

Brown Marmorated Stink Bug: A Common Enemy of Multiple Crops



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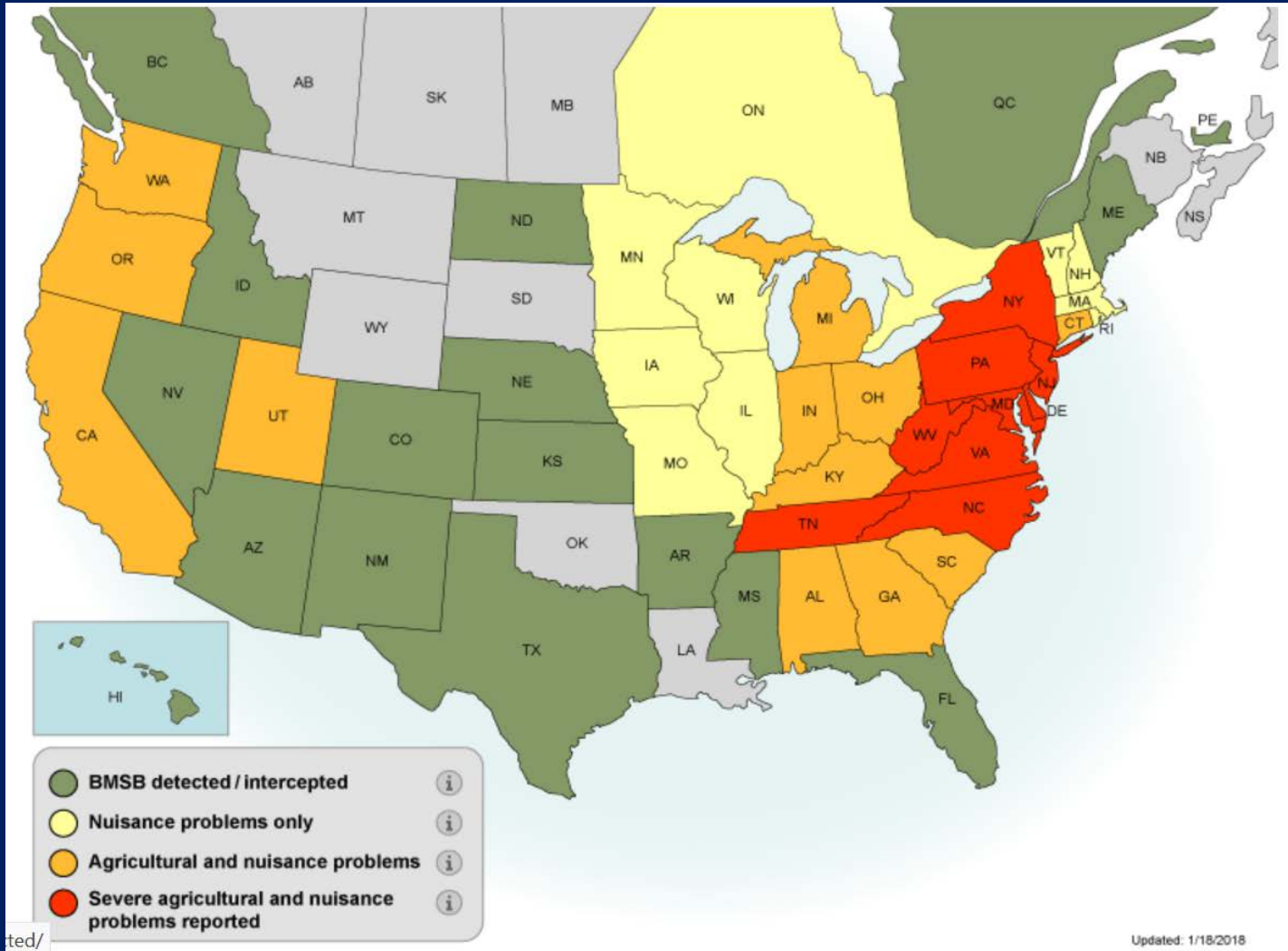
University of California Cooperative Extension-Modesto
(San Joaquin, Stanislaus, Merced Counties)

