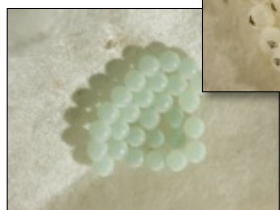
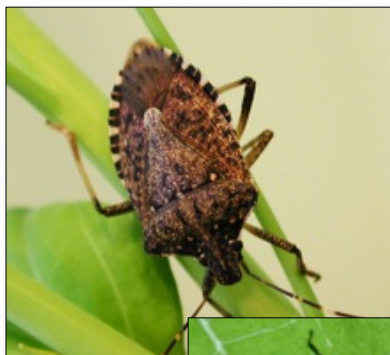


Redistribution of Trissolcus japonicus (Hymenoptera: Platygasteridae) for Use in the Biological Control of BMSB Management in NYS



Photograph: Elijah J. Talamas,
ARS USDA.



Photograph: **Christopher Hedstrom**
USDA-APHIS Quarantine Facility,
Corvallis, Oregon

Peter Jentsch, Arthur Agnello, Tessa Grasswitz, Dana Acimovic

9th International IPM Symposium

Baltimore, Maryland

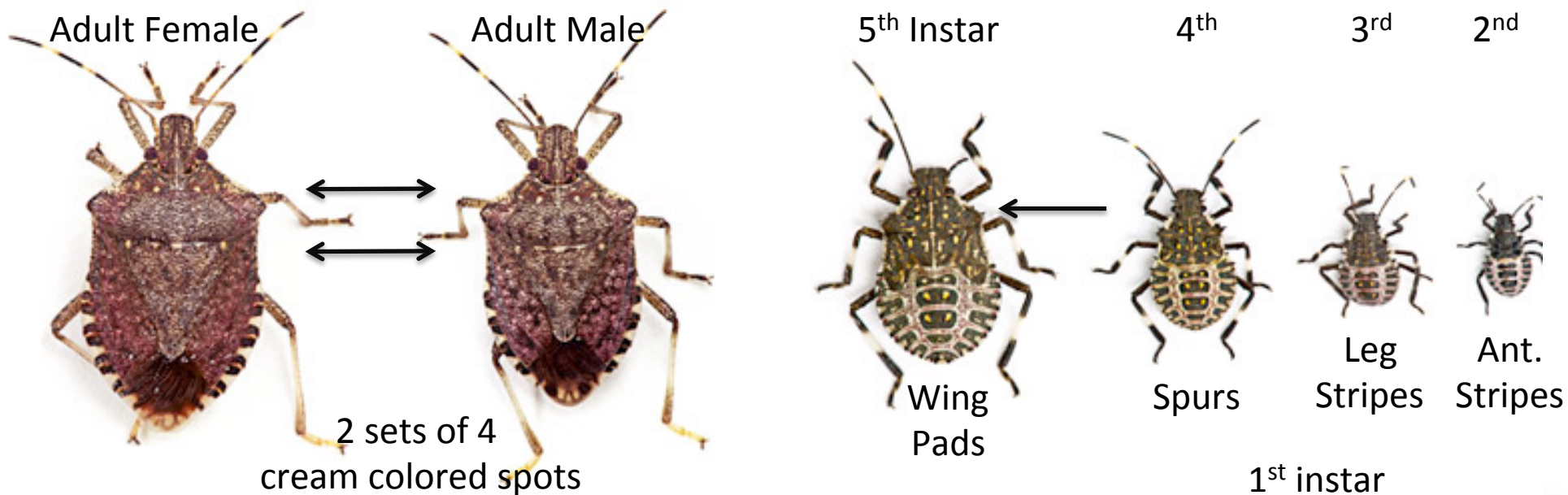
Wednesday, March 21st 1:15-2:45PM



Cornell University

Hudson Valley Research Laboratory

Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae)



- 1-2 Generations / year in the Hudson Valley of NY
- 5 instar stages, 1st instar feed only on egg symbionts
- Early life stages have greater susceptibility to insecticides




Brown Marmorated Stink Bug: Host Plant List


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
<i>Abeliea x grandiflora</i> (André) Rehd	Glossy abelia	Bernon, 2004
<i>Acer campestre</i> L.	Hedge maple	Bernon, 2004
<i>Acer palmatum</i> Thunb.	Japanese maple	Bernon, 2004
<i>Acer platanoides</i> L.	Norway maple	Bernon, 2004; Hamilton and Shearer, 2003
<i>Acer pseudoplatanus</i> L.		Wermelinger et al., 2008
<i>Acer rubrum</i> L.	Red maple	Bernon, 2004
<i>Acer</i> spp.*	Maple	Hoebeker and Carter, 2003; Wermelinger et al., 2008
<i>Amelanchier</i> spp.	Shadbush	Bernon, 2004; Hoebeker and Carter, 2003
<i>Arctium minus</i> Bernh.	Burdock	Bernon, 2004
<i>Arctium</i> spp.		Wermelinger et al., 2008
<i>Asparagus officinalis</i> L.*	Asparagus	Hamilton and Shearer, 2003
<i>Asparagus</i> spp.		Bernon, 2004; Wermelinger et al., 2008
<i>Basella rubra</i> Linn.	T'ang ts'oi or Climbing spinach	Hoffman, 1931
<i>Beta vulgaris</i> L.	Beet Root	Hua, 2000
<i>Betula</i> spp.	Birch	Bernon, 2004
<i>Buddleia davidii</i> Franch.	Butterfly bush	Bernon, 2004; Wermelinger et al., 2008
<i>Buddleia</i> spp.	Butterfly bush	Hamilton and Shearer, 2003
<i>Camellia oleifera</i> C. Abel	Tea-oil camellia	Hua, 2000
<i>Capsicum annuum</i> L.*	Bell pepper	Bernon, 2004; Leskey, 2010a, 2010b
<i>Caragana arborescens</i> Lam.	Siberian pea shrub	Bernon, 2004; Nielsen and Hamilton, 2009
<i>Carya</i> spp.	Pecan	Bernon, 2004
<i>Catalpa</i> spp.*	Catalpa	Bernon, 2004; Hoebeker and Carter, 2003
<i>Celastrus</i> spp.	Bittersweet	Bernon, 2004
<i>Celosia argentea</i> L.	Princess feather or Cock's comb	Hoffman, 1931
<i>Celtis occidentalis</i> L.	Hackberry	Bernon, 2004
<i>Cercis canadensis</i> L.	Redbud	Bernon, 2004
<i>Cleome</i> spp.	Cleome	Bernon, 2004
<i>Citrus</i> spp.*	Citrus	Wermelinger et al., 2008; Hoebeker and Carter, 2003
Host	Common name	Reference
<i>Tilia americana</i> L.	Linden	Bernon, 2004
<i>Tilia</i> spp.*	Basswood	Hoebeker and Carter, 2003
<i>Triticum aestivum</i> L.	Wheat	Hua, 2000
<i>Tropaeolum majus</i> L.		Wermelinger et al., 2008
<i>Ulmus</i> spp.	Elm	Hua, 2000
Uncultivated hedge		Nielsen and Hamilton, 2009
<i>Viburnum opulus</i> var. <i>americanum</i> Ait.	Highbush cranberry	Nielsen and Hamilton, 2009
<i>Viburnum prunifolium</i> L.	Blackhaw viburnum	Bernon, 2004; Nielsen and Hamilton, 2009
<i>Viburnum setigerum</i> Hance	Tea Viburnum	Bernon, 2004
<i>Viburnum</i> spp.	Cranberry bush	Bernon, 2004
<i>Vigna sesquipedalis</i> L.	Chinese long bean	Hoffman, 1931
<i>Vitis</i> spp.*	Grape	Bernon, 2004; Hamilton, 2009
<i>Vitis vinifera</i> L.	Grapevine	Wermelinger et al., 2008
<i>Zea mays</i> L.*	Corn	Leskey, 2010a, 2010b



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 host species
- Observed on over 300 plants
- Deciduous tree, vegetable, legumes & tree fruit**

