Brown Marmorated Stink Bug: Management Strategies for a *New* New England Pest

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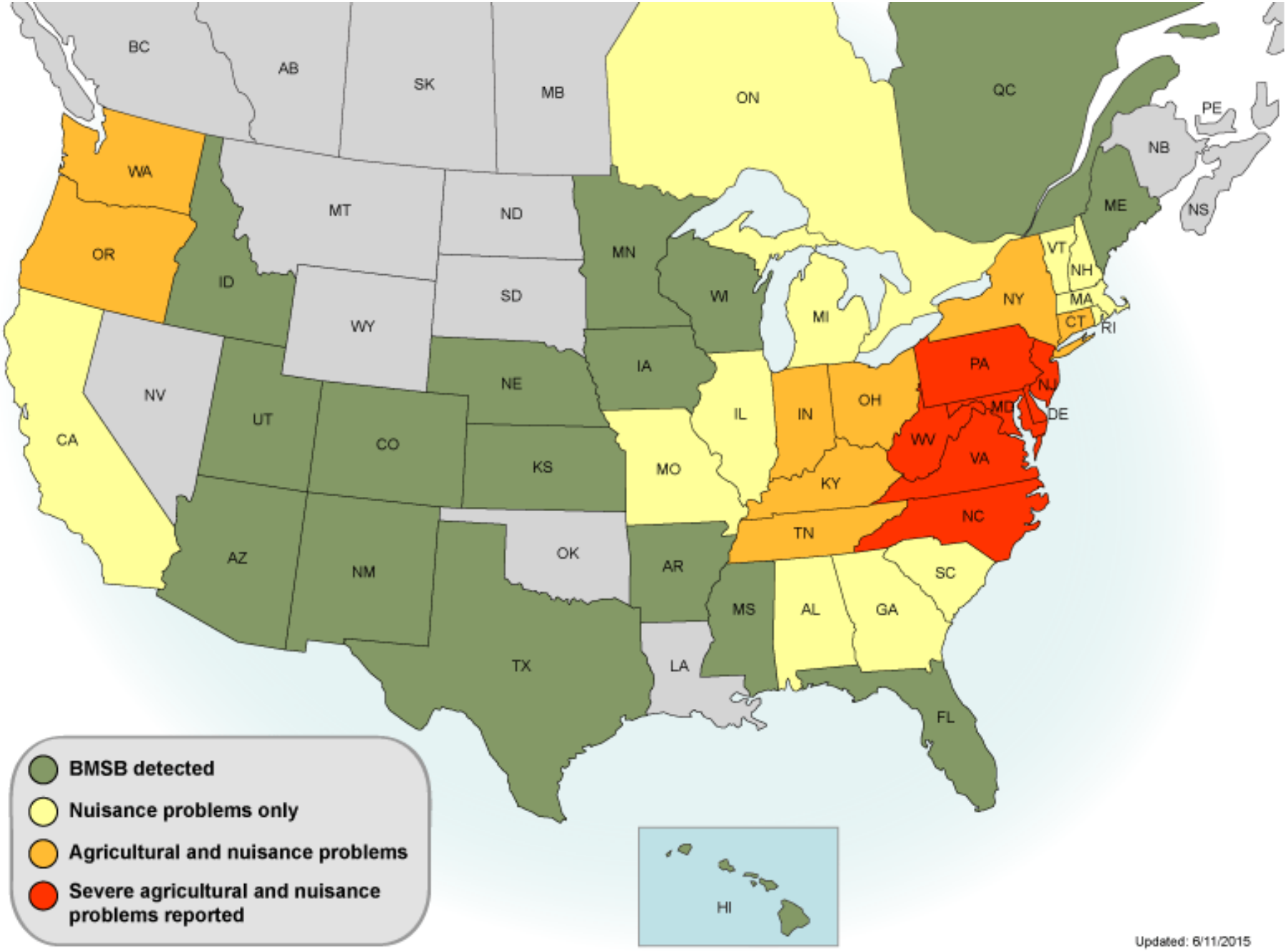
History of the BMSB

Halyomorpha halys

- From Asia
- First discovered in PA in 1999
- Nuisance in homes, buildings
- 2010 became ag pest
- In Connecticut since at least 2011
- Moving north

Photo: T. Leskey


BC
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SC
NC
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MD
DE
NJ
CT
RI
MA
VT
NH
HI
BMSB detected
Nuisance problems only
Agricultural and nuisance problems
Severe agricultural and nuisance problems reported
Updated: 6/11/2015

