Eastern NY Entomology Update on Invasive Species Management

2015 Hudson Valley Commercial Fruit Growers’ School
Best Western Plus
Kingston, NY
February 10\textsuperscript{th}, 2015

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Hudson Valley Research Laboratory
Historical Invasive Insect Pests Of Fruit In Eastern New York

Apple maggot, *Rhagoletis pomonella* (Wash, 1867)  
European red mite, *Panonychus ulmi*  
Grape berry moth, *Lobesia botrana* ([Dennis & Schiffermuller])  
Japanese beetle, *Popillia japonica*  
Oriental fruit moth, *Grapholita molesta* (Busck)  
Oystershell scale, *Lepidosaphes ulmi* (Linnaeus)  
Pear psylla, *Cacopsylla pyricola* Foerster  
Rose leafhopper, *Edwardsiana rosae* (Linnaeus)  
San Jose scale, *Quadraspidiotus perniciosus* (Comstock)

Tephritidae; Diptera  
*Acari*: Tetranychidae  
Tortricidae; Lepidoptera  
Scarabaeidae; Coleoptera  
Tortricidae; Lepidoptera  
Diaspididae; Hemiptera  
Homoptera: Psyllidae  
Cicadellidae; Homoptera  
Diaspididae; Hemiptera
The Spotted Lanternfly, *Lycorma delicatula* (White), is a planthopper originating from China, Korea, India, Vietnam, and parts of eastern Asia.

On Sept. 22, 2014, the Pennsylvania Department of Agriculture, in cooperation with the Pennsylvania Game Commission, confirmed the presence the Spotted Lanternfly in Berks County, PA.

It is an invasive insect in Korea where it was introduced in 2006 and since has **attacked 25 plant species** which also grow in Pennsylvania. In the U.S. it has the potential to greatly impact **>70 plant host species including grape, pome and stone fruit**.

**Adults** appear in July & moves to **Tree of Heaven** (*Ailanthus altissima*) to lay eggs in October

**SLF** pierces the bark to feed on sap.

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New Pest Update: Spotted Lanterfly. Hemiptera: Fulgoridae

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New Pest Update: Spotted Lanternfly. Hemiptera: Fulgoridae

- Nymphs hatch from Late April to early May egg masses laid on smooth bark, stone, and other vertical surfaces. Nymphs **climb, feed and fall** repeatedly onto host plants.

- Nymphs complete **four immature stages**. The first stage is black with white spots and wingless.

- As it grows, the Spotted Lanternfly will start to develop red patches in addition to the white spots. Nymphs spread from the initial site by crawling and feeding on woody and non-woody plants.
Distribution in PA
7 Townships in Berks County

180 miles south of Highland, NY
**New Pest Update: Spotted Lanterfly: Management**

**Target adults in mid-late September prior to egg laying & nymphs as they hatch**

- Removal of egg masses from bark

- Trunk applications of Dinotefuran (*Safari, Scorpion, Venom*)
  - Systemic insecticide activity kills insects as they feed on sap

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SLF Eggs

[Images of the spotted lanternfly and its eggs on a tree bark]

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Spotted Wing Drosophila

SWD Adult Male

Infected Blackberry

Fruit Fly Egg ‘Respitory Horns’
Life Cycle of the Spotted Wing Drosophila

*Drosophila suzukii* (Matsumura)

- **Eggs**: 12-72 hours
- **Three Larval Instars**: 5-7 days
- **Pupation**: 4-15 days (inside or outside of fruit)
- **Adults**: 20-30 days

Development Range: 10d – 4 weeks
Female Drosophila species

Spotted Wing Drosophila (D. suzukii)

SWD has a large, saw-like, serrated ovipositor with two even rows of teeth that are much darker than rest of ovipositor.

Other Drosophila spp. have smaller, more rounded ovipositors, sometimes with irregular, poorly defined teeth.

UC Berkeley & UC Cooperative Extension  Photos: M. Hauser, CDFA
Spotted Wing Drosophila

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Spotted Wing Drosophila
Spotted Wing Drosophila

New York, 2013
SWD Trap Network

Month of first spotted wing drosophila trap catch.
Counties colored white had no traps reporting.
* Traps removed in August after harvest.
** Larvae found in fruit.

