

# New and evolving pests in fruit orchards 2018 update



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# SPOTTED LANTERNFLY IN PENNSYLVANIA



Sven-Erik Spichiger, Entomology Program Manager

First original report: Sep 34, 2014



# SPOTTED LANTERNFLY IN PENNSYLVANIA



Sven-Erik Spichiger, Entomology Program Manager



Adults: July - December



Egg Laying:  
September - November



Eggs: October - June



Fourth Instar:  
July - September

## One Generation Per Year



Hatch and 1st Instar:  
May - June



Third Instar: June - July



Second Instar: June - July

# SPOTTED LANTERNFLY IN PENNSYLVANIA

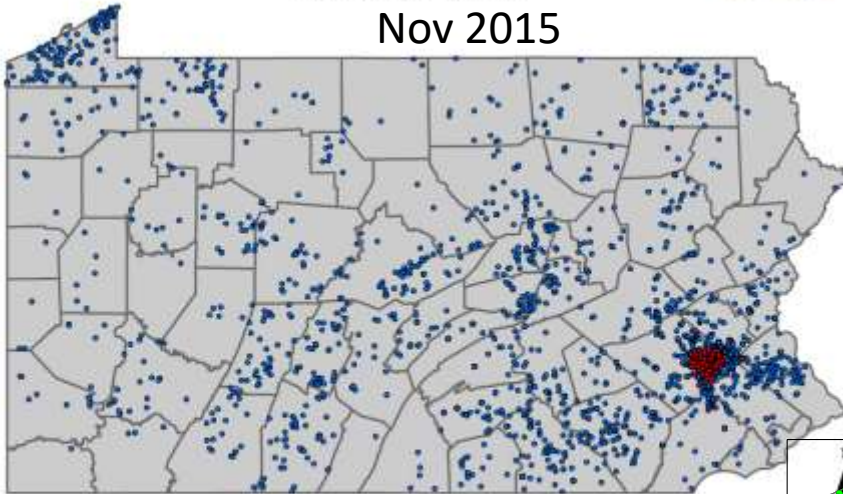


Sven-Erik Spichiger, Entomology Program Manager

Lycorma Detection Survey  
Results through 30 Nov 2015



Nov 2015



Spotted Lanternfly Presence

Lycorma Survey Points

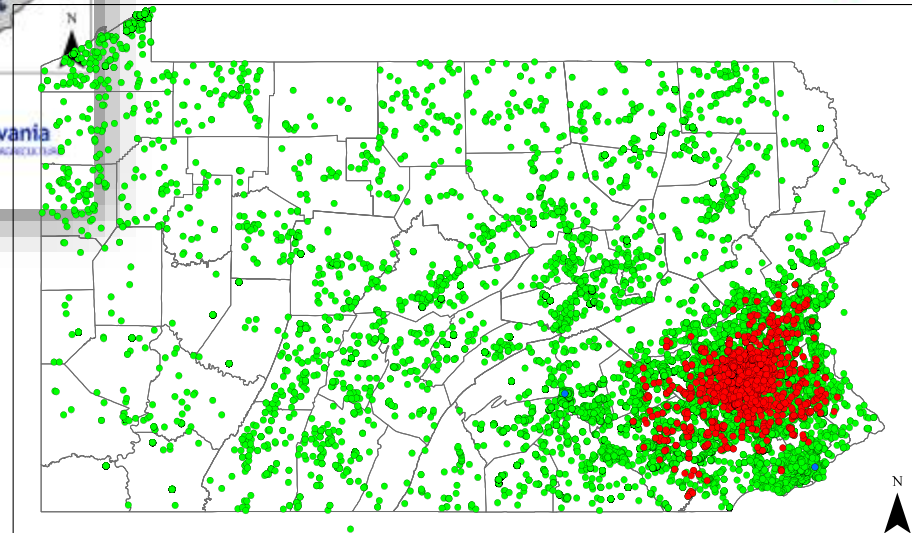
- Present
- Not Found



## Distribution

Jan 2018

2014 -- 2018 Lycorma Detection Survey  
Results through 31 January 2018



Spotted Lanternfly Presence • Regulatory Incident • Pos • Neg



# Insecticide Bioassays

- New York and Pennsylvania Pest Management Guidelines for Grapes
  - Focused on grape leafhopper management
- Restricted and unrestricted products
- 20 products tested
  - 18 products applied via foliar spray; 2 direct contact
  - 2 controls (water)
  - Used highest recommended rate/acre on label