BMSB
Halyomorpha halys
Photo: Buguide.net

Rough Stink Bug
Brochymena quadripustulata,
Photo: Bugguide.net

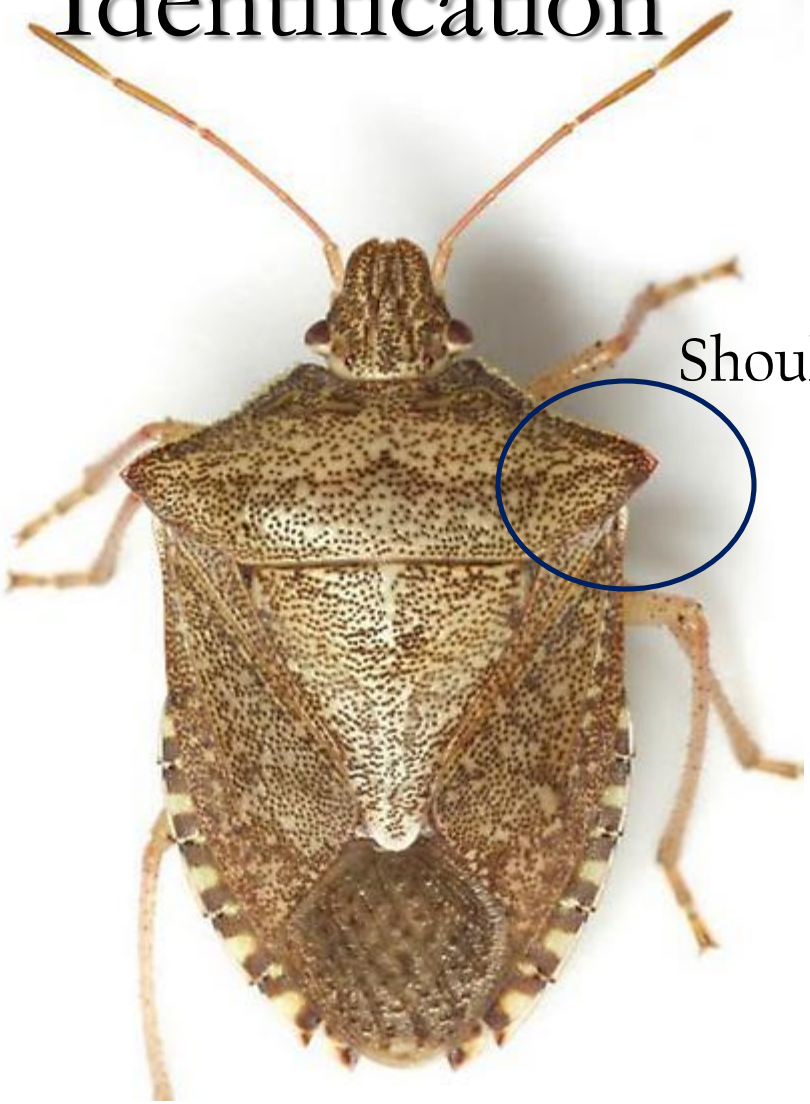
Look-a-Likes

Spined soldier bug
Podisus maculiventris
Photo: Marlin Rice

Brown Stink Bug
Euschistus servus
Photo: Bugguide.net

Dusky Stink Bug
Euschistus tristigmus
Photo: Bugguide.net

Identification



Shoulder

Brown stinkbug

Brown stinkbug

Antennae

Distinct white & black pattern around abdomen

Life Cycle

- Overwinters as adults
- Female lays up to 250 eggs into the summer
  - Clustered 25-30

Photo: M. Raupp, UMD

Life Cycle

- 5 nymphal stages
- 2 generations/year

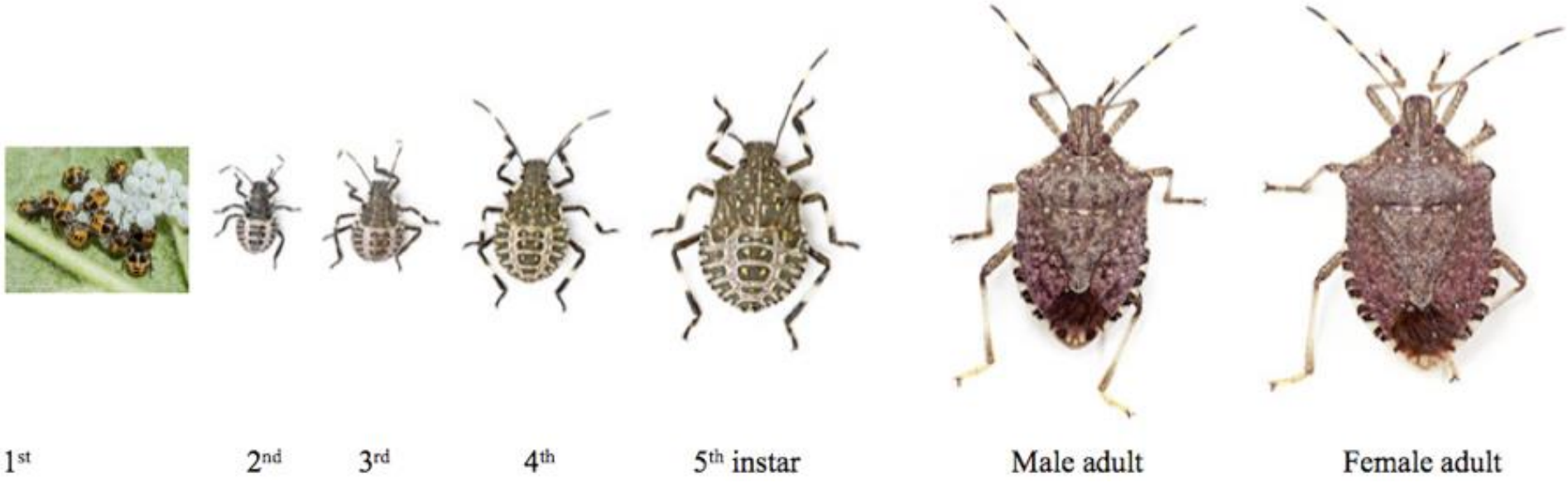
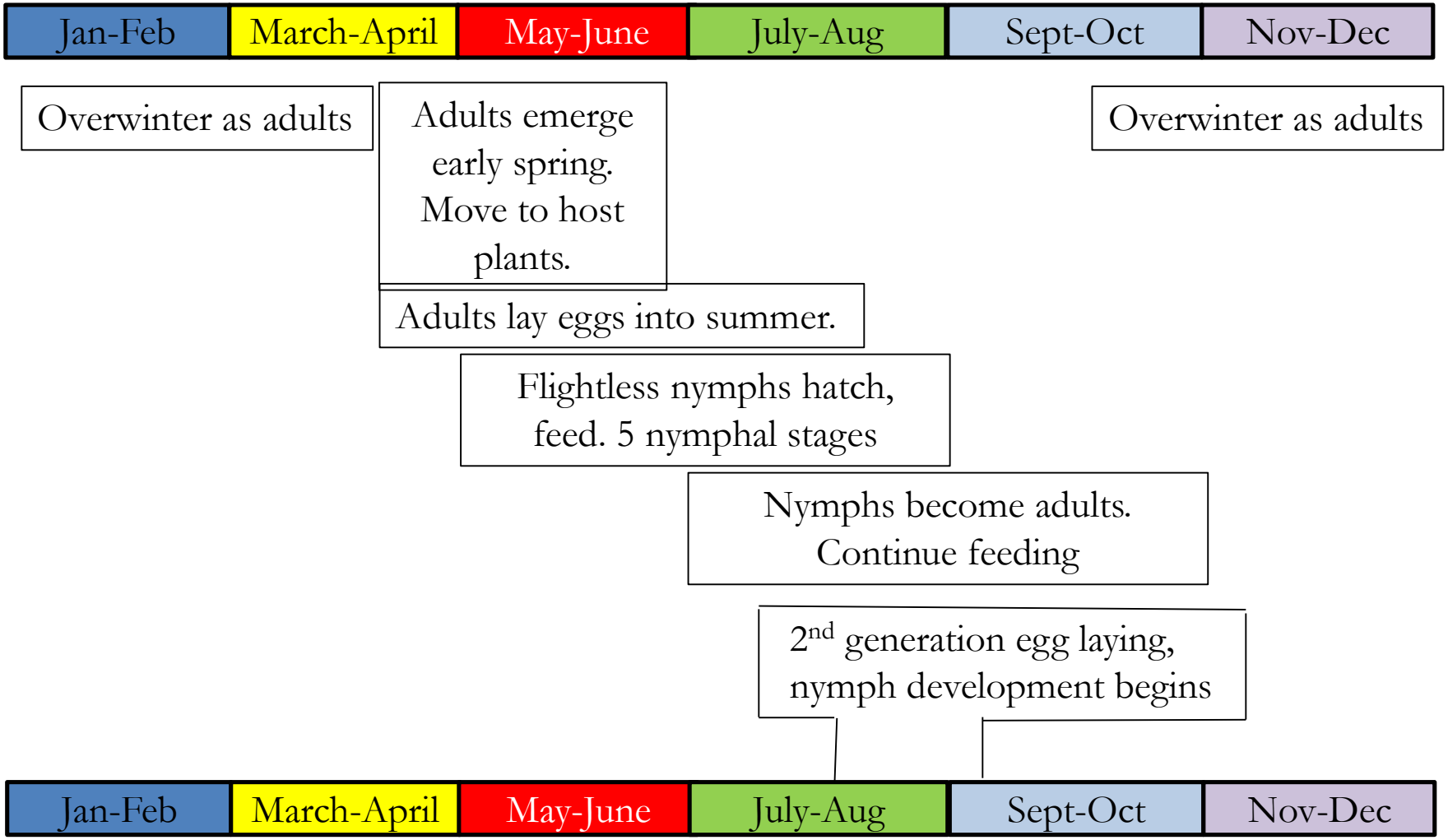