Host	Common name	Reference	Host	Common name	Reference
<i>Corylus colurna</i> L.	Turkish filbert	Bernon, 2004	<i>Phaseolus</i> spp.*	Pole bean, Bush bean	Bernon, 2004
<i>Crataegus</i> spp.	Hawthorn	Bernon, 2004	<i>Phaseolus vulgaris</i> L.	String beans	Hamilton and Shearer, 2003; Wermelinger et al., 2008
<i>Cryptomeria</i> spp.	Japanese cedar	Wermelinger et al., 2008	<i>Pisum sativum</i> L.	Peas	Wermelinger et al., 2008
<i>Cucumis sativus</i> L.	Cucumber	Bernon, 2004	<i>Platanus occidentalis</i> L.	Sycamore	Bernon, 2004
<i>Cupressus</i> spp.	Cypress	Wermelinger et al., 2008	<i>Prunus armenica</i> L.	Apricot	Bernon, 2004; Wermelinger et al., 2008
<i>Decaisnea fargesii</i> Franch.		Wermelinger et al., 2008	<i>Prunus avium</i> L.	Cherry	Wermelinger et al., 2008; Hoebeker and Carter, 2003
<i>Diospyros kaki</i> L.	Persimmon	Hoebeker and Carter, 2003	<i>Prunus domestica</i> L.	Plum	Bernon, 2004; Wermelinger et al., 2008
<i>Diospyros kaki</i> Thunb.	Japanese persimmon	Kawada and Kitamura, 1983	<i>Prunus grayana</i> Maxim.	Japanese bird cherry	Funayama, 2007
<i>Diospyros</i> spp.*	Persimmon	Wermelinger et al., 2008	<i>Prunus mume</i> Sieb. et Zucc.	Japanese apricot	Hoebeker and Carter, 2003
<i>Elaeagnus angustifolia</i> L.	Russian olive	Nielsen and Hamilton, 2009	<i>Prunus persica</i> Batsch	Japanese peach	Hoebeker and Carter, 2003; Wermelinger et al., 2008; Hua, 2000
<i>Euonymus alatus</i> (Thunb.) Siebold	Winged Euonymus	Bernon, 2004	<i>Prunus</i> spp.*	Peach, Ornamental plum, Sour cherry, Black cherry	Bernon, 2004; Leskey, 2010a, 2010b; Wermelinger et al., 2008
<i>Euonymus</i> spp.	Euonymus	Bernon, 2004	<i>Prunus</i> spp.		Wermelinger et al., 2008
<i>Ficus</i> spp.	Fig	Hoebeker and Carter, 2003	<i>Pyracantha coccinea</i> M. Roem.	Firethorn	Bernon, 2004; Hamilton and Shearer, 2003
<i>Fraxinus americana</i> L.	White ash	Nielsen and Hamilton, 2009	<i>Pyracantha</i> spp.	Firethorn	Hoebeker and Carter, 2003
<i>Fraxinus</i> spp.	Ash	Bernon, 2004	<i>Pyrus prifolia</i> Nakai	Japanese pear	Nielsen and Hamilton, 2009
<i>Glycine max</i> Merrill	Soybean	Bernon, 2004; Hoebeker and Carter, 2003; Wermelinger et al., 2008; Hua, 2000; Son et al., 2000	<i>Pyrus pyrifolia</i> (Burm. f.) Naki	Asian pear	Bernon, 2004; Nielsen and Hamilton, 2009; Hua, 2000
<i>Gossypium</i> spp.	Cotton	Hua, 2000	<i>Pyrus</i> spp.*	Pear	Bernon, 2004
<i>Helianthus</i> spp.	Sunflower	Bernon, 2004	<i>Rhamnus</i> spp.	Buckthorn	Bernon, 2004
<i>Hibiscus rosa-sinensis</i> L.	Chinese hibiscus	Hoffman, 1931	<i>Rhodotypos scandens</i> (Thunb.) Makino	Jethead	Bernon, 2004
<i>Hibiscus</i> spp.		Wermelinger et al., 2008	<i>Rhus</i> spp.	Sumac	Bernon, 2004
<i>Ilex opaca</i> Ait.	American holly	Bernon, 2004; Hamilton and Shearer, 2003	<i>Rosa rugosa</i> Thunb.	Rugosa rosea	Bernon, 2004; Nielsen and Hamilton, 2009
<i>Ilex</i> spp.*	Holly	Bernon, 2004	<i>Rosa</i> spp.	Rose	Hamilton, 2009
<i>Ilex verticillata</i> (L.) A. Gray	Winterberry holly	Bernon, 2004	<i>Rubus</i> spp.*	Raspberry	Bernon, 2004; Hamilton and Shearer, 2003; Wermelinger et al., 2008
<i>Juglans nigra</i> L.*	Walnut	Bernon, 2004	<i>Salix</i> spp.	Willow	Bernon, 2004; Wermelinger et al., 2008
<i>Koeleruteria</i> spp.	Goldenrain Tree	Bernon, 2004	<i>Sambucus</i> spp.	Elder	Bernon, 2004
<i>Ligustrum</i> spp.	Privet	Bernon, 2004	<i>Sicyos angulatus</i> L.	Burcucumber	Bernon, 2004
<i>Lonicera</i> spp.	Honeysuckle	Bernon, 2004; Hoebeker and Carter, 2003; Wermelinger et al., 2008	<i>Solanum nigrum</i> L.	Black nightshade	Hoffman, 1931
<i>Lycopersicon</i> spp.	Tomato	Bernon, 2004	<i>Solanum</i> spp.	Nightshade	Bernon, 2004
<i>Magnolia stellata</i> (Siebold & Zucc.) Maxim.	Star magnolia	Bernon, 2004	<i>Solanum</i> spp.*	Tomato	Hamilton, 2009; Leskey, 2010a, 2010b
<i>Malus domestica</i> L. (or Brokh)*	Apple	Hua, 2000; Hoebeker and Carter, 2003	<i>Sorbus</i> spp.	Mountainash	Bernon, 2004
<i>Malus</i> spp.	Crabapple	Bernon, 2004; Hamilton and Shearer, 2003; Wermelinger et al., 2008	<i>Spiraea</i> spp.	Spiraea	Bernon, 2004
<i>Morus</i> spp.	Mulberry	Wermelinger et al., 2008; Bernon, 2004; Hoebeker and Carter, 2003	<i>Stewartia pseudocamellia</i> Maxim.		Wermelinger et al., 2008
<i>Paulownia</i> spp.	Paulownia	Hoebeker and Carter, 2003	<i>Symphytum</i> spp.	Comfrey	Bernon, 2004
<i>Paulownia tomentosa</i> (Thunb.) Siebold & Zucc. ex Steud.*	Princess Tree or Paulownia	Bernon, 2004; Hoebeker and Carter, 2003; Wermelinger et al., 2008	<i>Syringa</i> spp.	Lilac	Bernon, 2004; Wermelinger et al., 2008
<i>Phaseolus lunatus</i> Linn.	Lima beans	Hoffman, 1931			

Brown Marmorated Stink Bug: Host Plants - Food for Success

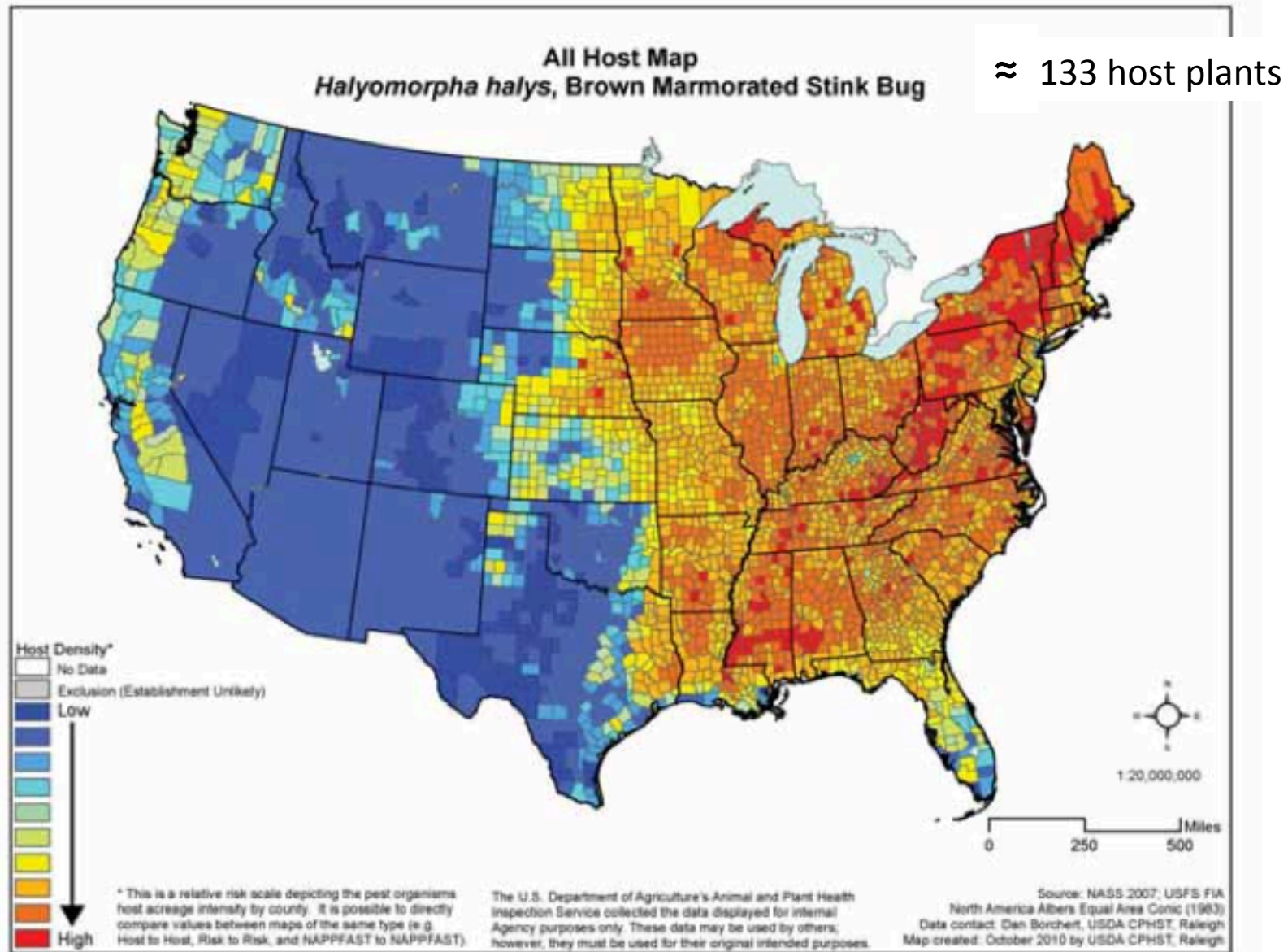
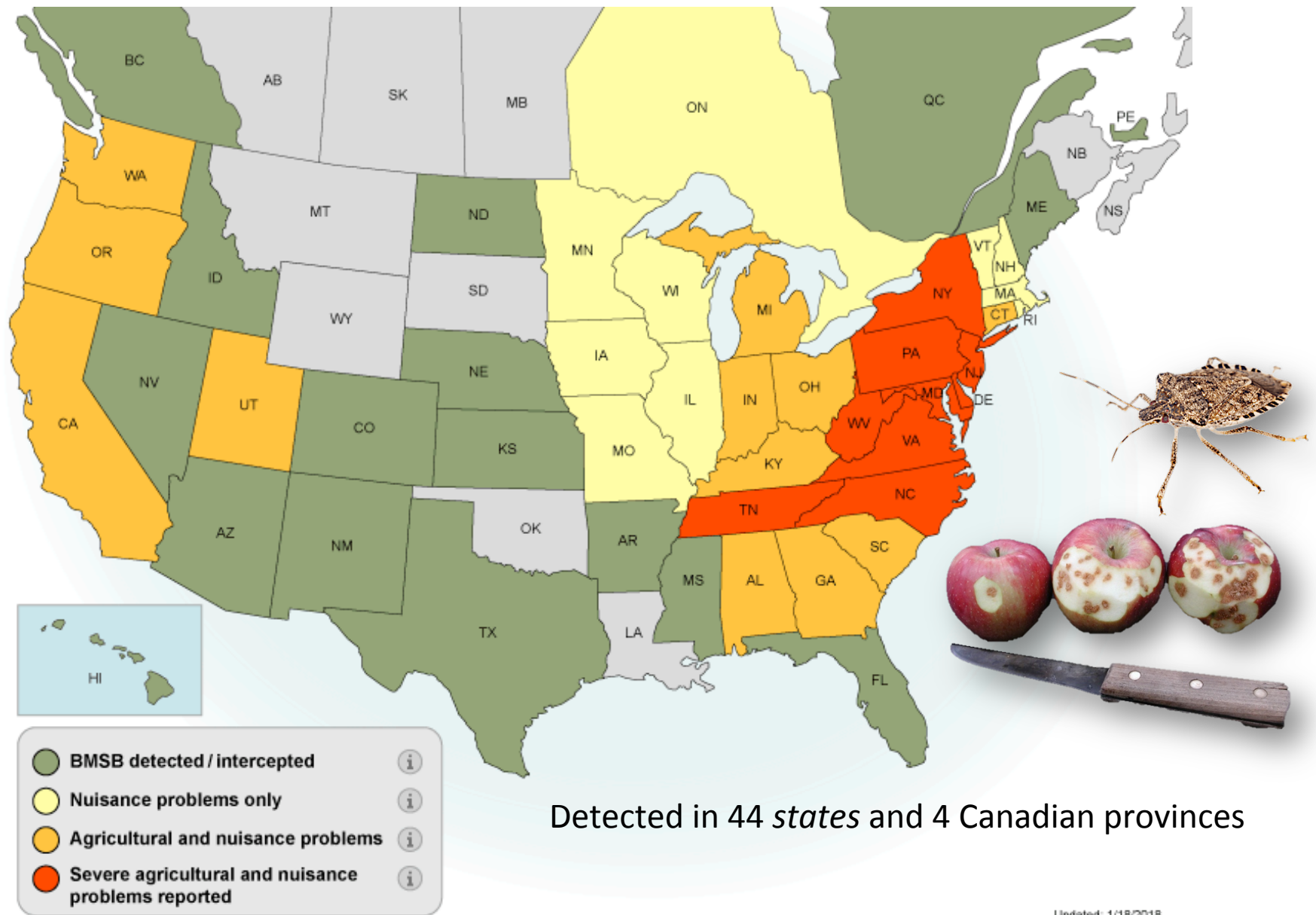


Figure 1: Risk maps displaying the relative density of field, vegetable, and fruit crop hosts plants of BMSB throughout the United States.