*Slide courtesy of Erica Smyers, Ph.D. graduate student, PSU Entomology*


## Foliar applications

- Grapevine cuttings treated & allowed to air dry before introducing insects
- 6 reps per treatment
- 4 adults (2M/2F) per rep
- Morality recorded 24 and 48 hr post exposure
- Repeated 4 times



# Insecticide efficacies: mortality at 48 h AT



Mortality %			
Trade name	Active Ingredient	Korean tests eggs/nymphs (eggs and 2 <sup>nd</sup> instar)	PSU tests adults 
<b>Actara</b>	thiamethoxam	32/100	<b>100</b>
<b>Venom</b>	dinotefuran	0/100	<b>99</b>
<b>Assail</b>	acetamoprid	27/100	<b>92</b>
<b>Provado</b>	imidacloprid	21/100	<b>Not tested</b>
<b>Belay</b>	clothianidin	20/100	<b>Not tested</b>
<b>Sevin</b>	carbaryl	Not tested	<b>98</b>
<b>Lorsban</b>	chlorpyrifos	100/100	
<b>Imidan</b>	phosmet	Not tested	<b>100</b>
<b>Malathion</b>	malathion	Not tested	<b>100</b>
<b>Confirm</b>	tebufenozide	26/-	<b>50</b>
<b>Voliam flexi</b>	Thiametoxam +chloratraniliprole	Not tested	<b>100</b>


*Slide courtesy of  
Erica Smyers, Ph.D.  
graduate student,  
PSU Entomology*

ANOVA Total Dead 48 Hrs  
Means for groups in homogeneous subsets  
Student-Newman-Keuls<sup>a, b, c</sup>

# Insecticide efficacies: mortality at 48 h AT




*Slide courtesy of  
Erica Smyers, Ph.D.  
graduate student,  
PSU Entomology*

Mortality %			
Trade name	Active Ingredient	Korean tests eggs/nymphs (eggs and 2 <sup>nd</sup> instar)	PSU tests adults 
<b>Brigade</b>	bifenthrin	9/100	<b>99</b>
<b>Brigadier</b>	bifenthrin + imidacloprid	Not tested	<b>96.75</b>
<b>Leverage 360</b>	imidacloprid + beta-cyfluthrin	Not tested	<b>88.5</b>
<b>Sniper</b>	bifenthrin	9/100	<b>94</b>
<b>Baythroid XL</b>	beta-cyfluthrin	Not tested	<b>77.25</b>
<b>Mustang Maxx</b>	zeta-cypermethrin	Not tested	<b>76</b>
<b>Asana</b>	esfenvalerate	0	<b>Not tested</b>
<b>Endeavor</b>	pymetrozine	Not tested	<b>77.25</b>

ANOVA Total Dead 48 Hrs  
Means for groups in homogeneous subsets  
Student-Newman-Keuls<sup>a, b, c</sup>