Brown Marmorated Stink Bug: A New Bug in the Town

- ❑ Invasive stink bug,
Halyomorpha halys (Stal)
- ❑ First detected in PA in the
late 1990s
- ❑ In 2010, significant economic
loss in Mid-Atlantic States
(\$ 37 million only in apple)

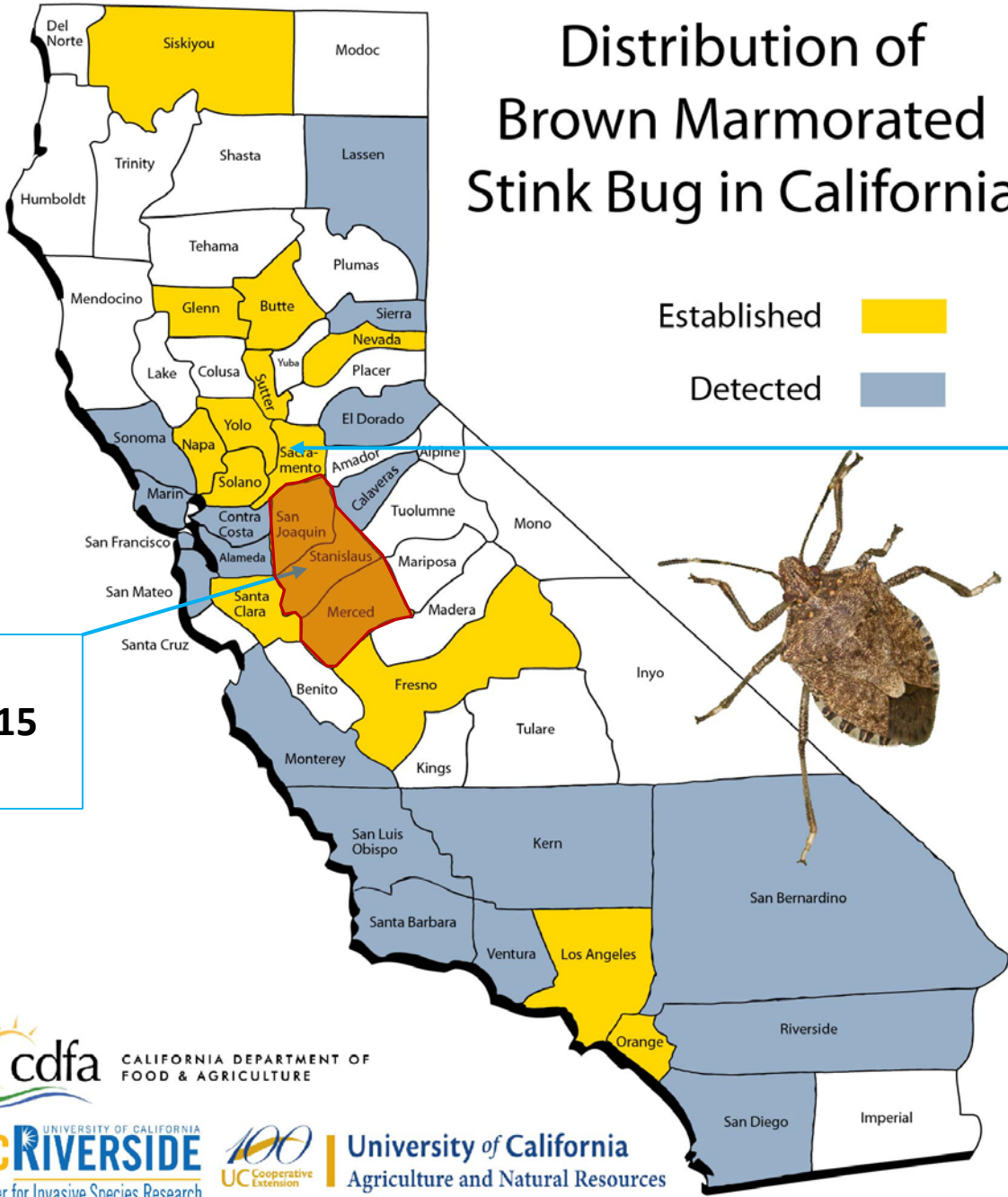


Current Distribution in the U.S.

