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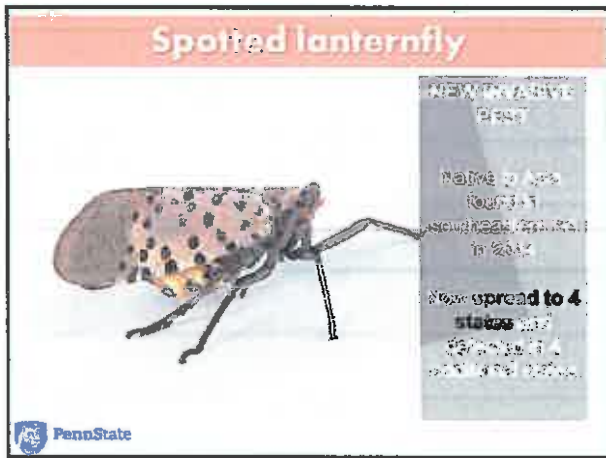
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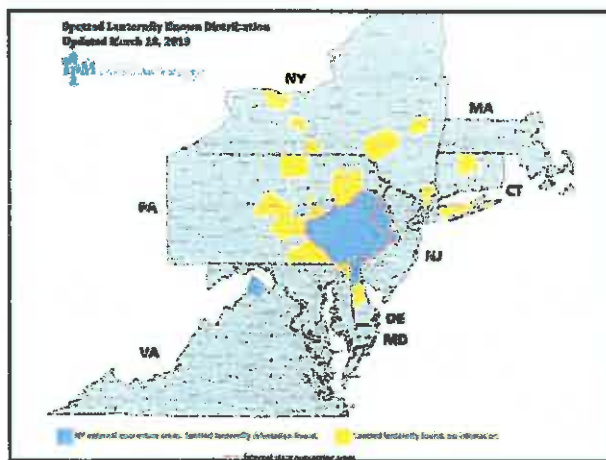
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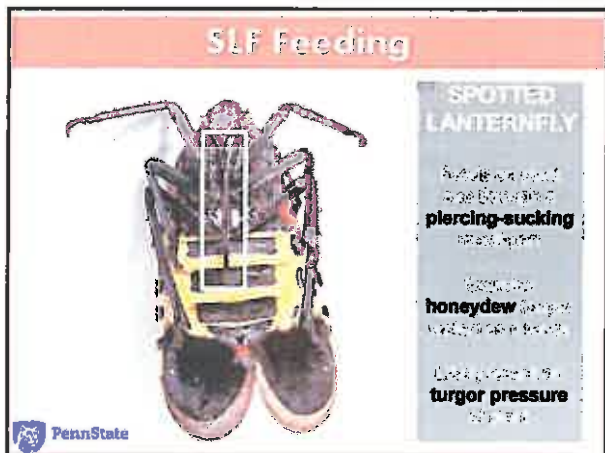
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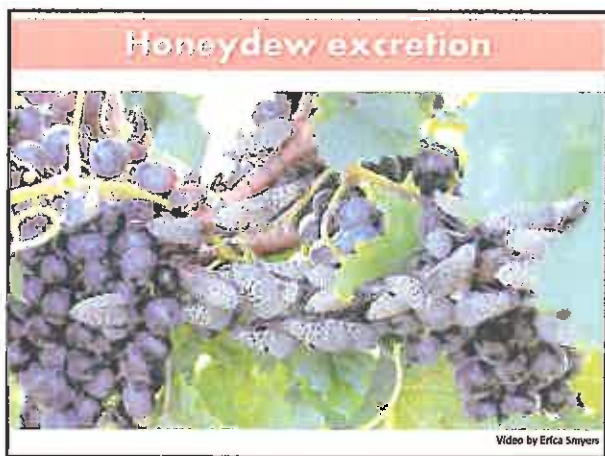
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### SLF has a broad host range

**HOSTS**

**Preferred hosts:**  
 grape  
 grape  
 black walnut  
 silvered maple  
 river birch  
 willow  
 & others

Substantial feeding  
 not recorded on  
 conifers

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### SLF can survive on a host plants

Tree of heaven  
 Black walnut  
 Chinaberry  
 Tulip tree  
 Sawtooth oak  
 Hops  
 Oriental bittersweet  
 Butternut

**SPOTTED LANTERNFLY LIFE CYCLE**

Miriam Cooperband, USDA-APHIS, unpublished data

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### SLF seasonal host phenology

Host	May	June	July	August	September	October
Rose (cultivated, multiflora, etc.)						
Tree-of-heaven						
Grape (wild and cultivated)						
Black walnut, butternut						
River birch						
Willow						
Silvered maple						

**This is NOT a comprehensive host list for SLF.**  
 Nymphs appear to have an especially large host range.  
 Host selection appears to be dependent on **proximity** and **seasonality**  
 River birch, willow, sycamore, oaks, butternuts, and oriental bittersweet also appear to be highly desirable hosts.