The Brown Marmorated Stink Bug in the Ag. & Urban Environment

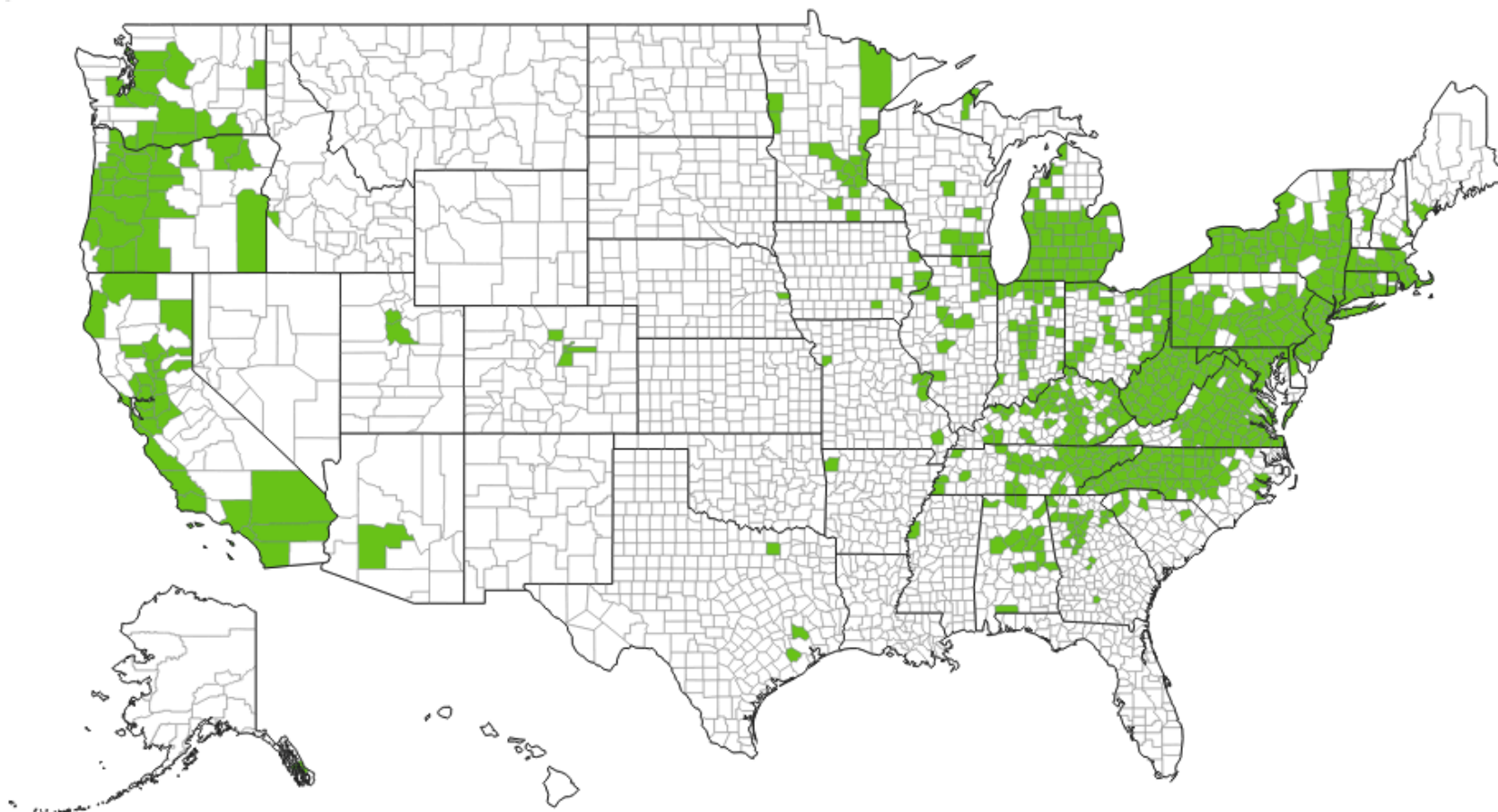




brown marmorated stink bug
Halyomorpha halys (Stal)

[States](#) [Counties](#) [Points](#) [List](#)

Citizen Science Project Participation (Homeowners)
BMSB has been detected in all but 6 of 62 counties in NYS

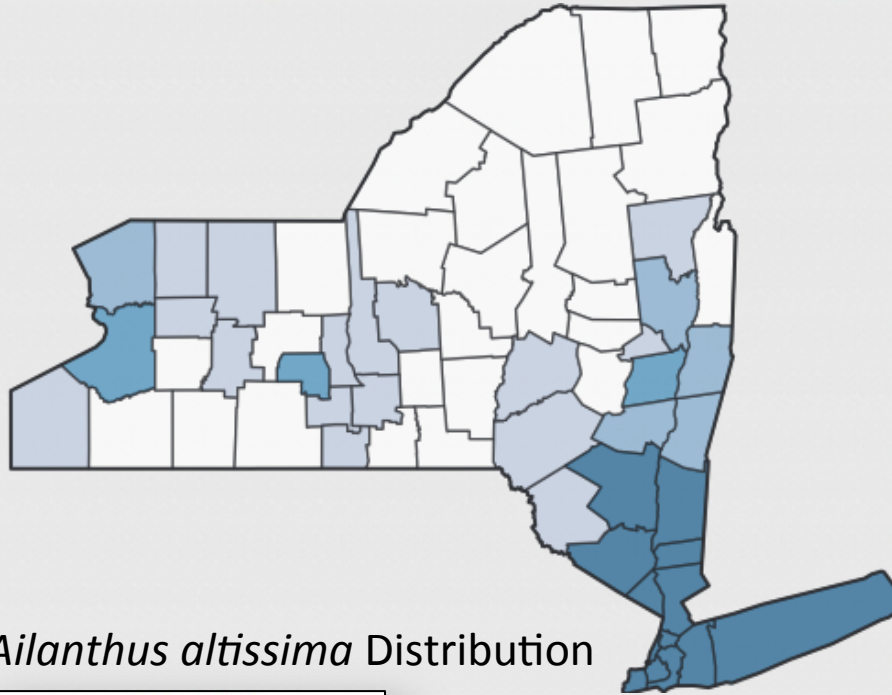


Legend

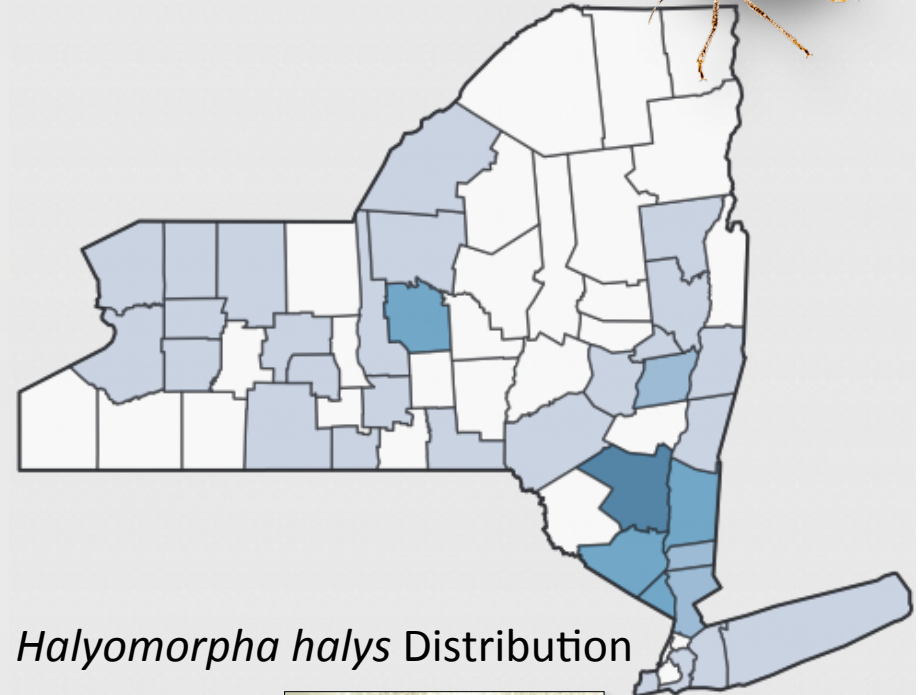
- ☐ No Data
- ☒ Species Reported

New York Invasive Species Public Map

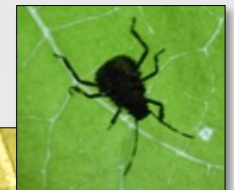
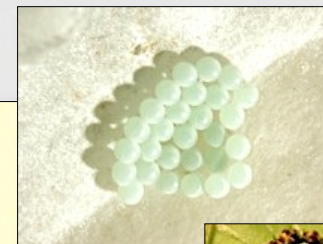
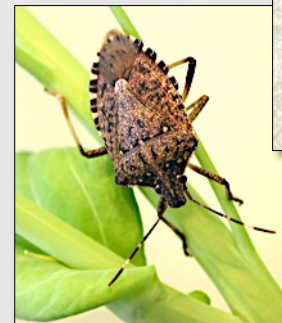
BMSB Distribution in NYS



Ailanthus altissima Distribution



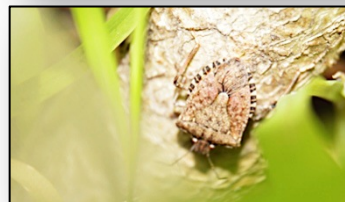
Halyomorpha halys Distribution



Tree of Heaven: *Ailanthus altissima*



A primary food and reproductive host plant of brown marmorated stink bug in NY State



Cornell University

Hudson Valley Research Laboratory

Tree of Heaven: *Ailanthus altissima*



Trap Tree Study 2011

Assessment of BMSB

- Perimeter plant surveys of orchards
- Density of BMSB adult and nymph in *A.a.* canopy

The systemic insecticide

Acephate was inserted as an implant (**AceCap**) and injected using **Arborjet injection system**, to reduce BMSB populations in *A. altissima*.

