Eastern NY Entomology Update on Invasive Species Management





2015 Hudson Valley Commercial Fruit Growers' School

Best Western Plus

Kingston, NY

February 10th, 2015

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Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

Historical Invasive Insect Pests Of Fruit In Eastern New York

Apple maggot, *Rhagoletis pomonella* (Wash, 1867)	Tephritidae; Diptera
European red mite, *Panonychus ulmi,*	*Acari*: Tetranychidae
Grape berry moth, *Lobesia botrana* ([Dennis & Schiffermuller])	Tortricidae; Lepidoptera
Japanese beetle, *Popillia japonica* Newman,	Scarabaeidae; Coleoptera
Oriental fruit moth, *Grapholita molesta* (Busck)	Tortricidae; Lepidoptera
Oystershell scale, *Lepidosaphes ulmi* (Linnaeus)	Diaspididae; Hemiptera
Pear psylla, *Cacopsylla pyricola* Foerster,	Homoptera: Psyllidae
Rose leafhopper, *Edwardsiana rosae* (Linnaeus)	Cicadellidae; Homoptera
San Jose scale, *Quadraspidiotus perniciosus* (Comstock)	Diaspididae; Hemiptera

New Pest Update: Spotted Lanterfly. Hemiptera: Fulgoridae

- The **Spotted Lanternfly,** *Lycorma delicatula* (White), is a **planthopper** orinating 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.

Adult SLF

New Pest Update: Spotted Lanterfly. Hemiptera: Fulgoridae

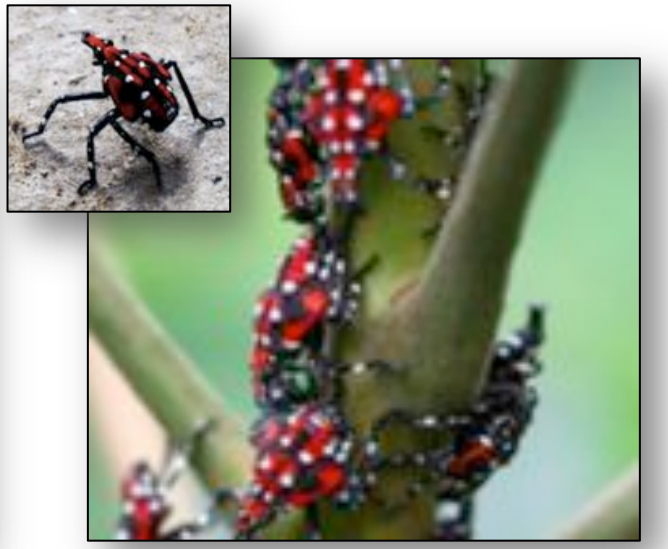
- Nymphs hatch from Late April to early May egg masses laid on smooth bark, stone, and other vertical surfaces. Nymphs **climb, feed and fall** repeatedly onto host plants.

- 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.

Fall/ Winter

Spring



Early Summer

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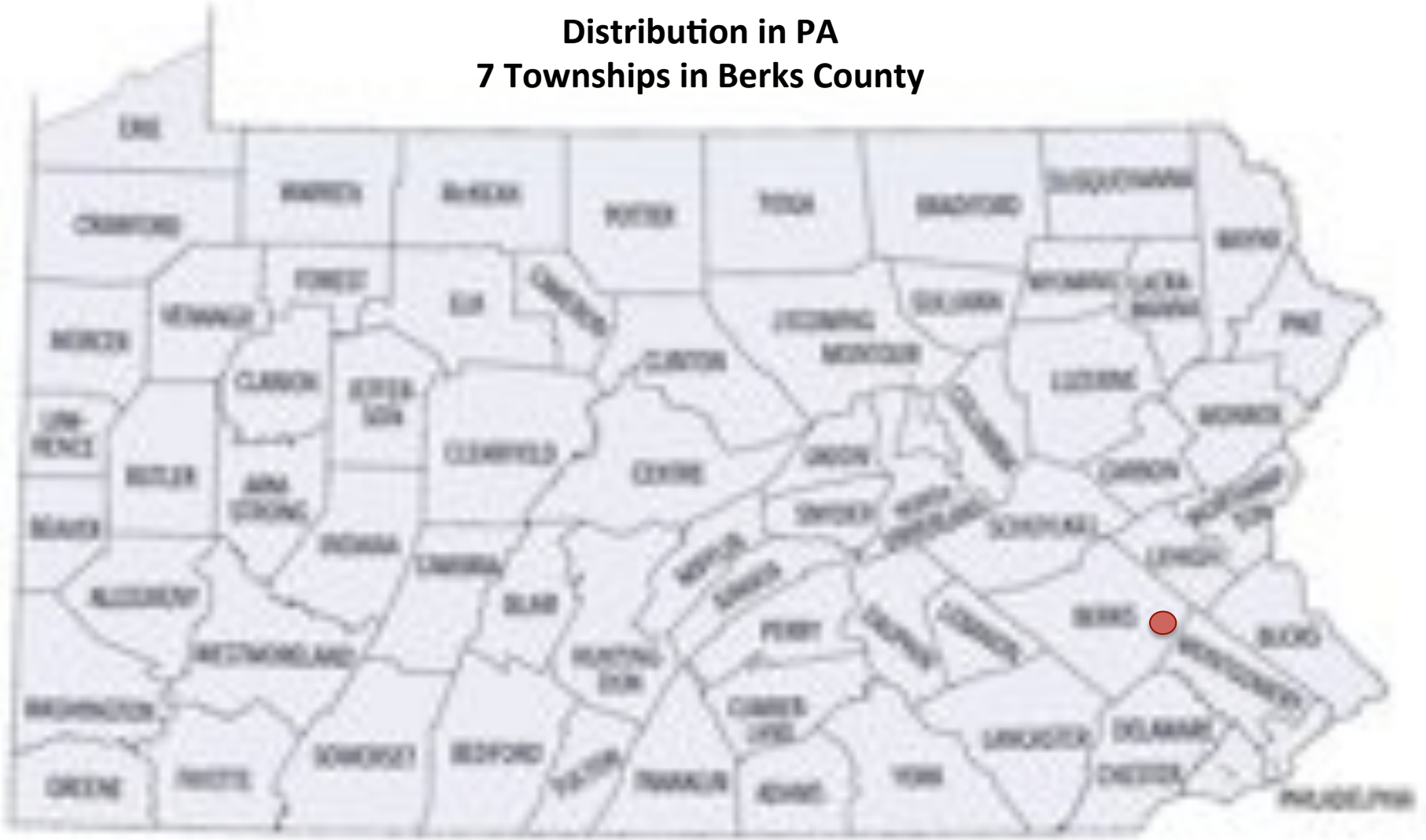
Lycorma Detection Survey

Results Through 15 December 2014

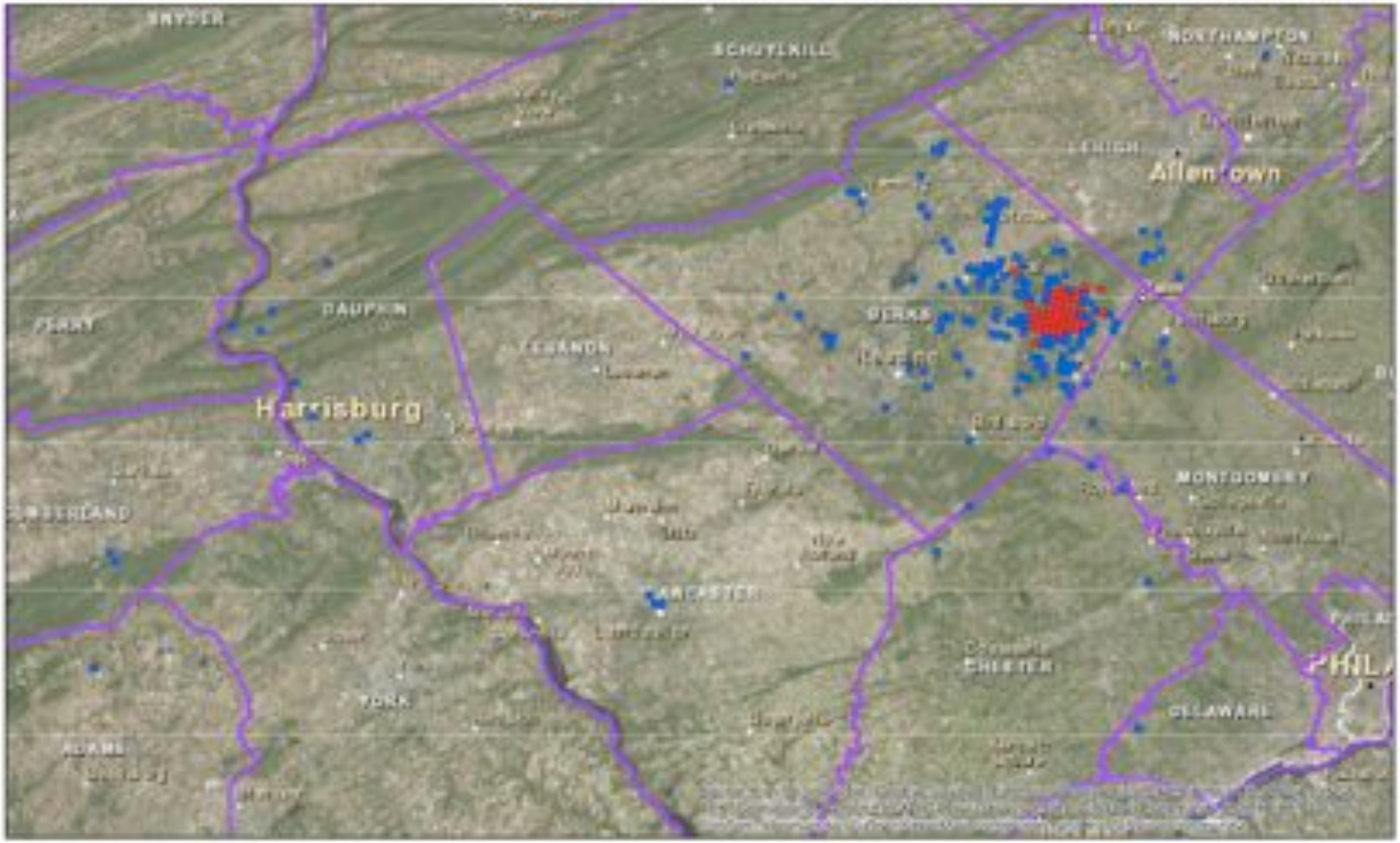
Distribution in PA
7 Townships in Berks County



180 miles south of Highland, NY

Lycorma Detection Survey

Results Through 15 December 2014



Survey Grids

- Surveyed - Positive
- Surveyed - Not Found

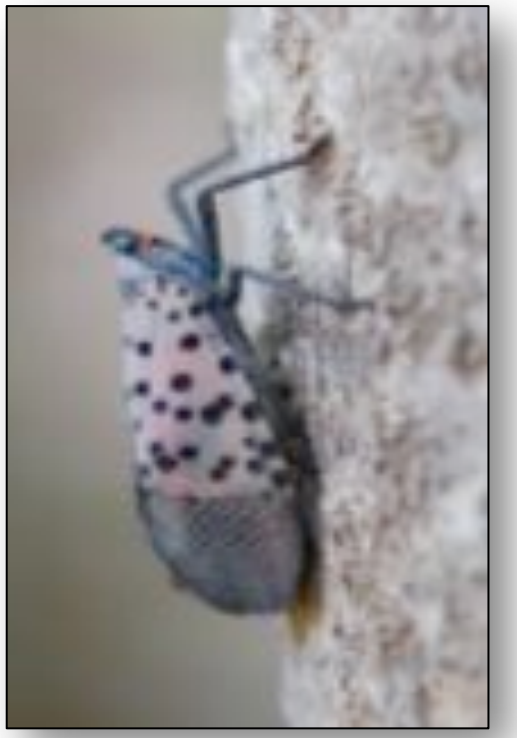
pennsylvania
DEPARTMENT OF AGRICULTURE

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 insetcicide activity kills insects as they feed on sap