Legend

- January 💚 February 💚 March 💚 April 💚 May 💚 June 💚 July
- August 💚 September 💚 October 💚 November 💚 December
- Not Found

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Crops at Highest Risk

- Raspberries, blackberries, and blueberries
- Fall-bearing and late maturing varieties
- **Day-neutral strawberry** varieties
- Late season tart and sweet cherries
- Thin-skinned grapes (*Pinot Noir: Dejon Clones*)
- Cracked or damaged fruit of peach.
Alternate hosts for SWD

*Lonicera sp - Tartarian Honeysuckle*
SWD SEASONAL DYNAMICS IN THE NORTHEAST

2013 Monitoring Data
Finger Lakes Region, NY

- Agricultural
- Woods

Credit: Greg Loeb Lab, NYSAES Geneva, NY
### CLASSES OF SWD INSECTICIDES

<table>
<thead>
<tr>
<th>Class</th>
<th>IRAC Code</th>
<th>Examples</th>
<th>SWD Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organophosphates</td>
<td>1B</td>
<td>Malathion</td>
<td>Excellent to good</td>
</tr>
<tr>
<td>Pyrethroids</td>
<td>3A</td>
<td>Brigade, Danitol, Mustang Max</td>
<td>Excellent</td>
</tr>
<tr>
<td>Spinosyns</td>
<td>5</td>
<td>Delegate, Entrust</td>
<td>Excellent to good</td>
</tr>
<tr>
<td>Neonicotinoids</td>
<td>4A</td>
<td>Assail</td>
<td>Good to poor</td>
</tr>
<tr>
<td>Carbamates</td>
<td>1A</td>
<td>Sevin</td>
<td>Good to poor</td>
</tr>
<tr>
<td>Diamide</td>
<td>28</td>
<td>Exirel*</td>
<td>Excellent to good</td>
</tr>
</tbody>
</table>

*Just received EPA label for blueberries, not raspberries*

**Credit:** Greg Loeb Lab, NYSAES Geneva, NY
Survey on insecticide efficacy against SWD, collated by Rufus Isaacs, MSU - November, 2013
Enhancing Mortality with Sugar

SWD infestation, Blueberries, 2013
(data from Rodriguez-Saona, Cowles et al, in press)

Cultivar: ‘Bluecrop’

Treatments: 4 wk spray program
- Alternate Delegate & Assail
- Delegate & Assail plus sugar

Plot size: 2 rows, 32 bushes

Replicates: 4

2 lbs. sugar / 100 gal. water

Credit: Greg Loeb Lab, NYSAES Geneva, NY
Sucrose Improves Insecticide Activity Against Drosophila suzukii (Diptera: Drosophilidae)

Richard S. Cowles, Cesar Rodriguez-Saona, Robert Holdcraft, Gregory M. Loeb, Johanna E. Elsensohn, Steven P. Hesler
Effect of Rain on Some Common Insecticides
From Rufus Isaacs, MSU

0.8 inches of rain on treated bushes
1 day after application
African Fig Fly, *Zaprionus indianus* Gupta
• Damage: Predominately to citrus and grape

• Reports from Rutgers, NJ of wine grape injury independent of SWD injury.

• Hudson Valley:
  - 4 AFF in 2012
  - 0 AFF in 2013
  - 3 AFF in 2014

• Not yet a threat in NY
Managing the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in New York State
Figure 1: Risk maps displaying the relative density of field, vegetable, and fruit crop hosts plants of BMSB throughout the United States.
Brown Marmorated Stink Bug: Urban mapping of adults
BMSB Management Threshold: Ag. Mapping Communication

Partnered with EEDMaps to extend outreach

- Early Detection & Distribution Mapping of Invasive Insects

By County:
- Weekly update
- Trap data per county
- Presence in degrees of risk
- Threshold levels
Eggs: Average 28/cluster; light green to white

1st instar: black & red; cluster near eggs

2nd instar: striped antennae

3rd instar: striped antennae and legs

4th instar: thoracic spur

5th instar: wing pads

BMSB Adults: red eyes, 4 cream colored dots on shoulders; banding on legs and antenna, smooth blunt shoulders. Banded abdomen; 14 - 17 mm in length.
Stink Bug Survey: #4
100 acre Orchard;
5 acre block; Pink Lady
Fruit damage survey
September 10, 2012

Evaluation of var. ‘Pink Lady’
Trees @ 3’ x 12’ spacing

- 10 fruit / tree = 100 fruit /30’
- 9 sections; 240’ row
Elongate depression with two feeding punctures
# BMSB Management Threshold: Insecticide Efficacy

