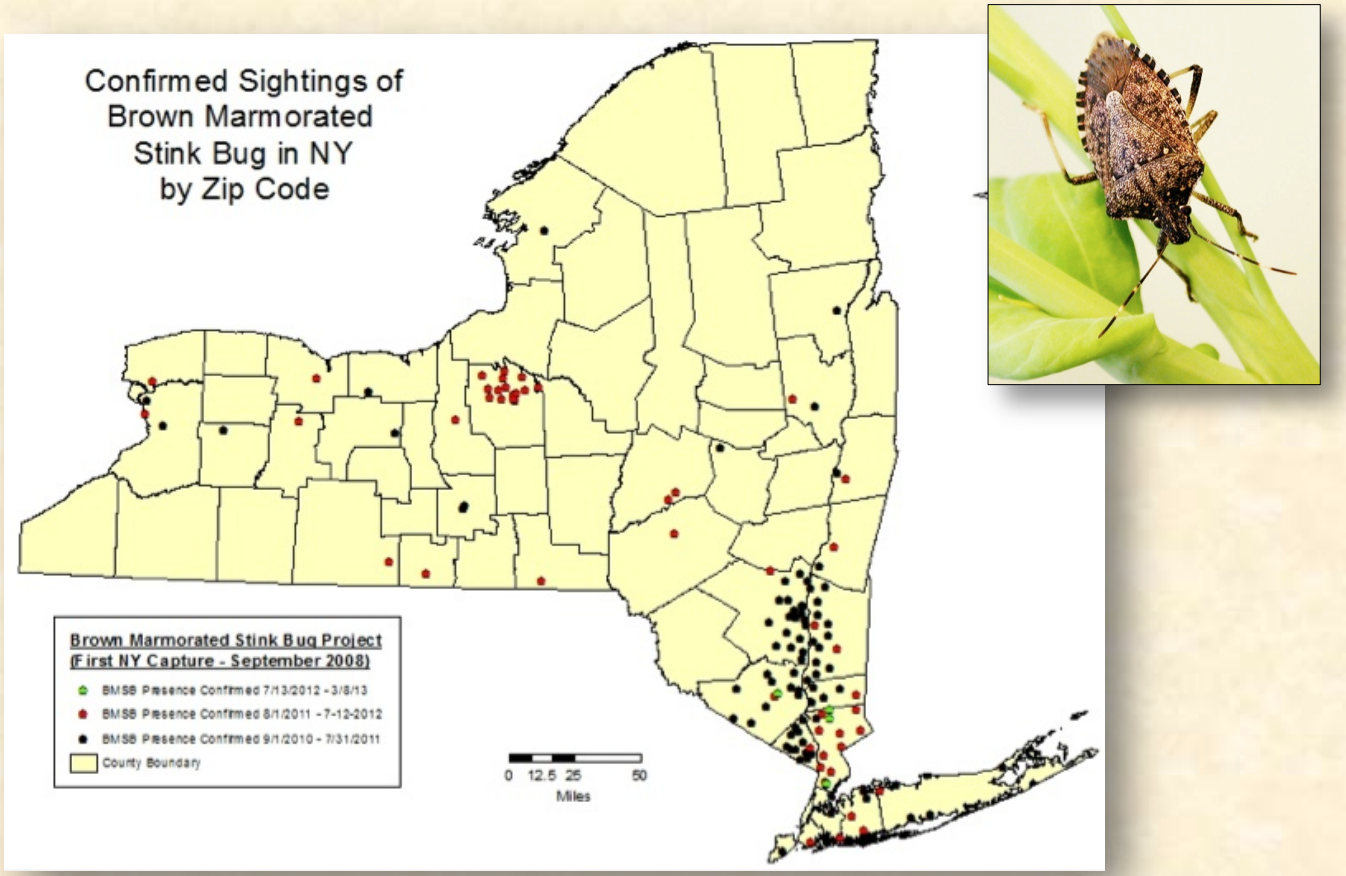
Studies of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), in New York State



74th New England, New York, & Canadian Fruit Pest Management Workshop

Bishop Booth Center, Burlington, VT

October 22nd – 23rd , 2013

Peter Jentsch

Senior Extension Associate – Entomology

CORNELL'S Hudson Valley LABORATORY

Appendix A: BMSB Host List

Table 2: Reported host list for BMSB. This pest's host range is likely larger than what has been reported in the literature and likely includes a wide variety of ornamentals and weeds that have not been specifically documented in the literature. (* indicates hosts used to develop the risk maps in Figure 1 and 2).

Host	Common name	Reference
Abeliea x *grandiflora* (André) Rehd	Glossy abelia	Bernon, 2004
Acer campestre L.	Hedge maple	Bernon, 2004
Acer palmatum Thunb.	Japanese maple	Bernon, 2004
Acer platanoides L.	Norway maple	Bernon, 2004; Hamilton and Shearer, 2003
Acer pseudoplatanus L.		Wermelinger et al., 2008
Acer rubrum L.	Red maple	Bernon, 2004
Acer spp.*	Maple	Hoebeke and Carter, 2003; Wermelinger et al., 2008
Amelanchier spp.	Shadbush	Bernon, 2004; Hoebeke and Carter, 2003
Arctium minus Bernh.	Burdock	Bernon, 2004
Arctium spp.		Wermelinger et al., 2008
Asparagus officinalis L.*	Asparagus	Hamilton and Shearer, 2003
Asparagus spp.		Bernon, 2004; Wermelinger et al., 2008
Basella rubra Linn.	T'ang ts'oi or Climbing spinach	Hoffman, 1931
Beta vulgaris L.	Beat Root	Hua, 2000
Betula spp.	Birch	Bernon, 2004
Buddleja davidii Franch.	Butterfly bush	Bernon, 2004; Wermelinger et al., 2008
Buddleia spp.	Butterfly bush	Hamilton and Shearer, 2003
Camellia oleifera C. Abel	Tea-oil camellia	Hua, 2000
Capsicum annuum L*	Bell pepper	Bernon, 2004; Leskey, 2010a, 2010b
Caragana arborescens Lam.	Siberian pea shrub	Bernon, 2004; Nielsen and Hamilton, 2009
Carya spp.	Pecan	Bernon, 2004
Catalpa spp.*	Catalpa	Bernon, 2004; Hoebeke and Carter, 2003
Celastrus spp.	Bittersweet	Bernon, 2004
Celosia argentea L.	Princess feather or Cock's comb	Hoffman, 1931
Celtis occidentalis L.	Hackberry	Bernon, 2004
Cercis canadensis L.	Redbud	Bernon, 2004
Cleome spp.	Cleome	Bernon, 2004
Citrus spp.*	Citrus	Wermelinger et al., 2008; Hoebeke and Carter, 2003
Cornus racemosa Lam.	Gray dogwood	Bernon, 2004
Cornus sericea L.	Redosier dogwood	Bernon, 2004

Host	Common name	Reference
Tilia americana L.	Linden	Bernon, 2004
Tilia spp.*	Basswood	Hoebeke and Carter, 2003
Triticum aestivum L.	Wheat	Hua, 2000
Tropaeolum majus L.		Wermelinger et al., 2008
Ulmus spp.	Elm	Hua, 2000
Uncultivated hedge		Nielsen and Hamilton, 2009
Viburnum opulus var. *americanum* Ait.	Highbush cranberry	Nielsen and Hamilton, 2009
Viburnum prunifolium L.	Blackhaw viburnum	Bernon, 2004; Nielsen and Hamilton, 2009
Viburnum setigerum Hance	Tea Viburnum	Bernon, 2004
Vibernum spp.	Cranberry bush	Bernon, 2004
Vigna sesquipedalis L.	Chinese long bean	Hoffman, 1931
Vitis spp.*	Grape	Bernon, 2004; Hamilton, 2009
Vitis vinifera L.	Grapevine	Wermelinger et al., 2008
Zea mays L.*	Corn	Leskey, 2010a, 2010b

USDA United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine

Qualitative analysis of the pest risk potential of the brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), in the United States

October 2010

Rev: Original

Polyphagous insect with an expansive host range

- 133 listed plant species hosts
- Observed on over 300 plants
- Deciduous trees, tree fruit, legume, vegetable

Host	Common name	Reference
Corylus colurna L.	Turkish filbert	Bernon, 2004
Crataegus spp.	Hawthorn	Bernon, 2004
Cryptomeria spp.	Japanese cedar	Wermelinger et al., 2008
Cucumis sativus L.	Cucumber	Bernon, 2004
Cupressus spp.	Cypress	Wermelinger et al., 2008
Decaisnea fargesii Franch.		Wermelinger et al., 2008
Diospyros kaki L.	Persimmon	Hoebeke and Carter, 2003
Diospyros kaki Thunb.	Japanese persimmon	Kawada and Kitamura, 1983
Diospyros spp.*	Persimmon	Bernon, 2004; Hoebeke and Carter, 2003; Wermelinger et al., 2008
Elaeagnus angustifolia L.	Russian olive	Nielsen and Hamilton, 2009
Euonymus alatus (Thunb.) Siebold	Winged Euonymus	Bernon, 2004
Euonymus spp.	Euonymus	Bernon, 2004
Ficus spp.	Fig	Hoebeke and Carter, 2003
Fraxinus americana L.	White ash	Nielsen and Hamilton, 2009
Franxinus spp.	Ash	Bernon, 2004
Glycine max Merrill	Soybean	Bernon, 2004; Hoebeke and Carter, 2003; Wermelinger et al., 2008 Hua, 2000; Son et al., 2000
Gossypium spp.	Cotton	Hua, 2000
Helianthus spp.	Sunflower	Bernon, 2004
Hibiscus rosa-sinensis L	Chinese hibiscus	Hoffman, 1931
Hibiscus spp.		Wermelinger et al., 2008
Ilex opaca Ait.	American holly	Bernon, 2004; Hamilton and Shearer, 2003
Ilex spp.*	Holly	Bernon, 2004
Ilex verticillata (L.) A. Gray	Winterberry holly	Bernon, 2004
Juglans nigra L.*	Walnut	Bernon, 2004
Koelreuteria spp.	Goldenrain Tree	Bernon, 2004
Ligustrum spp.	Privet	Bernon, 2004
Lonicera spp.	Honeysuckle	Bernon, 2004; Hoebeke and Carter, 2003; Wermelinger et al., 2008
Lycopersicon spp.	Tomato	Bernon, 2004
Magnolia stellata (Siebold & Zucc.) Maxim.	Star magnolia	Bernon, 2004
Malus domestica L. (or Brokh)*	Apple	Hua, 2000; Hoebeke and Carter, 2003
Malus spp.	Crabapple	Bernon, 2004; Hamilton and Shearer, 2003; Wermelinger et al., 2008
Morus spp.	Mulberry	Wermelinger et al., 2008; Bernon, 2004; Hoebeke and Carter, 2003
Paulownia spp.	Paulownia	Hoebeke and Carter, 2003
Paulownia tomentosa (Thunb.) Siebold & Zucc. ex Steud.*	Princess Tree or Paulownia	Bernon, 2004; Hoebeke and Carter, 2003; Wermelinger et al., 2008
Phaseolus lunatus Linn.	Lima beans	Hoffman, 1931