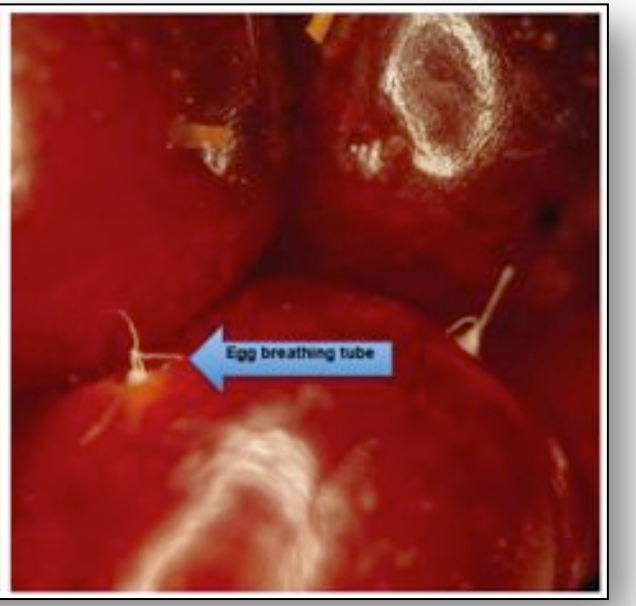


SLF Eggs

Spotted Wing Drosophila

SWD Adult Male

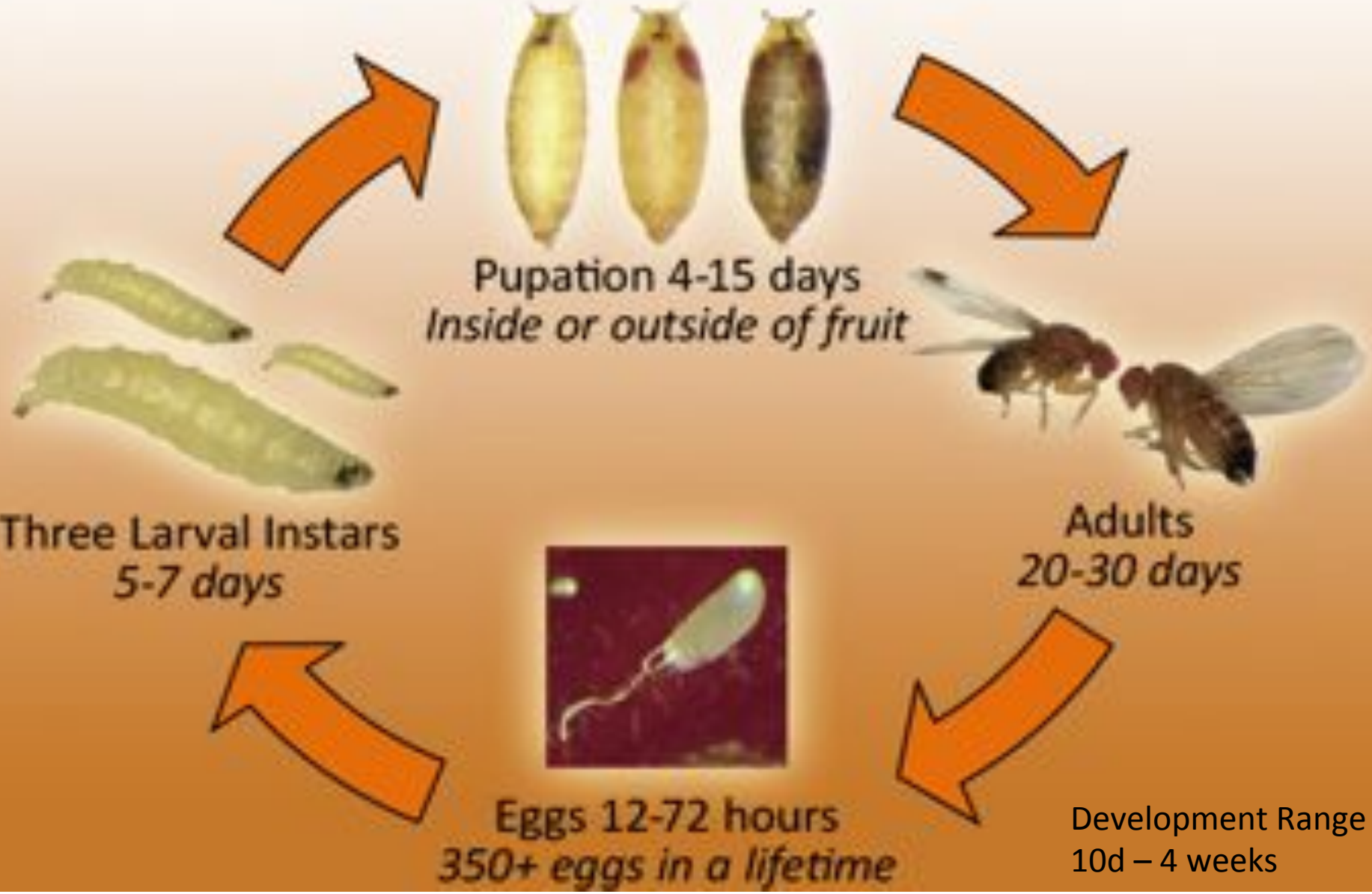
Infected Blackberry



Fruit Fly Egg 'Respitory Horns'

Life Cycle of the Spotted Wing Drosophila

Drosophila suzukii (Matsumura)



Development Range
10d – 4 weeks

Male Spotted Wing Drosophila (SWD)

UC Berkeley & UC Cooperative Extension

Photos: M. Hauser, CDFA

Double stripes on tarsi of front legs

Leading edge of wing has dark spot

Unbroken abdominal bands

Female Drosophila species

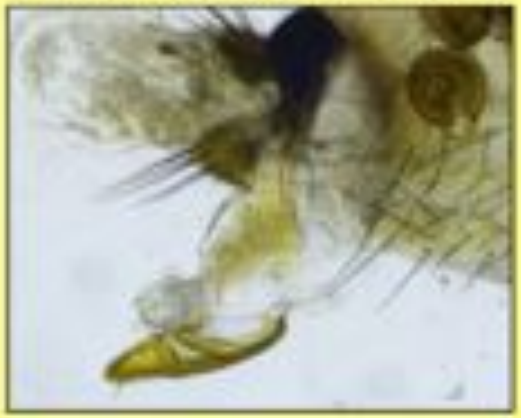
UC Berkeley & UC Cooperative Extension *Photos:* M. Hauser, CDFA

Spotted Wing Drosophila (D. suzukii)

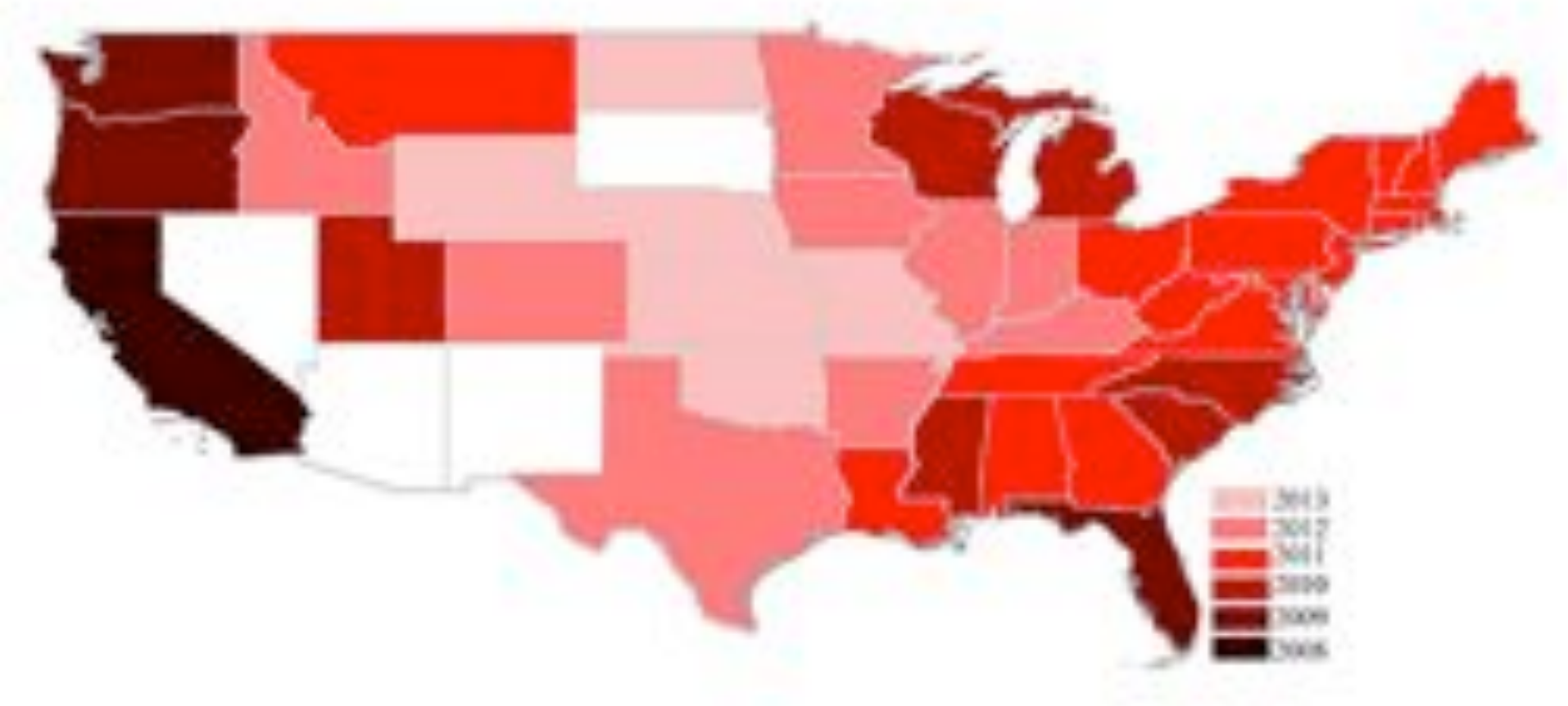
SWD has a large, saw-like, serrated ovipositor with two even rows of teeth that are much darker than rest of ovipositor

Other Drosophila spp.

have smaller, more rounded ovipositors, sometimes with irregular, poorly defined teeth



Spotted Wing Drosophila



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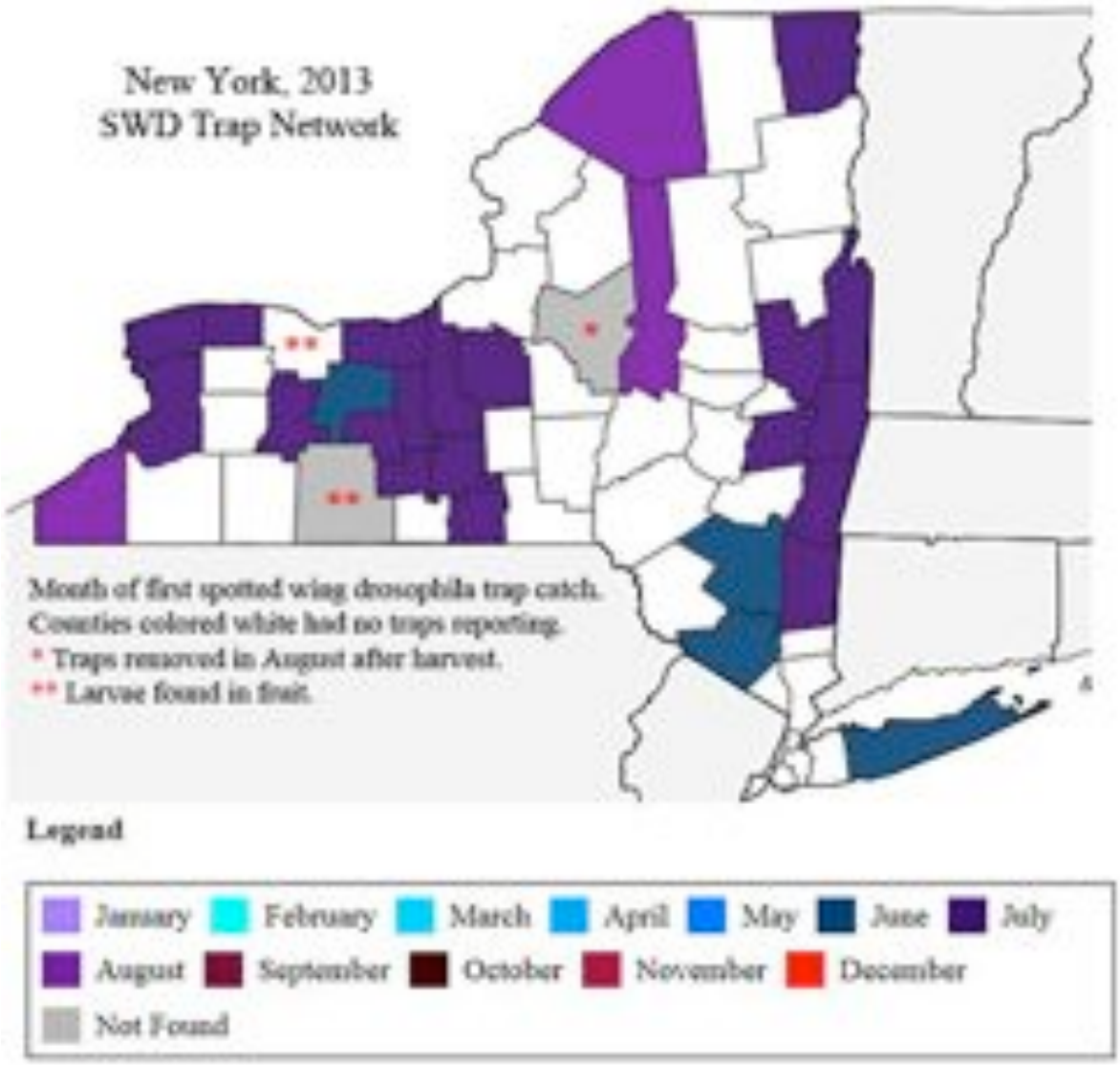
Spotted Wing Drosophila

