW:



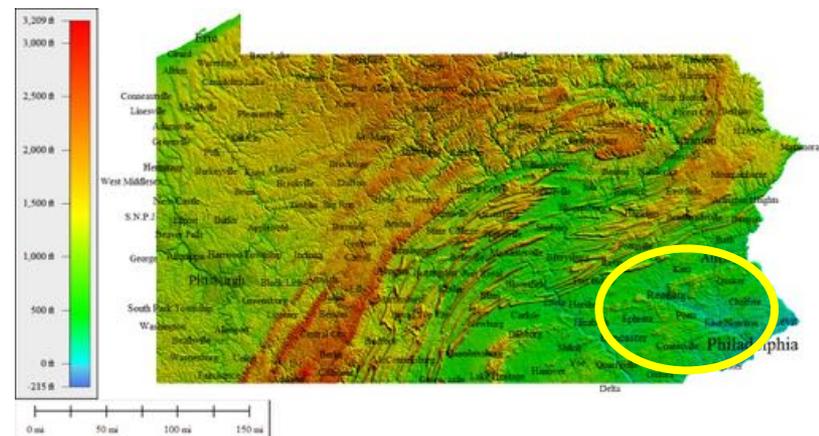
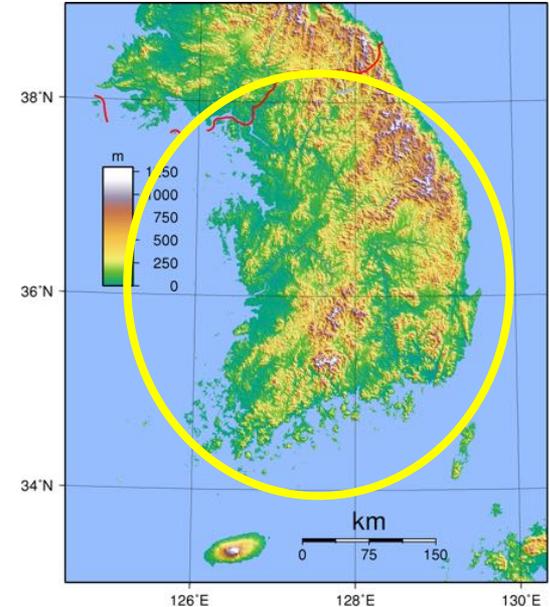
# Spotted Lanternfly in Pennsylvania



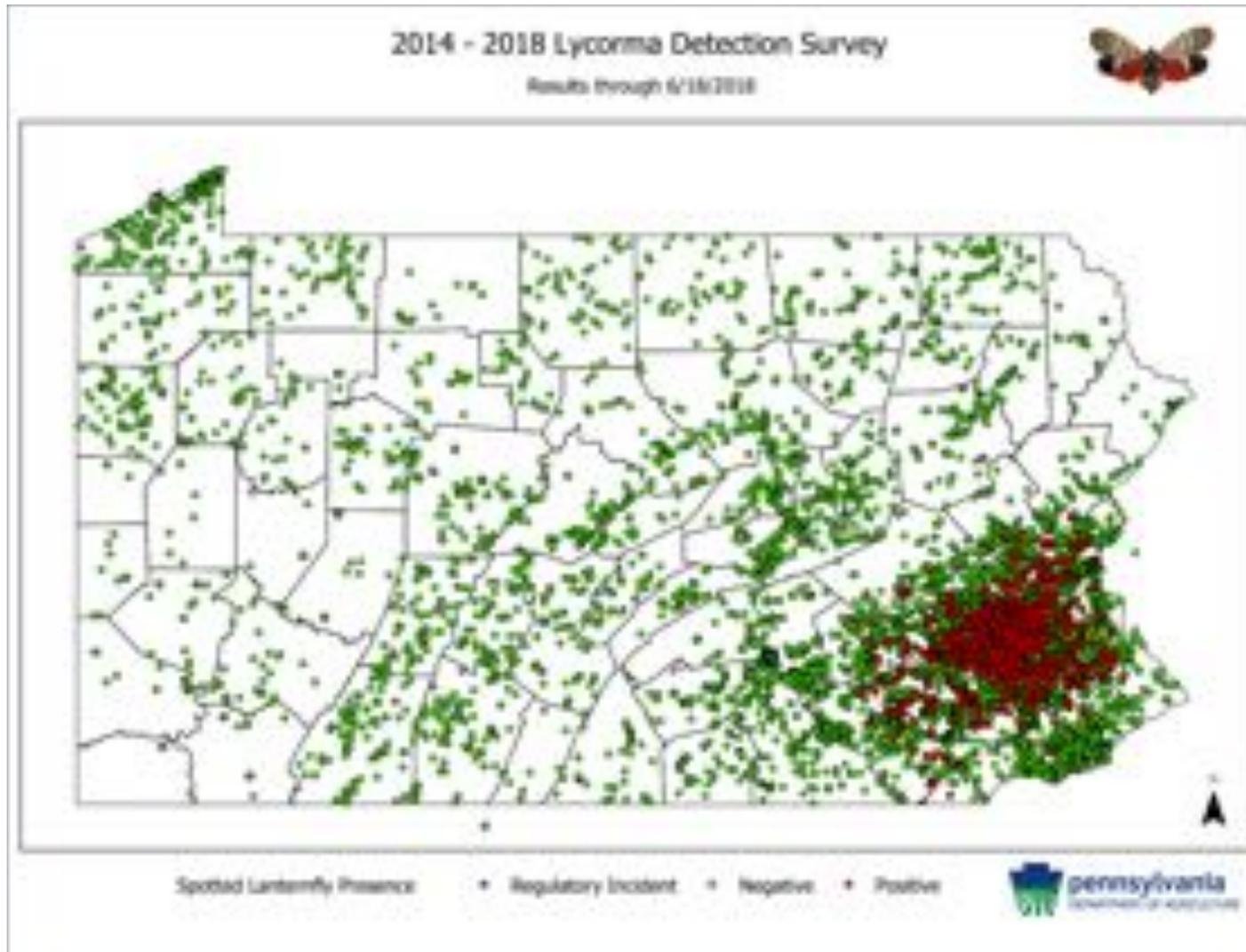
**South Korea at 38,622 sq. miles is slightly smaller than Pennsylvania at 46,055 sq. miles**