Host	Common name	Reference
Phaseolus spp.*	Pole bean, Bush bean	Bernon, 2004
Phaseolus vulgaris L.	String beans	Hamilton and Shearer, 2003; Wermelinger et al., 2008
Pisum sativum L.	Peas	Wermelinger et al., 2008
Platanus occidentalis L.	Sycamore	Bernon, 2004
Prunus armenica L.	Apricot	Bernon, 2004; Wermelinger et al., 2008
Prunus avium L.	Cherry	Wermelinger et al., 2008; Hoebeke and Carter, 2003
Prunus domestica L.	Plum	Bernon, 2004; Wermelinger et al., 2008
Prunus grayana Maxim.	Japanese bird cherry	Funayama, 2007
Prunus mume Sieb. et Zucc	Japanese apricot	Hoebeke and Carter, 2003
Prunus persica Batsch	Japanese peach	Hoebeke and Carter, 2003; Wermelinger et al., 2008; Hua, 2000
Prunus spp.*	Peach,	Bernon, 2004; Leskey, 2010a, 2010b; Wermelinger et al., 2008
Prunus spp.	Ornamental plum, Sour cherry, Black cherry	Bernon, 2004
Pyracantha coccinea M. Roem	Firethorn	Wermelinger et al., 2008
Pyracantha spp.	Firethorn	Bernon, 2004; Hamilton and Shearer, 2003
Pyrus prifolia Nakai	Japanese pear	Hoebeke and Carter, 2003
Pyrus pyrifolia (Burm. f.) Naki	Asian pear	Nielsen and Hamilton, 2009
Pyrus spp.*	Pear	Bernon, 2004; Nielsen and Hamilton, 2009; Hua, 2000;
Rhamnus spp.	Buckthorn	Bernon, 2004
Rhodotypos scandens (Thunb.) Makino	Jetbead	Bernon, 2004
Rhus spp.	Sumac	Bernon, 2004
Rosa rugosa Thunb.	Rugosa rosea	Bernon, 2004; Nielsen and Hamilton, 2009;
Rosa spp.	Rose	Hamilton, 2009
Rubus spp.*	Raspberry	Bernon, 2004; Hamilton and Shearer, 2003; Wermelinger et al., 2008
Salix spp.	Willow	Bernon, 2004; Wermelinger et al., 2008
Sambucus spp.	Elder	Bernon, 2004
Sicyos angulatus L.	Burcucumber	Bernon, 2004
Solanum nigrum L.	Black nightshade	Hoffman, 1931
Solanum spp.	Nightshade	Bernon, 2004
Solanum spp.*	Tomato	Hamilton, 2009; Leskey, 2010a, 2010b
Sorbus spp.	Mountainash	Bernon, 2004
Spiraea spp.	Spirea	Bernon, 2004
Stewartia pseudocamellia Maxim.		Wermelinger et al., 2008
Symphytum spp.	Comfrey	Bernon, 2004
Syringa spp.	Lilac	Bernon, 2004; Wermelinger et al., 2008

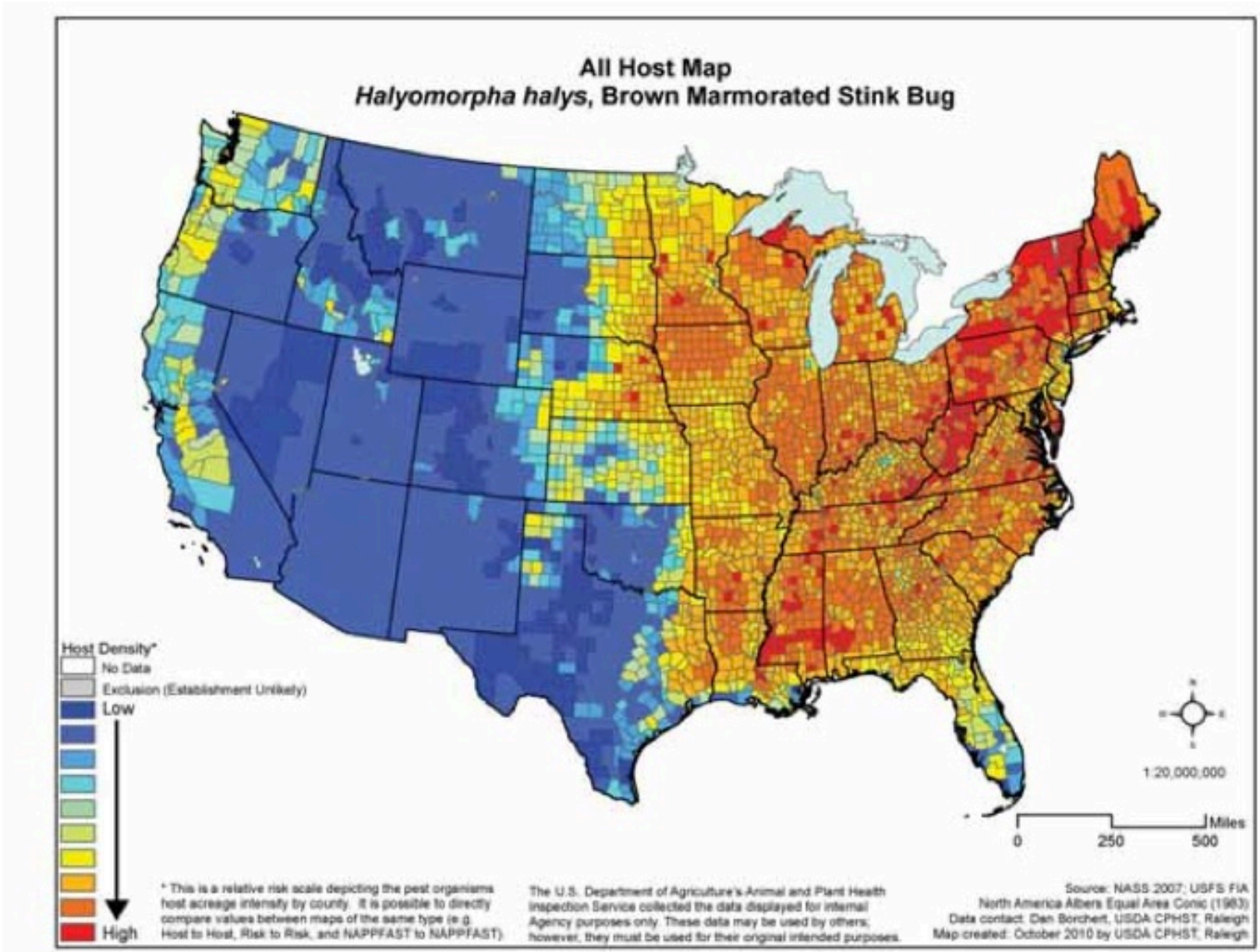


Figure 1: Risk maps displaying the relative density of field, vegetable, and fruit crop hosts plants of BMSB throughout the United States.

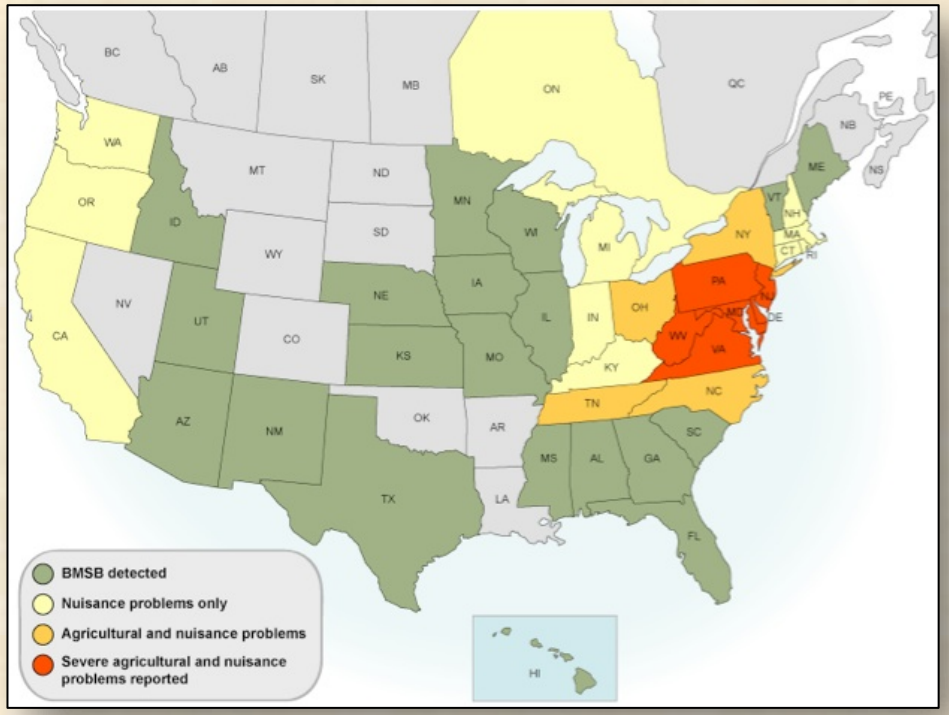
Studies of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), in New York State

- **1996: The first BMSB adults were first collected in Allentown, PA, later identified in 2001, observed in NJ sweet corn black light traps in 1998; spread throughout the mid-Atlantic.**

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

- 1996: The first BMSB adults were first collected in Allentown, PA, identified in 2001, observed in NJ sweetcorn black light traps in 198;, spread throughout the mid-Atlantic.

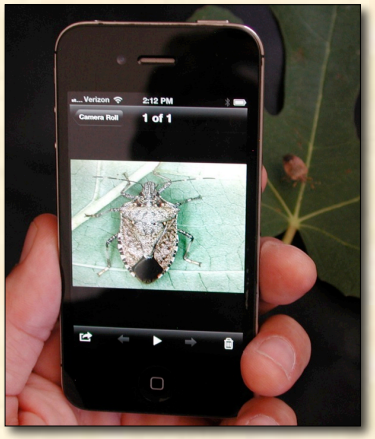
- **2007: The first adult BMSB found in NY; in the Hudson Valley in 2008.**
  A Citizen Science project for NYS began in September of 2010,



Tracking Invasives Using Your iPhone: The BMSB Citizen Science project

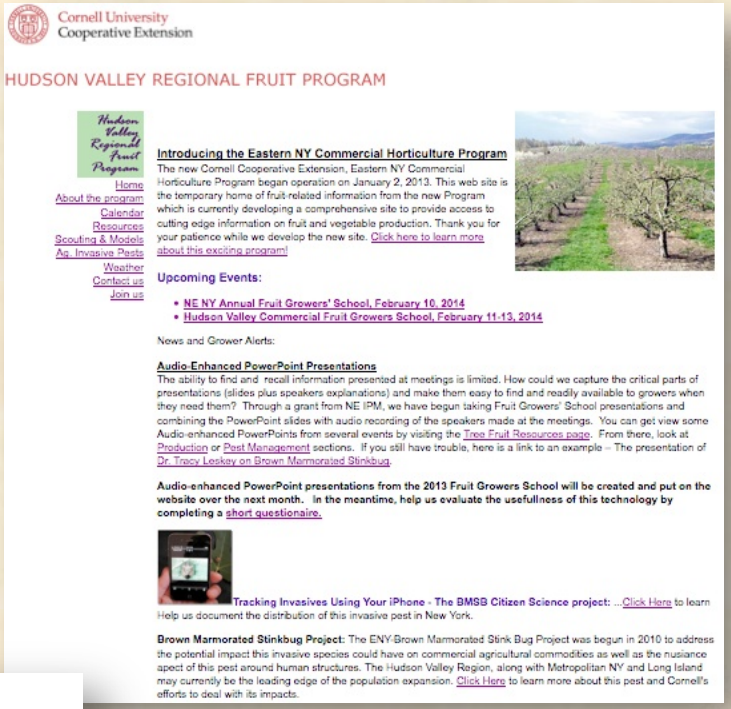
Peter J. Jentsch – Cornell University's
Hudson Valley Laboratory, Highland, NY

As the days grow shorter and the evening temperatures cool, hobos of the insect community begin making their way to our doorstep. Reduced light and temperature act as a switch to halt their feeding frenzy, turning now to find shelter for the winter months that lay ahead. Having stocked up on food reserves, they intend to use our homes as over wintering sites, guest cottages if you will, to increase their chance of survival.



iPhone Use for Citizen Science.
Photo: Cornell's Hudson Valley Lab

Two invasive insects making their way into our homes include the notorious brown marmorated stink bug and the multicolored Asian ladybird beetle. Both are exotic species that hail from regions of China, Korea, and Japan yet readily adapted to climates and habitats in the U.S. They are most commonly found this time of year gathering on the sun-facing exposure of your home, restlessly making their way into the living quarters of the building. In the spring, they will all leave.



Cornell University
Cooperative Extension

HUDSON VALLEY REGIONAL FRUIT PROGRAM

Hudson Valley Regional Fruit Program

Home
About the program
Calendar
Resources
Scouting & Models
Ag. Invasive Pests
Weather
Contact us
Join us

Introducing the Eastern NY Commercial Horticulture Program
The new Cornell Cooperative Extension, Eastern NY Commercial Horticulture Program began operation on January 2, 2013. This web site is the temporary home of fruit-related information from the new Program which is currently developing a comprehensive site to provide access to cutting edge information on fruit and vegetable production. Thank you for your patience while we develop the new site. Click here to learn more about this exciting program!

Upcoming Events:

- NE NY Annual Fruit Growers' School, February 10, 2014
- Hudson Valley Commercial Fruit Growers School, February 11-13, 2014

News and Grower Alerts:

Audio-Enhanced PowerPoint Presentations
The ability to find and recall information presented at meetings is limited. How could we capture the critical parts of presentations (slides plus speakers explanations) and make them easy to find and readily available to growers when they need them? Through a grant from NE IPM, we have begun taking Fruit Growers' School presentations and combining the PowerPoint slides with audio recording of the speakers made at the meetings. You can get view some Audio-enhanced PowerPoints from several events by visiting the Tree Fruit Resources page. From there, look at Production or Pest Management sections. If you still have trouble, here is a link to an example – The presentation of Dr. Tracy Leskey on Brown Marmorated Stinkbug.