Spotted Wing Drosophila



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.**

Imature blackberry

Alternate hosts for SWD

Lonicera sp -
Tartarian Honeysuckle

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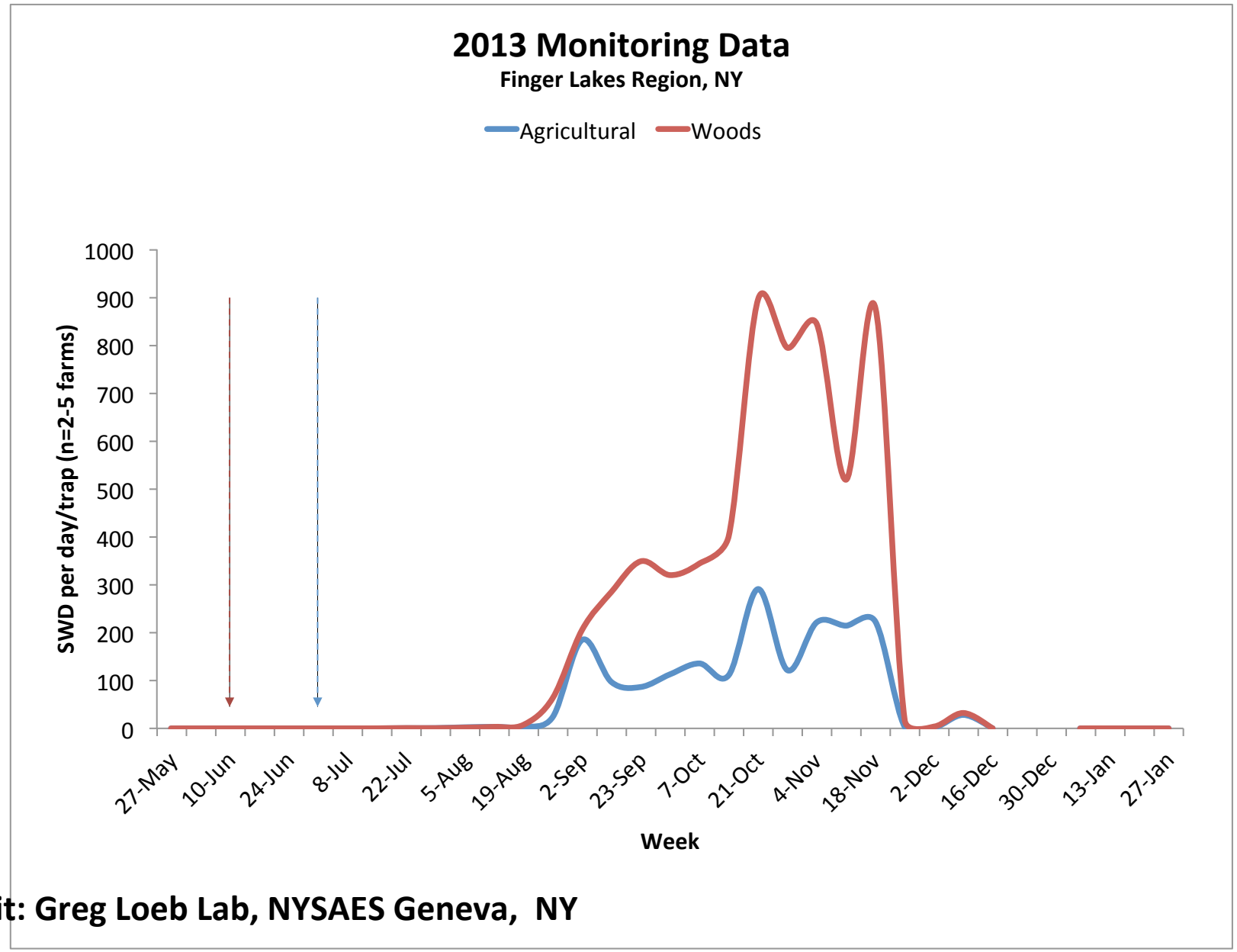
SWD SEASONAL DYNAMICS IN THE NORTHEAST



Credit: Greg Loeb Lab, NYSAES Geneva, NY

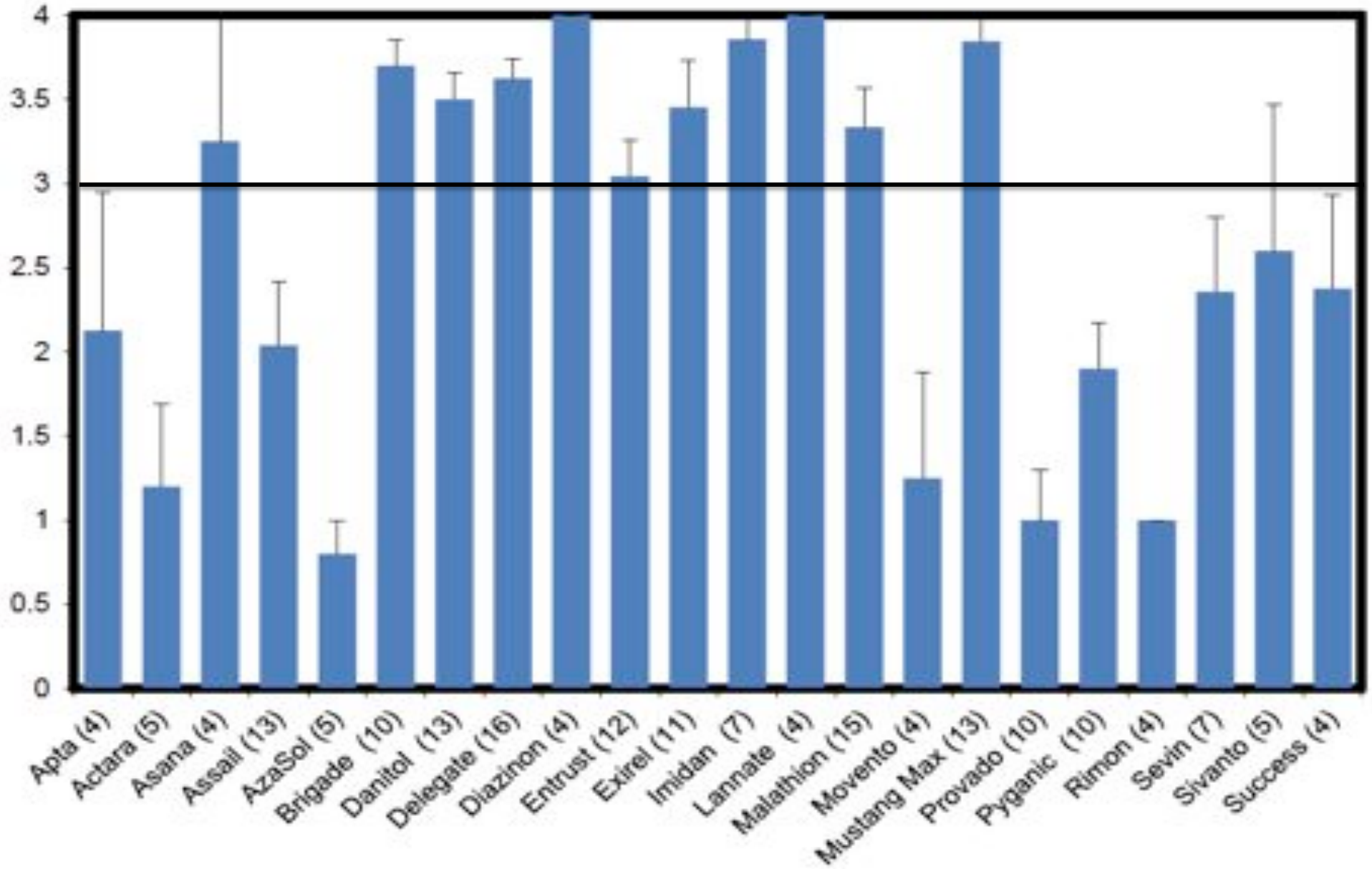
CLASSES OF SWD INSECTICIDES

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

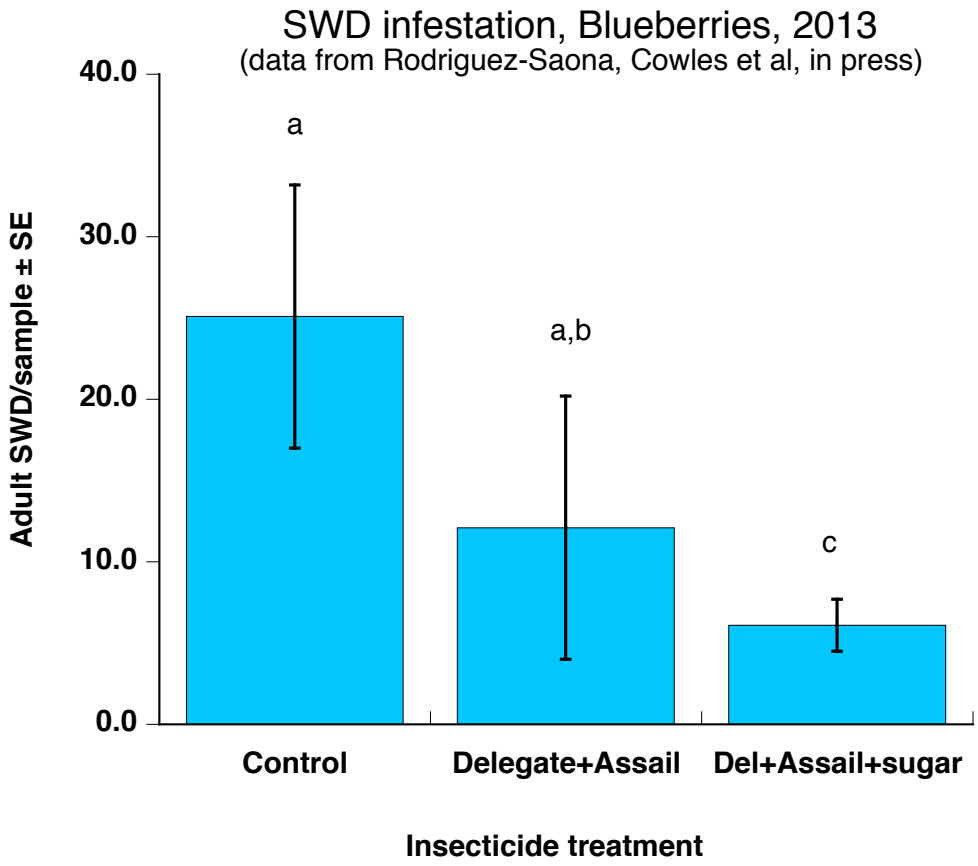
***Just received EPA label for blueberries, not raspberries**

