StopSLF.org:
Biology, Management and Reducing the Impact of the Spotted Lanternfly on Specialty Crops in the Eastern USA

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Planthoppers

Phloem feeders: piercing-sucking mouthparts
Spotted Lanternfly Reported Distribution
Updated April 6, 2021

- Individual finds of Spotted Lanternfly.
- No infestation present.
- Spotted Lanternfly infestation present.
- Internal state quarantine areas.
SLF Impacts
Damage to Vineyards

Economic Impact Studies on Grapes: Harper, Kime, Leach, Centinari

Recorded damage:
In 2017, 90% yield loss in 40 acre planting

In 2018, 100% death of a 8 acre Pinot Noir planting

From 2016-2018, 45% yield reduction in 10 acres Chardonnay planting

More vineyards detecting SLF in 2019 and reporting damage from 2018 feeding

Increased application and cost of insecticides (5 vineyards in SE PA):

The number of insecticide applications in 2016-2018 increased from an average of 4.2 applications to 14.0

This increases the average insecticide cost from $54.63/acre in 2016 to $147.85/acre in 2018 (+171%)
SLF Impacts
Damage to Vineyards

Beekman Orchard, May 23, 2019:
SLF Impacts
Damage to Vineyards
SLF Impacts
Damage to Vineyards

September 12, 2019:
SLF Impacts
Damage to Vineyards
### SLF Impacts

**Why is SLF such a problem?**

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- Eggs can move far: occur in this stage ~ 8 months

- Nymphs and adults feed on > 70 species of plants and trees

- Adults feed voraciously: occur in this stage ~ 4+ months

- Feeding preference of live stages is relative to hosts in their proximity

- In late season, adults MOVE and continue to feed
SLF SCRI CAP Project

Biology, Management, and Reducing the Impact of the Spotted Lanternfly on Specialty Crops in the Eastern USA

$7,308,194 over 4 years (2019 – 2023)

> $5,000,000 matching funds from in kind use of grower land for research

Penn State – Julie Urban (PI)

USDA ARS

USDA APHIS

Cornell

NE IPM

Rutgers

Temple

University of Delaware

University of Rhode Island

Virginia Tech

Project website: StopSLF.org
SLF SCRI CAP Project
Biology, Management, and Reducing the Impact of the Spotted Lanternfly on Specialty Crops in the Eastern USA

3 Objectives:

**Objective 1.** Quantify SLF impact on at-risk specialty crops and immediately develop management tactics to reduce the damage in areas where SLF is established.

**Objective 2.** Perform essential fundamental research on SLF basic biology, ecology, behavior and biological control tactics contributing to long-term sustainable solutions.

**Objective 3:** Deliver immediate SLF management solutions to specialty crop stakeholders and the general public via the Extension networks of the partnering land grant universities, USDA agencies, and NEIPMC.
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Penn State Extension Spotted Lanternfly site regularly updated with new recommendations from our research

https://extension.psu.edu/spotted-lanternfly
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- 16 mature vines
- 4 SLF density treatments (adults)
  - Control (0 SLF)
  - Low (4 SLF/shoot = 41 per vine)
  - Medium (8 SLF/shoot = 98 per vine)
  - High (12 SLF/shoot = 200 per vine)
- Plants were exposed to a total of six 4-day feeding cycles
- Measure aspects of vine physiology:
  - Carbon assimilation & leaf photosynthesis
  - Water transport in xylem & phloem
  - Accumulation of carbohydrates & nutrients in fruit and trunk, stem, root tissues
**Objective 1.** Quantify SLF impact on at-risk specialty crops and immediately develop management tactics to reduce the damage in areas where SLF is established.

SLF adults decrease photosynthesis in grapevines: the higher the density the greater and faster is the suppression (Centinari et al, from 2019)

Measurements were taken the last day of each introduction cycle (cycle 1 to cycle 5)

Control = 0 SLF; Low = 4 SLF/shoot; Medium = 8 SLF/shoot; High = 12 SLF/shoot

For each of 5 feeding cycles, SLF introduced to cage and left to feed for 4 days
Degree Day Model to Predict SLF Egg Hatch
At StopSLF.org (under Resources tab)

This spotted lanternfly (SLF) egg batch prediction map is designed to provide an estimate of first larval emergence based on current temperature conditions. This model was developed using data from two geographic locations: one in Pennsylvania, and a second in Virginia. As SLF spreads to new areas, this model should be verified in other geographic locations. This model provides estimates for egg hatch only – it should not be considered a certainty.

This is not a map showing where SLF currently exists. The known distribution of this pest is currently limited to specific areas in the eastern U.S. (see here for current distribution: https://pa.cornell.edu/invasive-species-exotic-pests/spotted-lanternfly). This model shows hatch predictions for the entire U.S. to provide information on when to begin early detection surveys nationwide.
Objective 2. Perform essential fundamental research on SLF basic biology, ecology, behavior and biological control tactics contributing to long-term sustainable solutions.
Mean SLF Mass

Live adults weighed and collected at Vynecrest Winery, 2019

Change in Mass since Week 1:

Females
Week 2 (vs. 1): increase of 42.6%
Week 3 (vs. 1): increase of 23.5%
Week 4 (vs. 1): increase of 50.2%
Week 5 (vs. 1): increase of 56.6%

Males
Week 2 (vs. 1): increase of 11.6%
Week 3 (vs. 1): increase of 27.7%
Week 4 (vs. 1): increase of 20.6%
Week 5 (vs. 1): increase of 26.1%
SLF houses bacteria in organs (= bacteriomes) that they require for survival

Early season female
Understanding Reproductive Development and Endosymbiont Transmission

SLF bacteriomes change across development

**Early season female**

**Later season female**
Building a Degree Day Model of SLF Reproductive Development: Urban & Calvin

Summary for 50th%:
Hatch ➞ Adult: 1150 D.Days
Adult ➞ Egg Lay: 820 D.Days

- Period of Active Movement
- First Observation of Yellow-sided Female
- First Observation of Fall Egg Masses
- Lag Between Yellow-sided Female Arrival and Egg Mass

Accumulative Degree Days (Bt = 8.14 °C) From January 1

Yellow-Sided Adult Females ➞ Fall Egg Masses ➞ Total Adult
**Objective 2.** Perform essential fundamental research on SLF basic biology, ecology, behavior and biological control tactics contributing to long-term sustainable solutions.

Electropenetration Graph (EPG): Where and How does SLF feed? (Shugart, Sattar, Urban)
Objective 2. Perform essential fundamental research on SLF basic biology, ecology, behavior and biological control tactics contributing to long-term sustainable solutions.

Electropenetration Graph (EPG): How does SLF feed?
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Electropenetration Graph (EPG): Where and How does SLF feed?

AC-DC EPG waveforms (recorded at PSU by Sattar and Roberts)
Objective 3: Deliver immediate SLF management solutions to specialty crop stakeholders and the general public via the Extension networks of the partnering land grant universities, USDA agencies, and NEIPMC.

37 Researchers and Extension personnel are Co-PIs -- to date, are training 8 undergraduate students, 12 graduate students, 12 post-doctoral scientists.
THANK YOU!

Urban Lab
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Mariam Taleb
Ju-Che Lo
Sarah Henderson
Sampurna Sattar
Holly Shugart
Dana Roberts
Liana Wodzicki
Mitchell Hornberger
Extended Lab Members:
Brain Walsh
John Rost
Dennis Calvin

Check out: StopSLF.org

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