Audio-enhanced PowerPoint presentations from the 2013 Fruit Growers School will be created and put on the website over the next month. In the meantime, help us evaluate the usefullness of this technology by completing a short questionaire.

Tracking Invasives Using Your iPhone - The BMSB Citizen Science project: ..Click Here to learn Help us document the distribution of this invasive pest in New York.

Brown Marmorated Stinkbug Project: The ENY-Brown Marmorated Stink Bug Project was begun in 2010 to address the potential impact this invasive species could have on commercial agricultural commodities as well as the nuisance apect of this pest around human structures. The Hudson Valley Region, along with Metropolitan NY and Long Island may currently be the leading edge of the population expansion. Click Here to learn more about this pest and Cornell's efforts to deal with its impacts.

Be A Citizen Scientist!

Here are 2 ways you can help us track the distribution of the Brown Marmorated Stinkbug in NY!

Option 1. Mail us a sample for identification so we can document this pest's distribution.

Place captured specimens in a *small plastic container* such as a plastic medicine bottle or film canister. **Be sure to fill out the Submission Form and include it with your sample.** Provide the complete information listed so we can document the distribution of this insect AND let you know if your sample contained any BMSB. Live specimens will be added to the research colony being established for the project (we cannot return any samples).

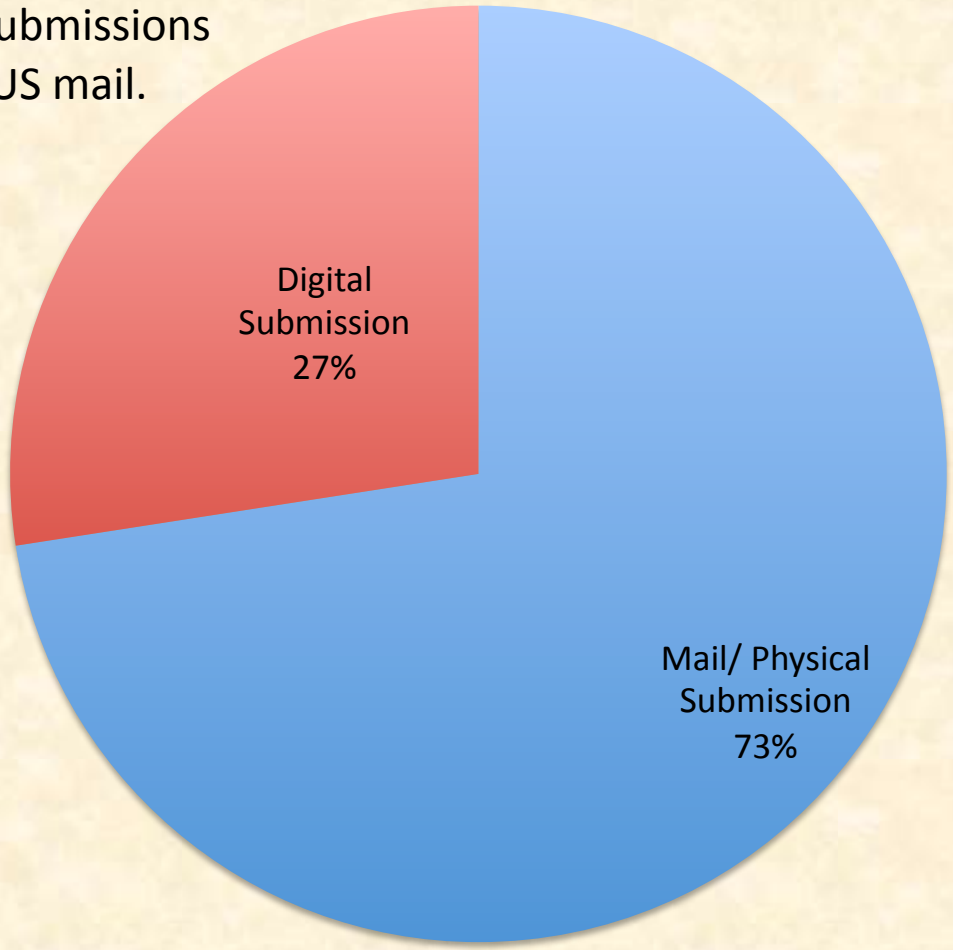
Mail samples to:
Attn: Peter Jentsch, BMSB Project
Cornell Hudson Valley Lab
P.O. Box 727
Highland, NY 12528

Option 2. Use your IPhone to photograph and e-mail your sighting. This method is quick and easy! Take the best close-up photo you can and email it to bmsbproject@cornell.edu. The image will let us identify what species it is and the embedded GPS location in the IPhone photo will allow us to map your specimen's location.

- Newspaper submissions to inform readers of the project began in September of 2010
- We've received 445 Submission as of early March, 2013.
- Participant surveys suggest increasing BMSB in the urban environment.

Citizen Science Technologies
BMSB Image Submission

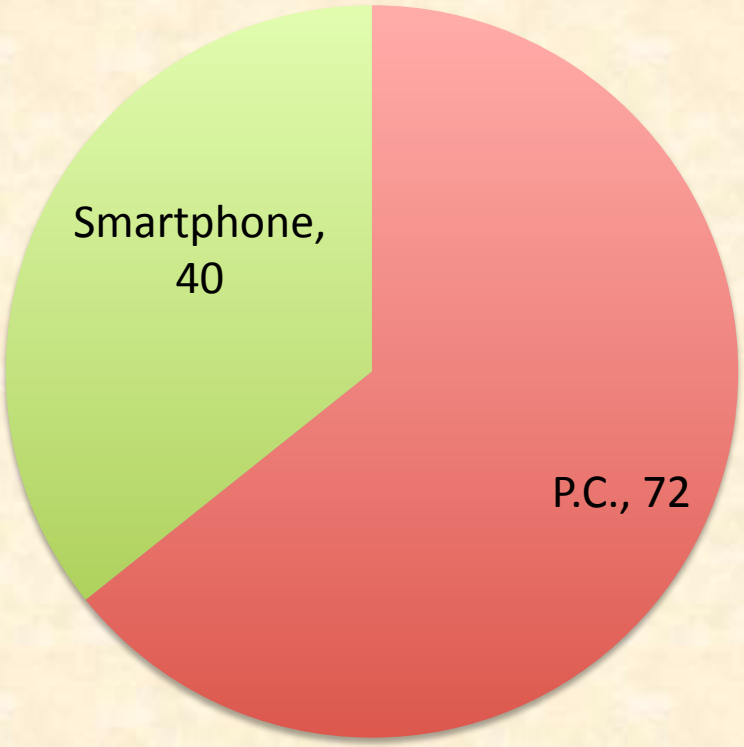
- The majority of submissions have been ‘live’ by US mail.

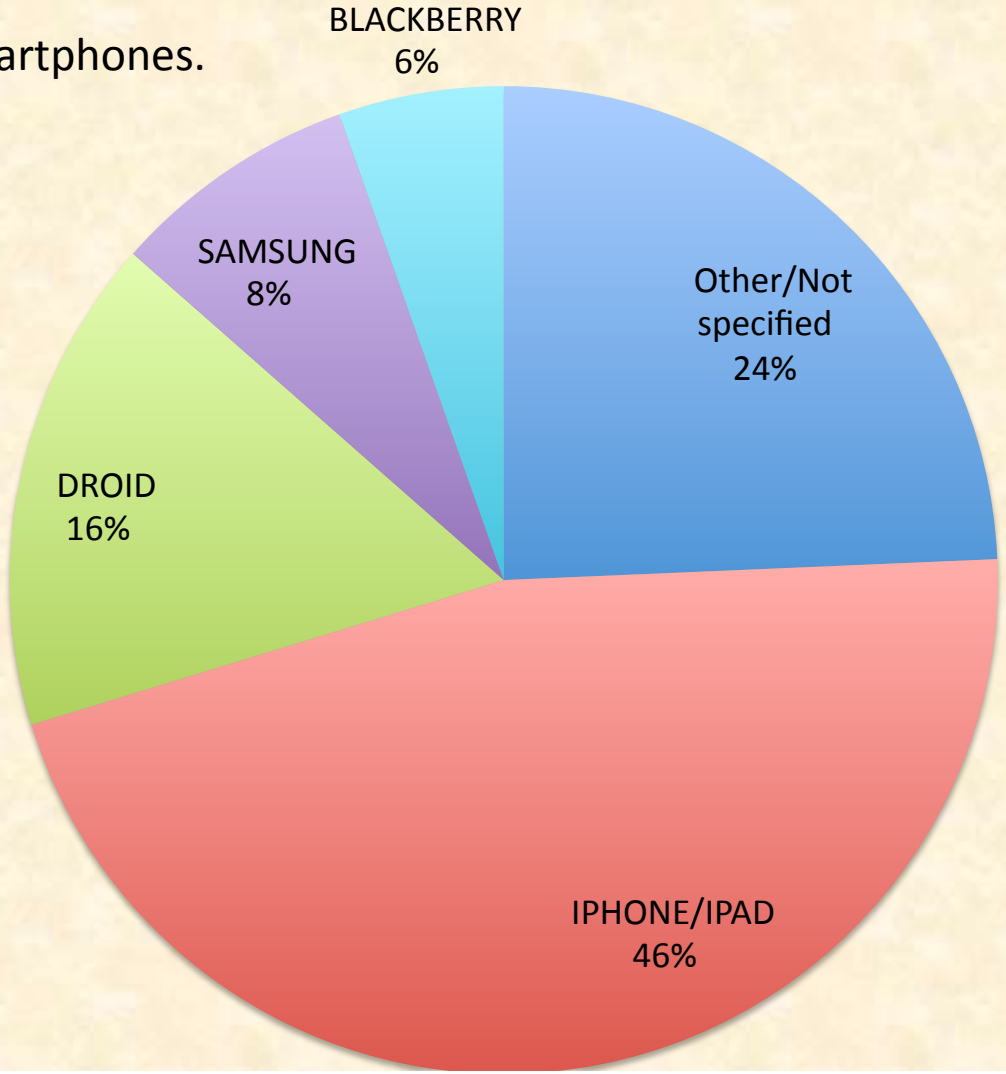


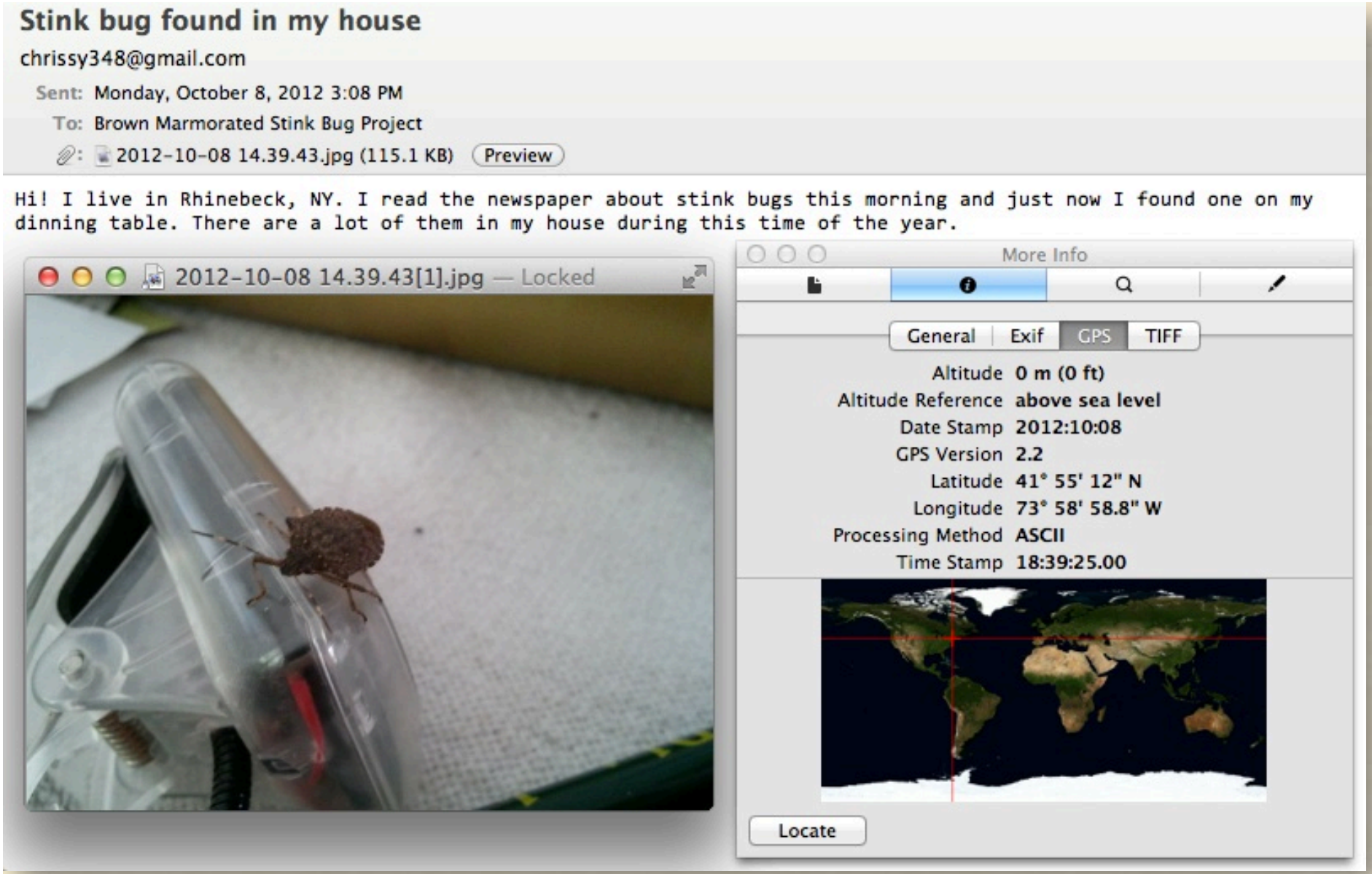
Citizen Science Technologies
BMSB Image Submission