- * **Effective in foliage (Adult)**
- * **Ineffective in seed (Nymph)**



Brown Marmorated Stink Bug

Whats the Problem ??



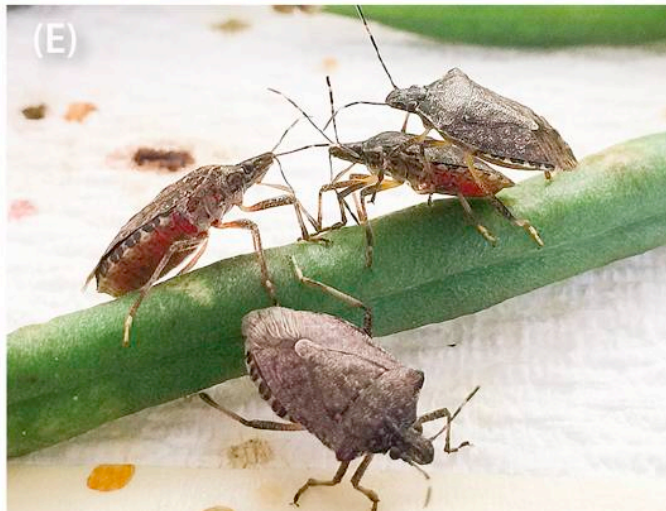
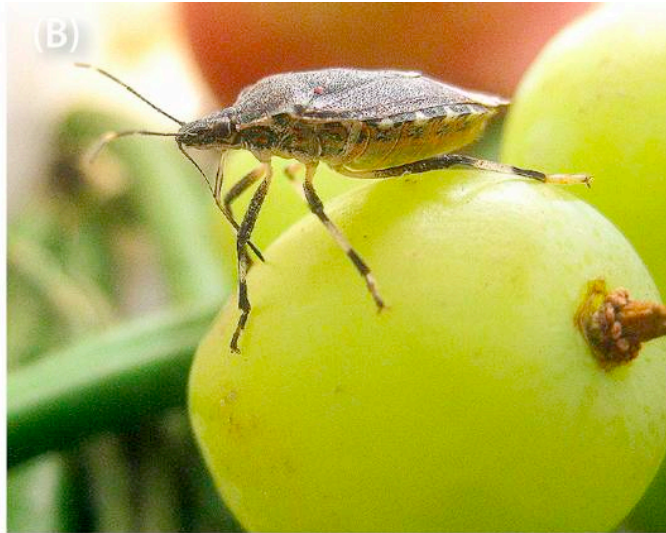
BMSB as an Invasive Insect:

- **Arboreal insect living predominately in tree hosts**
- **Adults move in flights, nymphs emerge on host plants and crawl.**
- **Adult requires high rates of effective insecticidal active ingredient**
 - **When feeding: little direct contact with residual insecticides**
 - **Proboscis protects mandibles during insertion into fruit**
 - **When walking: limited tarsi or abdominal contact (low rate of insecticide absorption)**



BMSB: Residual Efficacy

Feeding Sheath & Limited Abdominal Contact with Fruit



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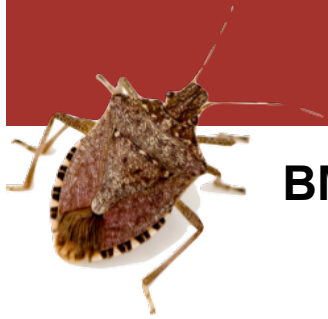


Management Options

Insecticide Group	Product	Active Ingredient	% Adult BMSB Mortality¹	
Pyrethroid	Bifenture	bifenthrin	100	●
	Danitol	fenpropathrin	95	●
	Warrior II	lambda-cyhalothrin	73	
Carbmate	Lannate	methomyl	92	●
	Vydate	oxymyl	68	
Neonicotinoid	Actara	thiamethoxam	92	●
	Assail	acetamiprid	87	
Pre-mix	Leverage 360	imidacloprid and β -cyfluthrin	95	●
	Endigo	lambda-cyhalothrin and thiamethoxam	98	●
	Voliam Flexi	chlorantraniliprole and thiamethoxam	98	●

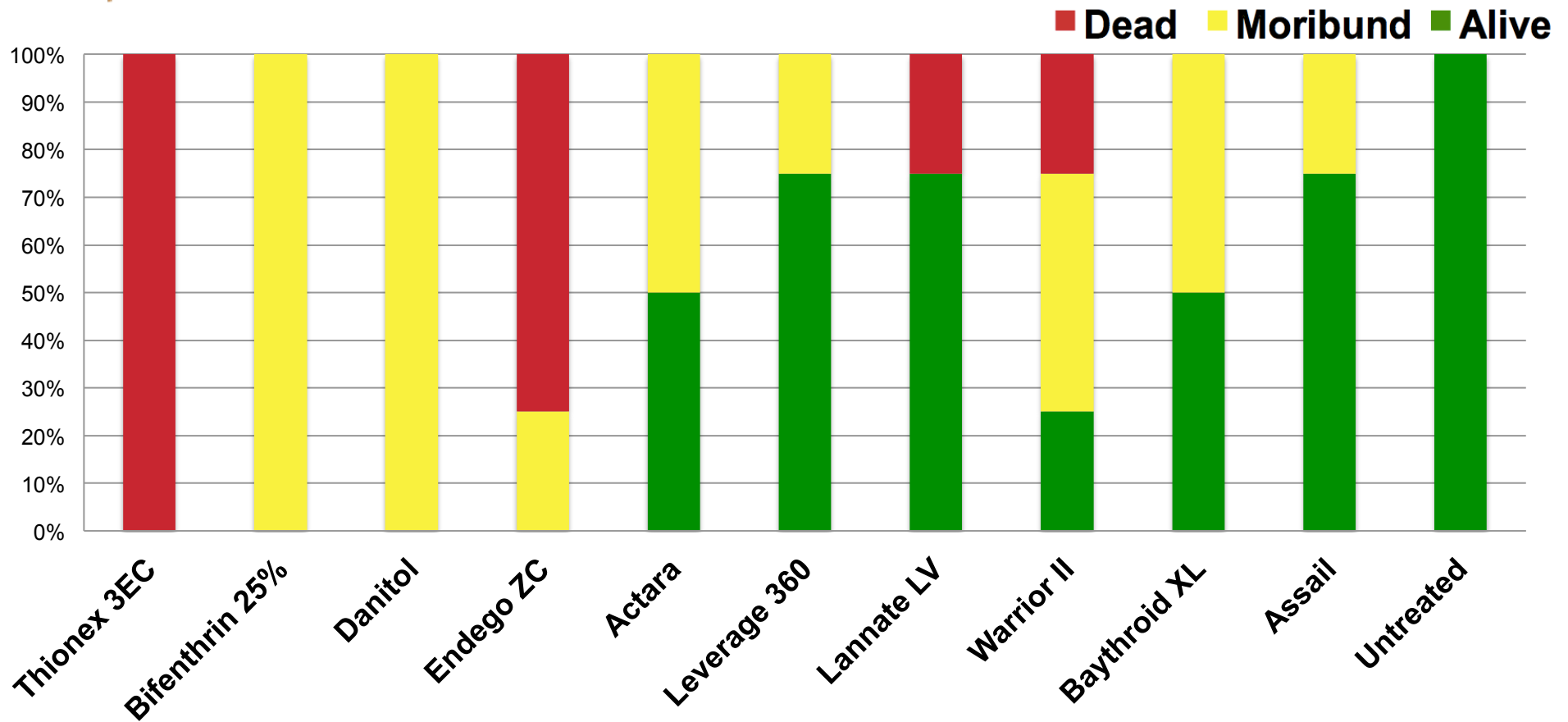
1. Direct contact activity of insecticides against BMSB adults in a lab setting may be very high, yet the activity of field-aged residue may, over time, quickly becomes ineffective at preventing feeding injury.





Management Options

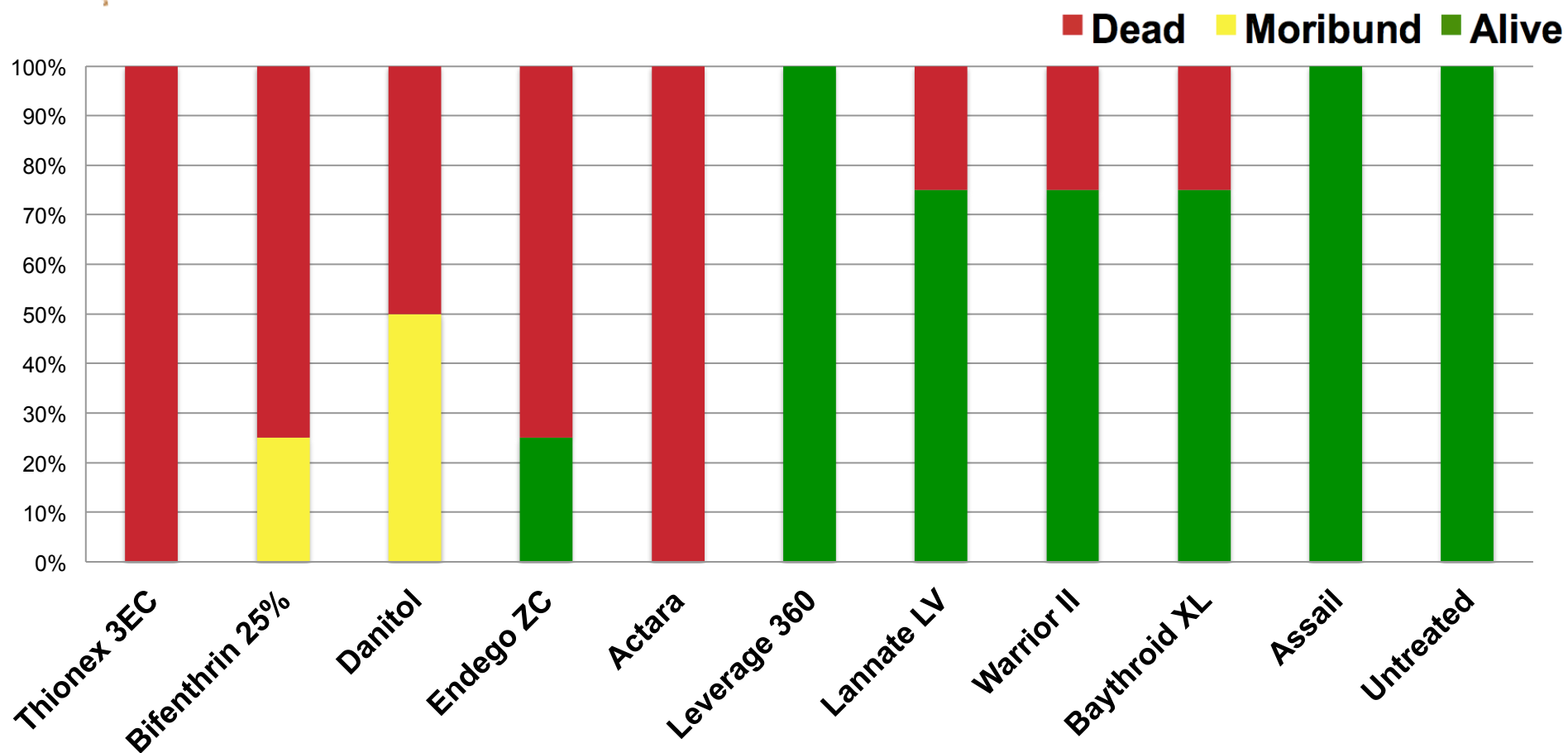
**BMSB Adult Exposure to Insecticide Residue of Apple Foliage
24h Old Residue @ 1 d**