Credit: Greg Loeb Lab, NYSAES Geneva, NY

Survey on insecticide efficacy against SWD, collated by Rufus Isaacs, MSU - November, 2013



Enhancing Mortality with Sugar



Cultivar: 'Bluecrop'

Treatments: 4 wk spray program

- **Alternate Delegate & Assail**
- **Delegate & Assail plus sugar**

Plot size: 2 rows, 32 bushes

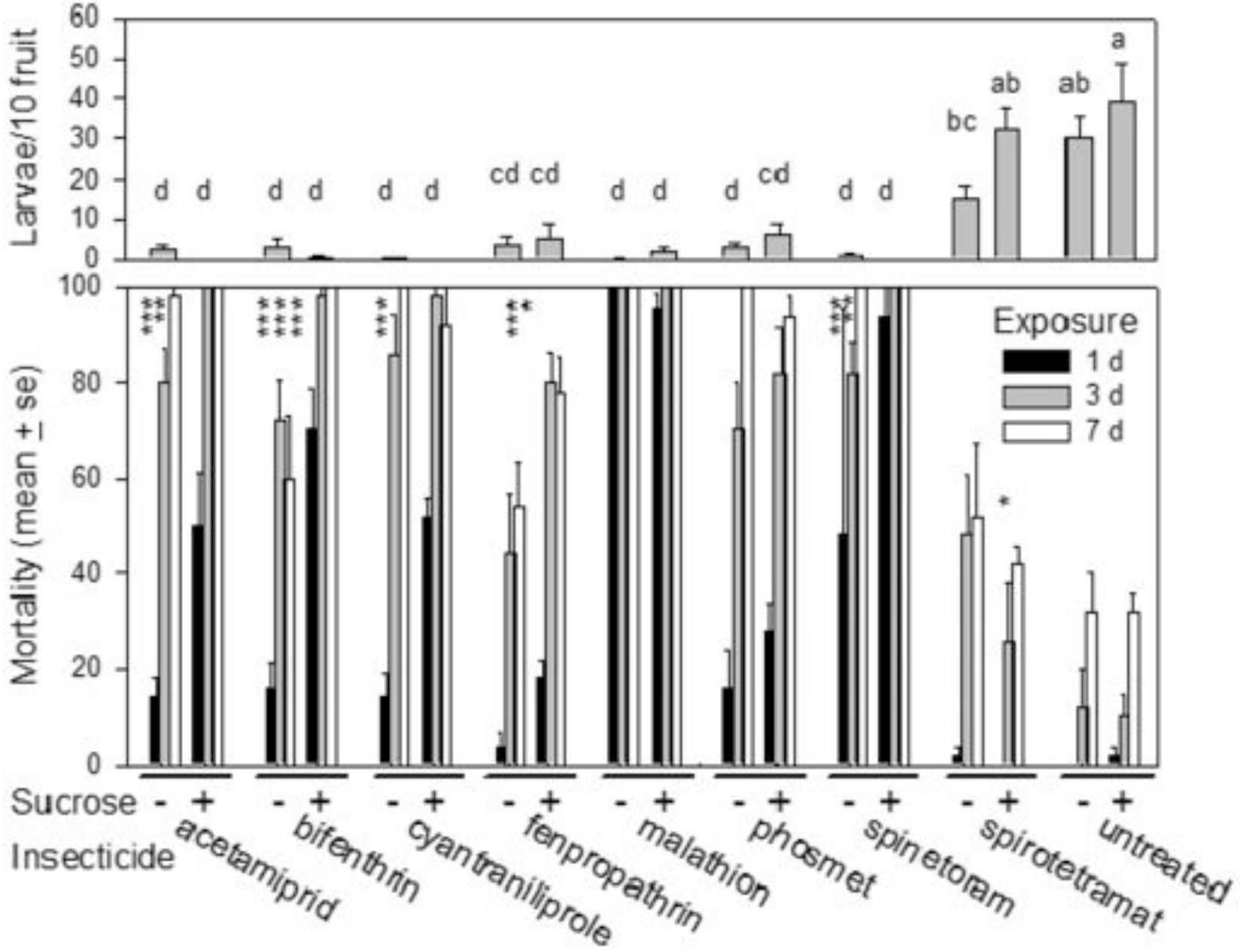
Replicates: 4

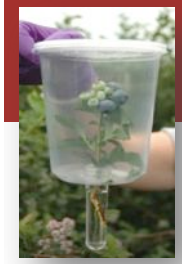
2 lbs. sugar / 100 gal. water

Credit: Greg Loeb Lab, NYSAES Geneva, NY

Sucrose Improves Insecticide Activity Against Drosophila suzukii (Diptera: Drosophilidae)

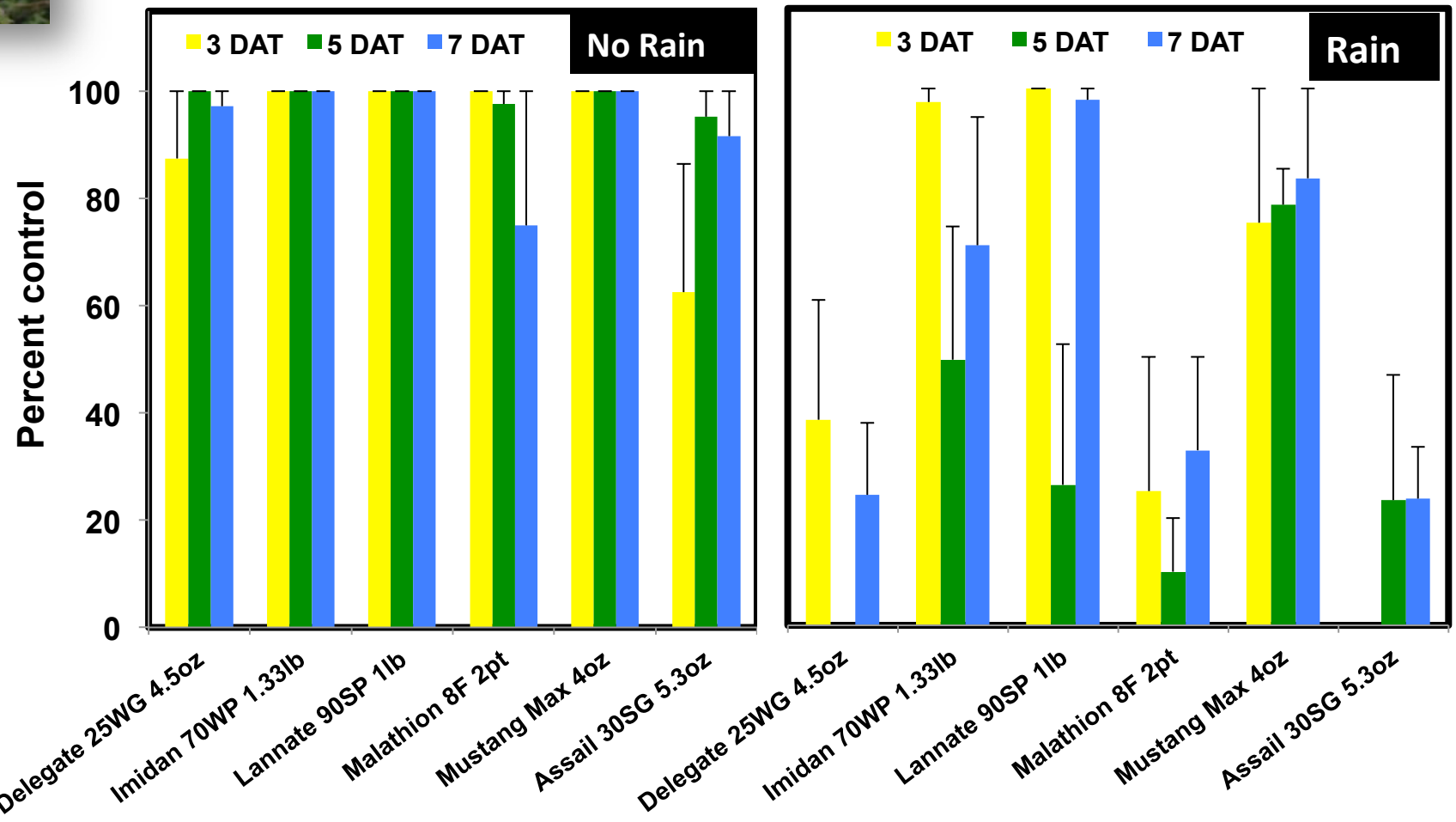
Richard S. Cowles , Cesar Rodriguez-Saona , Robert Holdcraft , Gregory M. Loeb , Johanna E. Elsensohn , Steven P. Hesler





Effect of Rain on Some Common Insecticides

From Rufus Isaacs, MSU



0.8 inches of rain on treated bushes
1 day after application

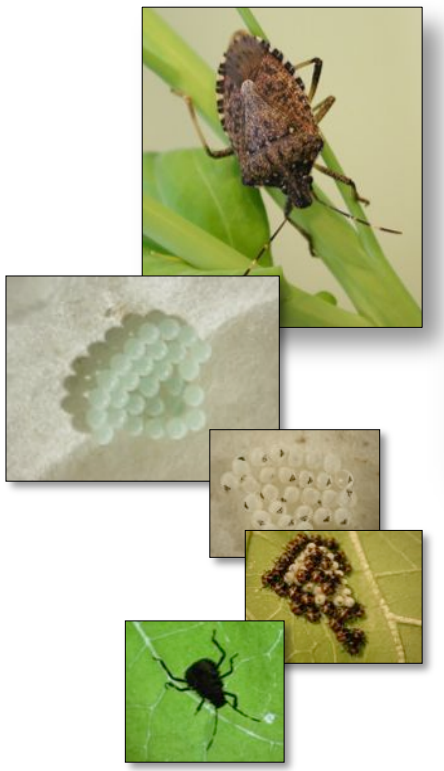
MICHIGAN STATE UNIVERSITY

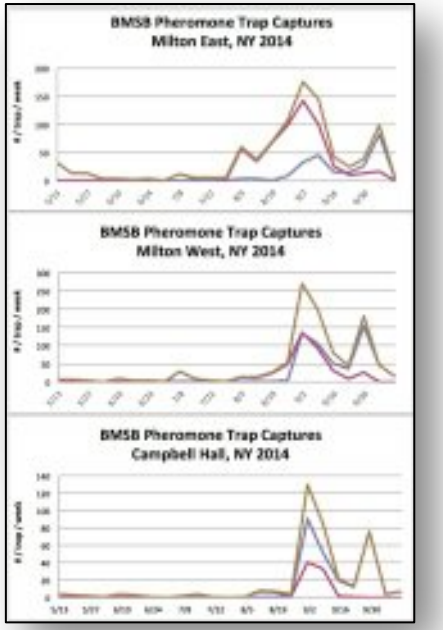
African Fig Fly, *Zaprionus indianus* Gupta