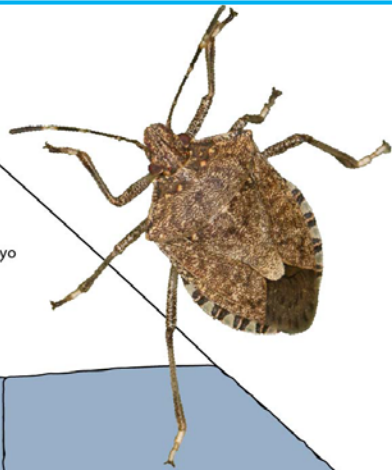


In 2010
\$ 37 million
loss reported
by Apple
Industry in
Mid-Atlantic
States

Distribution of Brown Marmorated Stink Bug in California



Severe nuisance problem since Fall 2013

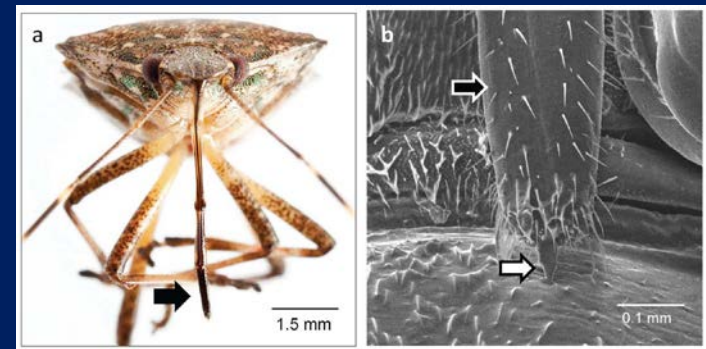


**Modesto
First detection 2015
July**

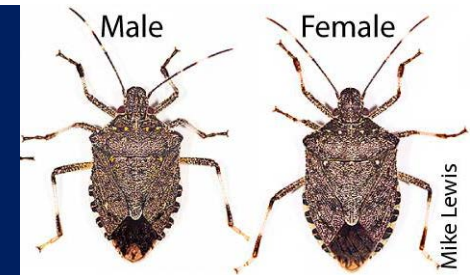
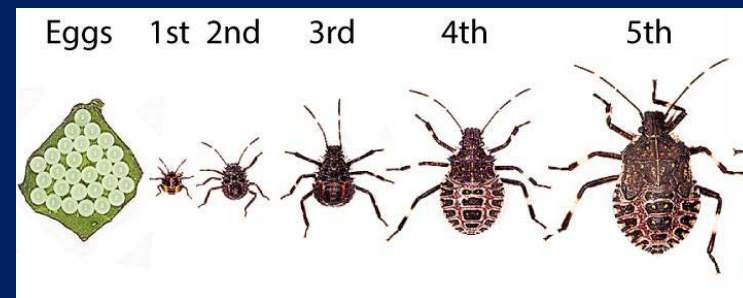


Why a big deal?

- Very wide host range (>200 plants: agriculture, landscape, forest trees)
- Active in the orchards throughout the season
- All stages of BMSB (except 1st instar nymphs) actively feed on fruits/crops
- Significant nuisance pest
- Absence of effective natural enemies; need stronger, but NE disruptive insecticides