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**Identification of tree-of-heaven**

**TREE of HEAVEN**

- Mostly **compound leaves**
- 1-4 feet in length
- 10-40 leaflets
- 1/2" **teeth** at base of leaflet
- Smooth leaf texture
- Strong **peanut butter odor** when crushed



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**Identification of tree-of-heaven**

**TREE of HEAVEN**

**Removal of tree-of-heaven must include a herbicide!**

**TREE OF HEAVEN: START YOUR OWN RECORD OF TREE-SPECIFIC HERBICIDES**



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**Tree-of-heaven in PA**



**Penn State**

Data courtesy of Dr. Dennis Cahin (Penn State) and Pennsylvania Department of Agriculture

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### What's being done to control SLF?

**SPREAD**

PA Dept. of Agriculture  
PA Dept. of Environmental Protection  
PA Dept. of Transportation  
PA Dept. of State  
PA Dept. of Health  
PA Dept. of Education  
PA Dept. of Labor  
PA Dept. of Public Safety  
PA Dept. of Corrections  
PA Dept. of Military & Veterans Affairs  
PA Dept. of Public Welfare  
PA Dept. of Human Resources  
PA Dept. of Aging & Disability Resources  
PA Dept. of Health & Senior Services  
PA Dept. of Environmental Protection  
PA Dept. of Transportation  
PA Dept. of State  
PA Dept. of Health  
PA Dept. of Education  
PA Dept. of Labor  
PA Dept. of Public Safety  
PA Dept. of Corrections  
PA Dept. of Military & Veterans Affairs  
PA Dept. of Public Welfare  
PA Dept. of Human Resources  
PA Dept. of Aging & Disability Resources  
PA Dept. of Health & Senior Services

**must have permits**

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### What's being done to control SLF?

**CONTROL**

PA Dept. of Agriculture  
PA Dept. of Environmental Protection  
PA Dept. of Transportation  
PA Dept. of State  
PA Dept. of Health  
PA Dept. of Education  
PA Dept. of Labor  
PA Dept. of Public Safety  
PA Dept. of Corrections  
PA Dept. of Military & Veterans Affairs  
PA Dept. of Public Welfare  
PA Dept. of Human Resources  
PA Dept. of Aging & Disability Resources  
PA Dept. of Health & Senior Services

**core**

**buffer**

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### What's being done to control SLF?

**CONTROL**

**Tree-of-heaven**

**systemic insecticide**

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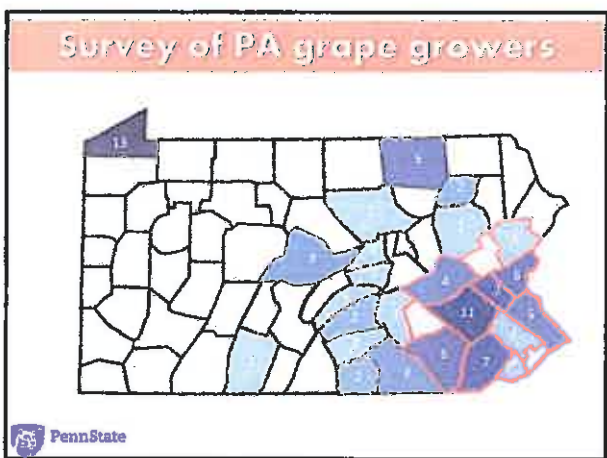
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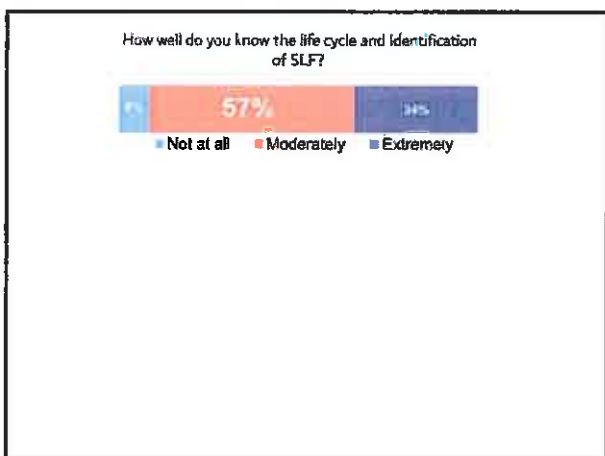
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### What are the growers top research priorities?