- Of the digital submissions the majority originate via digital camera
- Smart phone use (40% of digital submissions)
- Use of Apple products (iPhone or iPad)

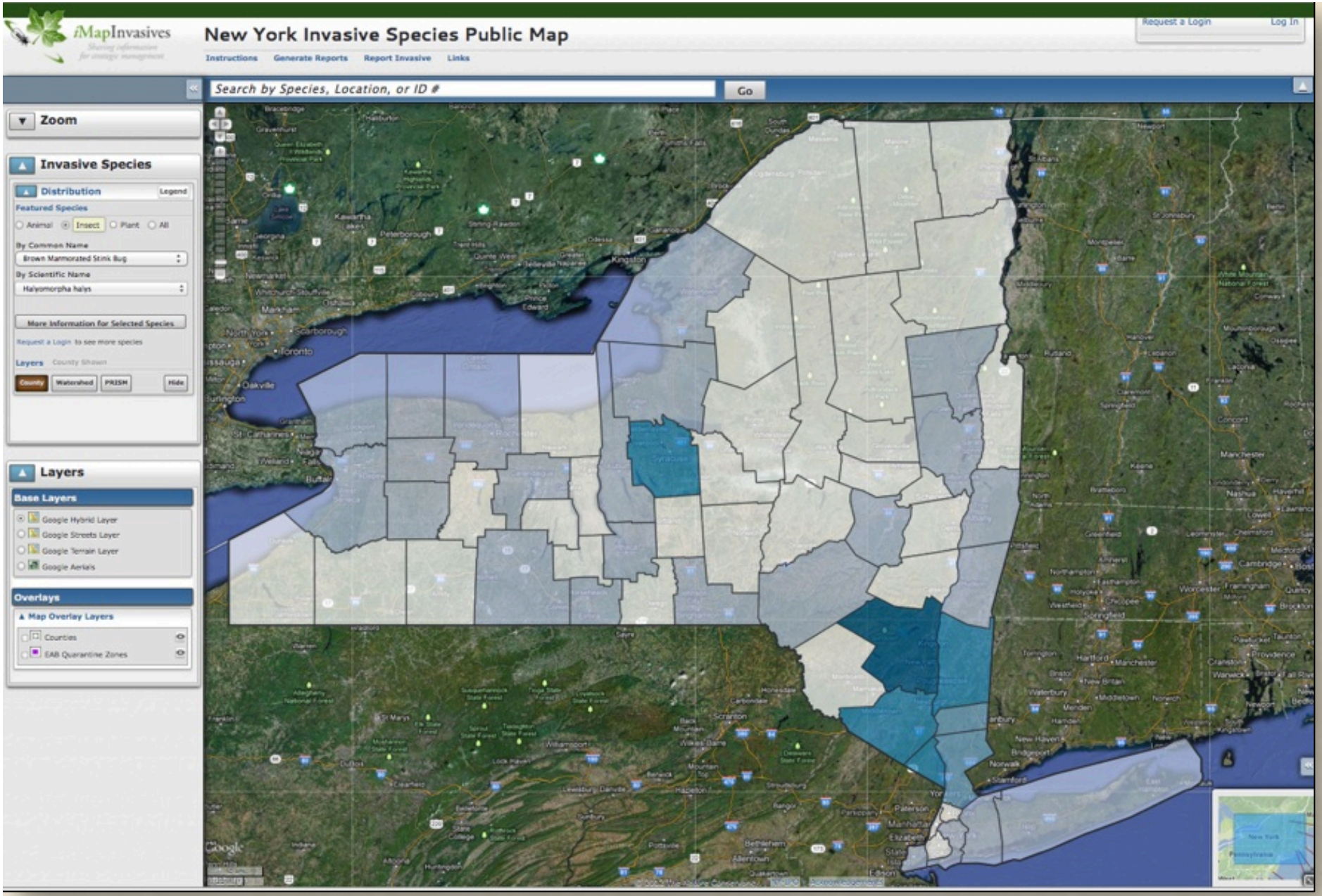
Used by 46% of CSS participants using smartphones.





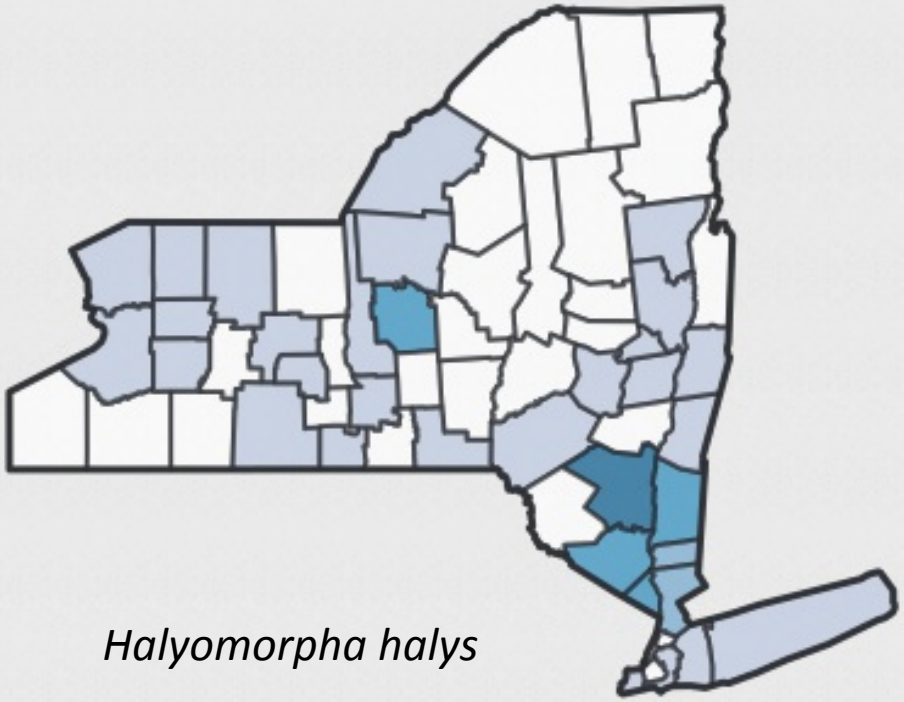


- Enabled GPS submission sent via email showing access to Lat/Long coordinates.

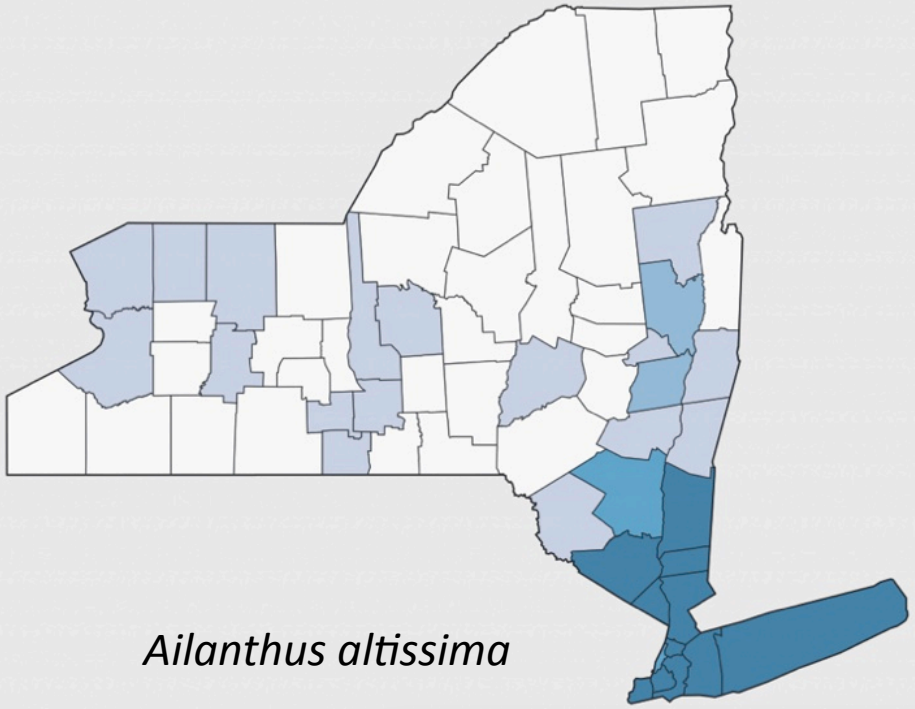


- Partnership with iMapInvasives provide additional mapping resources of BMSB in NYS.

iMapinvasive
New York Invasive Species Public Map
http://imapinvasives.org/nyimi/map/

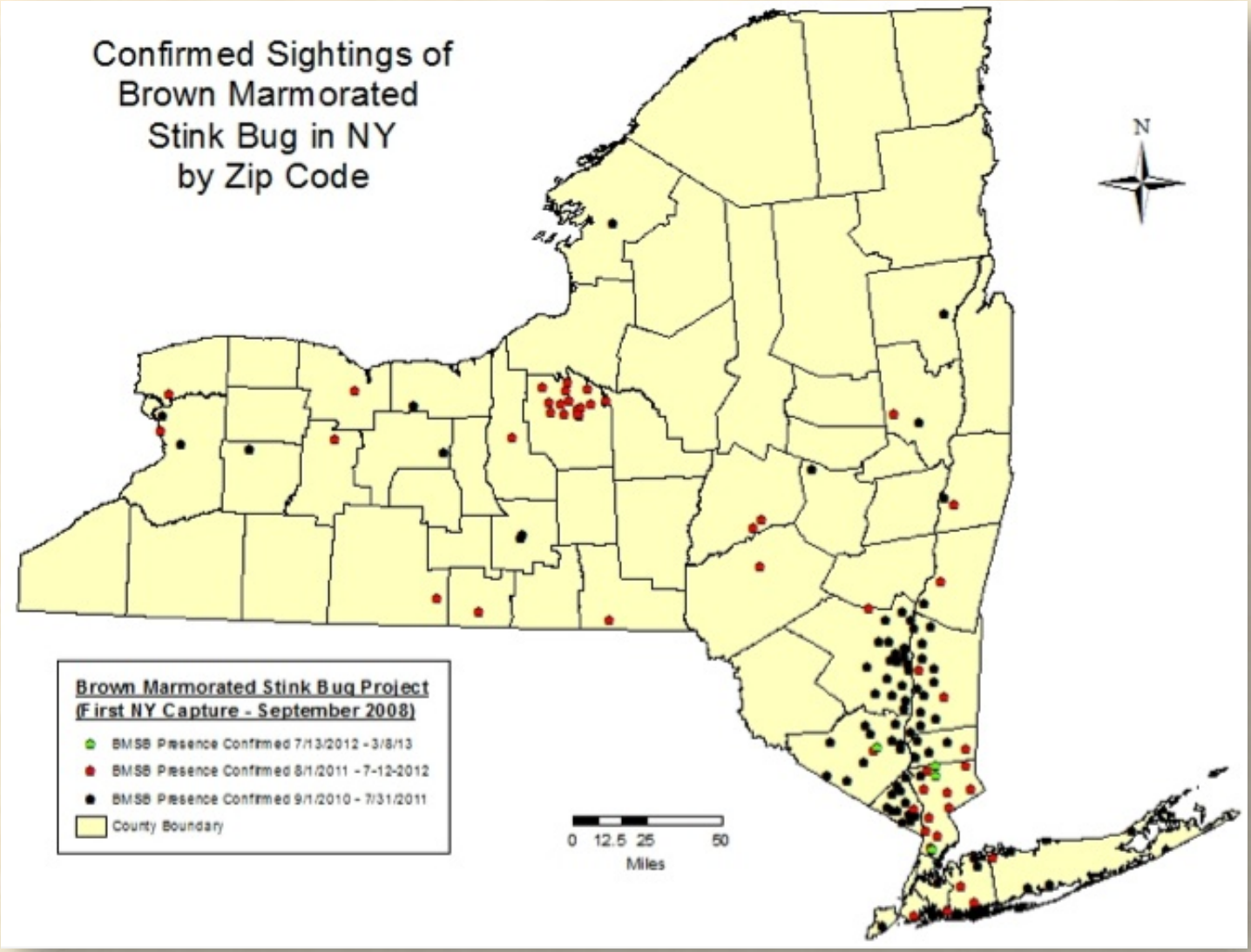


Halyomorpha halys



Ailanthus altissima

- Use of invasive species maps help to better understand the ecological niche of newly introduced invasive species
- The BMSB utilizes the Tree of Heaven, *Ailanthus altissima* as an important food and reproductive resource.