**South Korea completely infested in 3 years with 3 introductions**

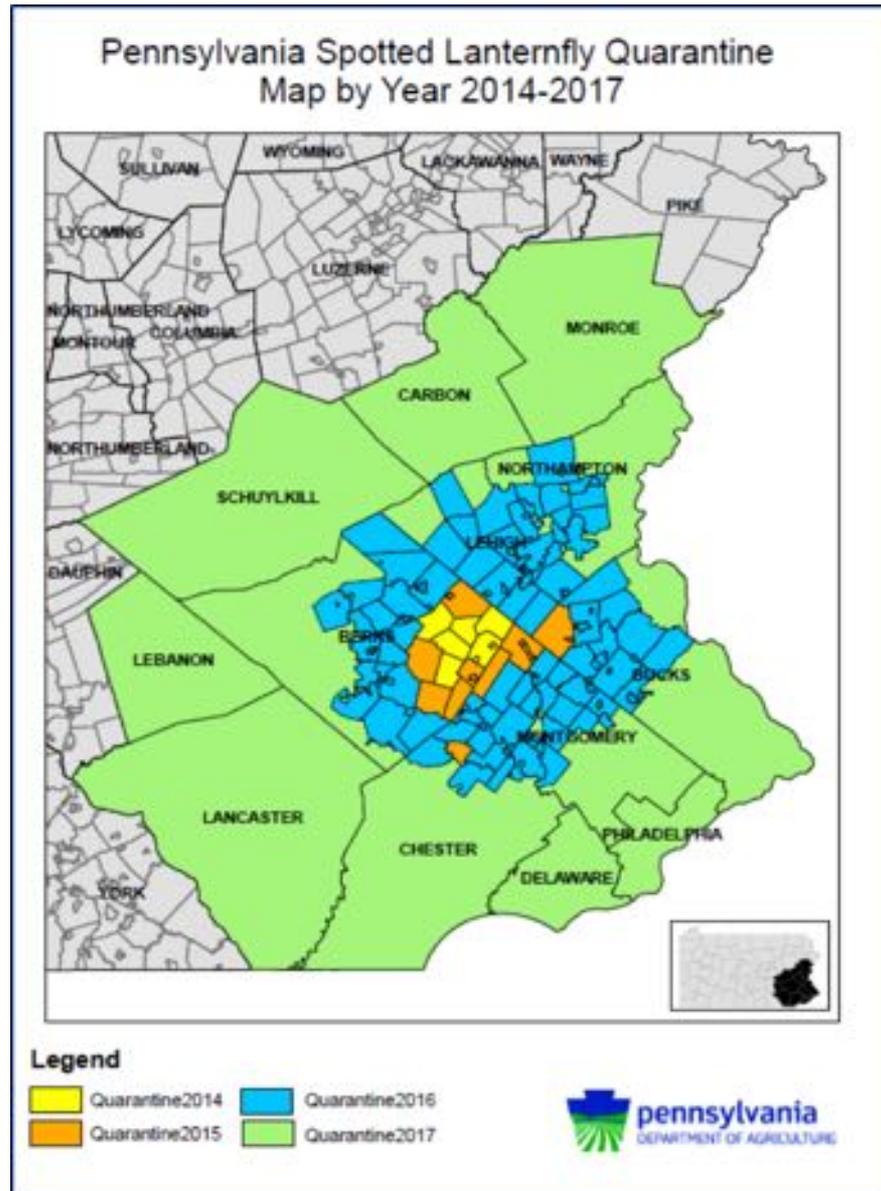
**PA still contained to small area, 1 introduction**



## Current Distribution



# Invasion process



**Spotted Lanternfly makes use of over 70 different plant species, but strongly prefers the invasive “Tree of Heaven”**



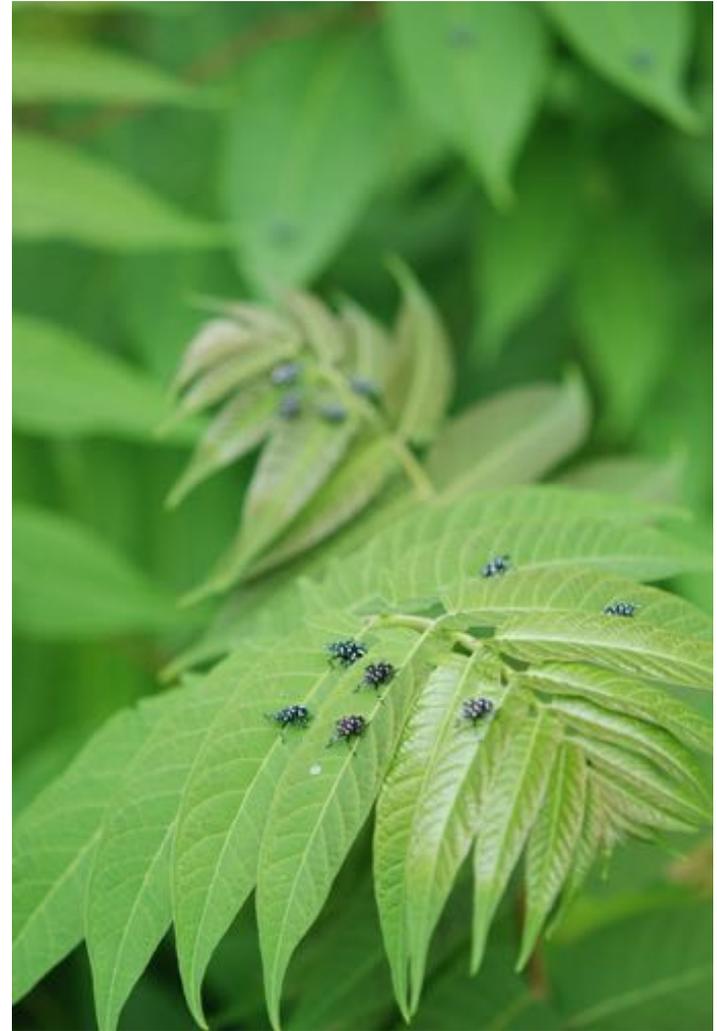
Tree of Heaven Distribution-USDA PLANTS Database



# Remove tree-of-heaven

Tree-of-heaven (*Ailanthus altissima*) is an invasive tree that is used in landscape design, and frequently found on the sides of roads and in other disturbed areas.