1. Insecticide recommendations
2. Insecticides with residual activity
3. Insecticide options to meet PHI requirements
4. Biological control
5. SLF damage to long-term vine health



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### Damage to vineyards in 2018

**3 growers** with vines that died and/or did not fruit from 2017 damage

Many growers spraying every **3-5 days** near harvest due to frequent rainwater of vineyard

Average number of insecticide applications increased by **10 per season** from 2016 to 2018 (J. Harper, unpublished data)

Cost per acre went from \$54.63 per acre in 2016 to **\$147.65 per acre in 2018 (+271%)** (J. Harper, unpublished data)

More vineyards detecting spotted lanternfly compared to 2017 (est. 50-60 growers)



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### Monitoring SLF in vineyards

**Weekly**, SLF was counted in 8 vineyards in SE PA beginning in September

Transects began at a **Wooded edge** and led to the vineyard interior

Every 3 meters, vines were counted for spotted lanternfly on the **trunk, cordon, and shoots**

Honeydew and sooty mold were also monitored weekly



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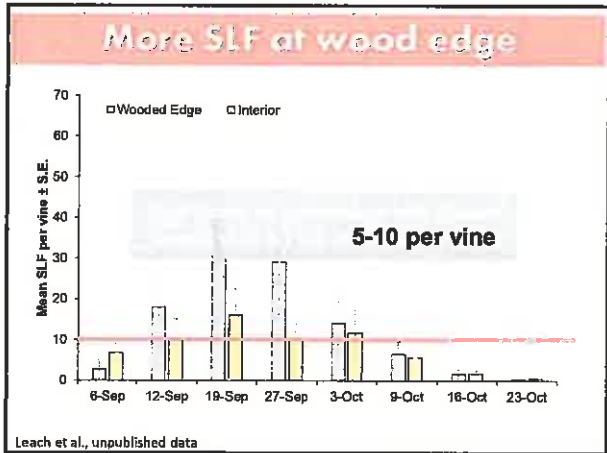
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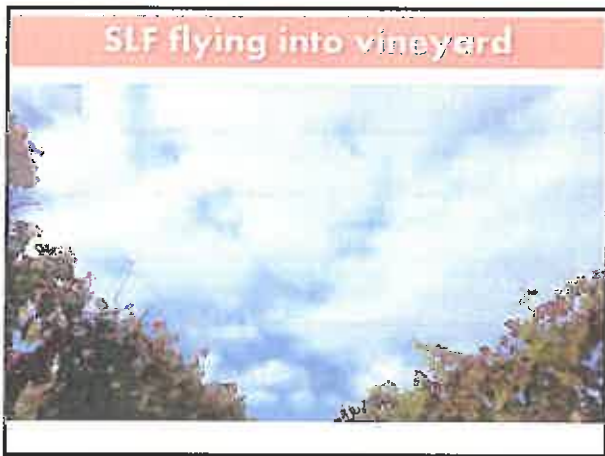
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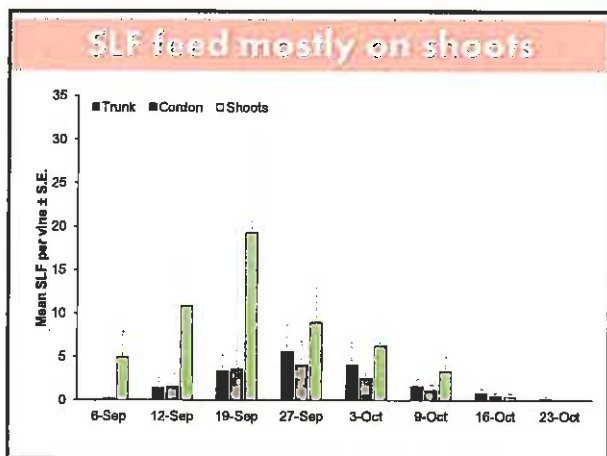
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**Adult SLF insecticide trials (on grape)**