# Insecticide efficacies: mortality at 48 h AT



Mortality %			
Trade name	Active Ingredient	Korean tests eggs/nymphs (eggs and 2 <sup>nd</sup> instar)	PSU tests adults 
<b>Natria</b>	sulfur; pyrethrins	Not tested	<b>87.5</b>
<b>Aza-Direct</b>	azadirachtin	Not tested	<b>45.75</b>
<b>BotaniGard</b>	<i>Beauveria bassiana</i> strain GHA	Not tested	<b>45.5</b>
<b>Insecticidal Soap</b>	potassium salts of fatty acids	Not tested	<b>100</b>
<b>Neem</b>	neem oil extract	-/45	<b>85.75</b>
<b>oil</b>	oil	48/100	<b>Not tested</b>
<b>Entrust</b>	spinosad	37/100	<b>Not tested</b>
<b>*Control (A)</b>	-	Corrected	<b>41.75</b>
<b>*Control (B)</b>	-	Corrected	<b>57.25</b>

*Slide courtesy of Erica Smyers, Ph.D. graduate student, PSU Entomology*

ANOVA Total Dead 48 Hrs  
Means for groups in homogeneous subsets  
Student-Newman-Keuls<sup>a, b, c</sup>



# Management strategies from south Korea

Dr. Myung-Kyu Song: Grape Research Institute in South Korea



## 4 strategy options

- Apply chlorpyrifos to eggs in March/April
- Treat with dinotefuran at 95% cumulated hatch in early June
- Decrease pest density using sticky traps between mid-June & early Sept. & spray when adult density is greater than 5-10 insects/grapevine in early August
- Treat adults before spawning (around late September)

*Slide courtesy of Erica Smyers, Ph.D. graduate student, PSU Entomology*

Organic vineyards:

Protective bags



Using the conical type bunch bag



preventing black mold on the inner bunch bag

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[http://www.agriculture.pa.gov/Plants\\_Land\\_Water/PlantIndustry/Entomology/spotted\\_lanternfly/Pages/default.aspx](http://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/Entomology/spotted_lanternfly/Pages/default.aspx)

# Leopard moth, *Zeuzera pyrina* L. US and Spain experience



Greg Krawczyk and  
GARCÍA S.; IVÁÑEZ P.; BOSCH D.; SARASÚA M. J. Y AVILLA J.  
Área de Protección de Cultivos - Centro UdL-IRTA de R+D, Lleida, Spain

# Leopard moth



PA and NJ issues , circa 2007

# Leopard moth stages



**Pupa**



**Pupa**



**Exuvia**



**Adult**

# Leopard moth



Photo W.A.



Photo J.H.



Photo J.H.



Photo J.H.

PA, four commercial fruit growers across the state, plus NJ 2016-2017

# Leopard moth damage potential

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↓ **Adult emergence from gallery monitoring:  
initial population**

<b>Plot / Year</b>	<b># Trees</b>	<b>Damaged trees (%)</b>	<b># Galleries per damaged tree</b>
<b>Alcarràs / 93</b>	<b>888</b>	<b>4.2</b>	<b>1.4</b>
<b>Rosselló / 93</b>	<b>320</b>	<b>20.0</b>	<b>3.2</b>
<b>Rosselló / 94</b>	<b>320</b>	<b>40.6</b>	<b>5.4</b>
<b>Gimenells / 99</b>	<b>1666</b>	<b>0.54</b>	<b>1.8</b>
<b>Lleida / 99</b>	<b>204</b>	<b>6.4</b>	<b>1.8</b>

**Life cycle**

↓ **Adult emergence from gallery monitoring:  
mortality of active galleries and biannual  
larvae**