Pfeiffer and Felton 2014



BMSB Compared to Other Stink Bugs

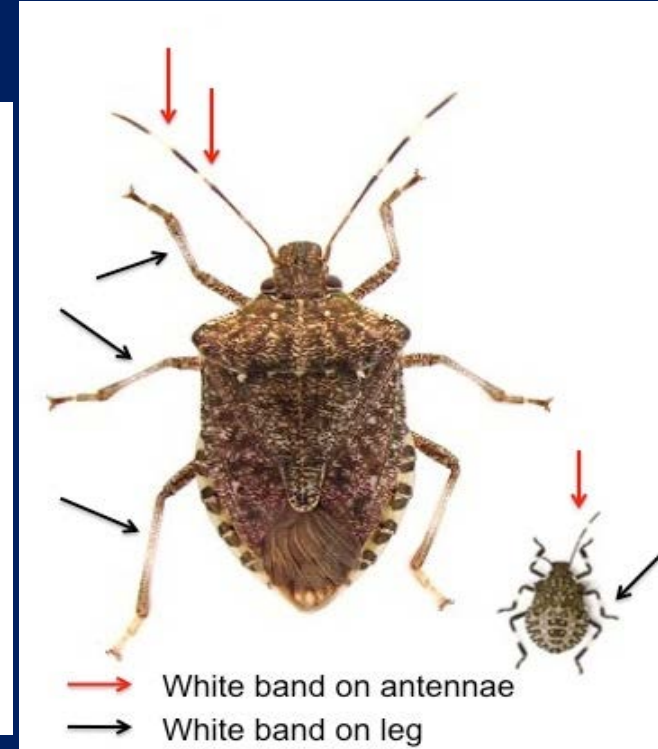
Rough Stink Bug,
Brochymena quadripustulata



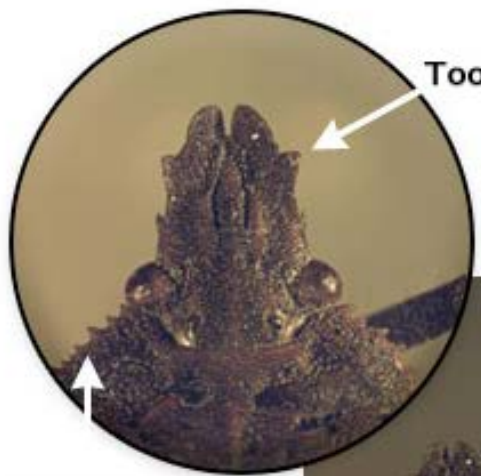
Consperse Stink Bug
Euschistus conpersus



Brown marmorated Stink Bug
Halyomorpha halys

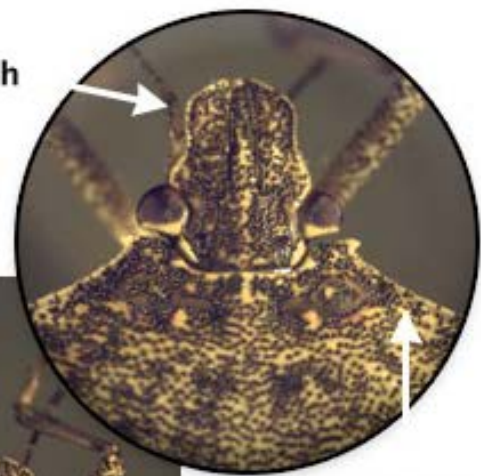


BMSB Compared to Other Stink Bugs



Tooth

Spines on shoulder



No tooth

No spines on shoulder



Rough Stink Bug

BMSB

Photos by Brent Short, USDA ARS AFRS.