Photo: StopBMSB.org

Life Cycle of BMSB



Host Range

- Over 170 known plants
  - Fruit
    - Apple
    - Peach
    - Grape
    - Caneberries
  - Vegetables
  - Field crops
  - Ornamentals

Photo M. Concklin

Host Range

- Over 170 known plants
  - Fruit
  - Vegetables
    - Peppers
    - Tomato
    - Sweet Corn
    - Beans
    - Eggplant
    - Swiss Chard
  - Field crops
  - Ornamentals

Photo M. Concklin

Specialty Crops at Risk to BMSB Damage

HIGH RISK	apple, Asian pear, beans (green, pole, snap), bee-bee tree, edamame, eggplant, European pear, grape[1], hazelnut, Japanese pagoda tree, nectarine, okra, peach[2], Peking tree lilac, pepper, redbud, sweet corn, Swiss chard, tomato	
MODERATE RISK	apricot, asparagus, blueberries[1,3], broccoli, cauliflower, cherry[2], collard, cucumber, flowering dogwood, horseradish, lima bean, littleleaf linden, serviceberry, tomatillo	
LOW RISK	blackgum, carrot, cranberries, garlic, ginkgo, greens, Japanese maple, kohlrabi, kousa dogwood, leeks, lettuce, many gymnosperms, onion, potato, spinach, sweet potato, turnip	
UNKNOWN	almond, citrus, hops, kiwi, olive, pistachio, plum, strawberries, walnut	
HOSTS Non-Specialty Crop BMSB Hosts Contributing to Specialty Crops Risk	field corn, soybean	

1—Potential risk of taint/contamination. 2—Additional risk potential due to bark feeding. 3—Considered moderate-high risk.

Funded by USDA-NIFA SCRI Coordinated Agricultural Project, grant #2011-51181-30937. Image credits—sweet corn: Joe Zlomek; eggplant: Howard F. Schwartz, Colorado State University, Bugwood.org; apple, carrots: morguefile.com/creative/bekahboo42; flowering dogwood: Richard Floyd, Creative Ideas LLC, Bugwood.org; blueberries, cauliflower: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org; ginkgo: Jan Samanek, State Phytosanitary Administration, Bugwood.org; cranberries: Cjboffoli (CC-BY-3.0). Printed May 2015.

About BMSB

The brown marmorated stink bug, *Halyomorpha halys* (Stål), is a voracious eater that damages fruit, vegetable, and ornamental crops in North America. With funding from USDA's Specialty Crop Research Initiative, our team of more than 50 researchers is uncovering the pest's secrets to find management solutions that will protect our food, our environment, and our farms.

Learn more at **StopBMSB.org**.