- Urban mapping of the BMSB provides data of population concentrations in NYS.
- BMSB maps, used by agriculturalists to help determine the potential regions for stink bug damage to susceptible crops, are updated yearly and made available with on-demand web access.

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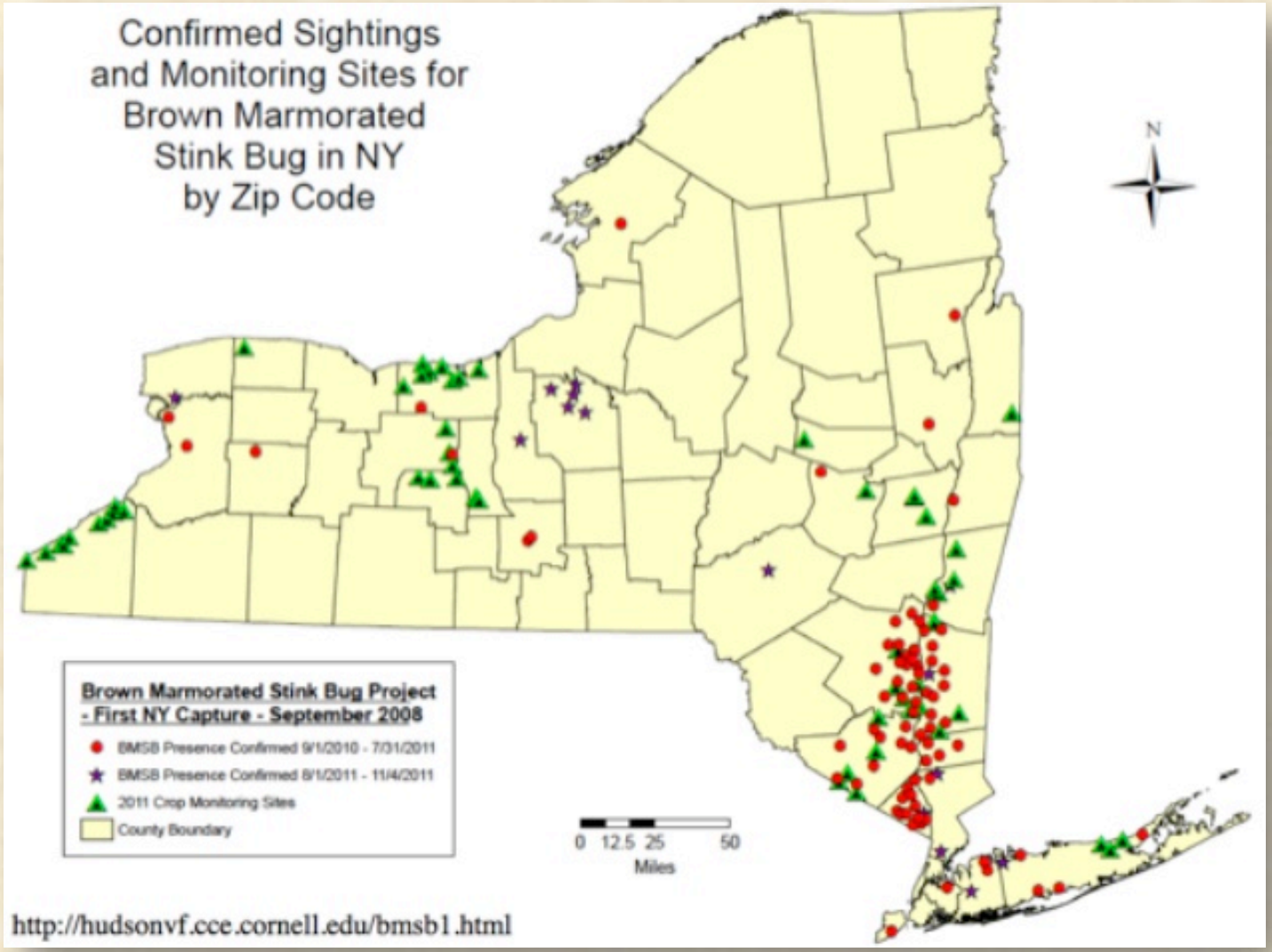
Studies of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), in New York State

- **2011: 70 Teders traps traps were set out in the major regions of the state using MDT alone. In only a single site were BMSB captures (Marlboro, NY).**



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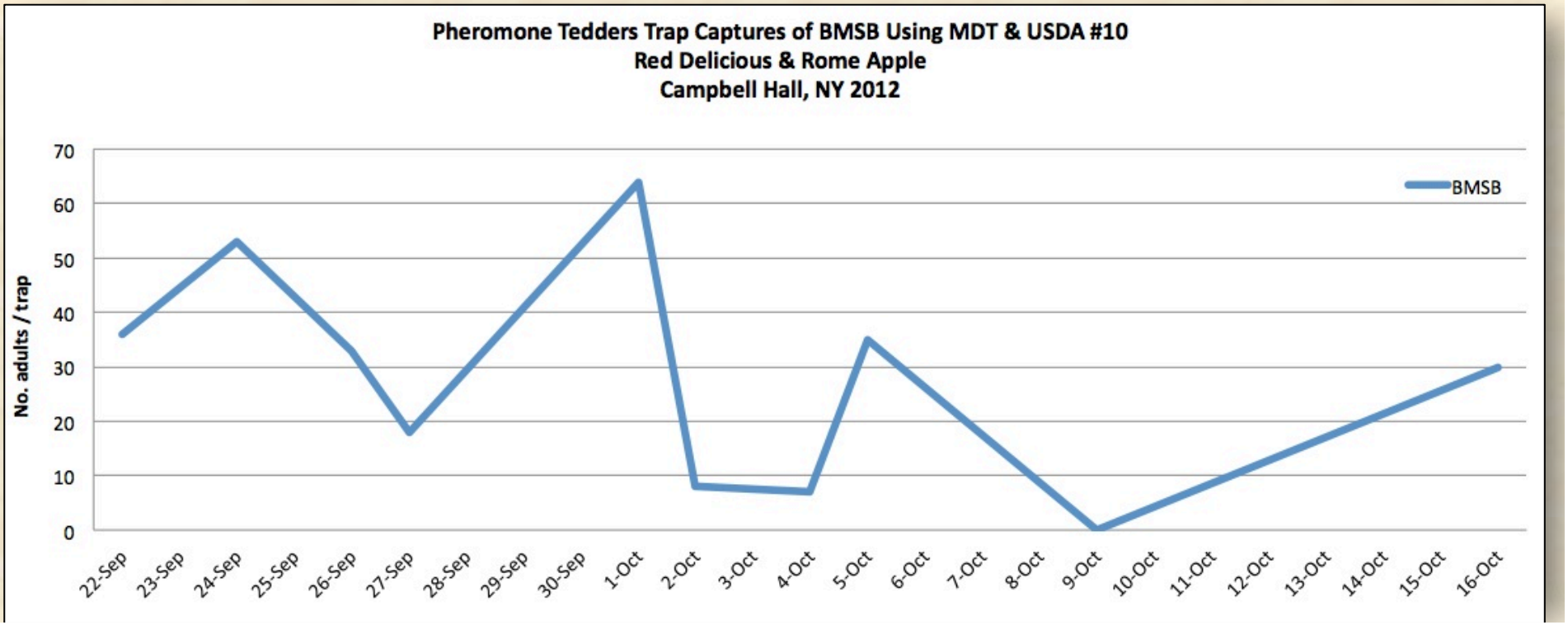

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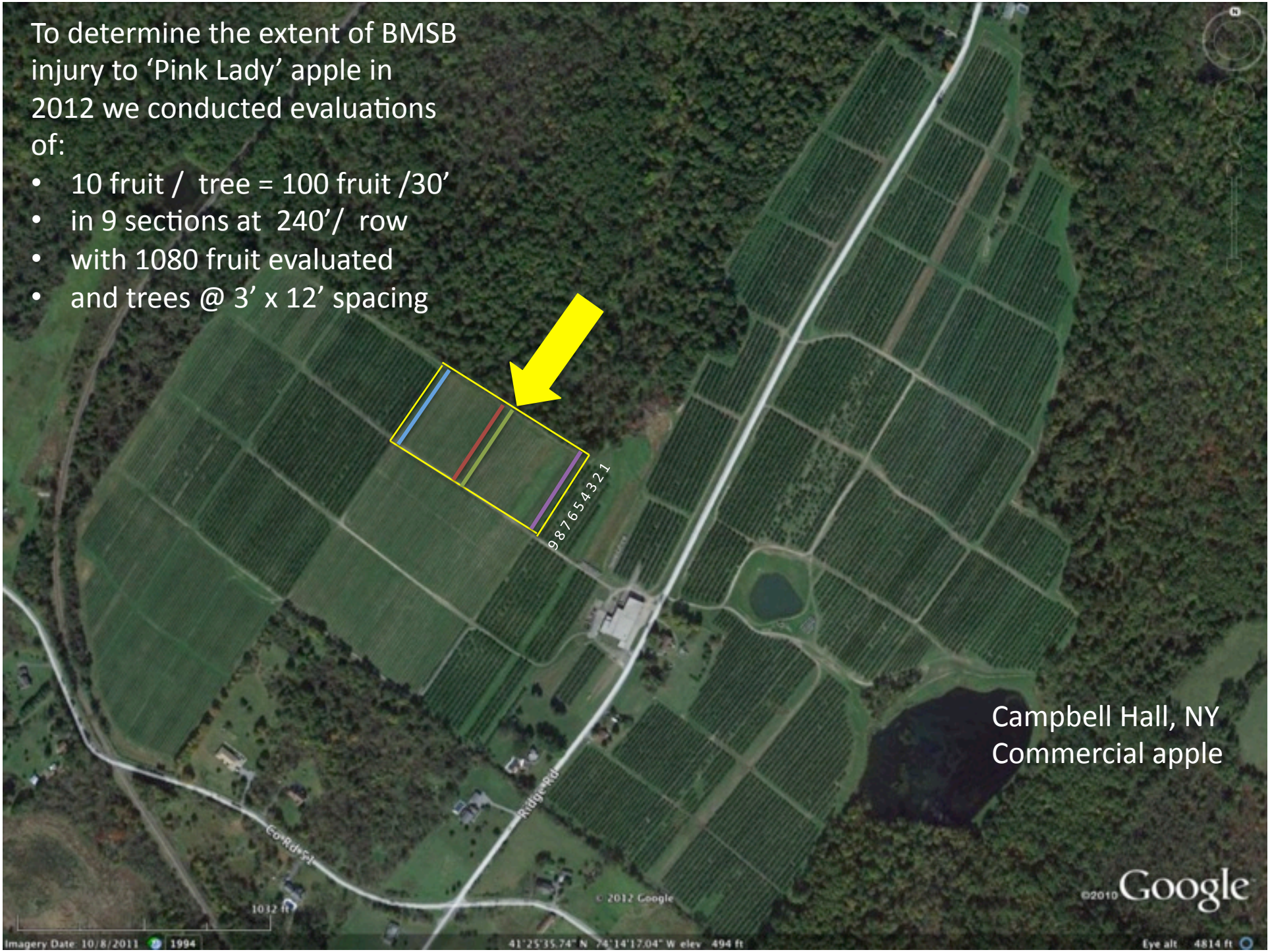
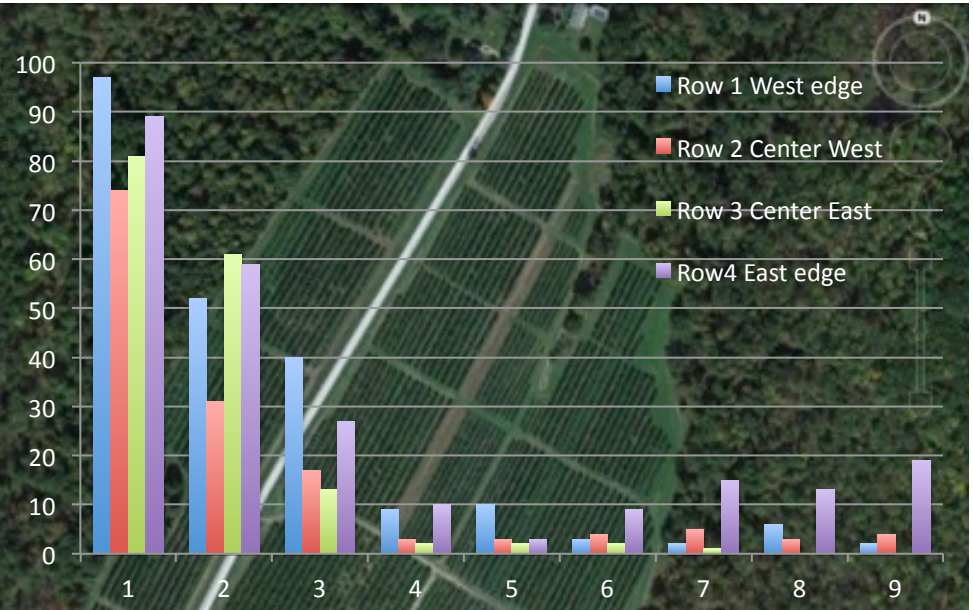
9 October, 2012
Milton, NY
Stink Bug injury to Golden Delicious
5 bins: Range from 38 – 57% damage
9 October, 2012; Milton, NY