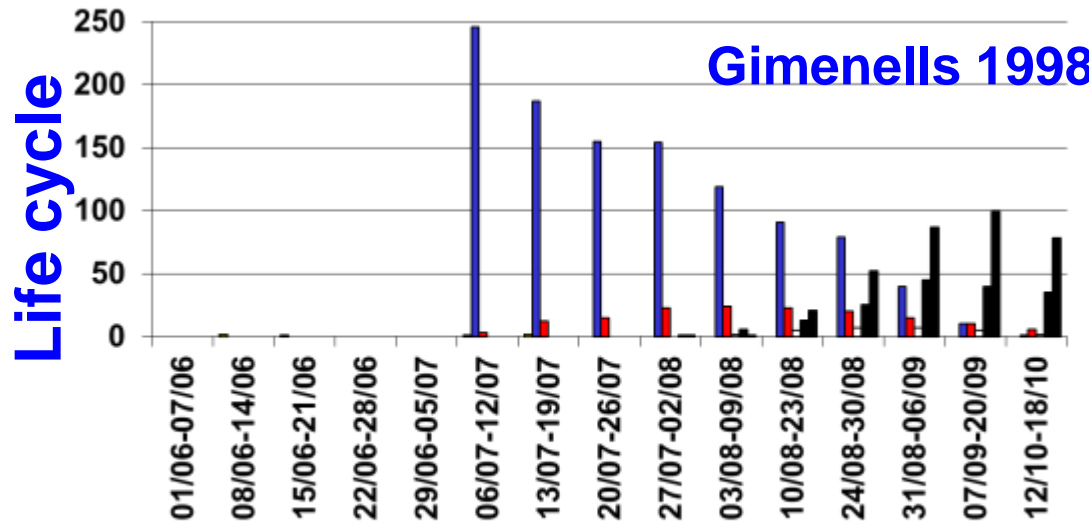
<b>Plot/ Year</b>	<b>% mortality active May gal.</b>	<b>% biannual larvae</b>
<b>Alcarràs / 93</b>	<b>23.5</b>	<b>9.8</b>
<b>Rosselló / 93</b>	<b>11.3</b>	<b>5.9</b>
<b>Rosselló / 94</b>	<b>11.9</b>	<b>1.7</b>
<b>Gimenells / 99</b>	<b>37.5</b>	<b>6.3</b>
<b>Lleida / 99</b>	<b>33.3</b>	<b>5.6</b>