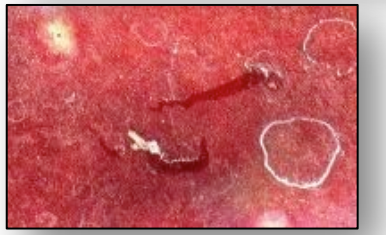
African Fig Fly: Crops at Risk

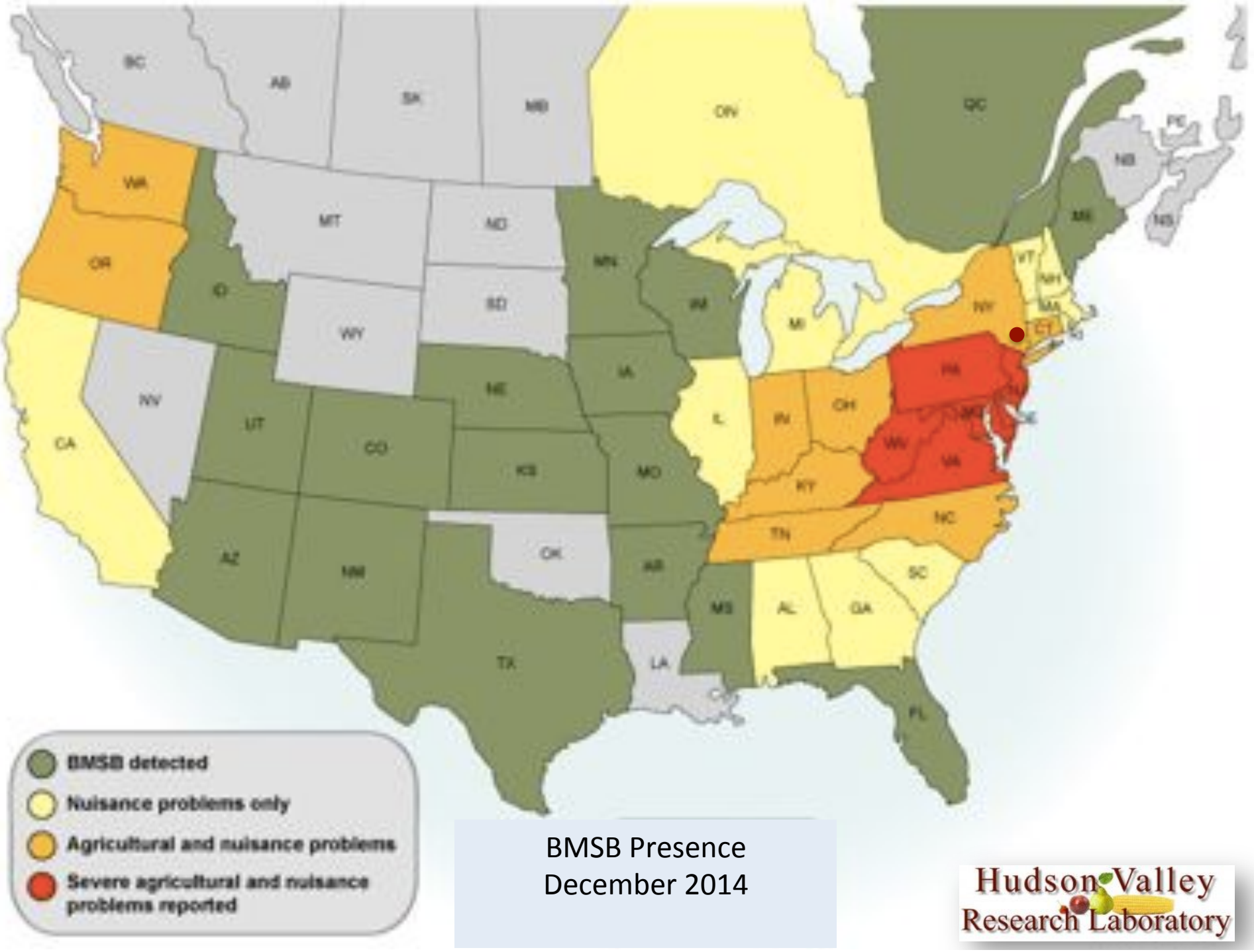
- **Damage: Predominately to citrus and grape**
- **Reports from Rutgers, NJ of wine grape injury independent of SWD injury.**
- **Hudson Valley:**
  - **4 AFF in 2012**
  - **0 AFF in 2013**
  - **3 AFF in 2014**
- **Not yet a threat in NY**

Managing the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in New York State









BMSB Presence
December 2014

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Brown Marmorated Stink Bug: Host Plants - Food for Success

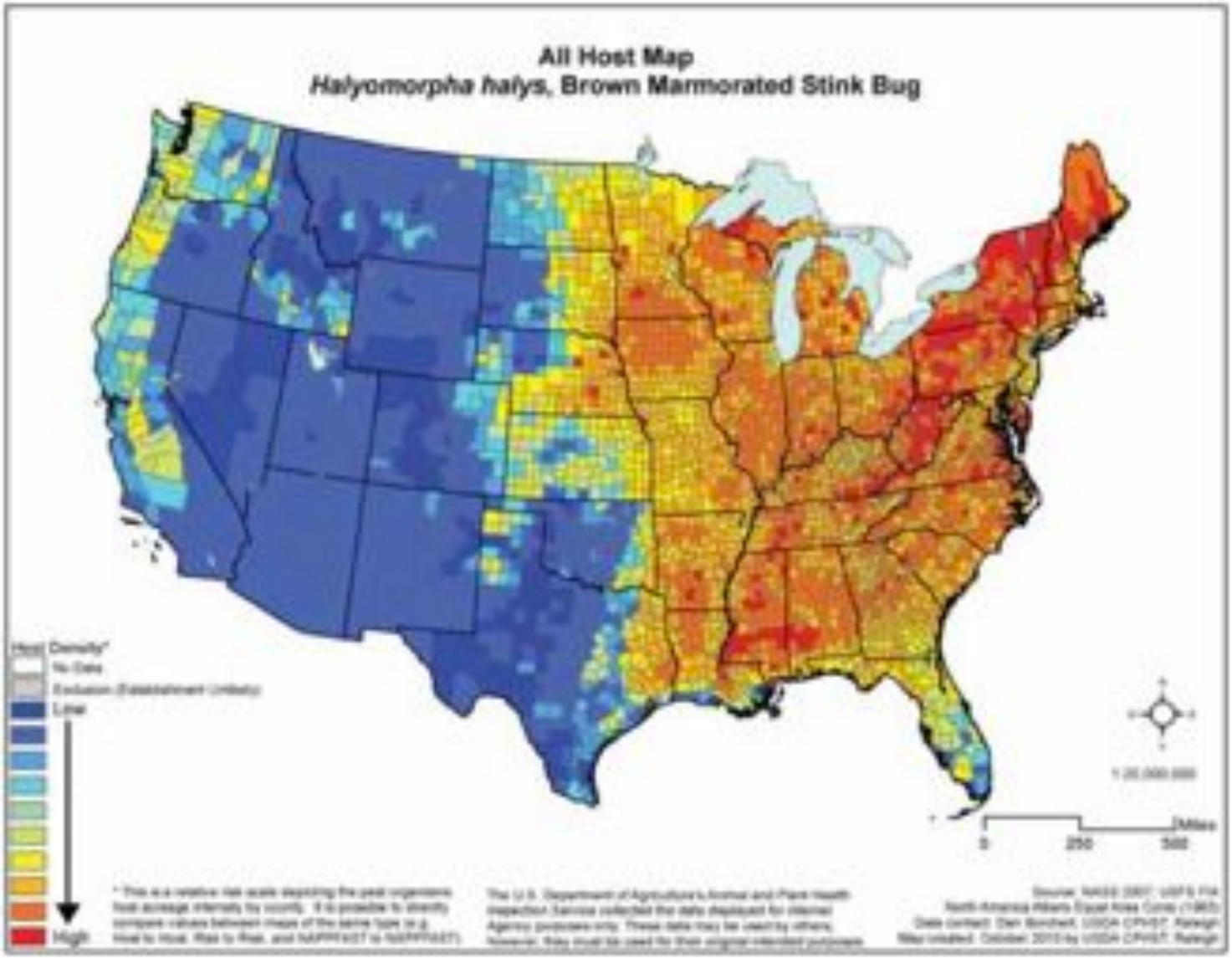
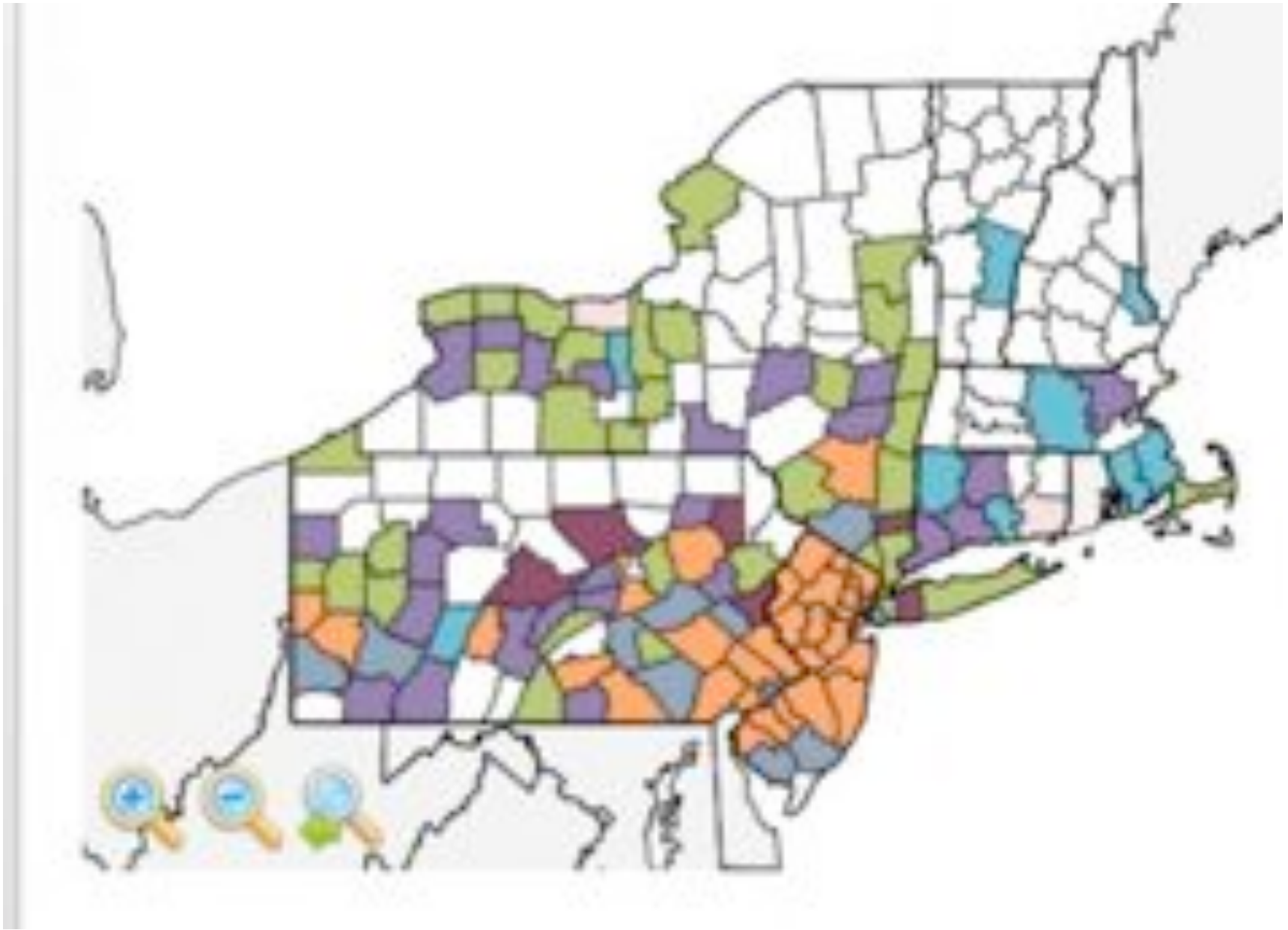
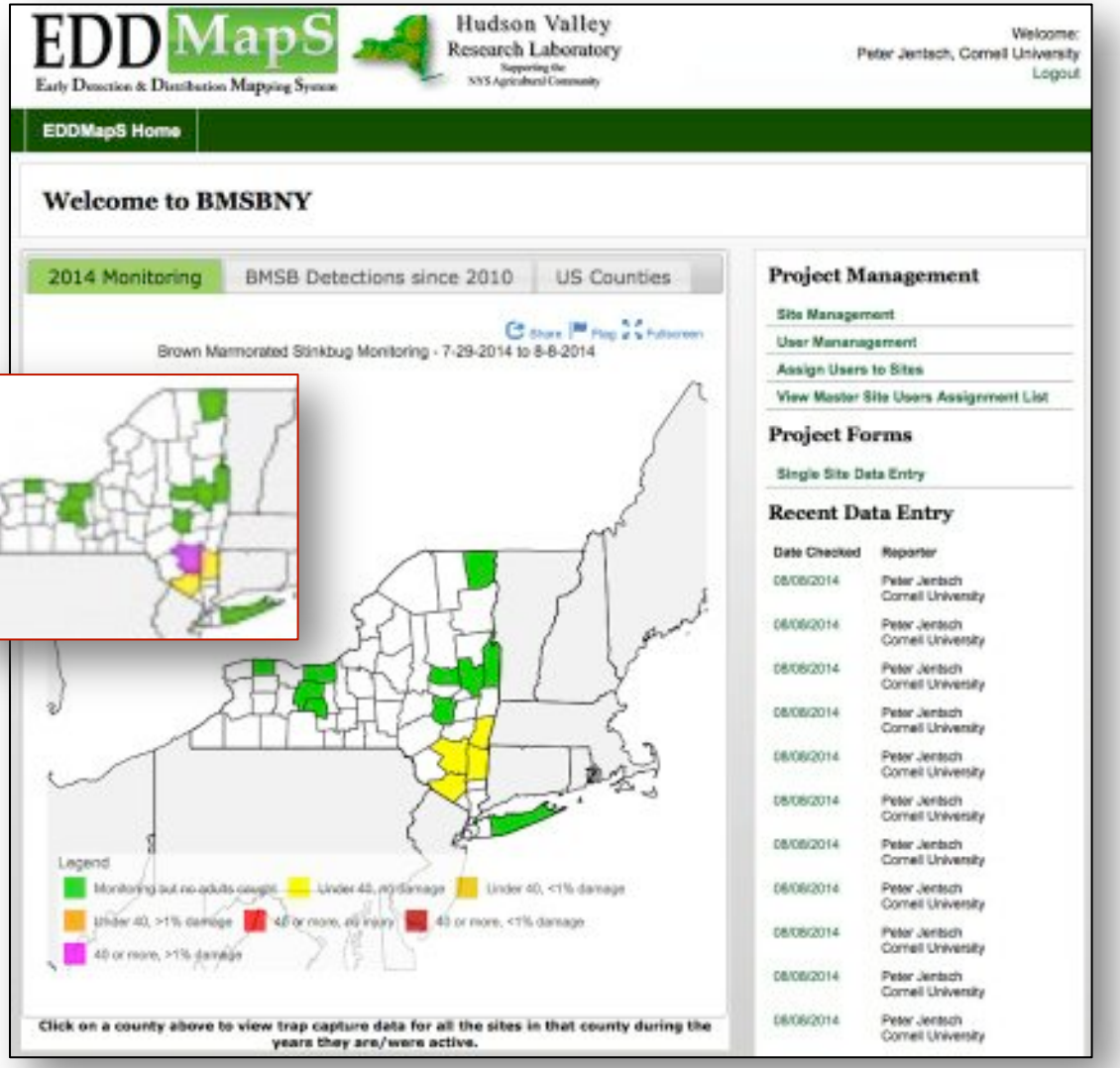