Insecticide	Chemical Group	Rate	Label	Treatments	Replications	Plots	Harvest	Notes	Rating
Insecta 70WP	phosmet	Organophosphate	2.125 lb	C, I	14	336	0	Yes, 2(x)	Poor
Insecta 70WP	phosmet	Organophosphate	1.93 lb	C, I	7	336	0	Yes, 2(x)	Poor
Insecta 70WP	phosmet	Organophosphate	1.74 lb	C, I	7	336	0	Yes, 2(x)	Poor
Insecta 70WP	phosmet	Organophosphate	1.55 lb	C, I	7	336	0	Yes, 2(x)	Poor
Insecta 70WP	phosmet	Organophosphate	1.36 lb	C, I	7	336	0	Yes, 2(x)	Poor
Insecta 70WP	phosmet	Organophosphate	1.17 lb	C, I	7	336	0	Yes, 2(x)	Poor
Closest 25C	sulfonamide	Sulfonamide	5.75 fl oz	S, C, I	7	12	0	2(x) pending	Poor
Closest 25C	sulfonamide	Sulfonamide	5.75 fl oz	S, C, I	7	12	0	0	7(x)
Assail 30SR	acetamiprid	Neonicotinoid	5.2 oz	S, C, I	3	48	0	Yes, 2(x) on nymphs only	Poor
Assail 30SR	acetamiprid	Neonicotinoid	5.2 oz	S, C, I	3	48	0	0	48(x)
Assault 30DG	imidacloprid	Neonicotinoid	6 oz	C, I	7	12	0	Yes, 2(x)	Poor
Assault 30DG	imidacloprid	Neonicotinoid	6 oz	C, I	7	12	0	0	12(x)
Admirer Pro	imidacloprid	Neonicotinoid	1.6 fl oz	C, I	0	12	47	No	Poor
Veninate XT	Bifenthrin	Other	4 qt	C, I	0	4	0	No	Poor
MuPhen 2	spiromesifen	Spirotrien	2.5 oz	C, I	7	6	0	No	Poor
Bonterra 80WP	spiromesifen	Spirotrien	2.5 oz	C, I	7	6	0	No	Poor
Solvento Prime 1.875C	flupyradifurone	Bulwericide	14 fl oz	S, C, I	0	4	0	No	Post

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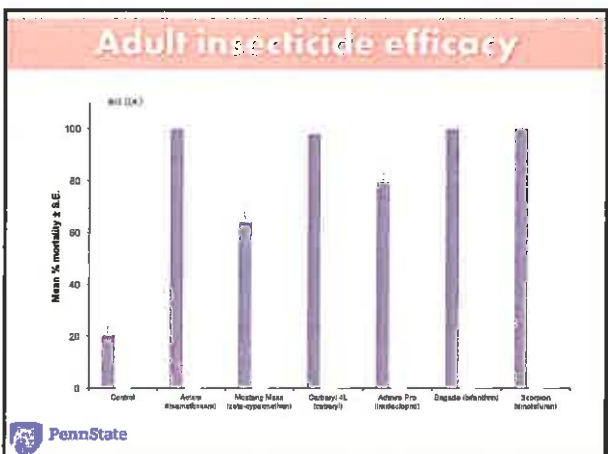
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**Chemical control**

**Nymph control:**  
Use short residual products with good knockdown for high densities of nymphs (e.g. carbaryl, zeta-cypermethrin).

**Adult control:**  
Use long residual compounds in August, if SLF reinfestation is occurring. Switch to short PHI compounds during harvest.

If SLF is high post-harvest, use long residual products (e.g. bifenthrin, thiamethoxam, dinotefuran).

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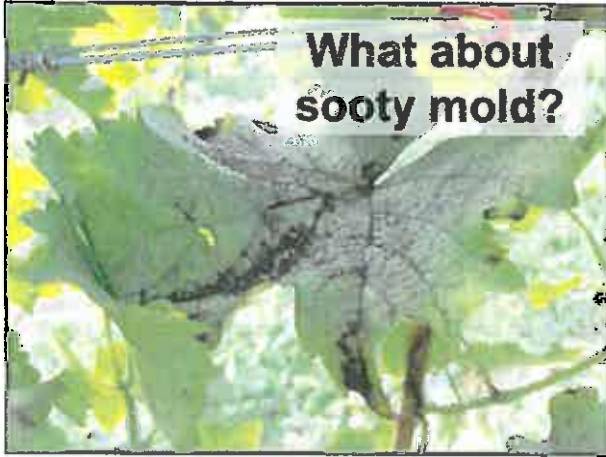
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**Sooty mold problematic in Korea**

Recent studies reported that sooty mold on grape leaves and clusters in Korea caused a significant reduction in grape yield and quality.