Damage / Injury

- Nymphs and adults feed
- Piercing, sucking mouthparts
  - Removes plant sap
  - Injects secretions

Photo USDA

Photo: M. Concklin

Damage / Injury

- Nymphs and adults feed
- Piercing, sucking mouthparts
  - Removes plant sap
  - Injects secretions

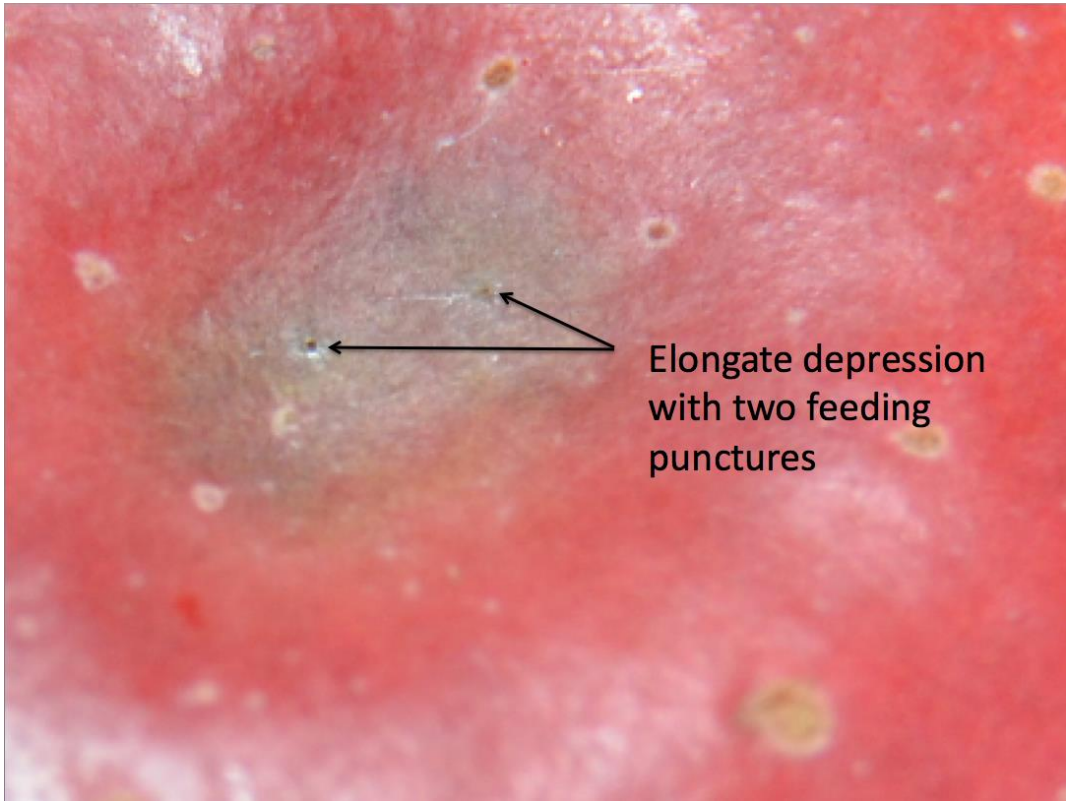
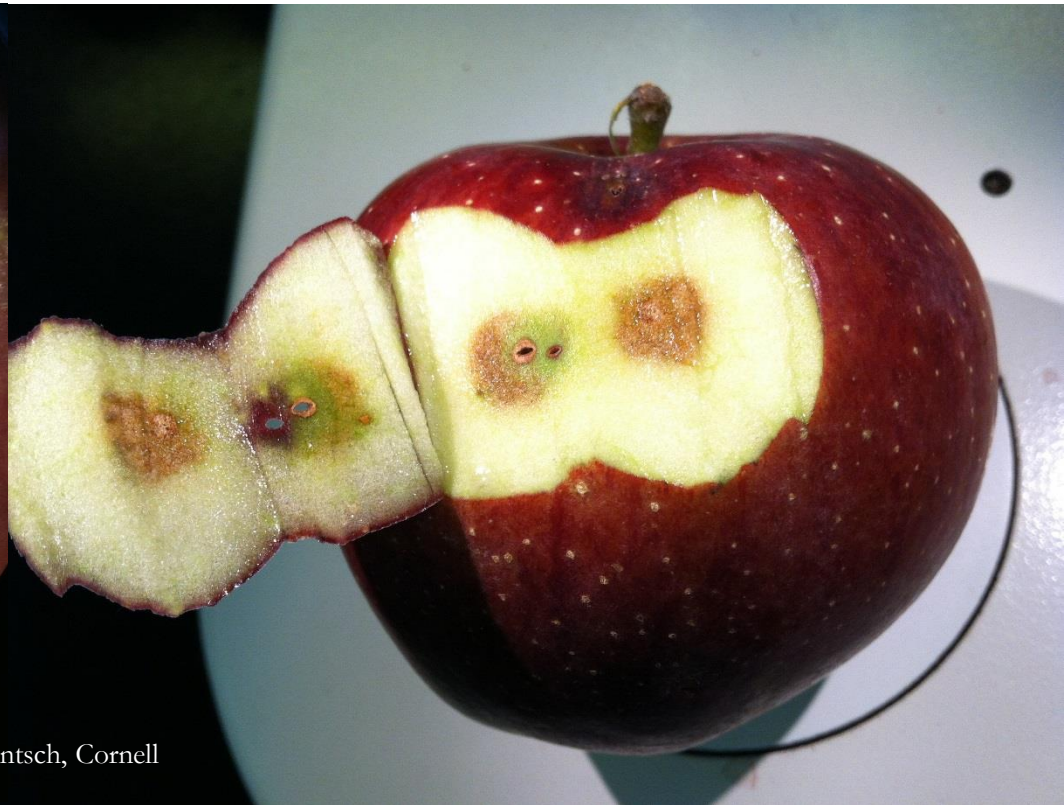