Figure 1: Risk maps displaying the relative density of field, vegetable, and fruit crop hosts plants of BMSB throughout the United States.

Brown Marmorated Stink Bug: Urban mapping of adults



BMSB Management Threshold: Ag. Mapping Communication

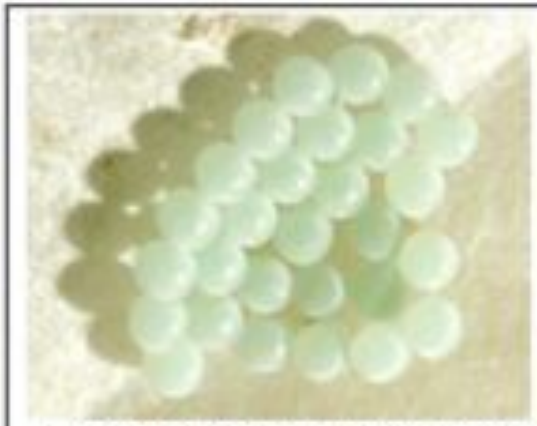


Partnered with EEDMaps to extend outreach

- Early Detection & Distribution Mapping of Invasive Insects

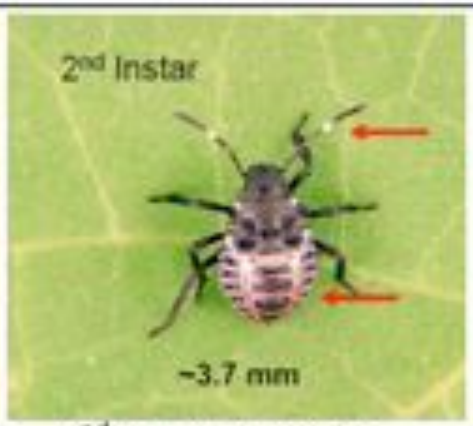
By County:

- 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

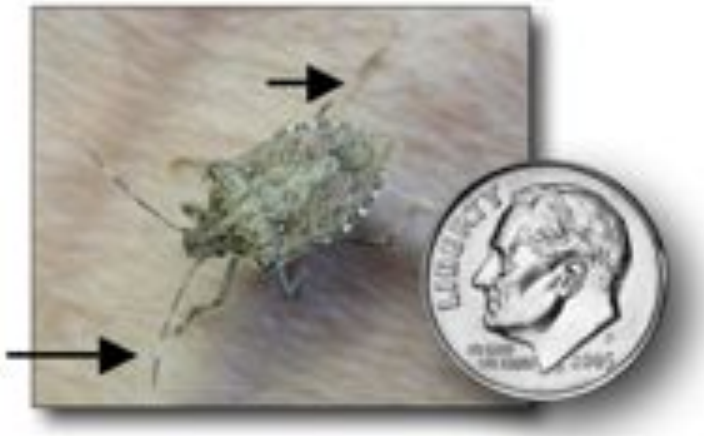


2nd instar: striped antennae

3rd instar: striped antennae and legs

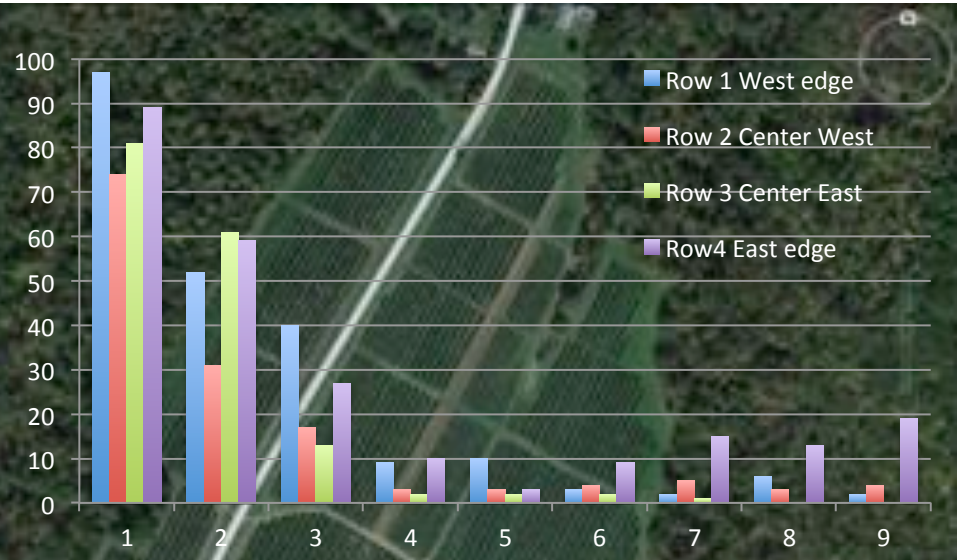
4th instar: thoratic spur striped antennae & legs

5th instar: wing pads striped antennae & legs



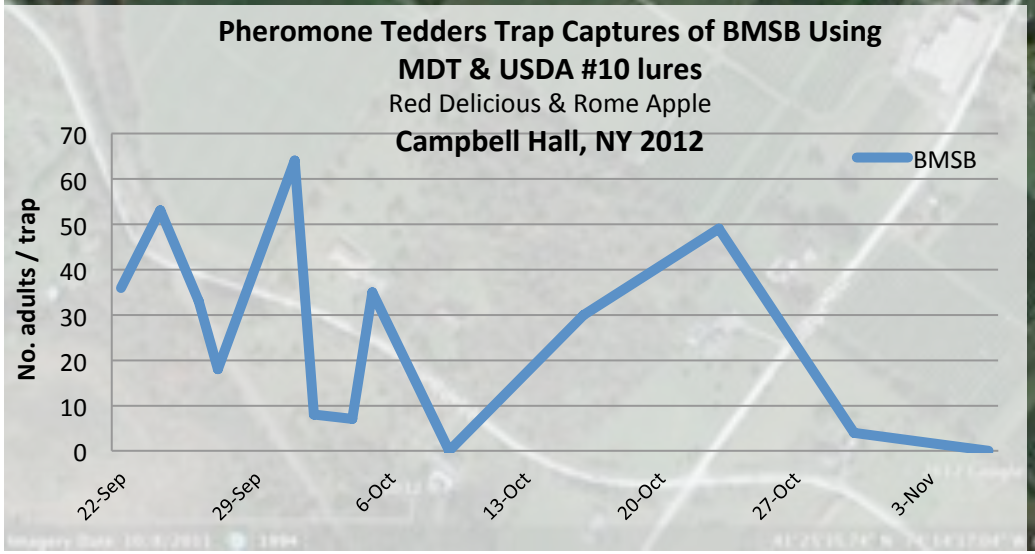
BMSB Adults: red eyes, 4 cream colored dots on shoulders; banding on legs and antenna, smooth blunt shoulders. Banded abdomen; 14 -17 mm in length.

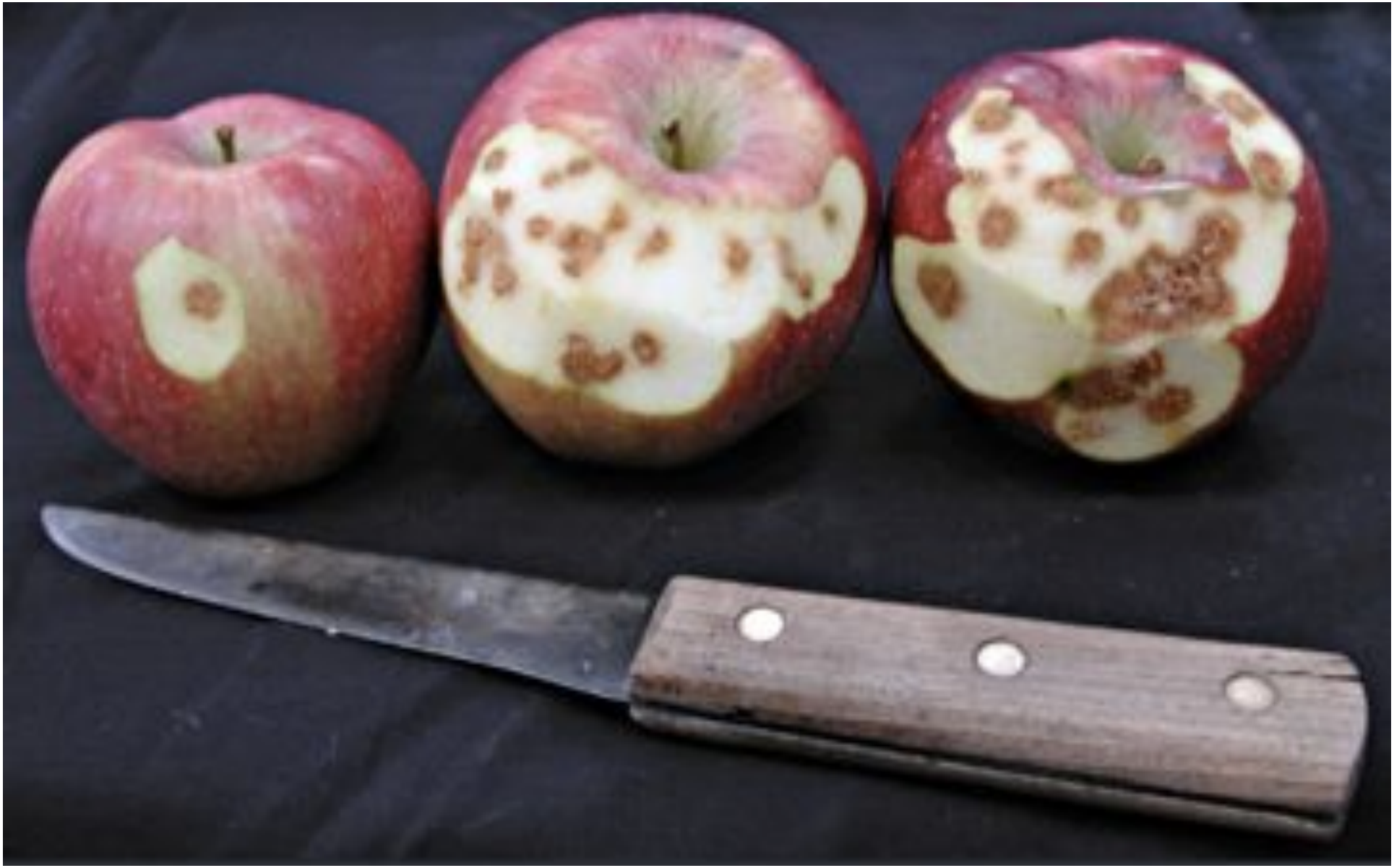
Stink Bug Survey: #4
100 acre Orchard;
5 acre block; Pink Lady
Fruit damage survey
September 10, 2012