**It is the preferred host for SLF.** Removing tree-of-heaven may help reduce SLF populations.



# Spotted Lanternfly in Pennsylvania



**It is a pest of Agricultural commodities like Grape, Hops, Apples, Hardwoods, Nursery Stock, and makes use of numerous other plants and vines like basil, horseradish, oregano, cucumber, blueberry, bittersweet, Virginia creeper and many other plants.**



# Spotted Lanternfly in Pennsylvania



## Impact:

**Damage reported  
on basil,  
blueberry,  
cucumber and  
horseradish in  
2017**



# Spotted lanternfly risk

Current values of PA commodities affected:

- Forest Products: \$16.7 billion
- Grapes: \$28 million
- Apples: \$87 million
- Peaches: \$19 million
- Nursery and Landscape: \$944 million

No current estimate of losses:

- Property Values
- Tourism at PA parks and Game Lands
- PA Ecosystems
- New Business Initiatives
  - Port of Philadelphia
  - PA Preferred Brew

# National rankings of some threatened PA commodities

Hardwoods: #1 exporter in USA

Apples: 4<sup>th</sup> largest producer in USA

Peaches: 4<sup>th</sup> largest producer in USA

Grapes: 5<sup>th</sup> largest producer in USA





Erica Smyers, PSU

## Impact:

**Adult clustering, swarming, Honeydew accumulation can impact quality of life.**



## Sooty mold on grape



E. Smyers

# Sooty mold on deck



Barbara Bowen

# Spotted Lanternfly in Pennsylvania



Amy Korman

**As the population of spotted lanternfly grows, and the insect adapts, new threats to multiple industries emerge**

**It is clear that more help is needed to contain this pest**

**Everyone needs to work to control the insect**



# Spotted Lanternfly in Pennsylvania



**Industries, residents,  
and agencies must join  
forces to take steps to  
control spotted lanternfly**





**Adults: July - December**



**Egg Laying:  
September -  
November**



**Eggs: October - June**

## One Generation Per Year



**Fourth Instar:  
July - September**



**Third Instar: June - July**



**Second Instar: June - July**



**Hatch and 1st  
Instar:  
May - June**

# SLF life cycle

Egg masses

1<sup>st</sup>-3<sup>rd</sup> instar

4<sup>th</sup> instar

Adults



E. Swackhamer



PA Department of Agriculture



PA Department of Agriculture



PA Department of Agriculture



PA Department of Agriculture

- A. Egg masses
- B. Early nymph
- C. Late nymph
- D. Adult, wings closed
- E. Adult, wings open

## Best Time to Use Management Practices

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Destroy egg masses												
Use sticky bands to capture spotted lanternfly												
Registered insecticides can be effective <sup>1</sup>												
Avoid moving gravid (fertilized) females <sup>2</sup>												
Avoid moving viable egg masses <sup>3</sup>												

# First to third instar



**Fourth instar**



**Fourth instar + adults**





Spotted Lanternfly (*Lycorma delicatula*) 8 November 2014

Length 25 mm

Beak - 7 mm



Piercing-Sucking Mouthparts

**Adults**



**Egg-laying female**



# Egg masses



**November 2015**



**March 2016**



# Host range

## Preferred host:

*Ailanthus altissima* (tree of heaven)

## Feed on 70+ plants:

grape, apple,

black walnut, hops,

maple, birch, sycamore,

willow, staghorn sumac,

many others



# Damage

Oozing, leaf curl, wilting, and potential death of trees

Yield losses in apple, grape (no current estimate)

Transmission of pathogens unknown

Sooty mold -> decreased photosynthesis

# What steps can we take to prevent the spread of the Spotted Lanternfly?

## Steps of Spotted Lanternfly Management

- 1** Stop the spread
- 2** Scrape eggs
- 3** Band trees to catch nymphs
- 4** Remove tree-of-heaven
- 5** Apply insecticides



# Stop the spread

Don't move firewood

Check outdoor equipment (mowers, grills, furniture, etc.) before moving it in or out of the quarantine zone

Don't park under infested trees, and leave your windows rolled up



# Stop the spread



# Spotted Lanternfly Biosecurity

Spotted Lanternfly is an active hitchhiker and makes use of many modes of human assisted transport



# look

*before you leave!*



[AGRICULTURE.PA.GOV/SPOTTEDLANTERNFLY](http://AGRICULTURE.PA.GOV/SPOTTEDLANTERNFLY)

# 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.

### Check before you move

#### Recreational or Camping Items

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- |  |  |                                |
|--|--|--------------------------------|
| <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

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- |  |   |   |
|--|---|---|
| <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

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- |   |  |  |
|---|--|--|
| <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

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- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Dog houses, rabbit sheds, chicken coops, etc | <input type="checkbox"/> Garden tilters   | <input type="checkbox"/> Signs and posts |
|   | <input type="checkbox"/> Yard decorations | <input type="checkbox"/> Storage sheds   |

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## Steps of Spotted Lanternfly Management

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- 5** Apply insecticides



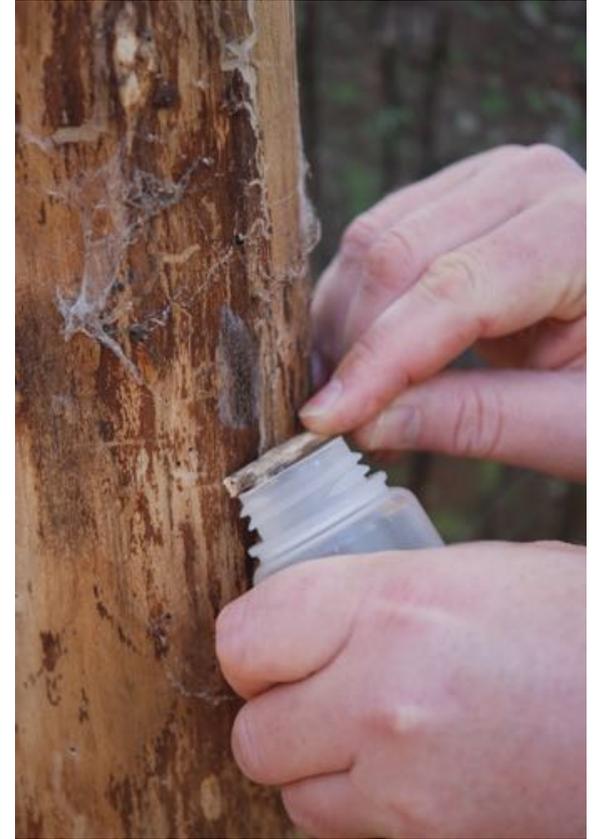
# Scrape eggs

- Eggs should be scraped off of trees, posts, stones, houses, and anywhere else you find them!
- Use a plastic card, putty knife, or stick to scrape eggs downward into a bottle or bag.
- Eggs can then be killed by putting them in rubbing alcohol, smashing them, or burning them.
- Removes 30-50 eggs per mass
- Link to video:  
<https://extension.psu.edu/how-to-remove-spotted-lanternfly-eggs>



PA Dept. Ag.