Management Options

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



Introduction to *Trissolcus japonicus* (Hymenoptera: Platygasteridae)

Samurai Wasp for BMSB Management in NYS

Why Use *Trissolcus japonicus* (Samurai Wasp)



2 mm

Trissolcus japonicus

Female Samurai Wasp
'Parasitoid'

- *Utilizes BMSB egg for reproduction
- *Larva feed on BMSB nymph
- *Adult wasp emerges from BMSB eggs

Success of *T.japonicus*
Wasp and BMSB are woodland residents

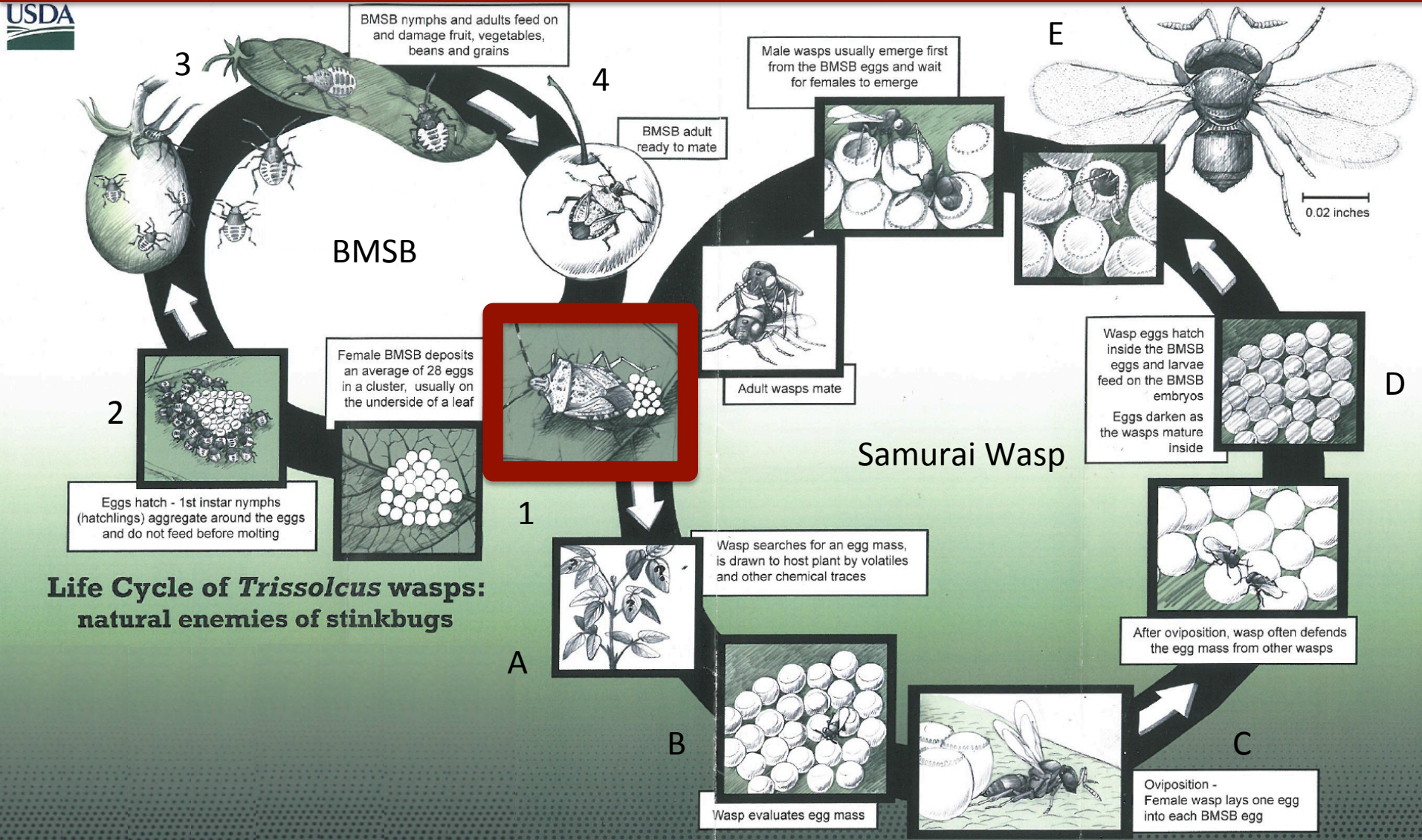


Cornell University

Hudson Valley Research Laboratory

Introduction to *Trissolcus japonicus* (Hymenoptera: Platygasteridae)

Samurai Wasp for BMSB Management in NYS



Trissolcus japonicus, (Hymenoptera: Scelionidae)



Trissolcus japonicus

Background:

- Kim Hoelmer, USDA-ARS, Newark DE, Beneficial Insects Introduction Research. In 2007 he surveyed natural enemies of BMSB in Asia, returning with live parasitoid specimens, held in U.S. quarantine facilities.
- ***Trissolcus japonicus* (Samurai Wasp)** was found to be a highly successful parasitoid. Parasitism rates of *H. halys* eggs reported to be as high as 80% in China (Talamas et al. 2013).



Host Specificity of the parasitoid wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae)



- In choice and non-choice tests of parasitoid wasps species found *Trissolcus japonicus* to be **highly effective**, parasitizing 60-100% of the eggs in BMSB clusters.
- *T. japonicus* is **highly specific** in choice tests, choosing BMSB over other pentitomiid eggs. However, in non-choice tests *T. japonicus* will oviposit into the eggs of the predatory spined soldier bug, *Podisus maculiventris* (Say).