**Life cycle**

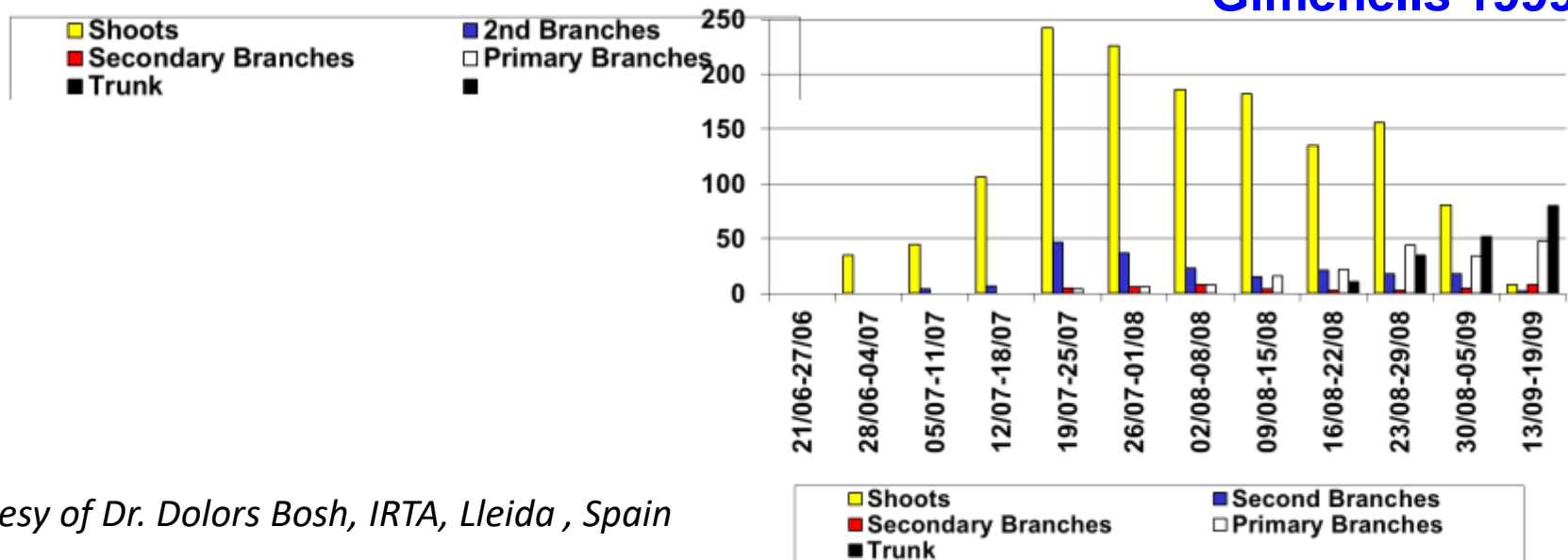




## Evolution of the larval attack of leopard moth # of active entrances



**Gimenells 1999**

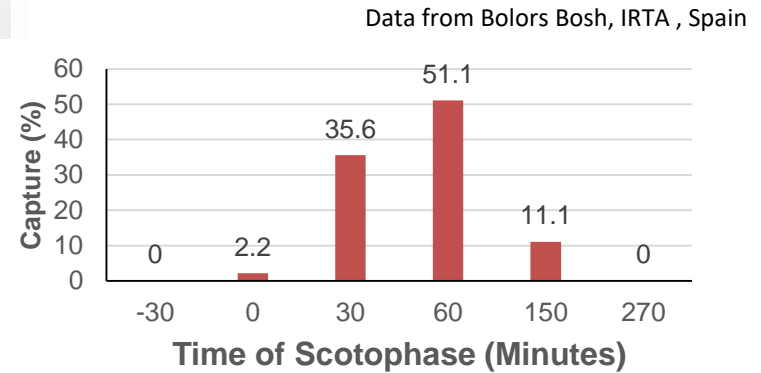


# Conclusions

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- ↓ The percent emergence from galleries that were active in May was between 61% and 87%. The percentage of **biannual larvae** was between 2% and 10%.
- ↓ A “protandry”, (males emerging before females) of about 4 days was observed. Pheromones attract males from **long distances**.
- ↓ Pheromone trap captures began in **late May** (at 340 DD<sub>(10C)</sub>) and ended in **mid-August**.
- ↓ The interval between emergence of the female and the maximum number of damaged shoots was about **5 weeks** which corresponded to a 468 – 589 degree days.

# Monitoring efficacy issues (2017 )



Captures in traps placed in tree canopy (20 traps):  
Jun – Aug - **1 moth** (Trece lures)

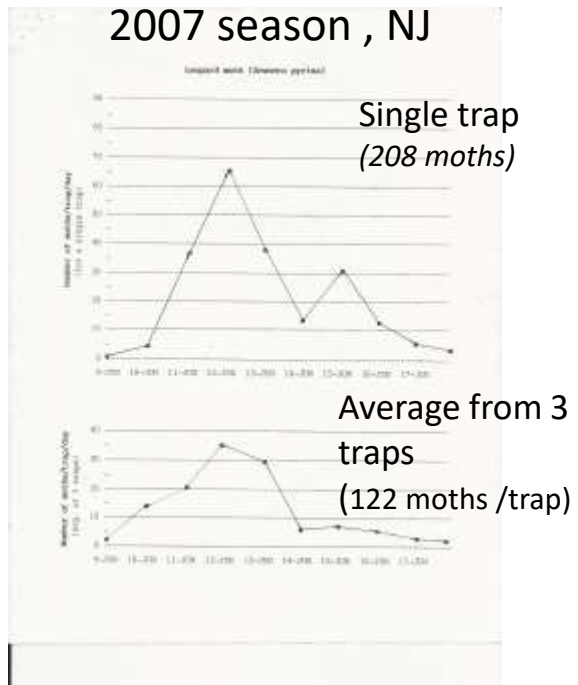
Captures during the 2017 season (2 traps):  
Jun 19 - July 31 - **24 moths** (Trece lures)  
Jun 19 – July 31 - **5 moths** (Alpha Scent lures)