# Egg masses that can be seen or reached are easily controlled by scraping



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# Band trees to catch nymphs

## Did you know?

In the spring, spotted lanternfly nymphs crawl up trees to find a place to feed— stop them by banding trees with sticky paper or tape.



Pennsylvania Department of Agriculture



# Mechanical Control

- Physical removal
- Exclusion from conveyances
- Swatting/Squishing
- Chipping
  - Study shows chipping disrupts egg masses and prevents hatching



# What steps can we take to prevent the spread of the Spotted Lanternfly?

## Steps of Spotted Lanternfly Management

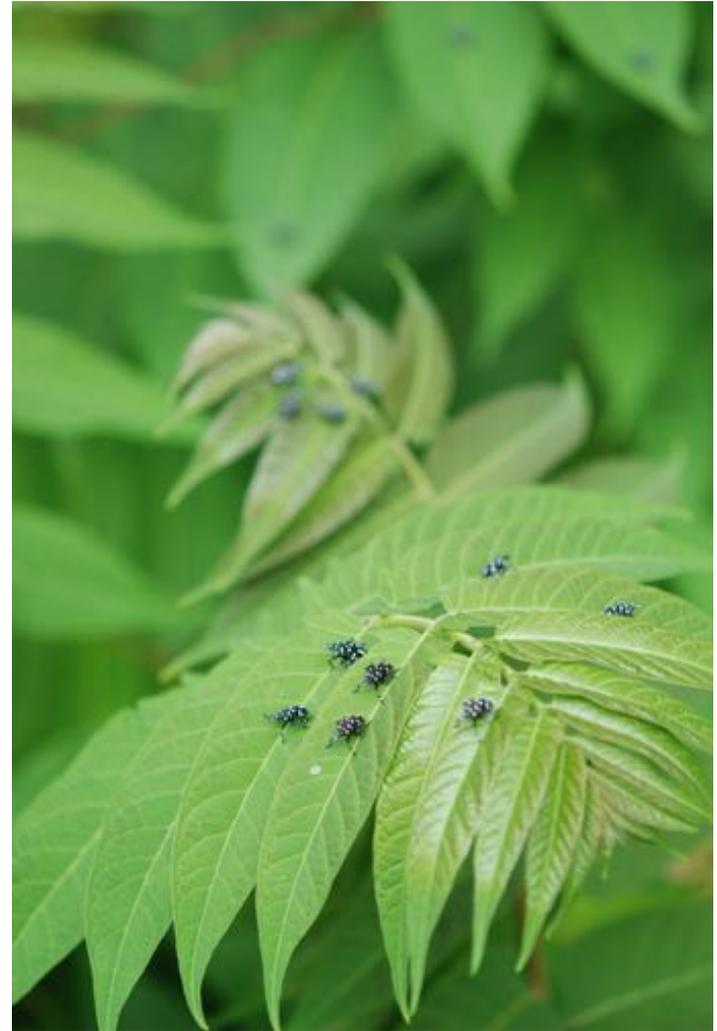
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# Remove tree-of-heaven

Tree-of-heaven (*Ailanthus altissima*) is an invasive tree that is used in landscape design, and frequently found on the sides of roads and in other disturbed areas.

**It is the preferred host for SLF.** Removing tree-of-heaven may help reduce SLF populations.





- A. Bark
- B. Leaf
- C. Leaf margin
- D. Brown Spongy Pith
- E. Leaf scar
- F. Seeds (Samaras)