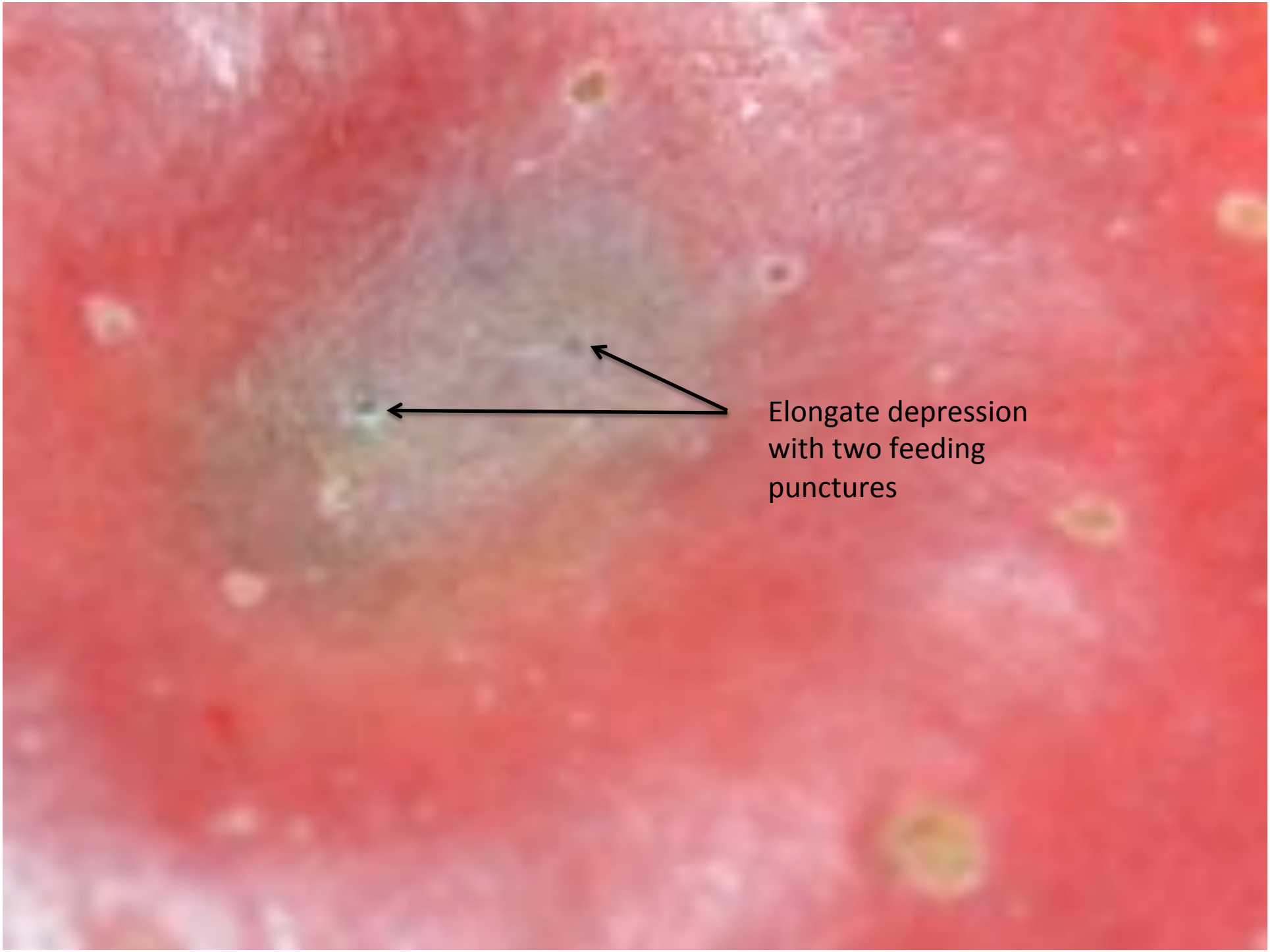


Evaluation of var. 'Pink Lady'
Trees @ 3' x 12' spacing

- 10 fruit / tree = 100 fruit /30'
- 9 sections; 240' row






Elongate depression
with two feeding
punctures

BMSB Management Threshold: Insecticide Efficacy

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

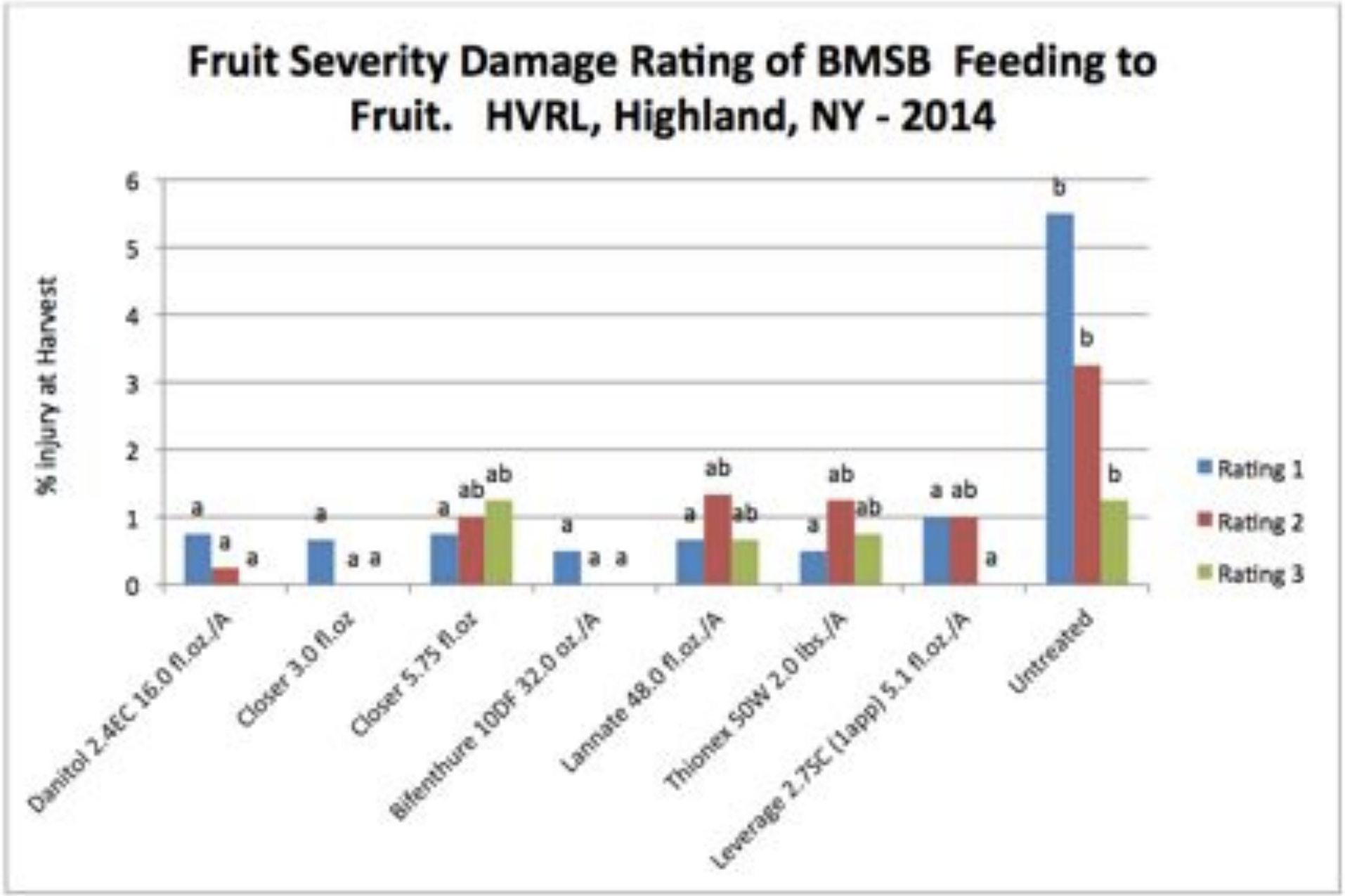
* Although these materials have excellent topical ratings in lab bioassay studies, field efficacy studies have shown economic fruit injury from BMSB feeding, suggesting low residual levels.

** Post bloom applications

(+) low to (++++) high efficacy

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

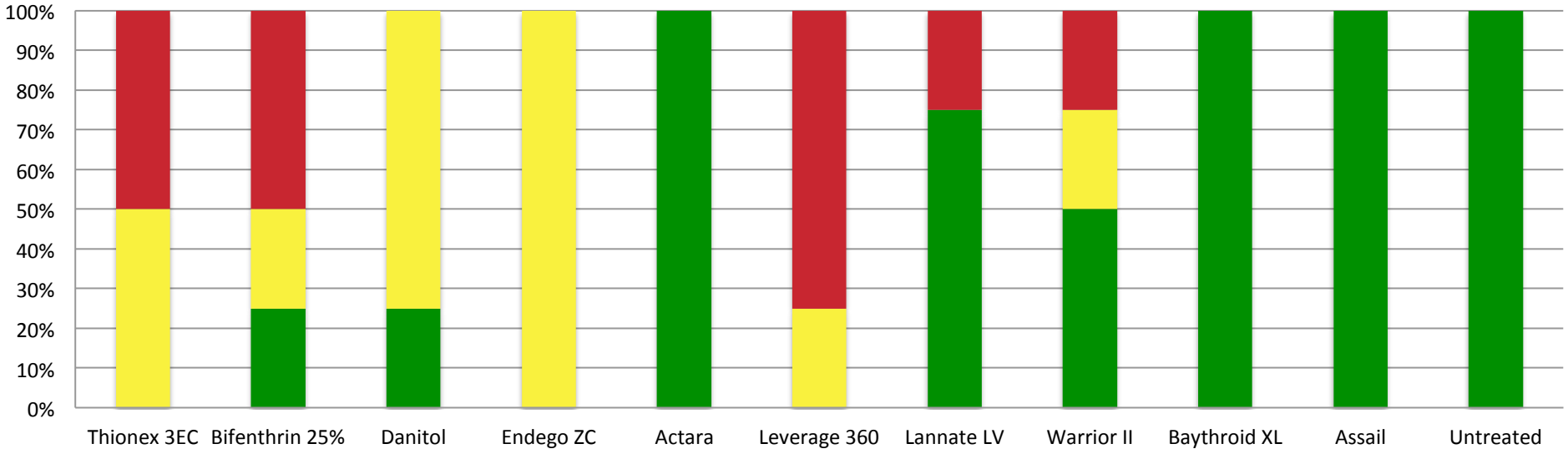
BMSB Resources



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

2014 Efficacy Screening Report

BMSB Adult Exposure to Insecticide Residue of Apple Foliage
72h Old Residue @ 1 d