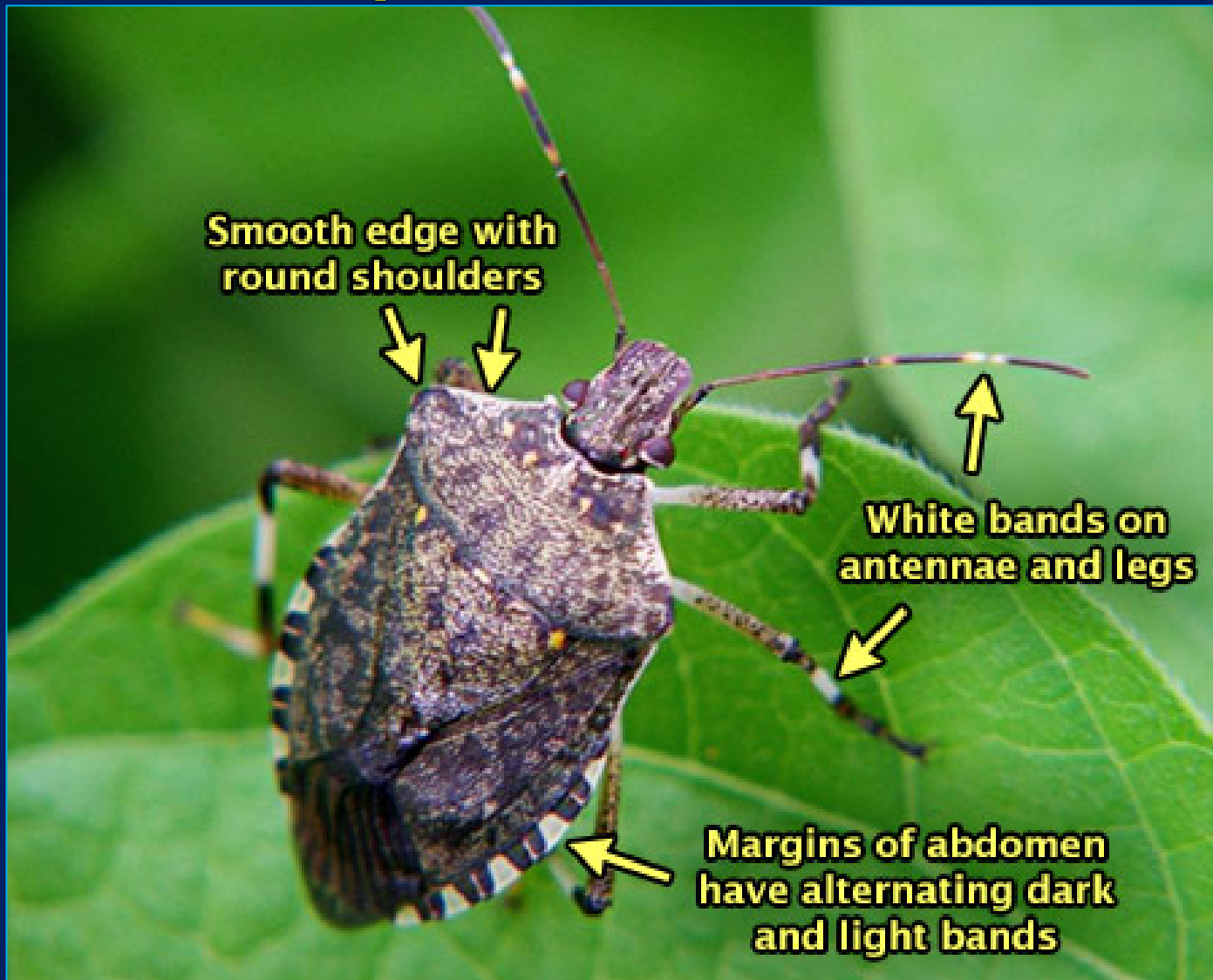


Rough Stink Bug



BMSB

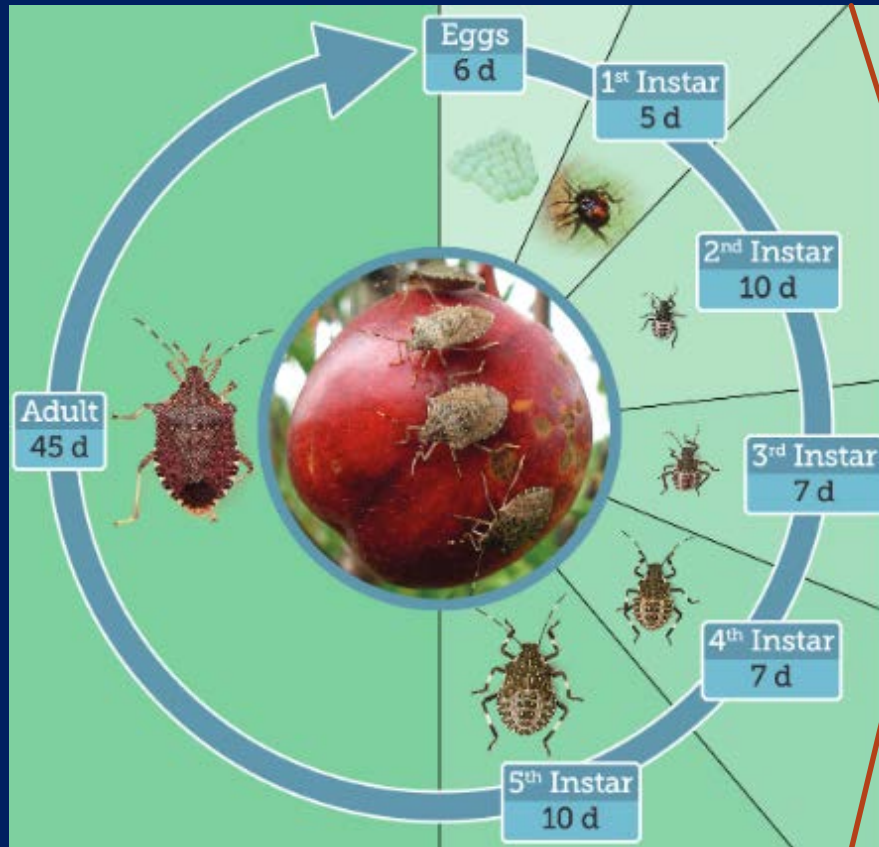
BMSB Compared to Other Stink Bugs



Life Stages of BMSB

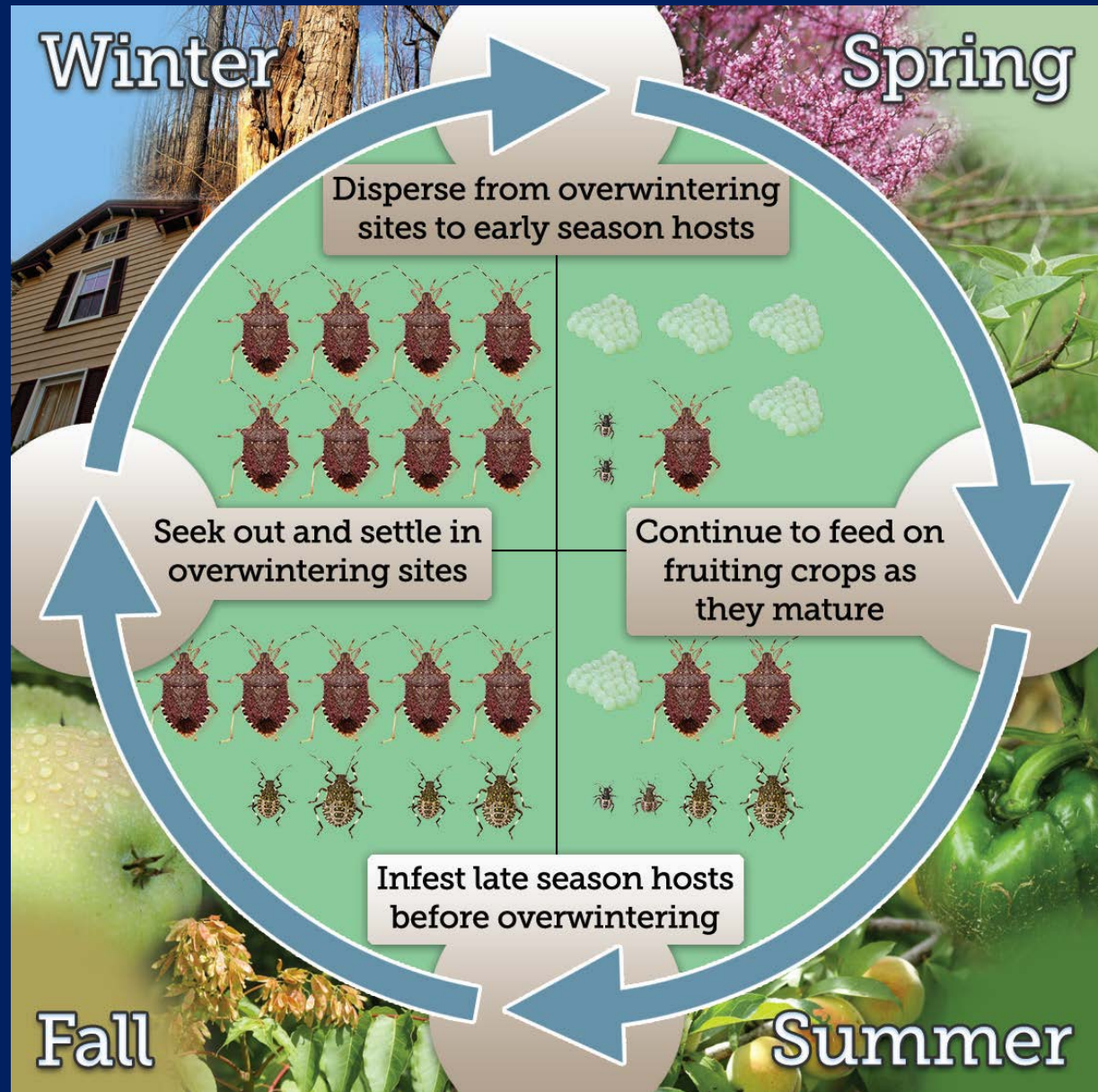


Eggs/1st
instar
nymphs



<http://www.stopbmsb.org/stopBMSB/assets/File/BMSB-in-Vegetables-English.pdf>

Seasonal Phenology



During the
winter

Overwinter
near
farmland in
homes,
office
buildings,
warehouses

Move Over, Bedbugs: Stink Bugs Have Landed

The New York Times

By KEN MAGUIRE SEPT. 26, 2010



Kelli Wilson and her father, Richard Lee Pry, cleared stink bugs from her porch Friday in Burkittsville, Md. The shield-shaped invaders have damaged fruit and vegetable crops.

Steve Ruark for The New York Times



**Dead
trees
can
harbor
BMSB**

T. Leskey

Increased Spread of BMSB (Stanislaus County, 2017-2018)





Sign in

3D

Wide Host Range

-Ornamental and Landscape Trees



Wide Host Range -Vegetable and Fruit Crops



BMSB abundance at first detection site (urban) in Modesto CA, 2015



Tree-of-heaven (*Ailanthus altissima*)