To determine the extent of BMSB injury to 'Pink Lady' apple in 2012 we conducted evaluations of:
• 10 fruit / tree = 100 fruit /30'
• in 9 sections at 240'/ row
• with 1080 fruit evaluated
• and trees @ 3' x 12' spacing
987654321
Campbell Hall, NY
Commercial apple
Ridge Rd
Co Rd 51
1012 ft
© 2012 Google
©2010 Google
Imagery Date: 10/8/2011
1994
41°25'35.74" N 74°14'17.04" W elev 494 ft
Eye alt 4814 ft

To determine the extent of BMSB injury to 'Pink Lady' apple in 2012 we conducted evaluations of:

- 10 fruit / tree = 100 fruit /30'
- in 9 sections at 240'/ row
- with 1080 fruit evaluated
- and trees @ 3' x 12' spacing

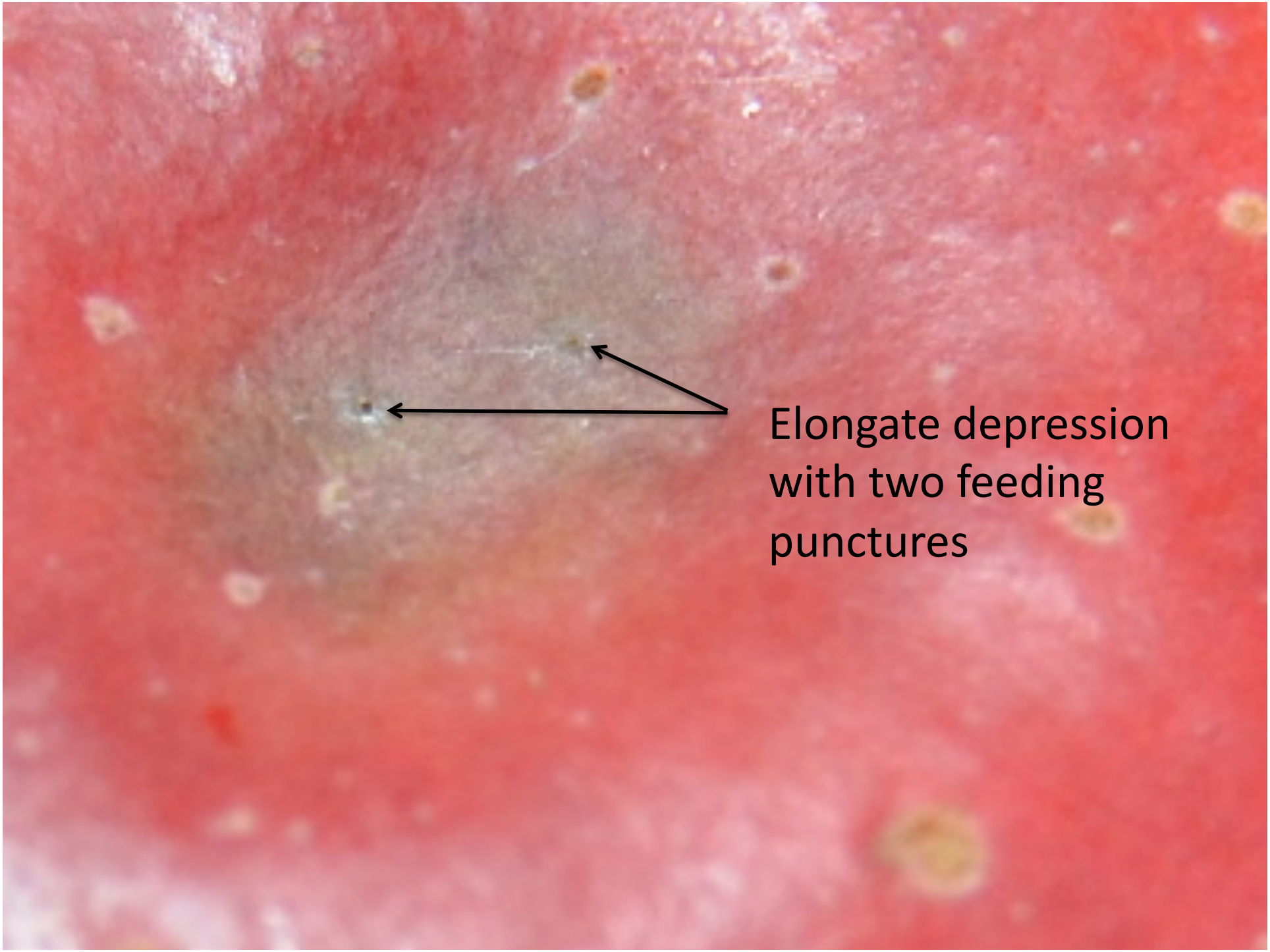
- A strong edge effect was observed from wooded edge toward the interior of the block.



Campbell Hall, NY
Commercial apple

©2010 Google

Pink Lady apple with BMSB feeding injury, Campbell Hall, NY 2012


Elongate depression with two feeding punctures

Determination of Stink Bug Injury

- Stink bug feeding site always visible
- Corking up to skin surface

Bitter Pit

Stink Bug Injury


Bitter Pit
CORNELL'S
Hudson Valley
LABORATORY

Hail Injury

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

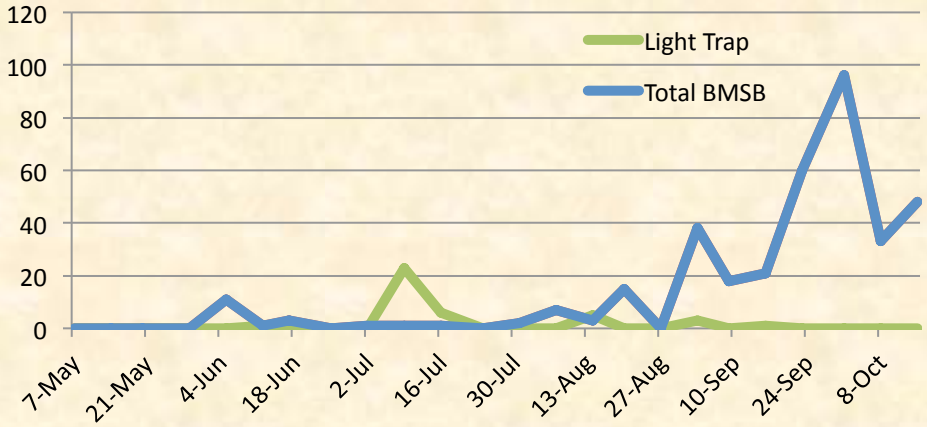
- **2013: Early trap captures with the use of #10 + MDT synergist**

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

- **2013: Early trap captures with the use of #10 + MDT synergist**

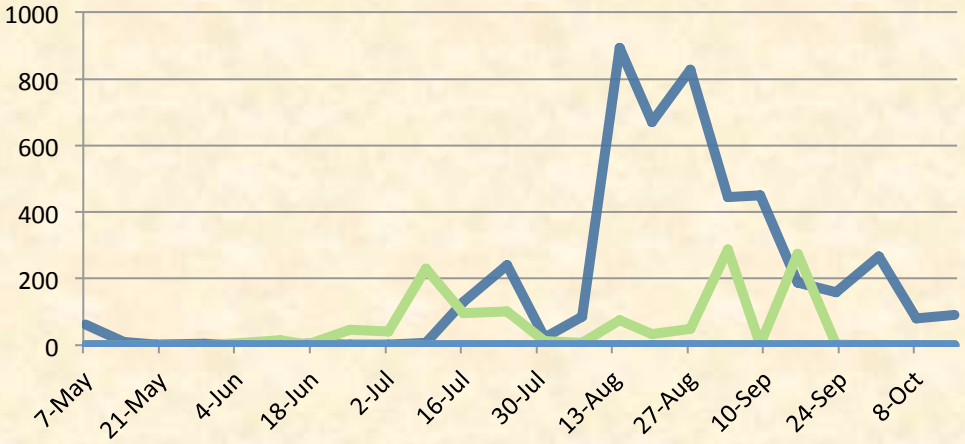
BMSB Trap Captures; #10 + MDT & Black Light

Campbell Hall, NY 2013



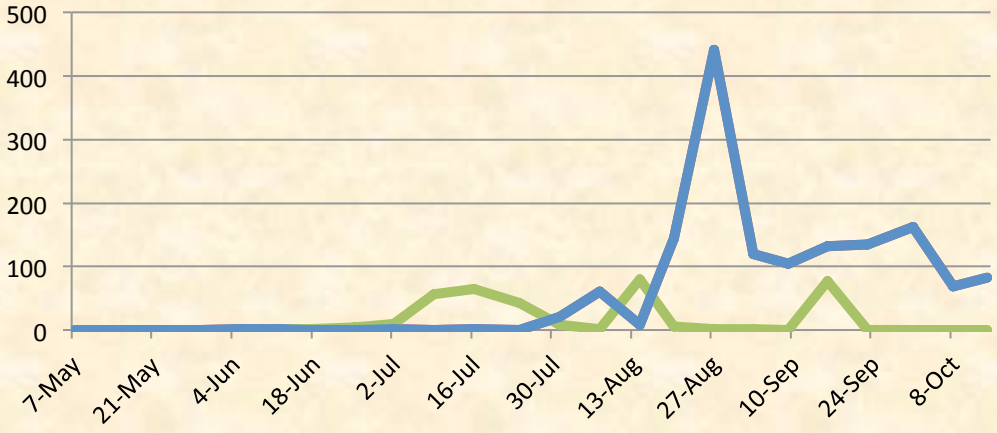
BMSB Trap Captures; #10+MDT & Black Light

Marlboro, NY 2013



BMSB Trap Captures; #10+MDT & Black Light

Milton, NY 2013



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

- **2013: Early trap captures with the use of #10 + MDT synergist**
  - **BMSB adults observed on pome & stone fruit in isolated orchards**
  - **Recommendations:**
    - **Initiate trapping to detect BMSB along the orchard perimeter**
    - **If BMSB is captured in traps then scout perimeter orchard rows**
    - **1 BMSB observed within 100' of scouting = orchard perimeter application using efficacious insecticides (bioassay results).**
    - **Repeat scouting after 4d, using observations of 1 BMSB along perimeter orchard rows as a trigger for subsequent perimeter application.**
    - **Following applications would employ alternate row at 7d followed by whole orchard application as observance of BMSB becomes evident.**
    - **Repeating scouting and perimeter spray sequence.**

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

- **2013:** Early trap captures with the use of #10 + MDT synergist
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    - Following applications would employ alternate row at 7dc then whole orchard as observance of BMSB becomes evident.
    - Repeating scouting and perimeter spray sequence.