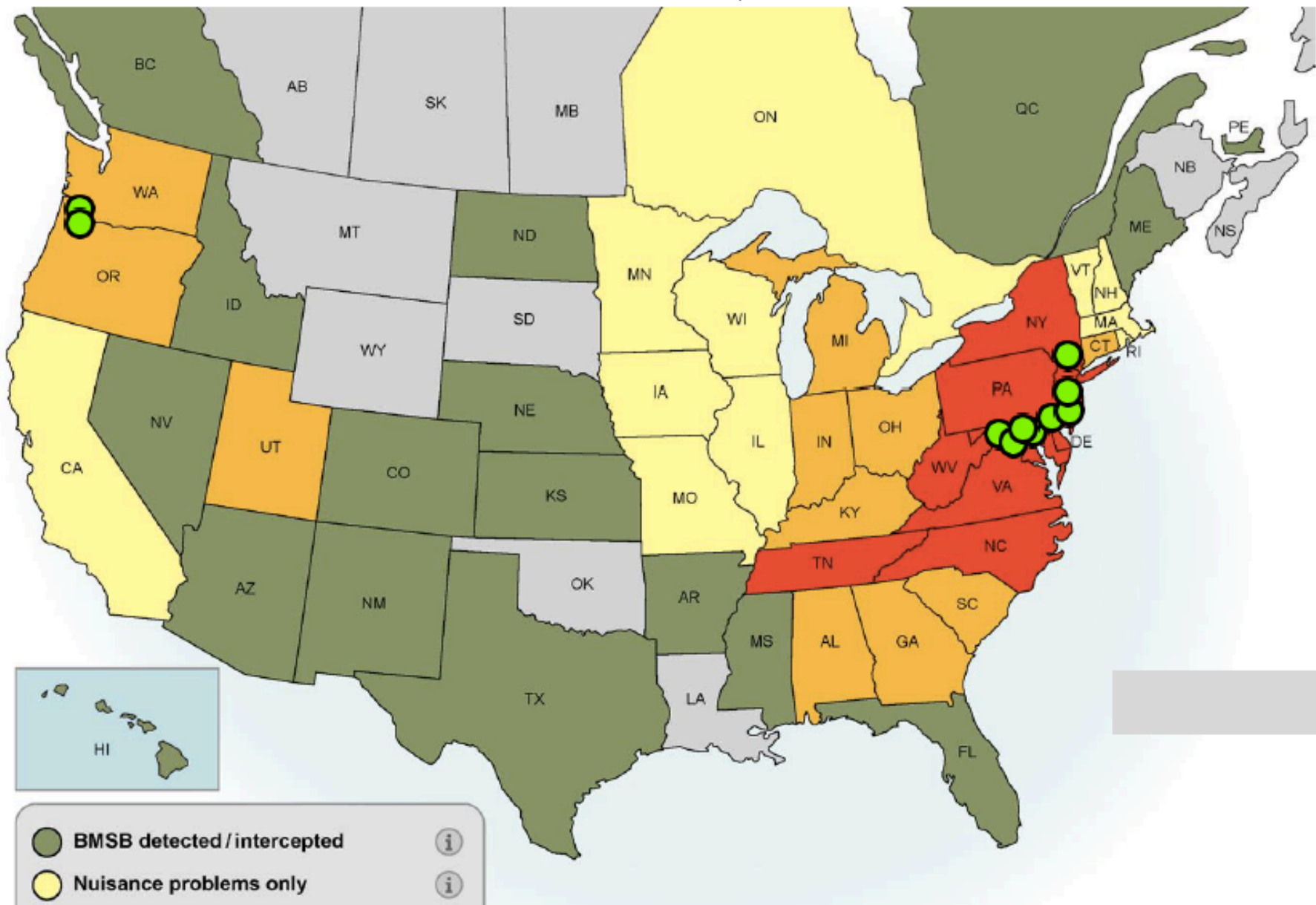
Trissolcus japonicus

Field Recovery Survey Sites in the US

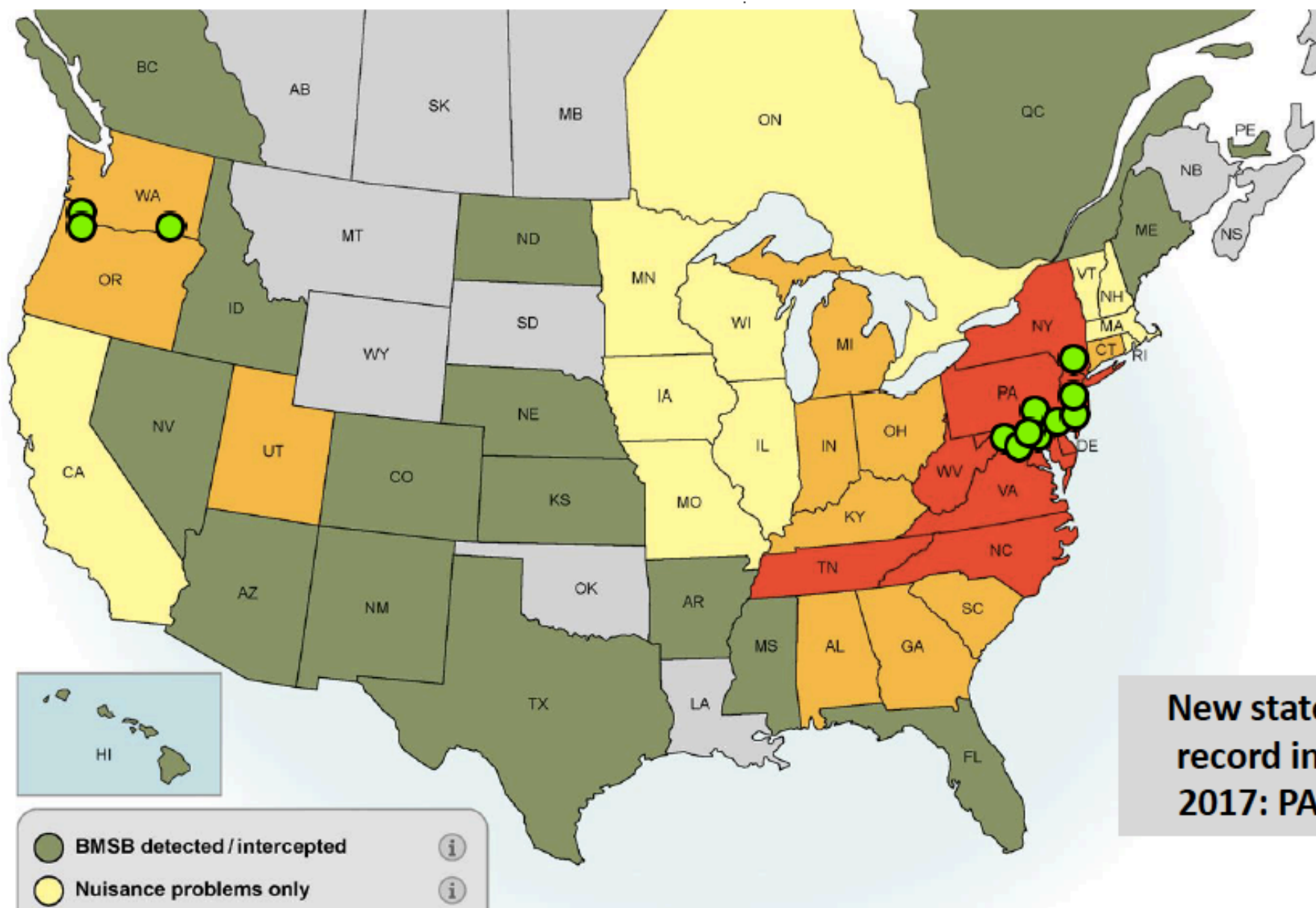


- In 2014 **adventive** populations (wild) of *T. japonicus* were found in Beltsville, MD.
- In 2015 *T. japonicus* were found in Washington, DC and Winchester, VA,.
- In 2016, *T. japonicus* was also found in VA, WV, MD, DE NJ and NY in the East, and WA and OR in the West.





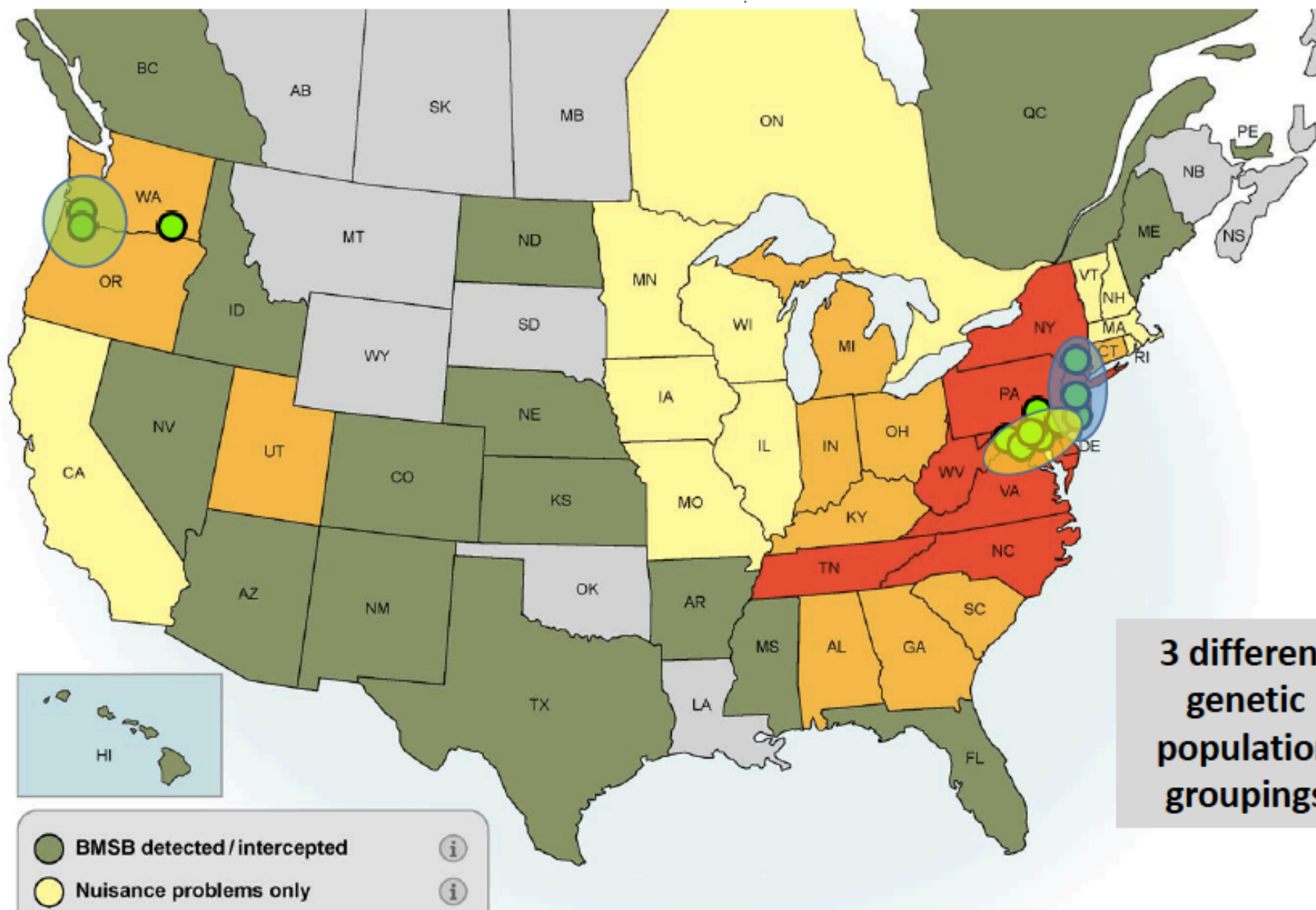
Field recoveries of *Trissolcus japonicus*
DC, MD, VA, WV, DE, NJ, NY, OR, WA (as of Dec. 2016)



Field recoveries of *Trissolcus japonicus*
DC, MD, VA, WV, DE, PA, NJ, NY, OR, WA (as of Dec. 2017)

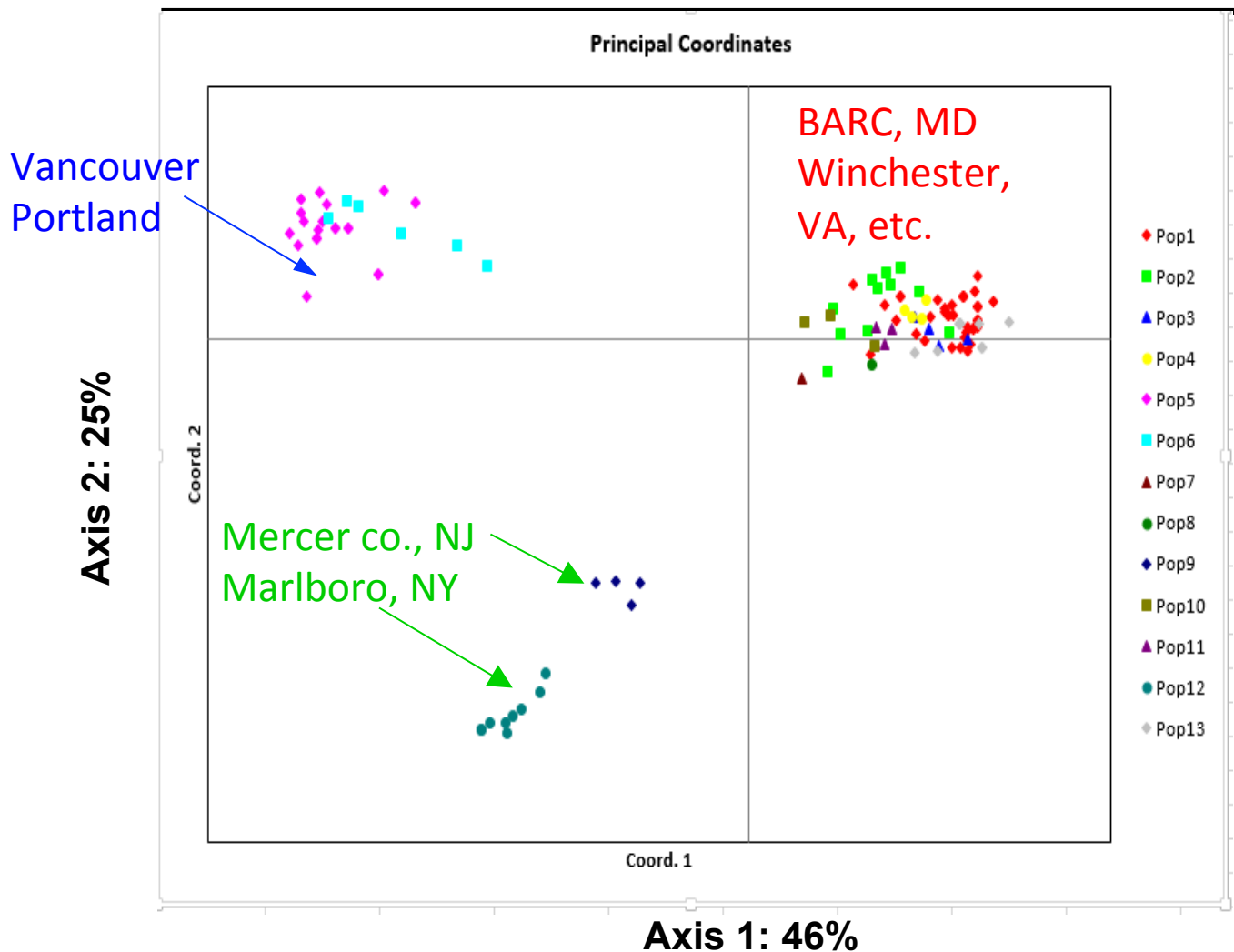


DC, MD, VA, WV, DE, PA, NJ, NY, OR, WA (as of Dec. 2017)