# Look Alikes



Sumac

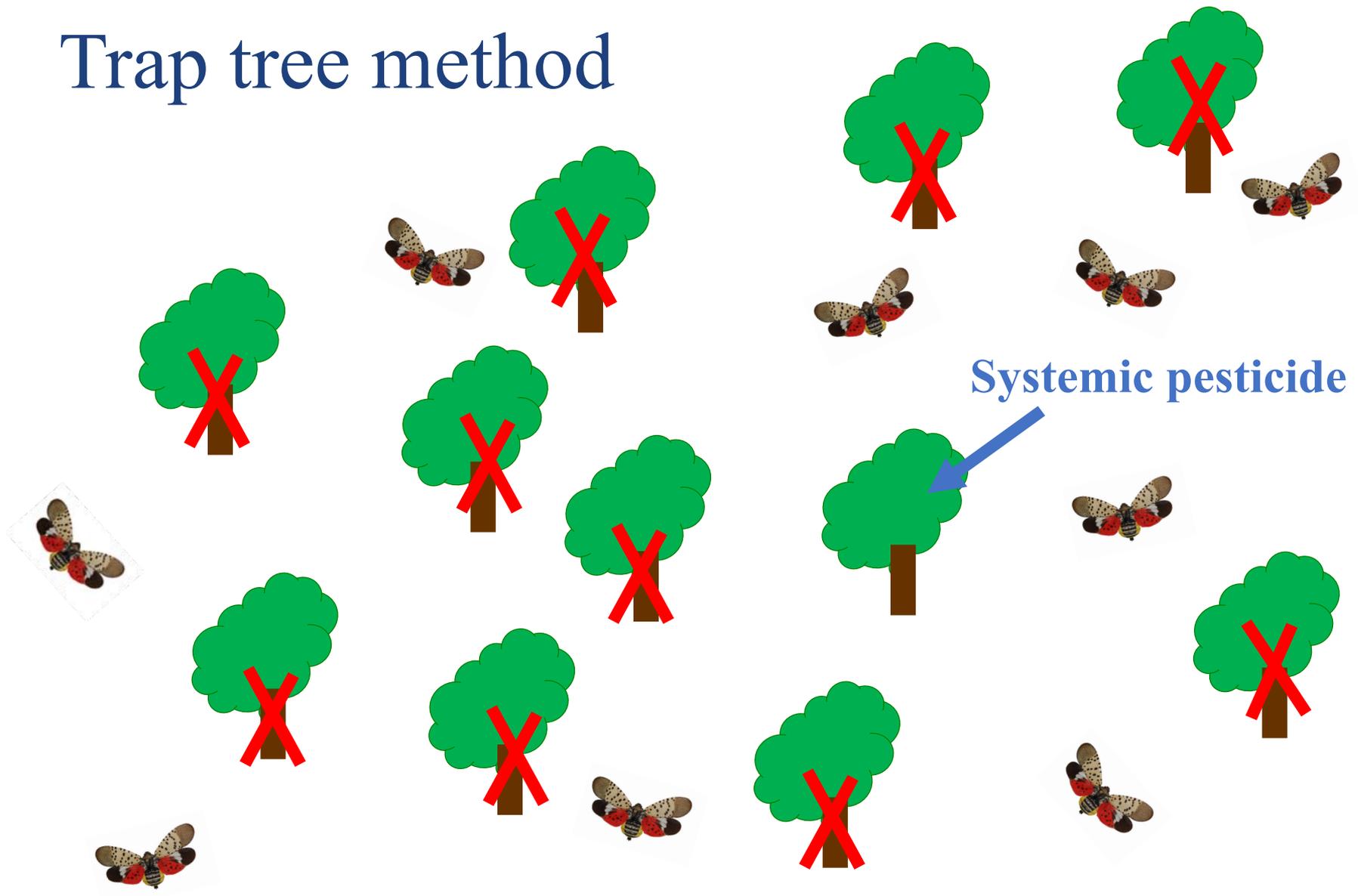
Black Walnut



- *Ailanthus altissima* or Tree of Heaven is considered an invasive weed
- Reproduces by seed and also root graft
- If not properly treated with herbicide, multiple shoots/trees can arise from one cut tree
- Treatment recommendations found on the Spotted Lanternfly webpage

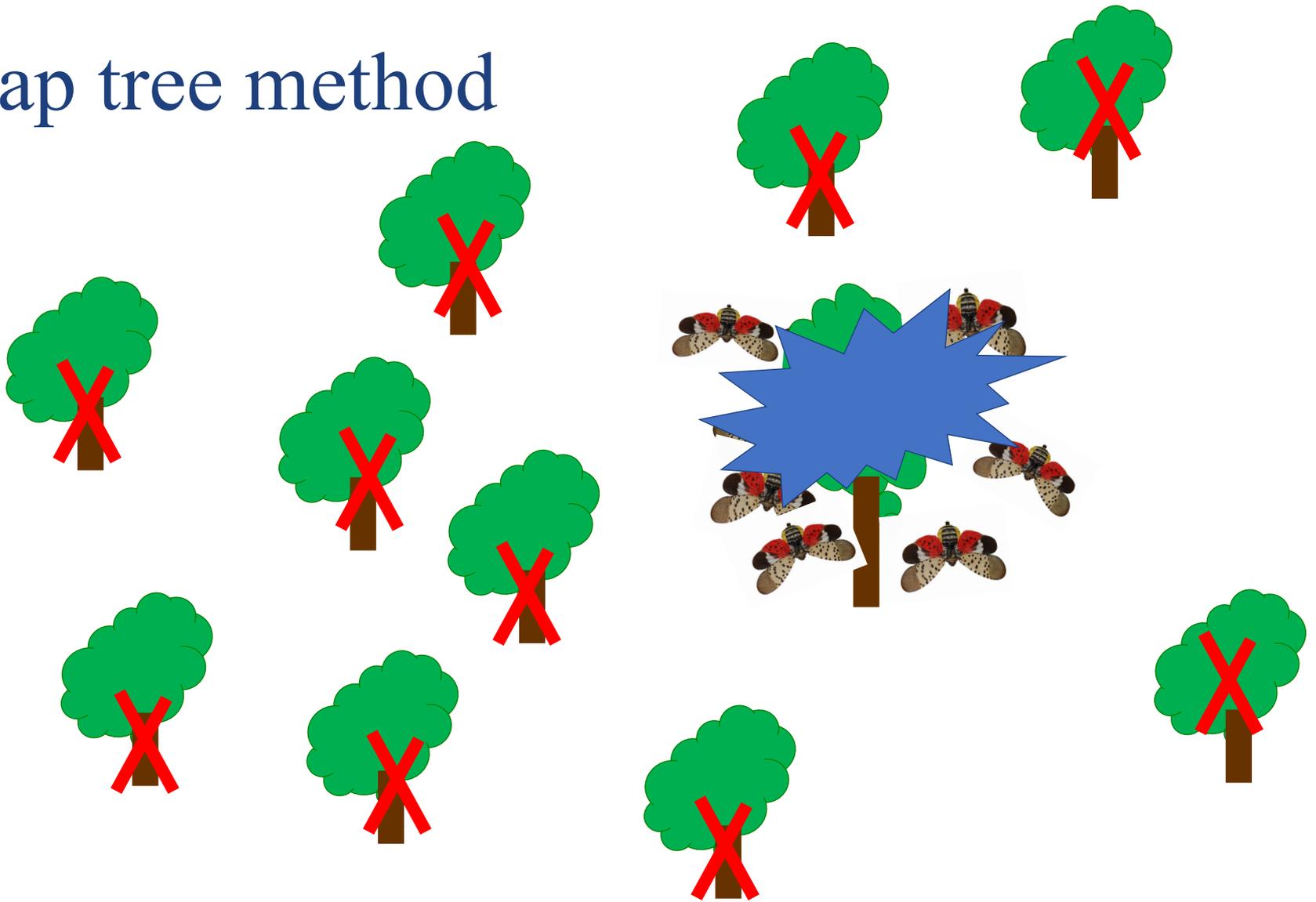


# Trap tree method



E. Swackhamer & A. Corman

# Trap tree method



E. Swackhamer & A. Corman

## Impact on Adults is Dramatic



# Insecticide options to control SLF



## Introduction

Spotted lanternfly (SLF), *Lycorma delicatula*, is an invasive planthopper, native to China, that was first detected in 2014 in southeastern Pennsylvania. It feeds voraciously on many plants, including economically important crops like fruit trees, grapevines, hops, hardwoods, and ornamentals. If you think you have SLF, do not panic! First, make sure the insect you are seeing is the spotted lanternfly. Second, learn about its life cycle and habits. Third, determine what plants it is infesting and what it is not. Fourth, employ management strategies at the proper time of the year.