BMSB Adult Exposure to Insecticide Residue of Apple Foliage
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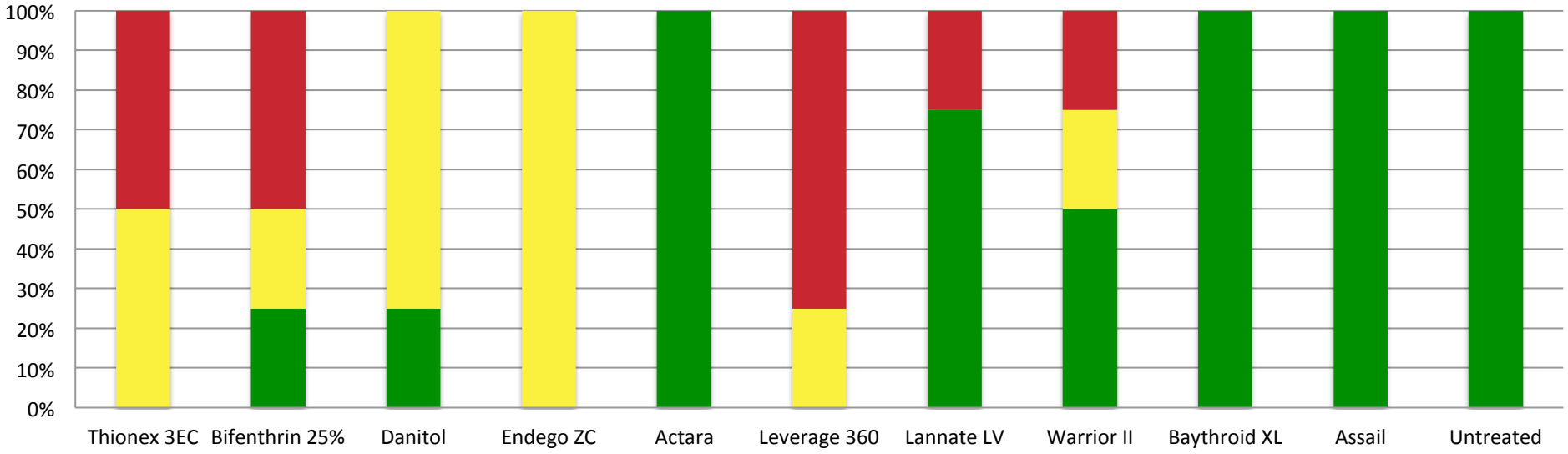
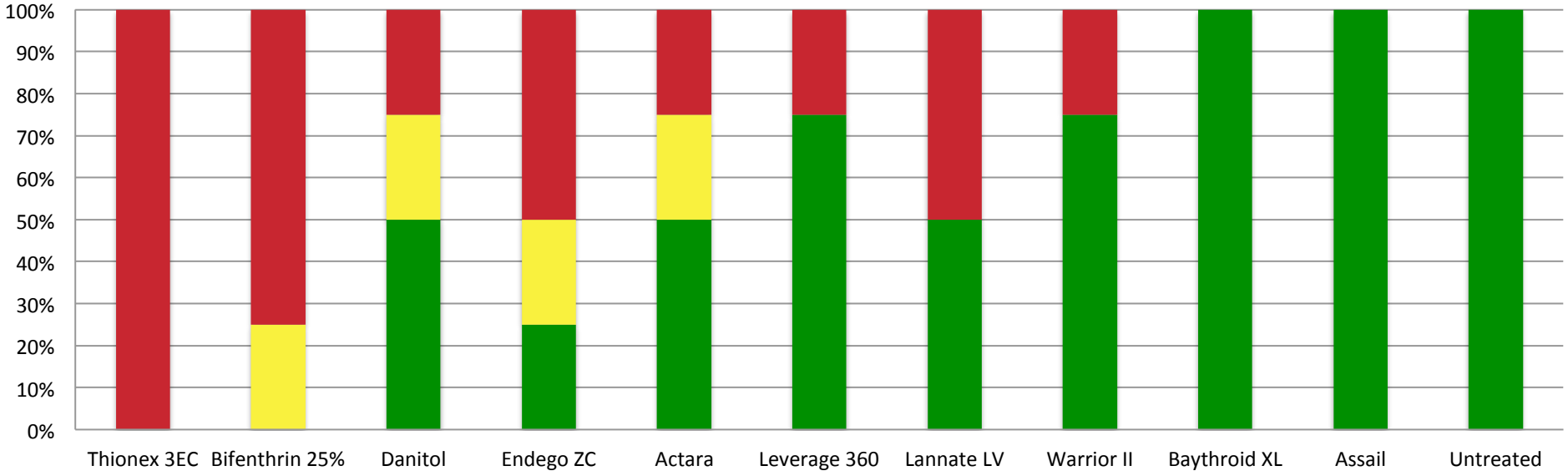


BMSB Adult Exposure to Insecticide Residue of Apple Foliage
72h Old Residue @ 3 d



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).

Hulcr, J. 2012. http://xyleborini.myspecies.info/gallery (last accessed October 22, 2012).

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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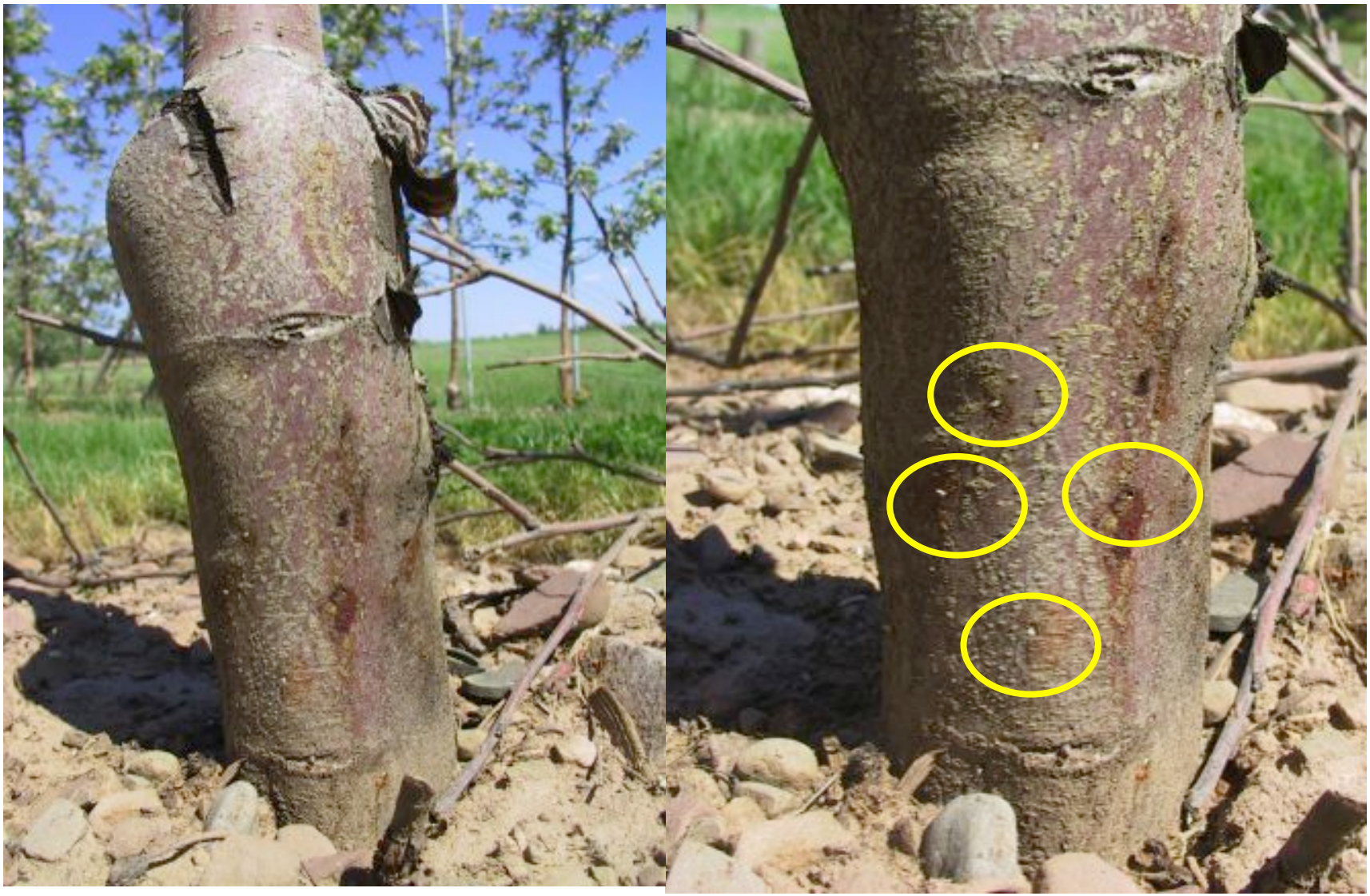
History

- 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.

Biology

Adult female drills a hole ~1mm in diameter, and hollows out a channel into the heartwood of small trees (2-50 cm diameter) .

Biology

- **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

- **Monitor for discoloration and blistering of bark.**

- **Monitor for bleeding sites on bark.**


• Monitor for dying trees.

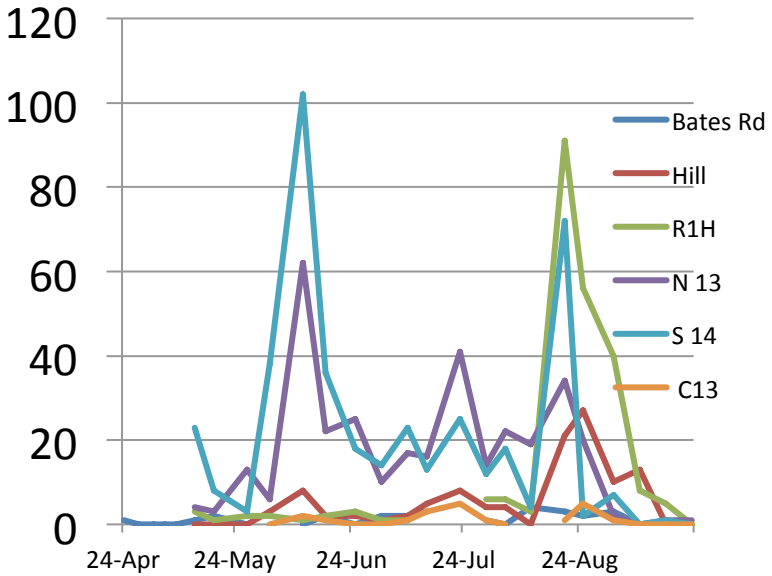
• Monitor: Trapping BSB

Re: **Peter Schultz**

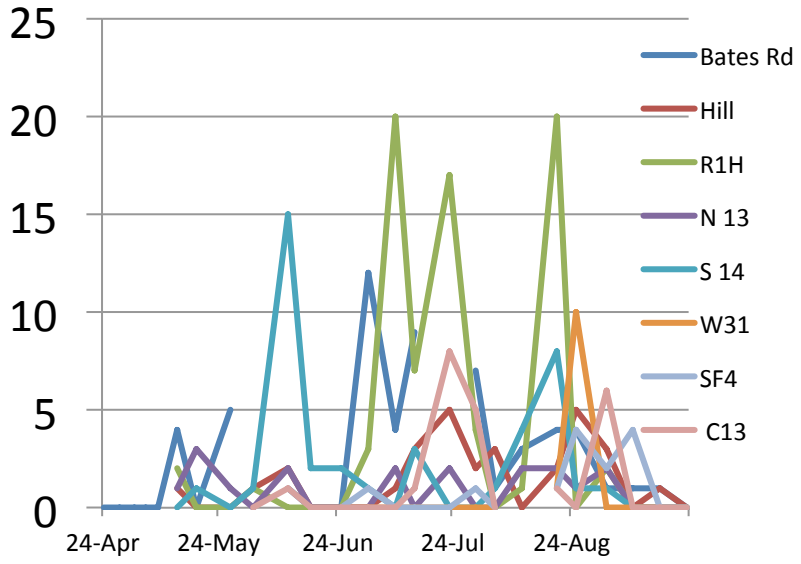
- **Inverted "Simply" OJ traps with rectangular openings cut in side panels**
- **Agbio: ethanol lures (agbio@agbio-inc.com)**
- **Hung 2-3 feet off the ground**
- **A drop of low toxicity anti-freeze in lid**
- **Hung on edge of woods next to orchard.**
- **Hung in interior of orchard.**
- **Checked traps weekly**

BSB weekly trap catch.

Edge BSB trap counts



Interior BSB trap counts



Black Stem Borer: *Management*

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