Field recoveries of *Trissolcus japonicus*
DC, MD, VA, WV, DE, PA, NJ, NY, OR, WA (as of Dec. 2017)

Principale Coordinate Analysis (PCoA)- 115 spécimens recovered in US génotype



**Axis 1: Split
between
Western
and 2
Eastern
populations
and all the
others**

**Axis 2: Split
between
Western
and the 2
Eastern
populations**

Dr. Marie-Claude Bon at the USDA-ARS European Biological Control Laboratory (Montpellier, France)
DNA specimen extractions employing 23 microsatellite gene markers to differentiate genotypes .

Trissolcus japonicus Field Recovery Sites in the US

- * Adventive specimens of *T. japonicus* from the US were sent to Marie-Claude Bon in USDA-ARS European Biological Control Laboratory (Montpellier, France)
- * DNA from submitted *T. japonicus* specimens was extracted and characterized using 23 microsatellite gene markers from thirteen different Asian *T. japonicus* populations, including those in quarantine in the U.S. and others collected in Asia in 2012-2013 by Kim Hoelmer's team at the USDA-ARS Beneficial Insects Introduction Research Laboratory (Newark, DE).
- * It was **determined none of the adventive finds originated from the populations held in quarantine (unpubl.), and thus represented independent introductions of *T. japonicus*.**

(E. Beers. PROC. ENTOMOL. SOC. WASH. 118(3), 2016, pp. 466–470)



NYS DEC Liberation of Wildlife Permit

In January of 2017 HVRL was requested to submit a 'Liberation of Wildlife' permit for transport of *T. japonicus* in NYS. After in-depth review of applicable provisions of the Environmental Conservation Law (ECL) and Codes, Rules and Regulations of the State of New York (NYCRR), DEC has determined that its regulatory authority extends to the issuance of permits for the release of specifically defined species of wildlife and listed endangered, threatened, and/or invasive species. Wildlife is defined in ECL S 11-0103. Endangered and threatened species are identified in 6 NYCRR Part 182, and listed invasive species are identified in 6 NYCRR Part 575.

DEC has recently concluded that their statutory and regulatory framework around the Liberation of Wildlife Permit regulating release of biologicals such as insects does not generally apply to releasing insects into the wild, so long as the proposed release is not of an insect that is listed on either the endangered or invasive species listings.

Upon review by the DEC, the adventive *T. japonicus* population does not require a license or permit from DEC to undertake the movement and release of the Samurai wasp, as it is not listed within 6 NYCRR 575.



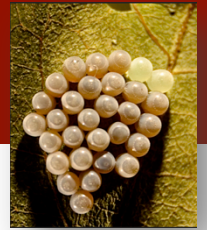
Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.



1. Monitored BMSB to determine agricultural presence since 2010
Established BMSB colony adult and nymphs for bioassay studies.
2. Employ BMSB eggs laid on Jalapeño leaves as sentinel eggs in 2016
(frozen -80C, 4min.) to survey the native and adventive parasitoid
complex using sentinel eggs to attract *Trissolcus japonicus* in NYS.
3. Developed *T. japonicus* colony in 2017, began establishing release
sites in NYS Art Agnello (CALS – NYSAES), Tessa Grasswitz, CCE-LOFT,
Debbie Breth, CCE-LOFT Ret.
4. Determine *T. japonicus* establishment in release sites (2017)



H. halys Sentinel Egg Production & Field Deployment 2017



July 28th – Oct 1st : Weekly Placement of Sentinel Eggs

- 7 WNY and 3 ENY sentinel sites were surveyed for parasitoids.
- Sentinel eggs were sent to cooperators in overnight shipments, placed in Wayne, Orleans, Ontario, Columbia, Ulster & Dutchess counties beginning 28th July.
- Sentinel eggs (-80°C @ 4 min.) were fixed onto known BMSB host foliage (7 host plants) @ 2-3 clusters/site/wk. recollected at 5-day, HVRL reared at 25 ° C. for 5-7d in environment chamber petri dishes
- Monitored for emergence of parasitoids. Sent to and identified by E. Talamas (U.of Fl. Gainesville).



Establish Baseline Survey of Native and Invasive Parasitoids in New York State

Sentinel Egg Staple Attachment



Paper Clip Attachment



Baseline Sentinel *H. halys* Egg Survey Placement Sites in NYS

(N=10 sites, 5 Counties, 3-24 clusters/site/wk. N=2700 sentinel eggs)

Farm	Town	County	Plant Host Plant	Latitude	Longitude
Schutt Orchard	Webster	Monroe	<i>Acer saccharum</i> (sugar maple)	43°11'3.78"N	77° 26' 56.76"W
Windmill Orchard	Ontario	Ontario	<i>Acer saccharum</i> (sugar maple)	43°15'50.27"N	77° 22' 35.32"W
KM Davies	Williamson	Wayne	<i>Acer saccharum</i> (sugar maple)	43°14'10.54"N	77 °11' 23.63"W
Wooded	Holley	Orleans	<i>Juglans nigra</i> (black walnut)	43° 13' 59.52"N	78° 18' 7.27"W
Wooded	Lyndonville	Orleans	<i>Malus sp.</i> (crab apple)	43° 19' 38.28"N	-78° 19' 33.96"W
Wooded	Medina	Orleans	<i>Ailanthus altissima</i> (tree of heaven)	43°12'1.79"N	78° 23' 36.81"W
Hepworth Farms	Marlboro	Ulster	<i>Robinia pseudoacacia</i> (black locust)	41°40'14.72"N	74° 5' 11.21"W
Hepworth Farms	Marlboro	Ulster	<i>Ailanthus altissima</i> (tree of heaven)	41°40'14.72"N	74° 5' 11.21"W
Crist Orchard	Walden	Orange	<i>Ailanthus altissima</i> (tree of heaven)	41°33'2.64"N	74° 9' 50.72"W
Minard Orchard	New Paltz	Ulster	<i>Vitis sp.</i> (wild grape)	41°42'1.47"N	74° 4' 24.13"W



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Baseline Sentinel *H. halys* Egg Survey Placement Sites in New York State

2017 Sentinel Egg Emergence

Native

Trissolcus euschisti

(1st on 6/23) (3 Sites, N=185)

Telenomus podisi

(1st on 6/30) (3 Sites, N=11)

Asian Invasive

Trissolcus japonicus

(1st on 7/7)

Marlboro, Ulster Co. (N=693)



Trissolcus japonicus Release Sites in New York State 2017

T.j. Parasitized Egg 'Redistribution'

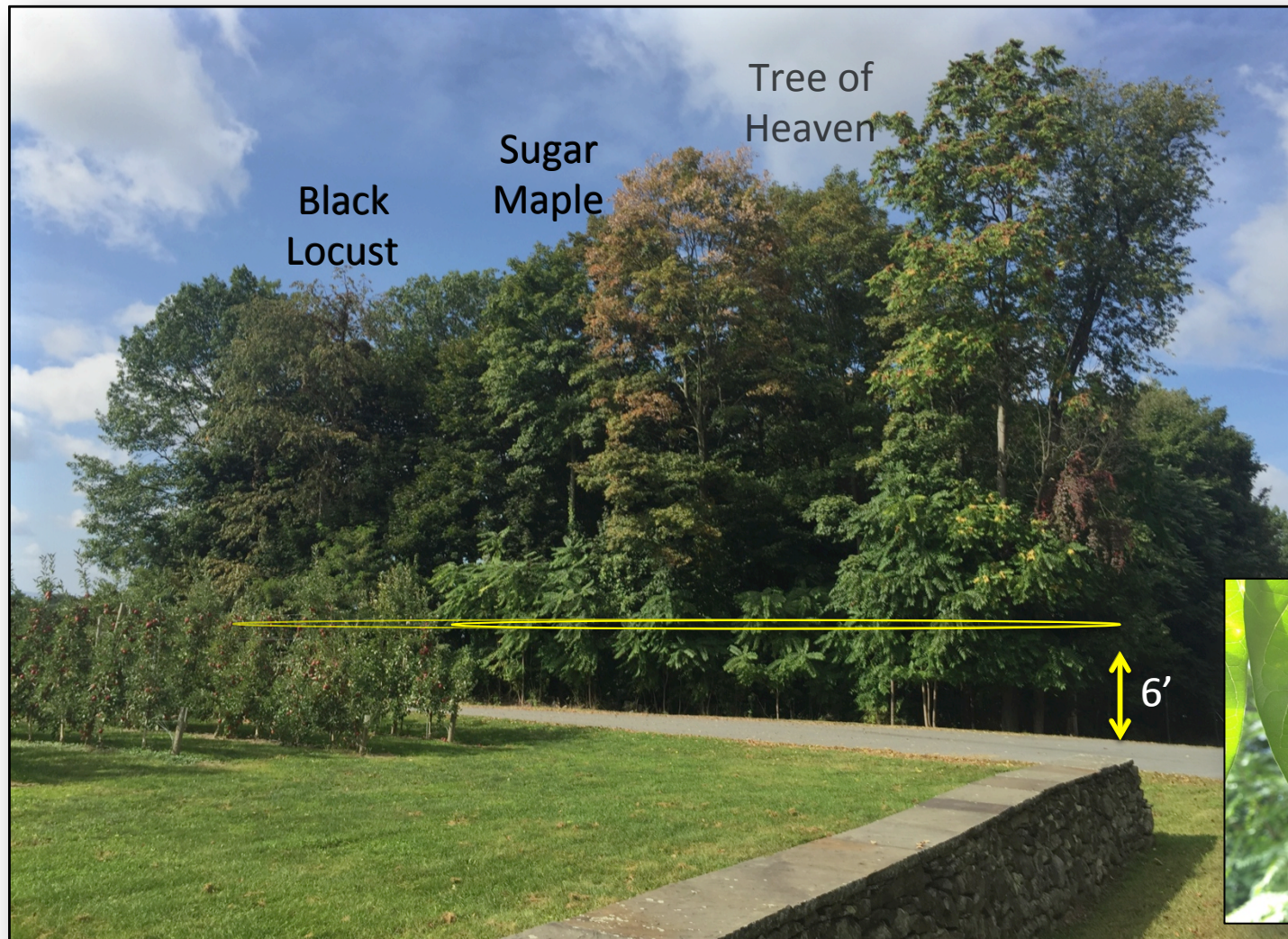


T. Japonicus Egg Placement

- Captured adventive *T. japonicus* from Hepworth Farms in Marlboro, NY on July 7th 2017.
- Wasps reared on parasitized -80°C frozen BMSB eggs.
- 1st parasitized eggs sent to cooperators on 15th Sept. using petri dish release.