Photo: Peter Jentsch, Cornell

Damage / Injury

- Injury appears 7-10 days later as distortion, discoloration

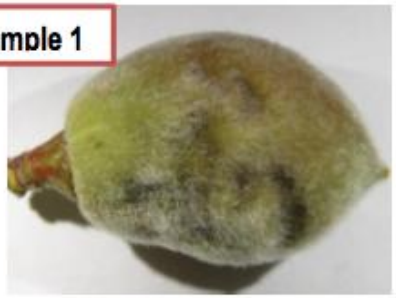
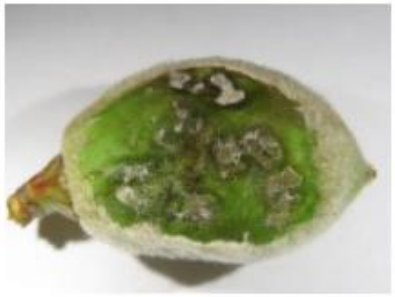
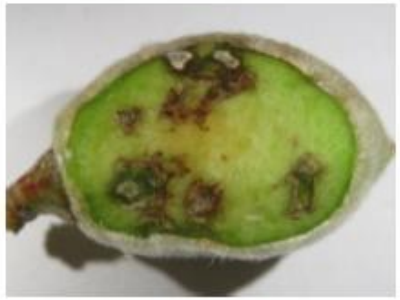


Photos: P. Jentsch, Cornell

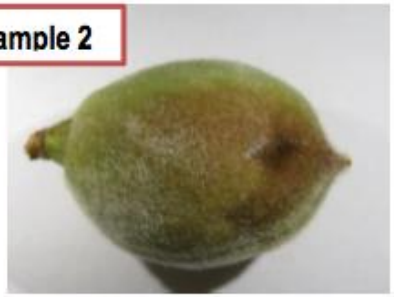
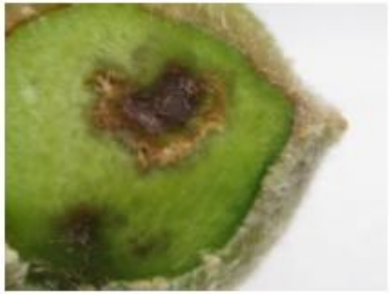
Brown Marmorated Stink Bug Feeding Injury

Surface and Internal Injury
'Loring' Peach at ~15 mm
Appalachian Fruit Research Station
Kearneysville, WV 25430
16 May 2011

Example 1


Example 2

Example 3



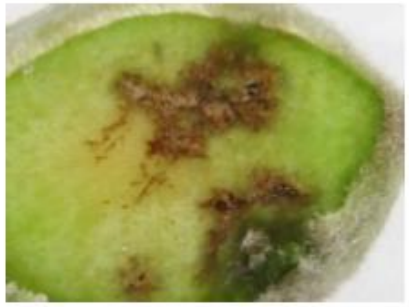
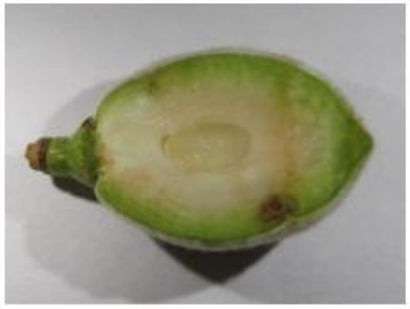



Photo: P. Jentsch, Cornell

Stink bug injury to Pink Lady apple on 4 September, 2012

Photo: P. Jentsch, Cornell

Photo: E. Day, VA Tech

Photos: Lincoln University

Look-a-Like Damage

- Ca deficiency/Bitter Pit

Photos: M. Concklin

Determination of Stink Bug Injury

- Bitter pit lesions clustered
- Corking beneath skin surface with separation from Skin.

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

Bitter Pit

Stink Bug Injury

Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency

Photos: M. Concklin

Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency
- Hail injury

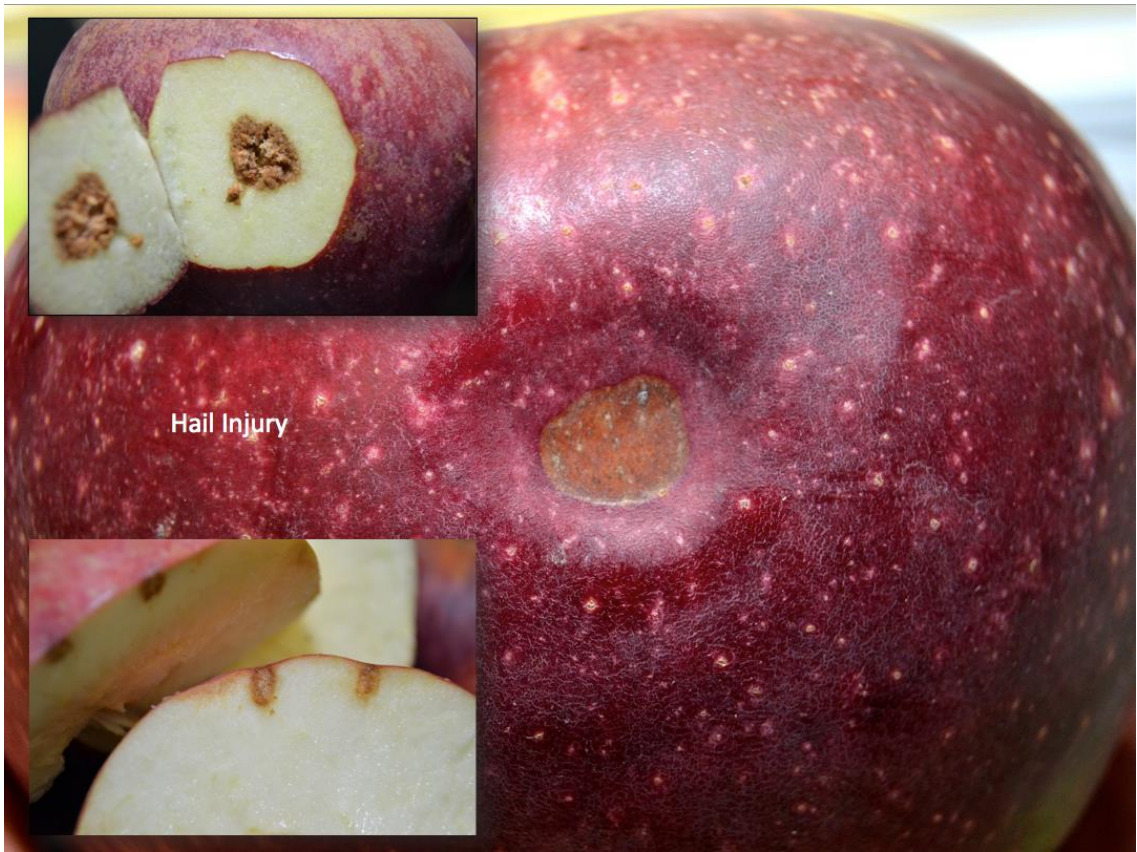


Photo: P. Jentsch, Cornell

Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency
- Hail injury
- TPB/ Cat-facing insects

Photo: Utah State Univ.