## Identification and Life Cycle

There is one generation of SLF per year. The eggs are laid in late fall and hatch in the spring. Egg masses are laid on hard sur-

### Quick Facts

- SLF is a **destructive invasive pest**, threatening agricultural, timber, and ornamental industries, and the plants in your backyard.
- SLF is currently under **quarantine** in 13 counties in Pennsylvania.
- SLF **does not bite or sting**.
- **Stop the spread** of SLF by checking your car and any outdoor equipment (grills, mowers, firewood, etc.) when going in and out of the quarantine zone.
- Manage SLF on your property by **scraping eggs, banding trees**, removing the favored host (**tree-of-heavens**), and using **chemical control** when appropriate.

dots and black stripes (Figure 1). SLF adults emerge in July



# Insecticide options to control SLF

Active Ingredient	Mode of Exposure	Example Products
acetamiprid (neonicotinoid)	systemic/contact	Ortho Flower Fruit & Vegetable Insect Killer
azadirachtin* (botanical)	contact	Neemix 4.5 Insect Growth Regulator
bifenthrin (pyrethroid)	contact	Ortho Bug-B-Gon Insect Killer for Lawns & Gardens, The Anderson's Turf Products Duocide Insect Control, Bug Blaster II Turf Ornamental Insect Control
carbaryl (carbamate)	contact	The Anderson's Turf Products Duocide Insect Control, Sevin Bug Killer, Bayer Complete Insect Killer for Gardens, Ortho Bug-Gets Plus Snail Slug & Insect Killer

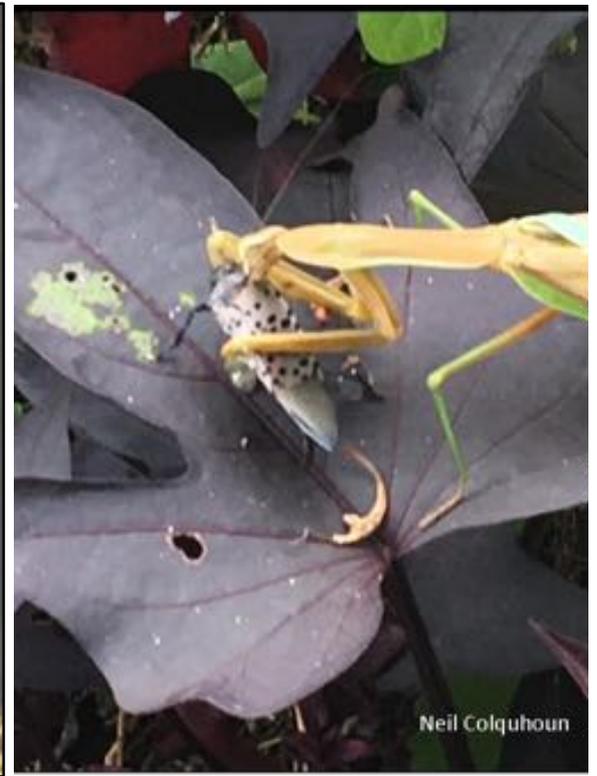
Active Ingredient	Mode of Exposure	Example Products
dinotefuran (neonicotinoid)	systemic/contact	Ortho Tree & Shrub Insect Control, Zylam Insecticide, Safari Insecticide, Transect Insecticide
imidacloprid (neonicotinoid)	systemic/contact	Ortho MAX Tree & Shrub Insect Control, Ferti-Lome Tree & Shrub Systemic Insect Drench, Bayer Tree and Shrub Insect Control, Bonide Annual Tree & Shrub Insect Control with SYSTEMAXX
thiamethoxam (neonicotinoid)	systemic/contact	Ambrands AMDRO Quick Kill Lawn & Landscape Insect Killer
soaps*	contact	Concern Insect Killing Soap C, Ortho Elementals Insecticidal Soap, Safer Insect-Killing-Soap



\*Organic product

**Note:** This product list provides an example of products with these active ingredients. It is not an endorsement or specific recommendation.

# Biological control of SLF



Neil Colquhoun

# Biological control of SLF

## An Old Remedy for a New Problem? Identification of *Ooencyrtus kuvanae* (Hymenoptera: Encyrtidae), an Egg Parasitoid of *Lycorma delicatula* (Hemiptera: Fulgoridae) in North America

Houping Liu<sup>1,2</sup> and Jason Mottern<sup>3</sup>

<sup>1</sup>Pennsylvania Department of Conservation and Natural Resources, Harrisburg, PA 17105, <sup>2</sup>Corresponding author: e-mail: hliu@pa.gov, and <sup>3</sup>USDA ARS Systematic Entomology Laboratory, Washington, DC 20013



# Ongoing research

Short and long-term effects of SLF on:  
ornamentals, tree fruit, grapes, hops, and forests