Comments from a grower dealing with the leopard moth for the last 10 years:

- First captures in traps: May 27 (2010) – June 19 (2017)
- Latest capture in traps: early August
- Calculating degree days starting January 1, the first captures were at 428 – 592 DD<sub>50</sub>
- Larvae attracted mostly to trunk and lowest branches and scaffolds
- The lure is also attractive to red oak clearwing borer, *Parathrene simulans*
- **Downy woodpecker** better than any chemical treatment

# Conclusions



Source: pinterest.com



# **Black Stem Borer – A New Pest in Apples**

Deborah Breth – CCE-LOF

Art Agnello – Cornell

Kerik Cox – Cornell

Elizabeth Tee – CCE-LOF

Hannah Rae Warren – Cornell Intern

# *Xylosandrus germanus* – Black Stem Borer

“Ambrosia Beetle” (Curculionidae: Scolytinae)



Female drills a hole ~1mm in diameter, and hollows out a channel into heartwood of (usually small) physiologically stressed trees.



larva/pupa in brood chamber

Slide courtesy of Art Agnello, et al. 2017

# Damage

- Discoloration and blistering of bark
- Compressed sawdust toothpicks from adult tunneling
- Tree's vascular system shuts down: wilting/dieback/death



*Slide courtesy of Art Agnello, et al. 2017*



Ambrosia beetle infestation on young apple trees in PA 2017



# Trapping BSB

- RE: Peter Schultz “Simply” trap
- Inverted “Simply” traps with rectangular openings cut in side panels
- Agbio: [agbio@agbio-inc.com](mailto:agbio@agbio-inc.com) ethanol lures
- Hung 2-3 feet off the ground
- A drop of low toxicity anti-freeze in lid
- Hung on edge of woods next to orchard.
- Hung in interior of orchard.
- Checked traps weekly