- Employed 'active' and 'passive' traps using fix netting over canopy (Campbell Hall, NY)
  - Both traps sprayed with Bifenthrin 10 DF (3.0 oz./quart).
  - Active trap pheromone baited using #10 + MDT, bi-weekly charge.


Active baited trap (left)
Passive trap (right)

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

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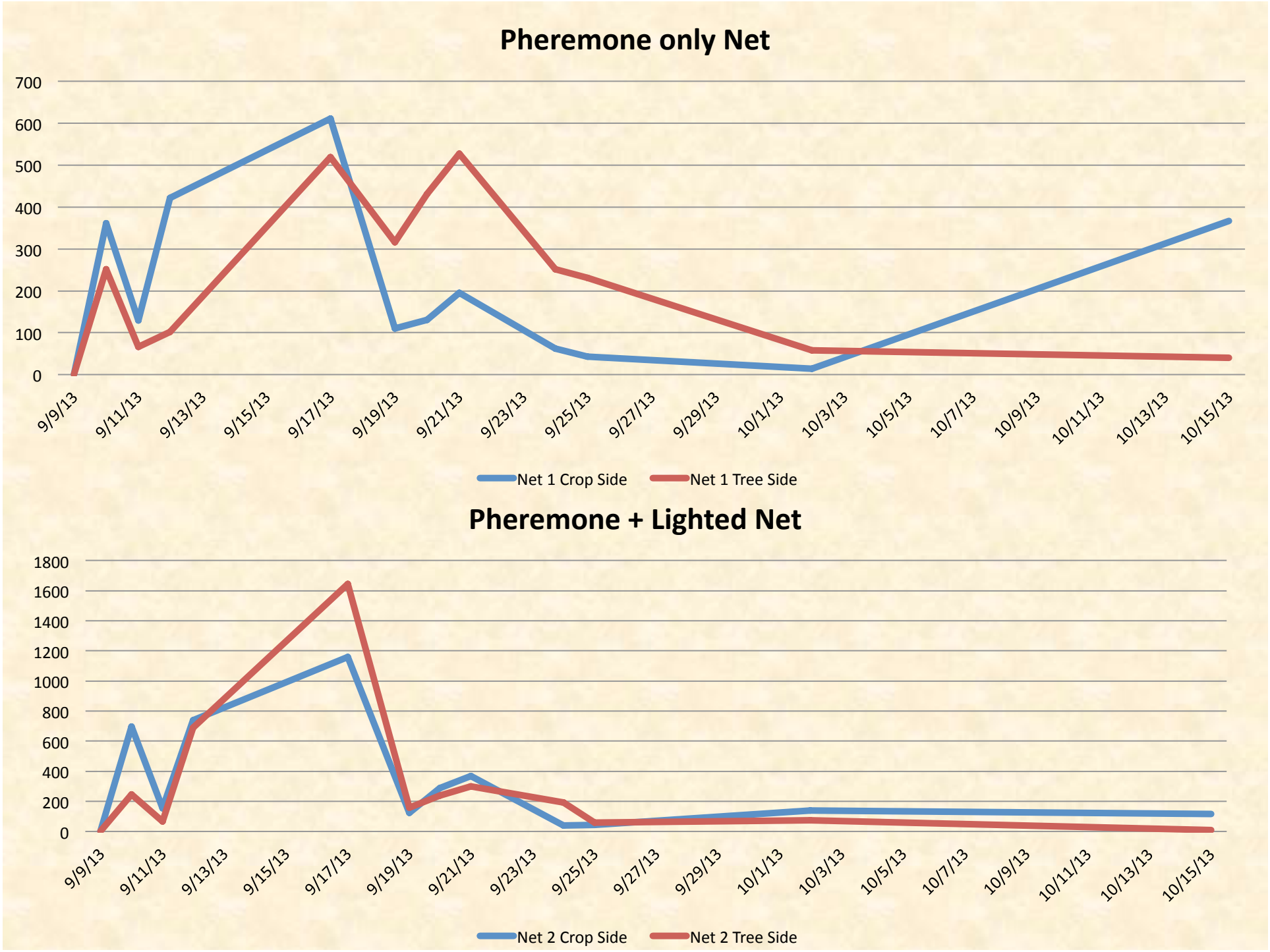
- Employed integrated pest management approach employing pheromone baited netting traps with and without lights to reduce BMSB field populations through Mycotrol-O applications. (Marlboro, NY)


HONDA
EM650
HONDA
EM650

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

CORNELL'S
Hudson Valley
LABORATORY


Pheremone only Net
700
600
500
400
300
200
100
0
9/9/13
9/11/13
9/13/13
9/15/13
9/17/13
9/19/13
9/21/13
9/23/13
9/25/13
9/27/13
9/29/13
10/1/13
10/3/13
10/5/13
10/7/13
10/9/13
10/11/13
10/13/13
10/15/13
Net 1 Crop Side
Net 1 Tree Side
Pheremone + Lighted Net
1800
1600
1400
1200
1000
800
600
400
200
0
9/9/13
9/11/13
9/13/13
9/15/13
9/17/13
9/19/13
9/21/13
9/23/13
9/25/13
9/27/13
9/29/13
10/1/13
10/3/13
10/5/13
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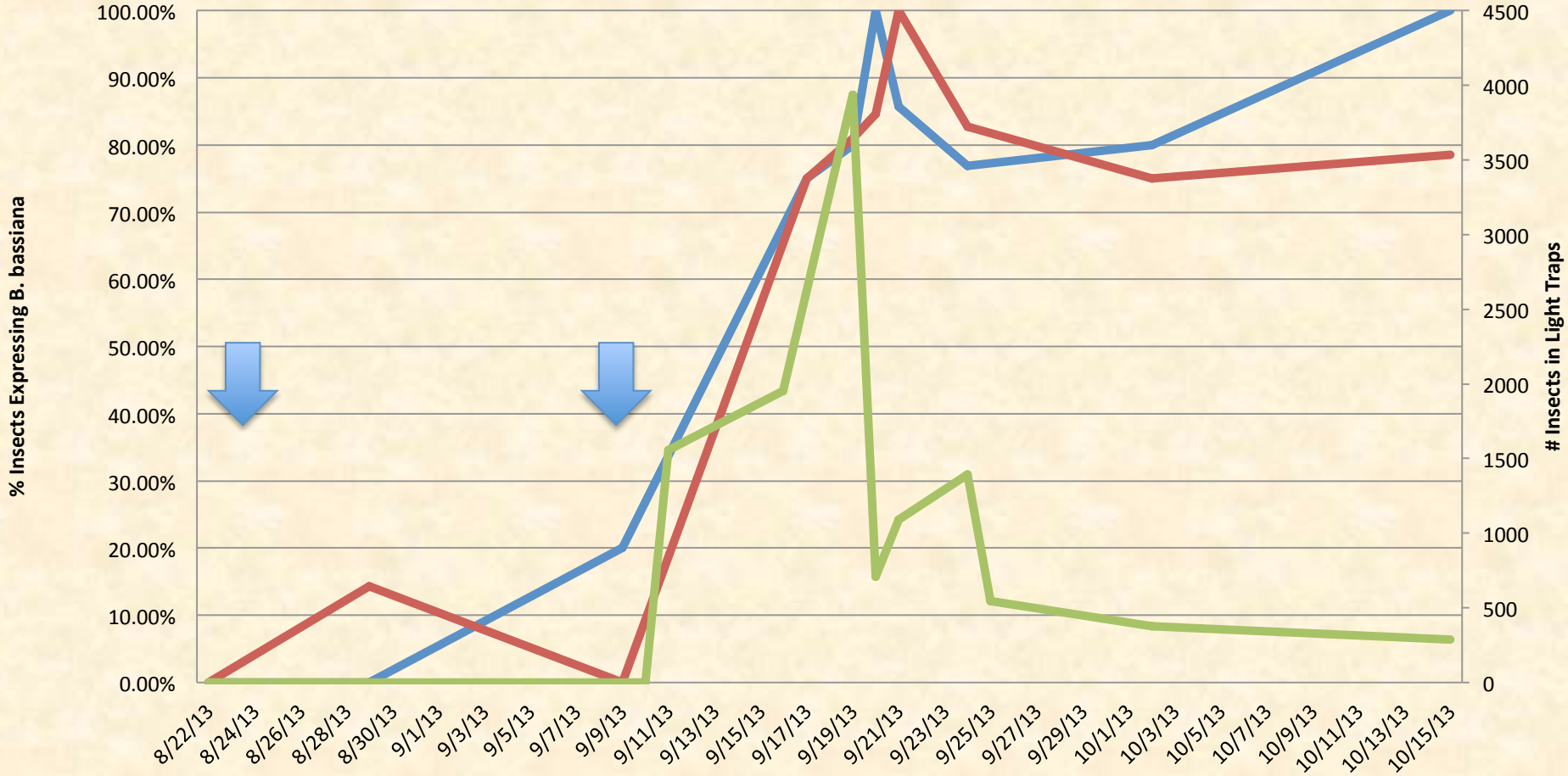
10/15/13
Net 2 Crop Side
Net 2 Tree Side

B. bassiana expression over Time



	8/22/13	8/29/13	9/9/13	9/10/13	9/11/13	9/16/13	9/17/13	9/19/13	9/20/13	9/21/13	9/24/13	9/25/13	10/2/13	10/15/13	
Net 1 infection	0.00%	0.00%	20.00%			73.66%		75.00%	80.00%	100.00%	85.71%	76.92%		80.00%	100.00%
Net 2 infection	0.00%	14.29%	0.00%			82.95%		75.00%	80.95%	84.62%	100.00%	82.76%		75.00%	78.57%
Population	0			0	1556	521	1954		3935	708	1090	1392	545	375	287

- *Beauvaria bassiana* strain GHA applications *(Mycotrol-O @ 16 oz./A)*

CORNELL'S Hudson Valley LABORATORY

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

Voltinism: Determine the # of generations of BMSB in NYS (Agnello).

Food source: *Ailanthus altissma (Tree of Heaven)*, peach and apple trees

2013 Caged observations

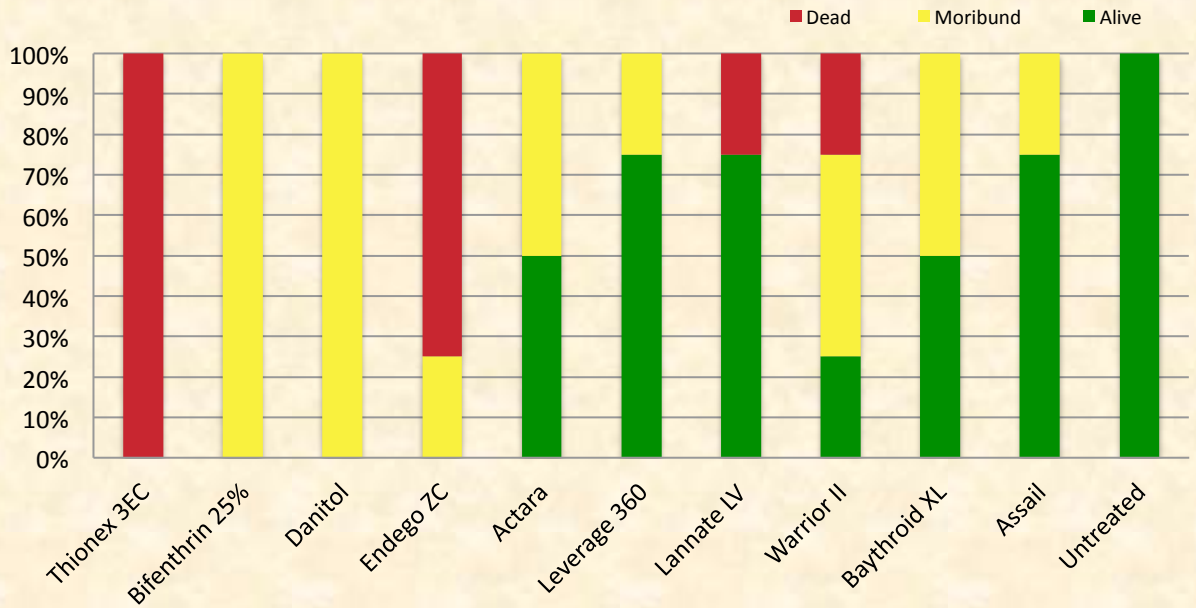
- Placed 24 adults, 12 male and 12 females into an outdoor screened cage on 6 May (14 hour day length)
- Field observations indicated 1st egg hatch on 24 June
- 1st instar present on 2 July (951.0DD50F from 14hr L/D photoperiod
- 2nd instars present on 5 July (1038.9DD50F from 14hr L/D photoperiod)
- 3rd instars present on 10 July (1181.5DD50F from 14hr L/D photoperiod)
- 4th and 5th instars present on 17 July (1181.5DD50F from 14hr L/D photoperiod).
- Adults present on 5th August (1802.3DD50F from 14hr L/D photoperiod).
- Newly emerged adults added to 'Bugdorm' within chamber
- Eggs observed, emergence on August 21st (2110.1DD50F from 14hr L/D photoperiod).