Insecticide recommendations for ornamentals, grape & peach

Characterizing SLF saliva & feeding

Lures & attractants

Communication of adult SLF

Dispersal and movement of SLF

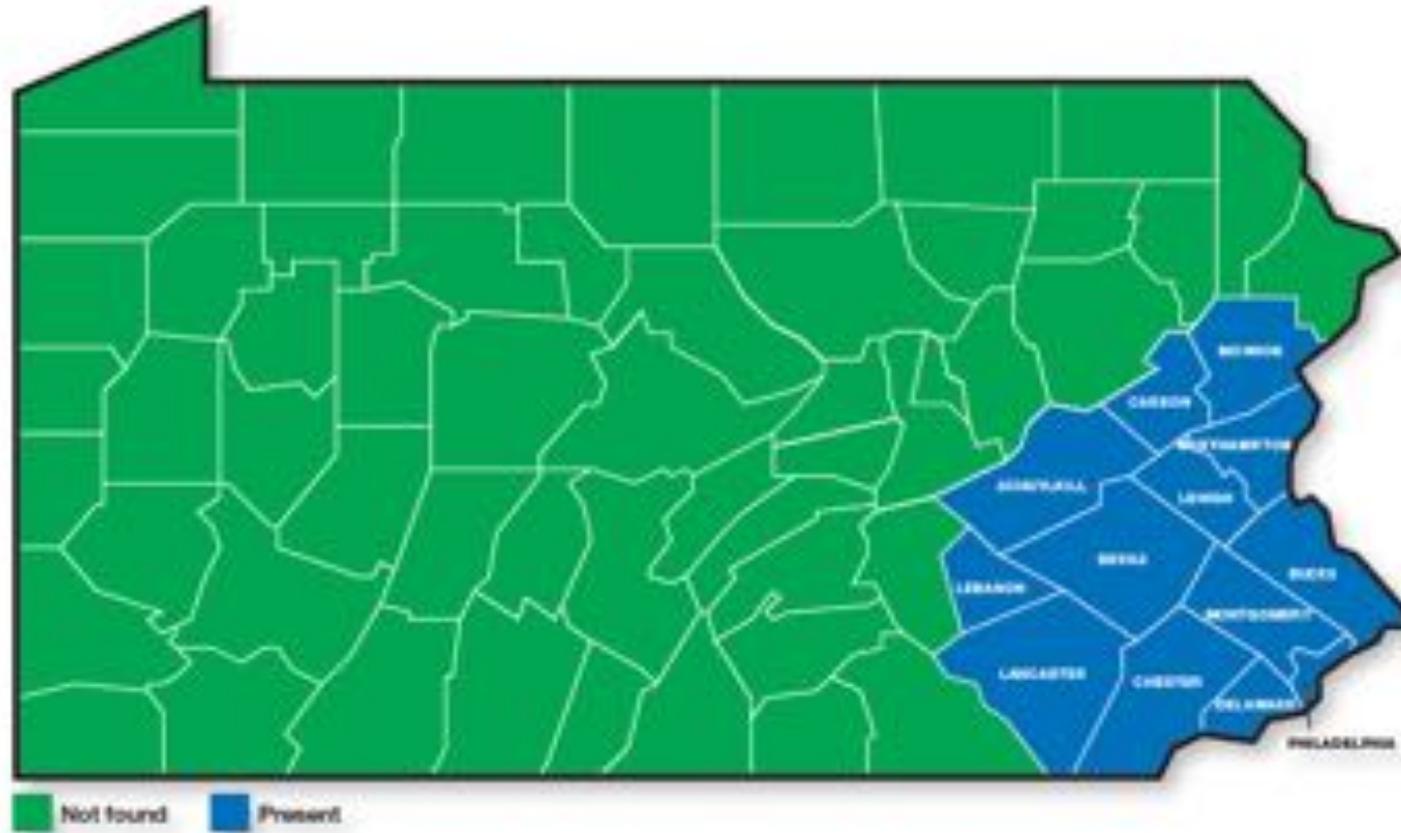
Host requirements/preferences

Foreign exploration for natural enemies

...and more!



# SLF quarantine



# What does the Quarantine Mean?

No one may intentionally move viable life stages of SLF

- Outdoor items
- Crafter materials
- Vehicles
- Equipment
- Trailers
- Recreational vehicles
- Hardgoods
  - Stone
  - Tile
  - Decorative materials
- Firewood
- Nursery stock

# SLF permits for businesses

ATTN business owners: if your business requires moving a product and operates within the spotted lanternfly quarantine zone (found here: <http://bit.ly/2rlaVbd>), you're required to have a permit. Info on training/required exam under business resources: <http://bit.ly/2JtK4BG>

“Do I need a permit?”

[http://www.agriculture.pa.gov/Plants\\_Land\\_Water/PlantIndustry/Entomology/spotted\\_lanternfly/quarantine/Pages/Do-I-Need-a-Permit.aspx](http://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/Entomology/spotted_lanternfly/quarantine/Pages/Do-I-Need-a-Permit.aspx)





## For Compliance Agreements for Spotted Lanternfly Quarantine

For information and questions regarding compliance agreements related to Spotted Lanternfly please contact your Pennsylvania Department of Agriculture Regional Office and speak with the Bureau of Plant Industry Supervisor (listed below).



**Region 1:** Clarion, Crawford, Elk, Erie, Forest, Jefferson, McKean, Mercer, Venango, and Warren  
Lisa K. Candelore  
Phone: (814) 332-6890

**Region 2:** Cameron, Clinton, Columbia, Lycoming, Northumberland, Montour, Potter, Snyder, Tioga, and Union  
Jay P. Bagley  
Phone: (570) 433-2640 ext. 206

**Region 3:** Bradford, Carbon, Lackawanna, Luzerne, Monroe, Pike, Sullivan, Susquehanna, Wayne, and Wyoming  
Richard J. Malak  
Phone: (570) 836-2181 ext. 111

**Region 4:** Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland  
Lisa K. Candelore  
Phone: (724) 832-1073 ext. 125

**Region 5:** Bedford, Blair, Cambria, Centre, Clearfield, Fulton, Huntingdon, Juniata, Mifflin, and Somerset  
Abbie Clark  
Phone: (814) 793-1849 ext. 216

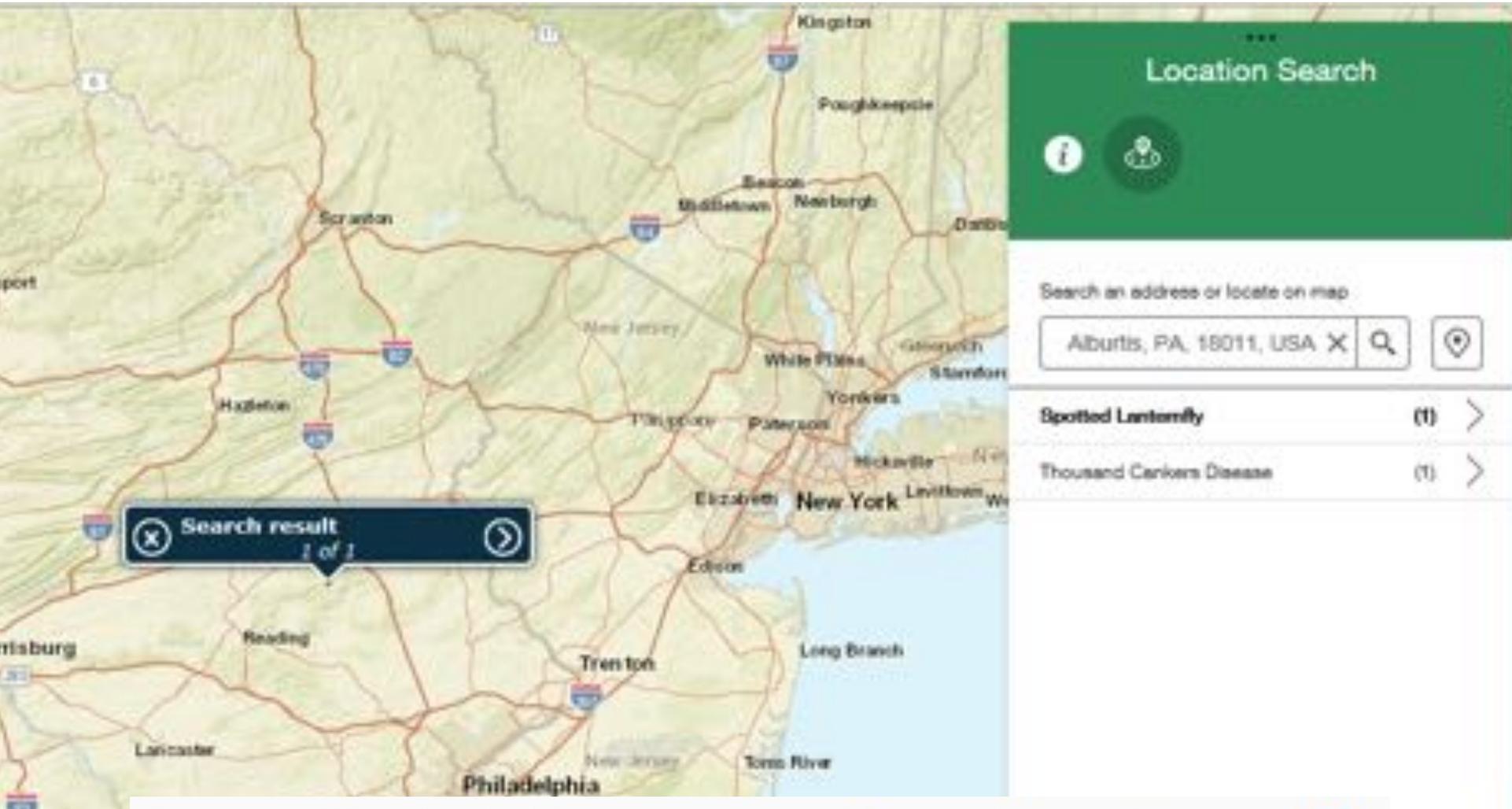
**Region 6:** Adams, Cumberland, Dauphin, Franklin, Lebanon, Lancaster, Perry and York  
Jeff Miller  
Phone: (717) 772-3206