Look-a-Like Damage

- Ca deficiency/Bitter Pit
- Boron deficiency
- Hail injury
- TPB/ Cat-facing insects
- Apple Maggot

Photo: P. Jentsch, Cornell

Damage / Injury

- Role of drought in movement of BMSB

Photos M. Concklin

Monitoring

- Rescue traps
  - Not for trapping out
  - Hang in tree or on border

Photo Rescue.com

Monitoring

- Tedder traps
  - Not for trapping out
  - Modify top

Photo: M. Concklin

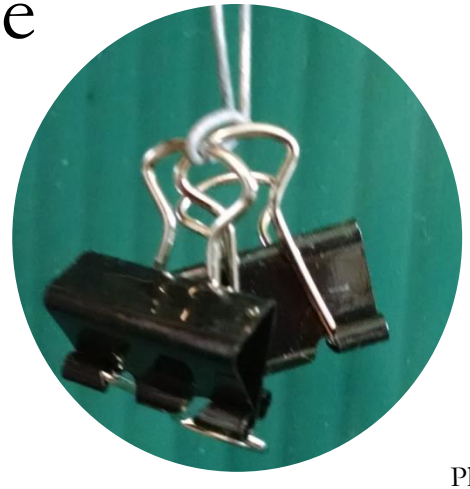
Monitoring

- Tedder traps
  - Not for trapping out
  - Modify top
- Placement
  - Border vegetation
  - Orchard border row
  - Orchard center

Photo: M. Concklin

Monitoring

- Lures
  - MDT for mid-late season
  - USDA for early season
  - Combo lures
  - Lure placement: in or out
- Vaportape



Photos: M. Concklin

Monitoring

- Visual monitoring
  - Border vegetation
  - Border fruit trees
  - Leaves, between fruit
  - On fruit

Photo: M. Concklin

Thresholds: Provisional for Tree Fruit

- 2013 – none
- 2014:
  - 40/trap
  - 10 adults/trap
  - 1/100' of perimeter orchard linear row