<table>
<thead>
<tr>
<th>Product</th>
<th>Active Ingredient</th>
<th>Rate / A</th>
<th>REI Hrs.</th>
<th>PHI Days</th>
<th>Efficacy (USDA)</th>
<th>Max. per crop / season</th>
<th>App. Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actara 25WDG</td>
<td>Thiamethoxam</td>
<td>2.0-5.5 oz/A</td>
<td>12</td>
<td>35</td>
<td>+++</td>
<td>16.5 oz/A (0.258 lb. a.i./A)</td>
<td>10d</td>
</tr>
<tr>
<td>Asana XL 0.66EC</td>
<td>Esfenvalerate</td>
<td>4.8-14.5 fl oz/A</td>
<td>12</td>
<td>21</td>
<td>++</td>
<td>101 fl oz/A (0.525 lb Al/A)</td>
<td>NA</td>
</tr>
<tr>
<td>Baythroid XL 1EC</td>
<td>Beta-Cyfluthrin</td>
<td>1.4-2.8 fl oz/A</td>
<td>12</td>
<td>7</td>
<td>++</td>
<td>2.8 fl oz/A (0.022 lb Al/A)</td>
<td>14d</td>
</tr>
<tr>
<td>Bifenture EC</td>
<td>Bifenthrin</td>
<td>5.2-12.8 fl oz/A</td>
<td>12</td>
<td>14</td>
<td>+++</td>
<td>32 fl ozs (0.50 lbs al)</td>
<td>30d</td>
</tr>
<tr>
<td>Bifenture 10DF</td>
<td>Bifenthrin</td>
<td>12.8-32.0 oz/A</td>
<td>12</td>
<td>14</td>
<td>+++</td>
<td>80 ozs (0.50 lbs al)</td>
<td>30d</td>
</tr>
<tr>
<td>Brigade WSB</td>
<td>Bifenthrin</td>
<td>12.8-32.0 oz/A</td>
<td>12</td>
<td>14</td>
<td>+++</td>
<td>80 ozs (0.50 lbs al)</td>
<td>30d</td>
</tr>
<tr>
<td>Danitol 2.4EC</td>
<td>Fenpropathrin</td>
<td>10.66-21.33 fl oz/A</td>
<td>24</td>
<td>14</td>
<td>+++</td>
<td>42.56 fl ozs (0.80 lbs al)</td>
<td>10d</td>
</tr>
<tr>
<td>Endigo ZC</td>
<td>Thiamethoxam / Lambda-cyhalothrin</td>
<td>5-6 fl fl oz/A</td>
<td>24</td>
<td>35</td>
<td>+++</td>
<td>19 fl oz (0.172 lb Al) NY</td>
<td>10d</td>
</tr>
<tr>
<td>Lannate 2.4LV*</td>
<td>Methomyl</td>
<td>2.25 pt/A</td>
<td>72</td>
<td>14</td>
<td>+++</td>
<td>240 ozs (0.50 lbs al)</td>
<td>7d</td>
</tr>
<tr>
<td>Lannate 90SP*</td>
<td>Methomyl</td>
<td>8-16 oz/A</td>
<td>72</td>
<td>14</td>
<td>+++</td>
<td>5.0 lbs</td>
<td>7d</td>
</tr>
<tr>
<td>Leverage 360</td>
<td>Beta-Cyfluthrin / Imidacloprid</td>
<td>2.4-2.8 fl oz/A</td>
<td>12</td>
<td>7</td>
<td>+++</td>
<td>2.8 fl oz/A</td>
<td>14d</td>
</tr>
<tr>
<td>Surround 95WP</td>
<td>Kaolin</td>
<td>25-50 lb/A</td>
<td>4</td>
<td>0</td>
<td>+</td>
<td>NA</td>
<td>0d</td>
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<tr>
<td>Thionex 50WP</td>
<td>Endosulfan</td>
<td>Max. 5 lb/A</td>
<td>20 days</td>
<td>21</td>
<td>+++</td>
<td>6.0 lbs</td>
<td>NA</td>
</tr>
<tr>
<td>Thionex EC</td>
<td>Endosulfan</td>
<td>1.33-2.67 qts./A</td>
<td>7 days</td>
<td>21</td>
<td>+++</td>
<td>2.2/3 qts (2.0 lbs al)</td>
<td>NA</td>
</tr>
<tr>
<td>Voam Xpress EC</td>
<td>Chlorantraniliprole / Lambda-cyhalothrin</td>
<td>6-12 fl oz/A</td>
<td>24</td>
<td>21</td>
<td>+++</td>
<td>31.0 fl oz/A</td>
<td>10d</td>
</tr>
<tr>
<td>Vydate 2L*</td>
<td>Oxamyl</td>
<td>4-8 pt/A</td>
<td>48</td>
<td>14</td>
<td>++</td>
<td>281 fl oz/A (128 oz Al/A)</td>
<td>7d</td>
</tr>
<tr>
<td>Warrior 1CS</td>
<td>Lambda-cyhalothrin</td>
<td>2.56-5.12 fl oz/A</td>
<td>24</td>
<td>21</td>
<td>++</td>
<td>20.48 fl oz. (0.28 lb. a.i.)**</td>
<td>5d</td>
</tr>
<tr>
<td>Warrior II 2.08CS</td>
<td>Lambda-cyhalothrin</td>
<td>1.28-2.56 fl oz/A</td>
<td>24</td>
<td>21</td>
<td>++</td>
<td>10.24 fl oz. (0.28 lb. a.i.)**</td>
<td>5d</td>
</tr>
</tbody>
</table>