**Region 7:** Berks, Bucks, Chester, Delaware, Lehigh, Montgomery, Northampton, Philadelphia, and Schuylkill  
Howard Walker  
Phone: (610) 489-3003 ext. 108



Spotted Lanternfly Quarantine as of November 4, 2017

# Check if you're in the quarantine using PDA's online tool

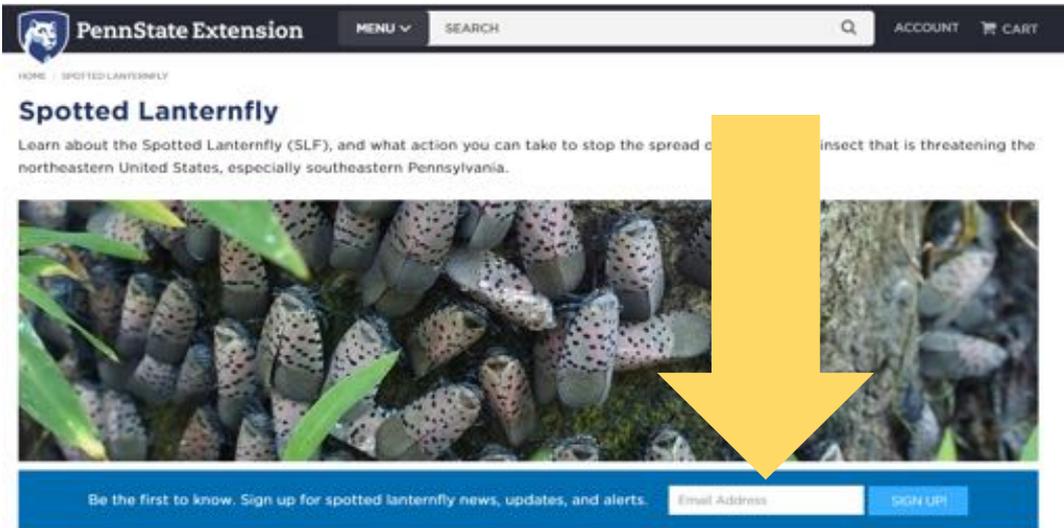


Not sure if you're in the quarantine? [Use our interactive map!](http://bit.ly/2rlaVbd)

<http://bit.ly/2rlaVbd>

# Stay up-to-date

Sign-up for newsletter updates via our website  
Twitter @StopSLF



**PennState Extension** MENU SEARCH ACCOUNT CART

HOME / SPOTTED LANTERNFLY

## Spotted Lanternfly

Learn about the Spotted Lanternfly (SLF), and what action you can take to stop the spread of this insect that is threatening the northeastern United States, especially southeastern Pennsylvania.



Be the first to know. Sign up for spotted lanternfly news, updates, and alerts.

Pinned Tweet

**StopSLF** @StopSLF · Jun 11

Springtime is the best time to band trees to capture spotted lanternfly nymphs. Learn more about tree banding to stop SLF at our website: [extension.psu.edu/spotted-lanternfly](https://extension.psu.edu/spotted-lanternfly)



**Did you know?**

In the spring, spotted lanternfly nymphs crawl up trees to find a place to feed— stop them by banding trees with sticky paper or tape.

Pennsylvania Department of Agriculture

9 19

# Resources

<https://extension.psu.edu/spotted-lanternfly>



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## Identification and Life Cycle

There is one generation of SLF per year. The eggs are laid in late fall and hatch in the spring. Egg masses are laid on hard surfaces (trees, decks, houses, outdoor equipment, rocks, etc.) and protected with a mud-like covering. Each egg mass contains 30–50 eggs. After hatching and before reaching adulthood, SLF goes through four nymph stages. Nymphs are small ( $\frac{1}{4}$  to  $\frac{1}{2}$  inch) and hard to find. The first three stages (instars) are all black with white spots, and the last instar is red with white

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dots and black stripes (Figure 1). SLF adults emerge in July and are active until winter. This is the most obvious and easily detectable stage because they are large (~1 inch) and highly mobile. Adults have black bodies with brightly colored wings. Only the adults can fly. Because SLF adults jump more than fly, their wings often remain closed. SLF wings are gray with black spots, and the tips of the wings are black with gray veins.



PennState



# To Report a Sighting of Spotted Lanternfly OUTSIDE of the Quarantine Zone

Visit the Penn State Extension Website

<https://extension.psu.edu/spottedlanternfly>

Or Contact the Spotted Lanternfly Hotline:



**1-888-4BAD-FLY**  
(1-888-422-3359)