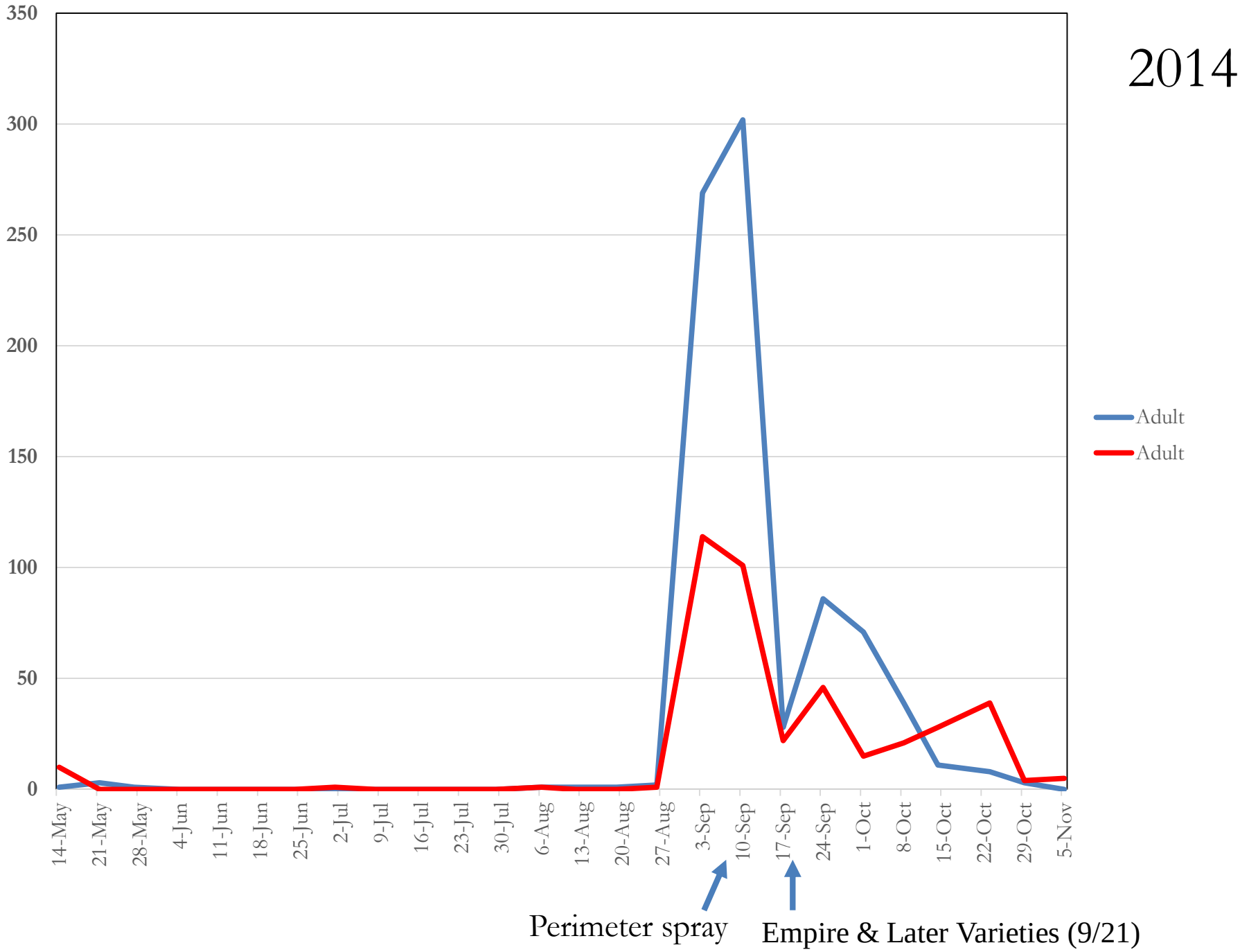
Photo M. Concklin

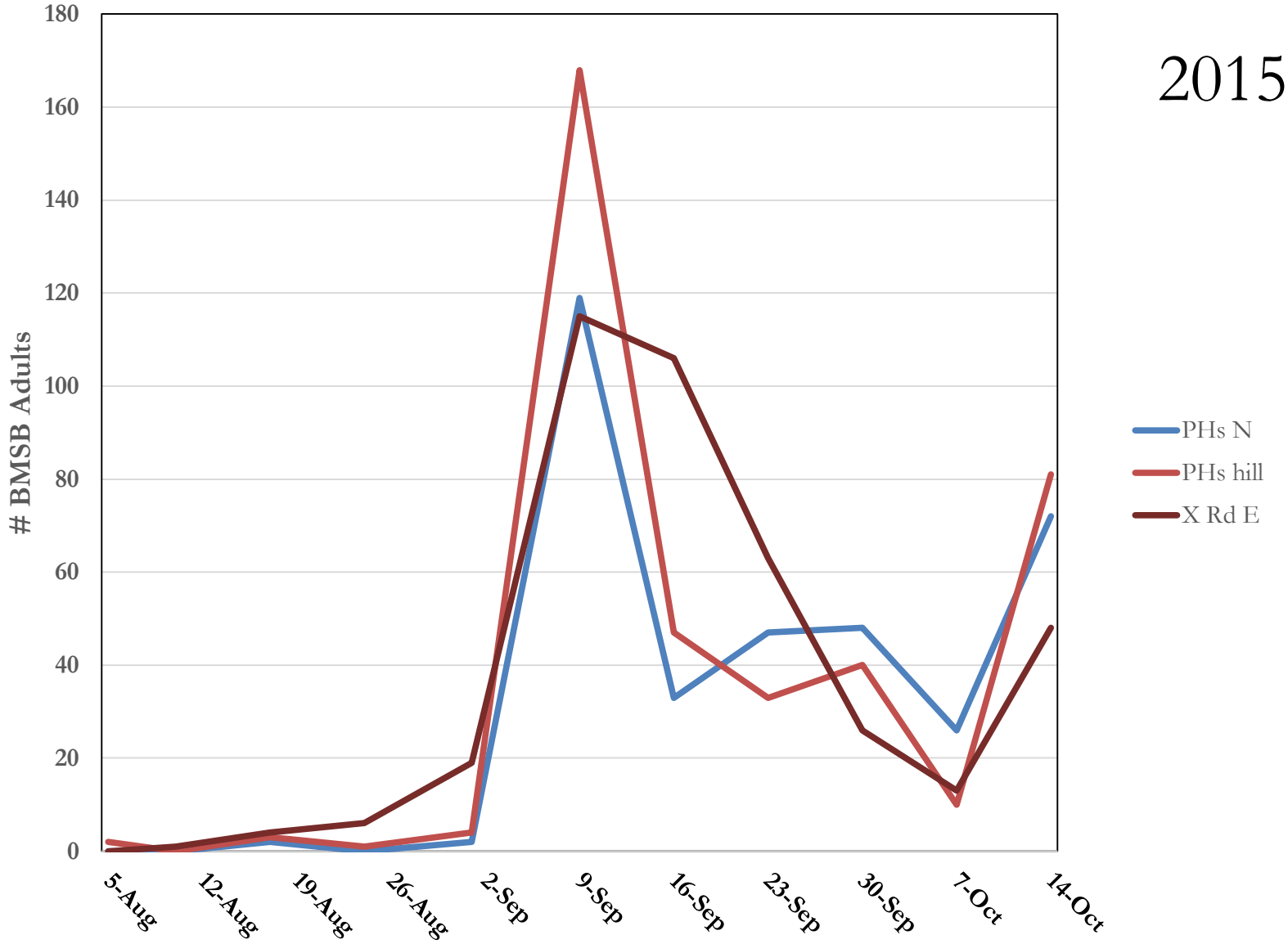
CT Trapping

- 2011: Traps, no lures
  - 14 farms
- 2012: Black light

CT Trapping

- 2013: Traps with lures
  - USDA lure trials
- 2014 & 2015: Traps with lures
  - Entire state
- 2016: additional lure trials with USDA


2014
350
300
250
200
150
100
50
0
14-May
21-May
28-May
4-Jun
11-Jun
18-Jun
25-Jun
2-Jul
9-Jul
16-Jul
23-Jul
30-Jul
6-Aug
13-Aug
20-Aug
27-Aug
3-Sep
10-Sep
17-Sep
24-Sep
1-Oct
8-Oct
15-Oct
22-Oct
29-Oct
5-Nov
Adult
Adult
Perimeter spray
Empire & Later Varieties (9/21)


2015
BMSB Adults
180
160
140
120
100
80
60
40
20
0
5-Aug
12-Aug
19-Aug
26-Aug
2-Sep
9-Sep
16-Sep
23-Sep
30-Sep
7-Oct
14-Oct
PHs N
PHs hill
X Rd E
Perimeter spray, 9/5
Follow-up spray, 9/14

Management Options

- Chemicals for BMSB that are present
  - Impact on IPM programs
    - Spray schedule
  - Impact on beneficials
    - Pyrethroids highly toxic, Very effective