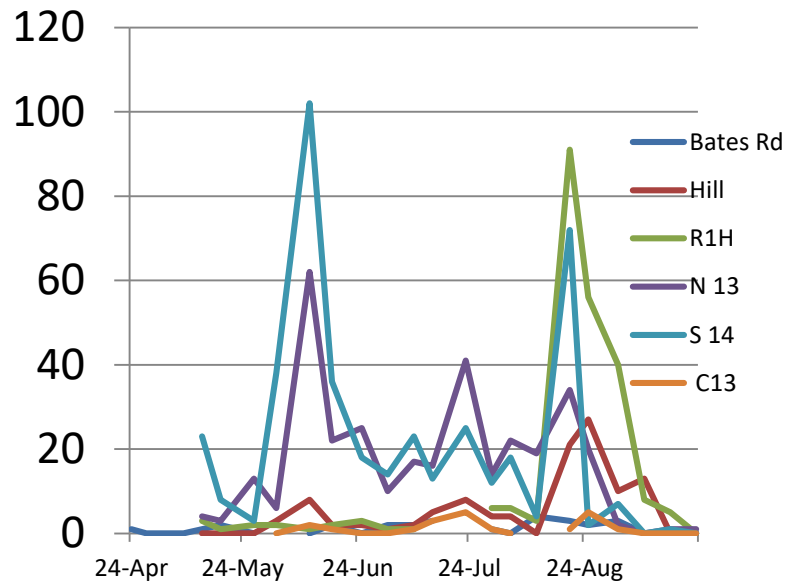


Slide courtesy of Deborah Breth et al. 2014

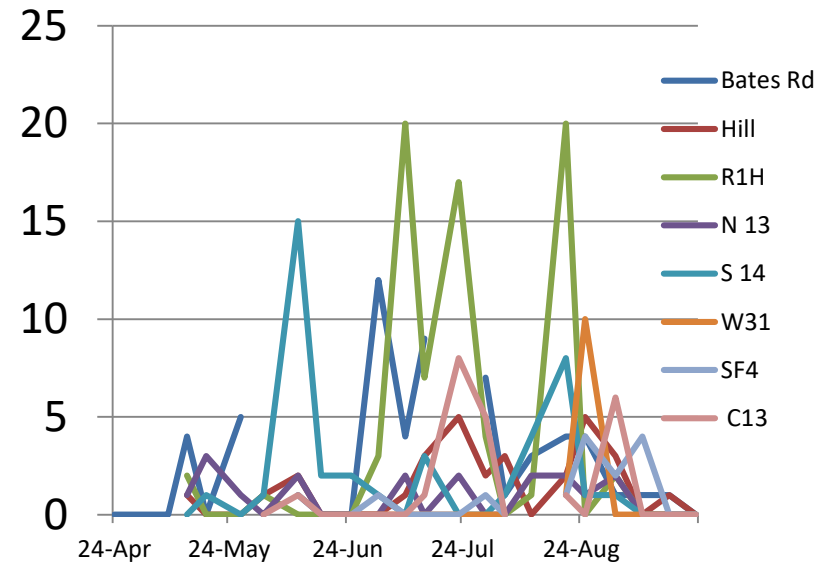
# BSB weekly trap catch NY sites.



## Edge BSB trap counts

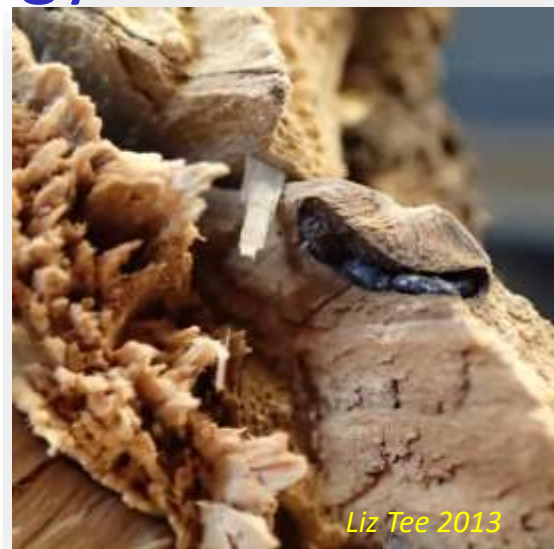


## Interior BSB trap counts



# Black stem borer biology in NY

- Adults overwinter in galleries at the base of infested trees
- Females emerge from overwintering sites to infest new sites **after 2-3 days with max temperatures  $\geq 68^{\circ}\text{F}$** 
  - “4 days after first bloom on Norway maple, and full bloom on border Forsythia.” (about 100 DD<sub>50</sub> since January 01)
  - Adult female drills a hole ~1mm in diameter, and hollows out a channel into the heartwood of small trees (2-50 cm diameter) .



# Black stem borer biology in NY

- The female starts to culture a fungal food source, *Ambrosiella hartigii*, *Fusarium*?
- Food for the larvae and adults
- She lays her eggs (tiny, ~1mm white, football shaped) in the chamber.
- Larvae also white with 3 instars
- **It takes ~ 30 days** for development from egg to adult producing 2 generations per year
- The ratio of females to males is about 10:1.
- **Late summer the beetles migrate to a hole lower in the trunk** to overwinter - as many as 100 in one chamber.
- The **beetles go into diapause** - not active again until the next spring.



## Chemical control:

### Ornamental Nurseries

- ☑ permethrin on a 2-week schedule
- ☑ neonicotinoids, anthranilic diamides (cyazypyr, acelepryn), and tolfenpyrad, not effective

### Apples?

- ☑ Warrior II or Grizzly, lambda-cyhalothrin, labeled for tree borer species
- ☑ DECLARE is gamma-cyhalothrin.
- ☑ chlorpyrifos trunk sprays for borers may be effective

# Thank you

Quiz ...



Spotted lanternfly



Leopard moth



Ambrosia beetle



Carpenter bee

Questions?