Sooty mold on grape leaves and clusters made the grapes **unmarketable** for consumers.

Slugs were used to protect grape clusters from sooty mold.

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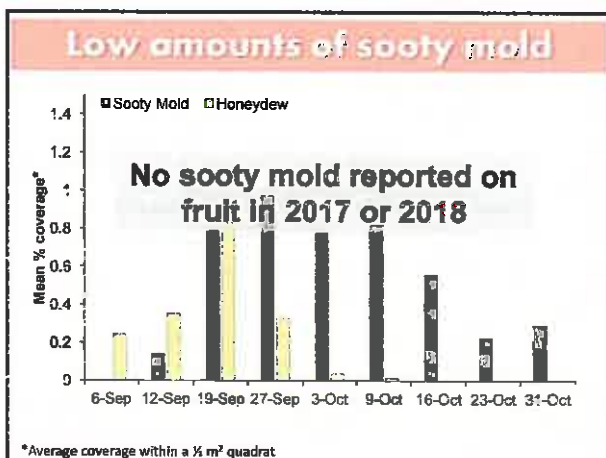
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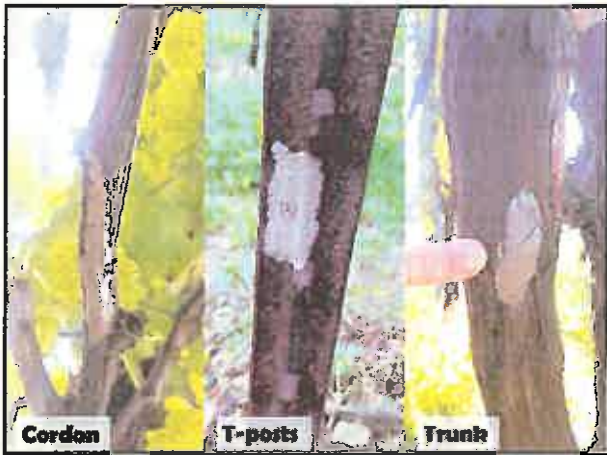
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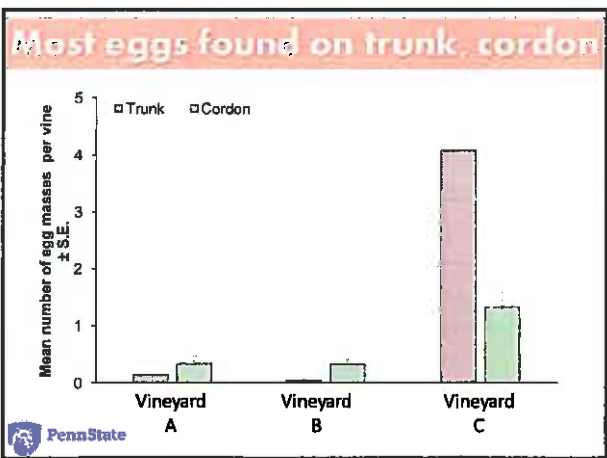
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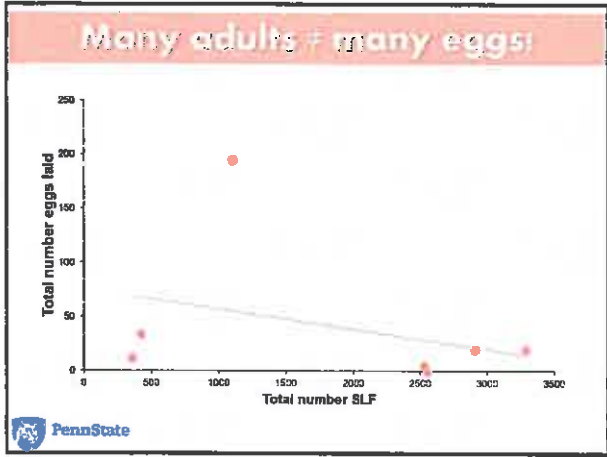
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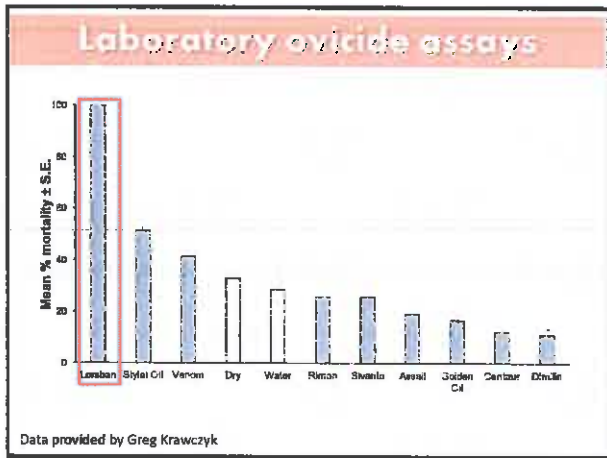
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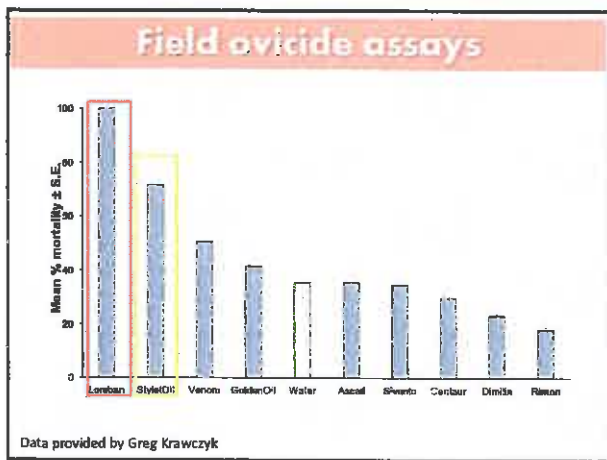
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### SLF feeding damage to grapevine