Most effective insecticides against BMSB

(based on combined bioassays data from T. Leskey, T. Kuchar and G. Krawczyk

Effect on beneficial insects

Highly toxic | Moderate toxic | Safe

PYRETHROIDS

IRAC Group 3A

- bifenthrin **(Brigade)**
- fenpropathrin **(Danitol)**
- cyfluthrin **(Baythroid)**
- λ-cyhalothrin **(Warrior)**

NEONICOTINOIDS

IRAC Group 4A

- dinotefuran **(Venom, Scorpion)**
- thiametoxam **(Actara)**
- clothianidin **(Belay)**
- imidacloprid **(Provado, Admire Pro)**
- acetamiprid **(Assail)**

OTHER

IRAC Groups 1A, 1B, 2A

- methomyl (carbamate) **(Lannate LV and SP)**
- endosulfan (organochlorine) **(Thionex)**
- acephate (organophosphate) **(Acephate)**

Product	Active ingredient	IRAC Code	REI (hrs)	PHI (days) Pome	PHI (days) Stone	Efficacy
Actara	Thiamethoxam	4A	12	35	14	***
Asana XL	Esfenvalerate	3A	12	21	14	**
Baythroid XL	Beta-Cyfluthrin	3A	12	7	7	**
Bifenture	Bifenthrin	3A	12	14 (Pear)	n/a	***
Brigade	Bifenthrin	3A	12	14 (Pear)	n/a	***
Danitol	Fenpropathrin	3A	24	14	3	***
Endigo ZC	Thiamethoxam/ Lambda-cyhalothrin	3A/4A	24	35	14	****
Gladiator	Zeta-Cypermethrin	3/6	12	28	21	***
Lannate	Methomyl	1A	72 apple, 48 pear, 96 peach	14 apple, 7 pear	4	****
Leverage 360	Beta-Cyfluthrin/ Imidacloprid	4A/3A	12	7		***
Scorpion	Dinotefuran	4A	12	n/a	3	****
Surround	Kaolin clay	NA	4	0	0	*
Voliam Xpress	Chlorantraniliprole/ Lambda-cyhalothrin	3A/28	24	21	14	***
Voliam Flexi	Thiamethoxam - Chlorantraniliprole	4A/28	12	35	14	***
Vydate(1)	Oxamyl	1A	48	14	n/a	**
Warrior	Lambda-cyhalothrin	3	24	21	14	**

** low efficacy to **** high efficacy

1. 2ee all NE states except NH

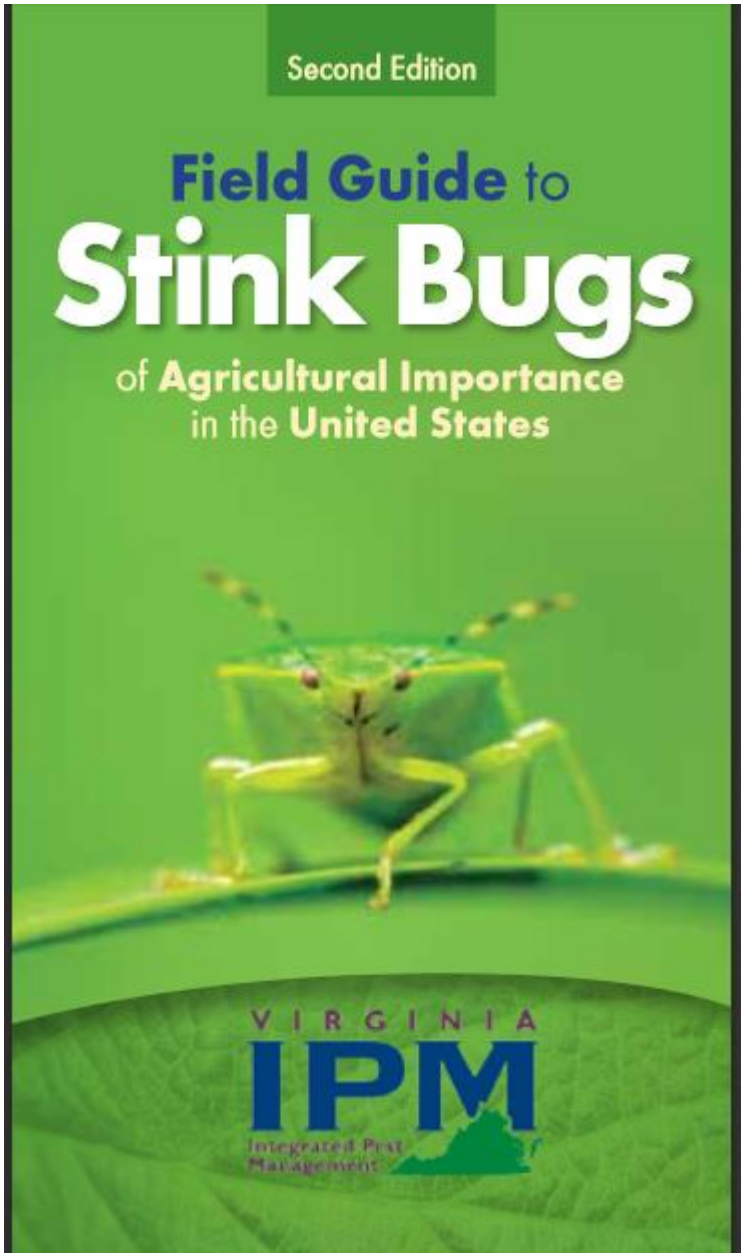
Management Options

- Chemicals for BMSB that are present
  - Impact on IPM programs
  - Impact on beneficials
- Alternate middle versus Every middle versus Perimeter
- Beware of border vegetation sprays

Management Options

- *Trissolcus japonicas*
- High parasitism rates of 60%-80%
- Multiple generations

Photos E. Talamas, USDA



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https://pubs.ext.vt.edu/444/444-356/444-356_pdf.pdf

Final advice . . .

Funding provided by USDA-NIFA Crop Production & Pest Management Grant