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

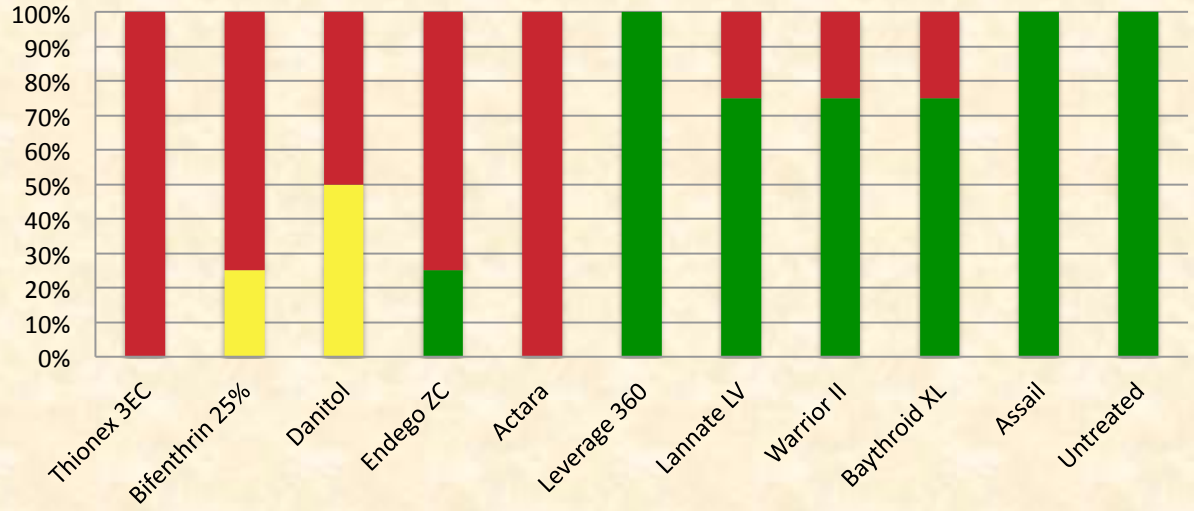
Residual bioassay of adult BMSB on treated foliage:

- **Four tree plots, 4 replicates** treated with the highest labeled rate of insecticides using tractor mounted airblast sprayer,
- Foliage collected 24, 48 and 72 hours after application.
- 1st generation adults placed on portions of 4 leaves wrapped on the inside of a 1 oz. enclosed container.
- Adults were observed at 1 and 3 day intervals and evaluated as live, morabund or dead, held at 70°F.

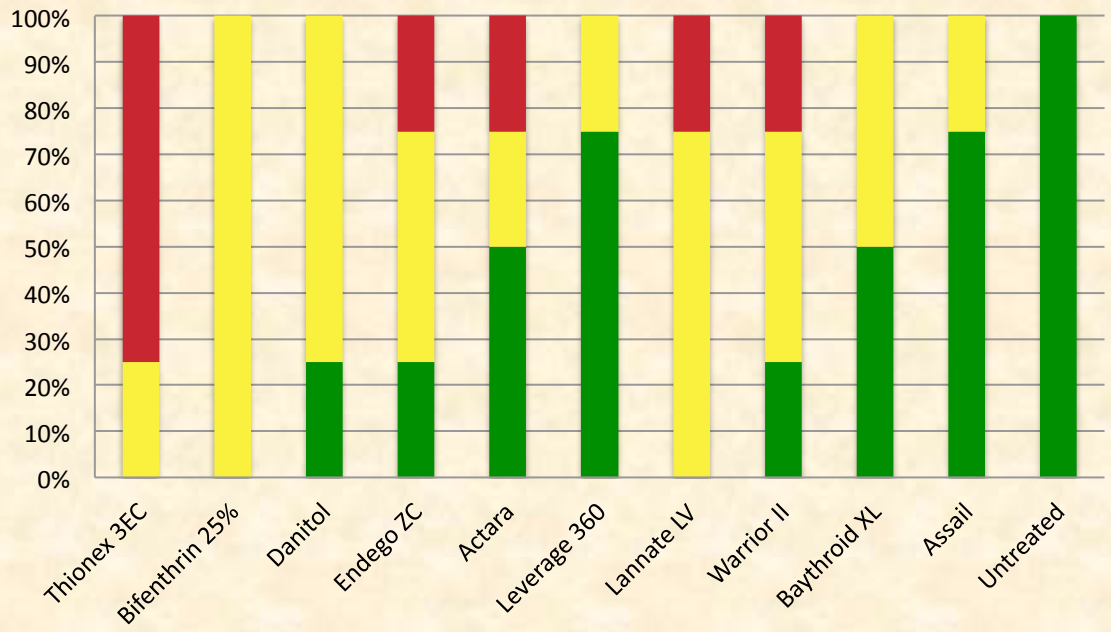
BMSB Adult Exposure to Insecticide Residue of Apple Foliage
24h Old Residue @ 1 d



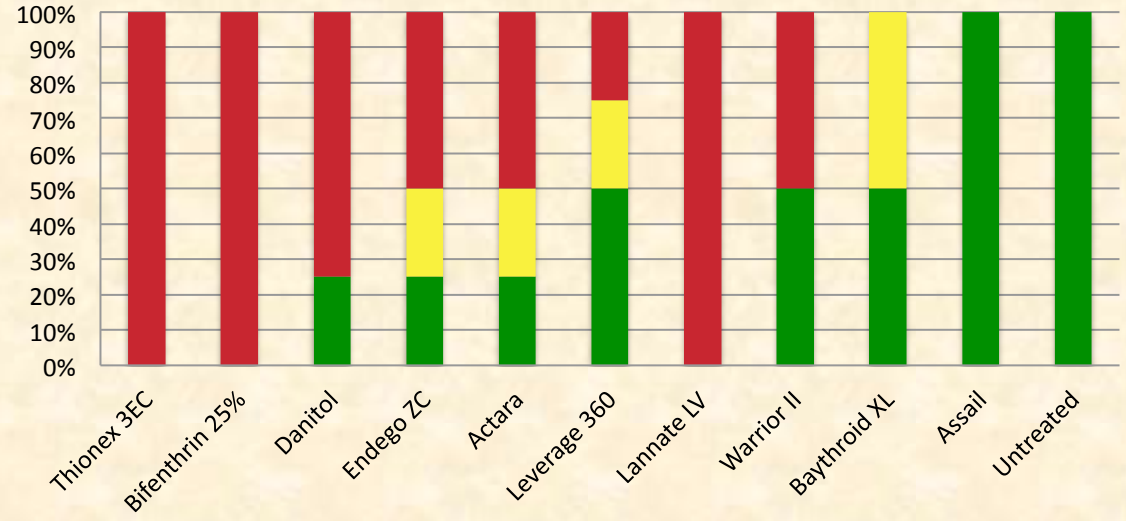
BMSB Adult Exposure to Insecticide Residue of Apple Foliage
24h Old Residue @ 3 d



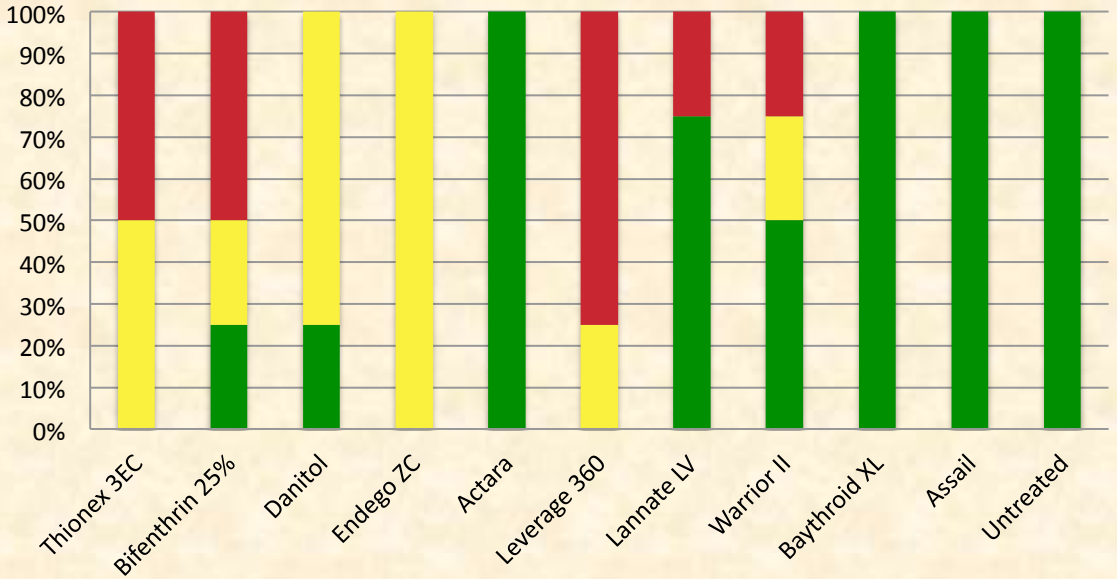
BMSB Adult Exposure to Insecticide Residue of Apple Foliage
48h Old Residue @ 1 d



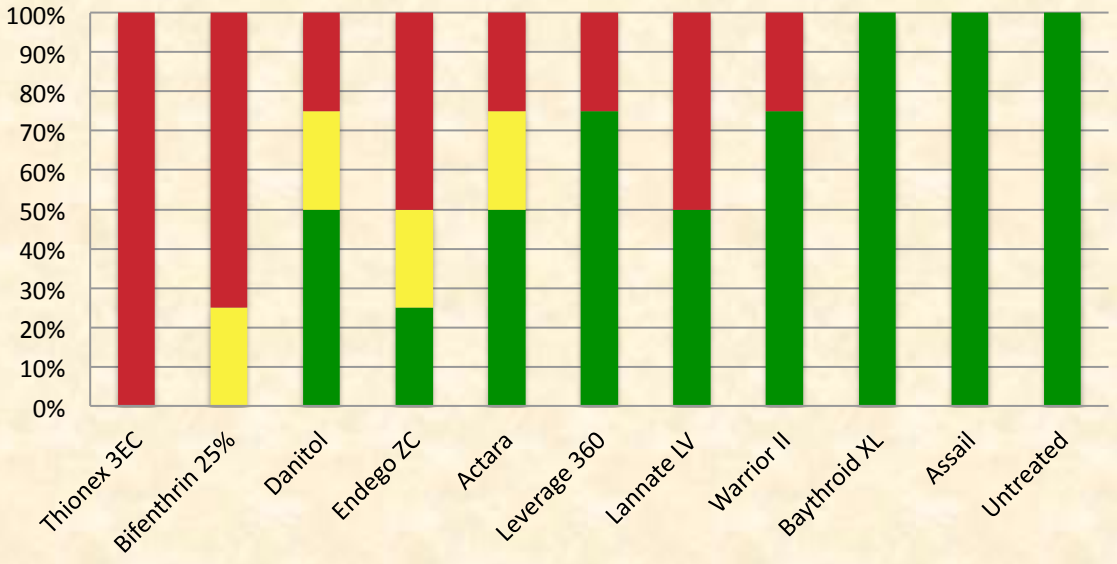
BMSB Adult Exposure to Insecticide Residue of Apple Foliage
48h Old Residue @ 3 d



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



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



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