Trissolcus japonicus Release Sites in New York State



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Placement Sites of *T. Japonicus* parasitized eggs in NYS (N=24 Farms, 6 NY counties on 32 sites using \approx 2300 eggs onto 7 host plant *sp.*)

Site	Town	County	Date	Clusters	Eggs	Placement / Host Plant	Latitude	Longitude
1	Webster	Monroe	15-Sep	3	78	<i>Acer saccharum</i> (<i>sugar maple</i>)	43°11'3.78"N	77°26'56.76"W
2	Holley	Orleans	22-Sep	3	84	Black Walnut	43°14'0.42"N	78° 1'10.46"W
3	Modena	Ulster	22-Sep	3	89	<i>Vitis riparia</i> (Native grape)	41°41'25.15"N	74° 4'3.51"W
4	New Paltz	Ulster	22-Sep	3	76	<i>Vitis riparia</i> (Native grape)	41°42'1.57"N	74° 4'24.22"W
5	Clintondale	Ulster	22-Sep	3	72	<i>Acer saccharum</i> (<i>sugar maple</i>)	41°41'32.91"N	74° 3'18.67"W
6	Walden	Orange	22-Sep	2	54	<i>A. altissima</i> (Tree of Heaven)	41°33'1.34"N	74° 9'36.77"W
7	Gardener	Ulster	23-Sep	3	74	<i>Robinia pseudoacacia</i> (Black Locust)	41°40'14.72"N	74° 5'11.21"W
8	Warwick	Orange	23-Sep	2	56	<i>A. altissima</i> (Tree of Heaven)	41°13'55.83"N	74°22'0.66"W
9	Warwick	Orange	23-Sep	2	56	<i>A. altissima</i> (Tree of Heaven)	41°13'52.59"N	74°23'11.62"W
10	Fishkill	Dutchess	24-Sep	3	73	<i>Robinia pseudoacacia</i> (Black Locust)	41°31'12.02"N	73°49'40.04"W
11	Hudson	Columbia	24-Sep	2	56	<i>Vitis riparia</i> (Native grape)	42°11'6.33"N	73°49'47.25"W
12	Hudson	Columbia	24-Sep	2	54	<i>A. altissima</i> (Tree of Heaven)	42°11'16.36"N	73°49'58.86"W
13	Marlboro	Ulster	24-Sep	2	56	<i>Rhus sp.</i> (Sumac)	41°38'13.67"N	74° 0'24.57"W
14	Milton	Ulster	24-Sep	3	78	<i>A. altissima</i> (Tree of Heaven)	41°39'4.29"N	73°59'33.93"W
15	Milton	Ulster	24-Sep	3	74	<i>Robinia pseudoacacia</i> (Black Locust)	41°38'43.94"N	73°59'24.84"W
16	Modena	Ulster	24-Sep	2	59	<i>A. altissima</i> (Tree of Heaven)	41°40'1.19"N	74° 7'44.19"W
17	Red Hook	Dutchess	24-Sep	3	73	<i>A. altissima</i> (Tree of Heaven)	42° 3'14.98"N	73°50'55.49"W
18	Tivoli	Dutchess	24-Sep	3	72	<i>Robinia pseudoacacia</i>	42° 2'56.09"N	73°52'59.69"W
19	Valatia	Columbia	24-Sep	2	59	<i>A. altissima</i> (Tree of Heaven)	42°14'48.18"N	73°43'25.07"W
20	Milton	Ulster	26-Sep	3	87	<i>Acer saccharum</i> (<i>Sugar Maple</i>)	41°38'39.48"N	73°58'6.6"W
21	Poughkeepsie	Dutchess	28-Sep	3	76	<i>Robinia pseudoacacia</i> (Black Locust)	41°40'40.28"N	73°53'50.91"W
22	Clintondale	Ulster	29-Sep	3	82	<i>Acer saccharum</i> (<i>Sugar Maple</i>)	41°40'39.00"N	74° 3'19.43"W
23	Clintondale	Ulster	29-Sep	3	84	<i>Vitis riparia</i> (Native Grape)	41°40'24.16"N	74° 3'30.29"W
24	Highland	Ulster	29-Sep	3	84	<i>A. altissima</i> (Tree of Heaven)	41°41'59.76"N	74° 3'7.90"W
25	Modena	Ulster	29-Sep	2	58	<i>Robinia pseudoacacia</i> (Black Locust)	41°40'6.74"N	73°59'39.28"W
26	New Paltz	Ulster	29-Sep	3	81	<i>Juglans nigra</i> (eastern black walnut)	41°42'43.82"N	74° 6'48.75"W
27	New Paltz	Ulster	29-Sep	3	86	<i>Juglans nigra</i> (eastern black walnut)	41°41'30.84"N	74° 7'43.96"W
28	Campbell Hall	Orange	6-Oct	3	71	Deer Fence	41°25'36.84"N	74°14'21.00"W
29	Cuddebackville	Orange	6-Oct	3	71	<i>Corylus avellana</i> (Hazelnut)	41°27'45.22"N	74°36'57.16"W
30	Cuddebackville	Orange	6-Oct	3	74	<i>Corylus avellana</i> (Hazelnut)	41°27'41.78"N	74°36'57.28"W
31	Cuddebackville	Orange	6-Oct	3	77	<i>Corylus avellana</i> (Hazelnut)	41°27'40.97"N	74°36'52.20"W
32	Warwick	Orange	6-Oct	3	76	<i>Acer saccharum</i> (<i>sugar maple</i>)	41°17'31.47"N	74°26'15.06"W





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Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

'17 Recollection of Parasitized Eggs

- Parasitized eggs recollected in 11 of 32 sites in late October & November to determine % emergence.
- Of the 11 sites, 77% of clusters recovered; 23% leaf senescence.
- In 3 of the 11 sites Samurai Wasp adult females found guarding egg clusters



Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.

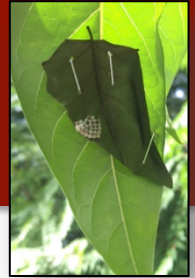
'17 Recollection of Parasitized Eggs

- 168 or 24.4% (N=719) successfully emerge as adults
- 0.7% partially emerged from the egg
- 66.4% of the eggs showing no sign of emergence; eggs were parasitized and unsuccessful in development





Release Site Confirmation of Samurai Wasp Using Post Emergence Sentinel Eggs*



- Upon emergence, sentinel eggs were placed 30 meters from *T. japonicus* in two of the release sites .
- Egg parasitism by *T. japonicus* was observed in these 2 release sites from 15th September to 3rd October.

Site	County	Google Earth Coordinates	Sentinel Eggs Placed (date)
Schutt Orchard Site 1	Monroe	43°11'3.78"N 77°26'56.76"W	9-15-2017
Schutt Orchard Site 1	Monroe	43°11'3.78"N 77°26'56.76"W	9-22-2017
Schutt Orchard Site 1	Monroe	43°11'3.78"N 77°26'56.76"W	10-3-2017
Holly	Orleans	43°13'59.52"N 78°18'7.271"W	10-3-2017



Expanding the Range of the Parasitoid Wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) in NYS.



Photograph: **Christopher Hedstrom**
USDA-APHIS Quarantine Facility,
Corvallis, Oregon

2018 Protocols ('17 sites)

- Placement of Alphascent yellow cards in non-release and 2017 release sites to monitor native parasitoids & the adventive *T.j.*
- Re-establish *T.j.* in 2017 release sites as needed.
- Early season 2018 establishment of additional sites (~ 200) employing *T.j.* parasitized eggs upon request.
- Monitor BMSB in release and non-release sites to determine efficacy.





Thanks to the staff at the HVRL for all their support:

Research Support Specialist I	Dana Acimovic
Laboratory Technician	Lydia Brown
Research Assistant	Christopher Leffelman
Research Assistant	Lucas Canino
Research Assistant	Ben Lee
Research Assistant	Addie Kurchin
Summer Research Intern	Cameron Fuhr
Farm Manager	Albert Woelfersheim
Administrative Assistant	Erica Kane
Administrative Assistant	Christine Kane
HRVL & NEWA Weather Data.....	Christopher Leffelman, Albert Woelfersheim

Support from NYS Ag. & Mkts, ARDP, Dow AgroSciences, Bayer, NYS SCRI,
NYS Farm Viability Institute, NYS Ag Producers

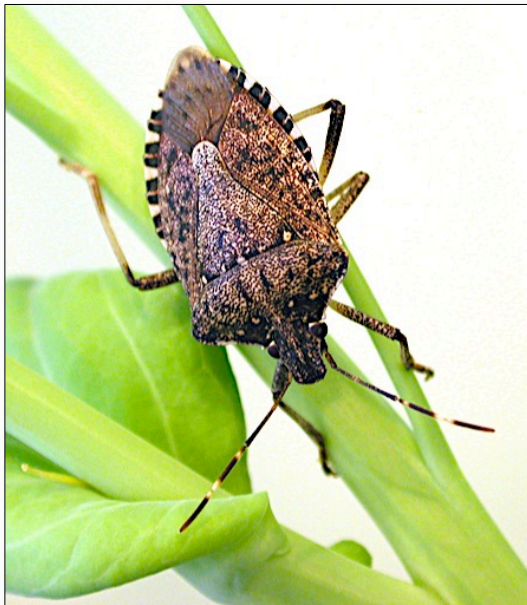


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Questions??
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The National March Madness
Citizen Science Project
To Find
The Brown Marmorated Stink Bug



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