Preliminary data suggests that SLF feeding at high levels (6-10 per shoot) on Chardonnay:

- Reduced cold hardiness from **-1.3 °F to 0.5 °F**
- 2 SLF per shoot did not drastically reduce cold hardiness.



Data provided by Erica Smyers and Michela Centinari

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### Current recommendations

SLF peaks in **mid-late September**, coinciding with harvest

No current action thresholds, but **5-10 SLF** per vine might be a good estimate

Adults may be **harder to kill** than nymphs, but dinotefuran, bifenthrin, thiamethoxam, carbaryl, and zeta-cypermethrin offer best control

If you had high levels of SLF, **check bud mortality** before pruning. Potentially, leave more buds

...but still many unanswered questions!



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### Ongoing grape research



Dr. Erica Smyers, Penn State University  
 Dr. Michela Centinari, Penn State University  
 Dr. David Niswander, Penn State University  
 Dr. John Hartman, Penn State University  
 Dr. Robert Mitchell, Penn State University  
 Dr. David Niswander, Penn State University  
 Dr. John Hartman, Penn State University

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### SLF predators



**Generalist predators** are attacking SLF in the US  
 (10% of the life manual 200 SLF populations)

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### SLF parasitoids




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### SLF endemic parasitoids



*Chorebus*

Spiny mouth parasitoid  
introduced in 1908

Not reported on SLF in  
China

~7% parasitism of  
cattle egg masses

~20% of SLF eggs  
parasitized

Optimal parasitism  
at 15°C

Lee & Motern (2017) J. Insect Sci.

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### Search for parasitoids in China



**FOREIGN EXPLORATION**  
 100 egg masses and 529 nymphs collected (2015-2016)

**TO BE REPORTED AS:**  
 Parasitoid: *Anastatus orientalis*  
 Host: *Dryinus* sp. nr. *browni*

Withholding authority of U.S. quarantine facility

Data courtesy of Kim Hoelmer & Juli Gould

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### Fungal pathogens for SLF

**FUNGAL PATHOGENS**

Two fungal pathogens for SLF are being tested:

Genus *Besouveria* sp., and *Bathomyces major*

Researcher working with Dr. Aron Entwistle at Cornell University



Penn State

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### What about damage to other crops?



To date, no damage from SLF reported in any agricultural commodity except grape

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SLF on soybean, corn, alfalfa



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SLF in backyard gardens



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SLF in orchards



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Pruning and care <2 weeks on a 10' tree and 10' crown

No economic damage to the tree and the crown

SPN can get you started now and help

SPN can get you started now and help

PennState

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### Other research

- 1. Spotted lanternfly
- 2. Tree health
- 3. Tree growth
- 4. Tree mortality
- 5. Tree-ring analysis
- 6. Tree-ring analysis
- 7. Tree-ring analysis
- 8. Tree-ring analysis
- 9. Tree-ring analysis
- 10. Tree-ring analysis

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### Preparing for spotted lanternfly

Monitor your wood edge for spotted lanternfly

If you find a spotted lanternfly on a tree, please report it to the local extension office.

<https://extension.psu.edu/spotted-lanternfly> or 1-888-422-3359

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