* Although these materials have excellent topical ratings in lab bioassay studies, field efficacy studies have shown economic fruit injury from BMSB feeding, suggesting low residual levels.
** Post bloom applications
(+ low to (+++) high efficacy

http://blogs.cornell.edu/jentsch/

BMSB Resources

Cornell University

Hudson Valley Research Laboratory
Fruit Severity Damage Rating of BMSB Feeding to Fruit. HVRL, Highland, NY - 2014

http://blogs.cornell.edu/jentsch/
2014 Efficacy Screening Report
BMSB Adult Exposure to Insecticide Residue of Apple Foliage
72h Old Residue @ 1 d
Black Stem Borer: *Xylosandrus germanus*

Keyed out by Dan Gilrein

Slide Credits to:
- Deborah Breth – CCE-LOF
- Art Agnello – Cornell
- Kerik Cox – Cornell
- Elizabeth Tee – CCE-LOF
- Hannah Rae Warren – Cornell Intern

http://www.barkbeetles.info
Xylosandrus germanus (female) (by J Hulcr, University of Florida).
**Xylosandrus germanus (Blandford 1894) (introduced)**

- Introduced from eastern Asia - first found in NY in ’32
- Ambrosia beetle, a general wood boring insect
- Attacks many ornamental/forest species
- American beech, maple, dogwood, black walnut, oak, magnolia.
- BSB observed in apple and sweet cherry in 1982
- Cornell research and extension have not seen this pest before in apple orchards over the past 30 years in NY.
Black Stem Borer, Xylosandrus germanus (Blandford 1894) (introduced) – NE Recorded findings

http://www.barkbeetles.info

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History

• Reported by Deb Breth in WNY:

• Growers complained of trees dying or oozing from holes or fire blight from oozing rootstocks with no history of FB in the planting in 2013 growing season.

• Identified 25 sites with trees dying 2013-14.

• 1 to 15 year old plantings.
Grower sent this picture on May 1, ‘13 Fuji/M9(Pajam 2) in 4th leaf.
Found in 6 sites in 2013 associated with fire blight. Which came first? Fire blight or borers?
A second site 90 miles away in 2013.
Also found in apple nurseries, commercial and on-farm.
Adult female drills a hole ~1mm in diameter, and hollows out a channel into the heartwood of small trees (2-50 cm diameter).
The female starts to culture a fungal food source, Ambrosiella hartigii, Fusarium?

Food for the larvae and adults

She lays her eggs in the chamber. (tiny, ~1mm white, football shaped)

Larvae also white with 3 instars
Biology

- Produce 2 generations per year
- 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.
Gallery with eggs, larvae and pupae for first generation BSB

Liz Tee 2013
• Monitor for discoloration and blistering of bark.
• Monitor for bleeding sites on bark.
• Monitor for dying trees.
• Monitor: Trapping BSB
  Re: Peter Schultz

  ➢ Inverted “Simply” OJ traps with rectangular openings cut in side panels

  ➢ Agbio: ethanol lures (agbio@agbio-inc.com)

  ➢ 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
BSB weekly trap catch.

**Edge BSB trap counts**

**Interior BSB trap counts**

![Graphs showing weekly BSB trap counts for edge and interior, with data for different sites and dates.](image-url)
Apples

- Warrior II or Grizzly, **lambda-cyhalothrin**, labeled for tree borer species

- **DECLARE**: gamma-cyhalothrin.

- **Lorsban**: chlorpyrifos trunk sprays for borers may be effective

- Neonicotinoids, anthranilic diamides (cyazypyr, acelepryn), and tolfenpyrad, not found to be effective
Thank You

Technical staff and assistants
Support: NYS Ag & Mkts, ARDP, NEIPM, EDDMaps, HATCH, Bayer, Dow, Nichino, Syngenta, Gowan

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