Automotive

AVE

Google



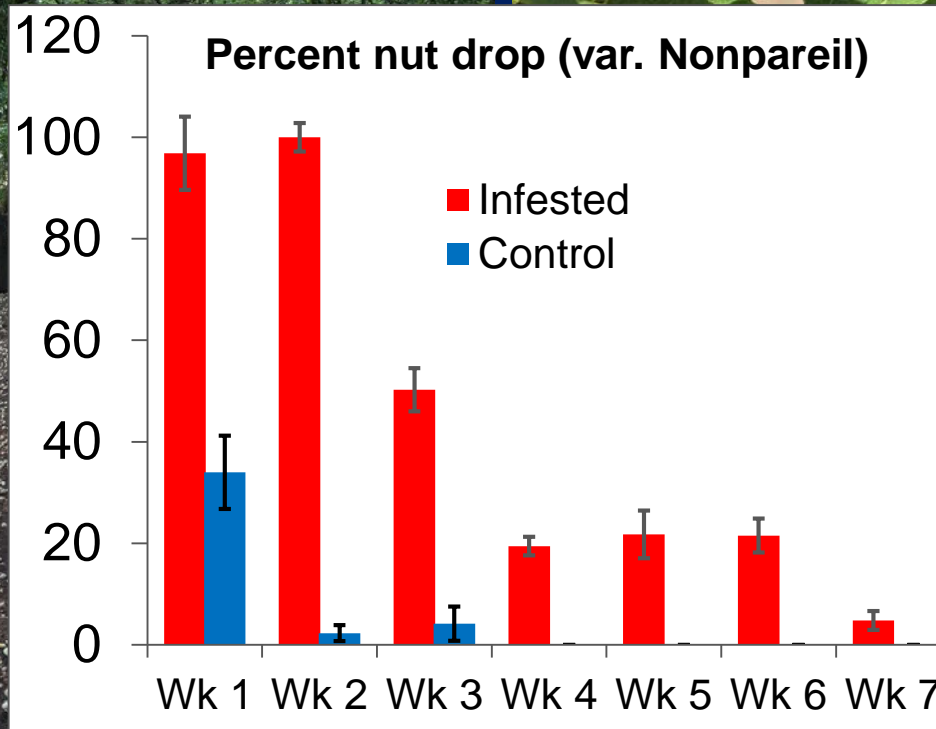
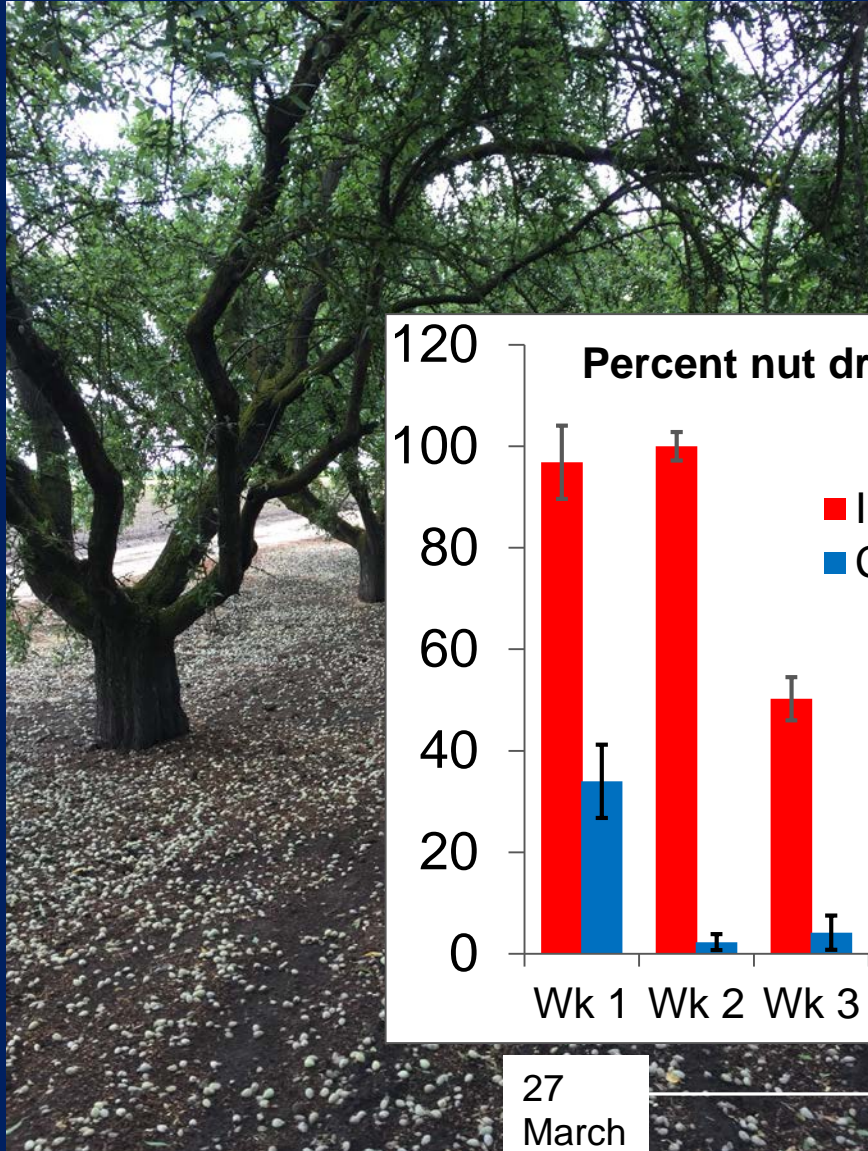
BMSB Injury to Peach-Stanislaus County (Early, Mid- to Late Season)



2018-19: BMSB Infestation in Commercial Orchards -Stanislaus and Merced Counties



2019-BMSB Infestation in Commercial Orchards (April-May)

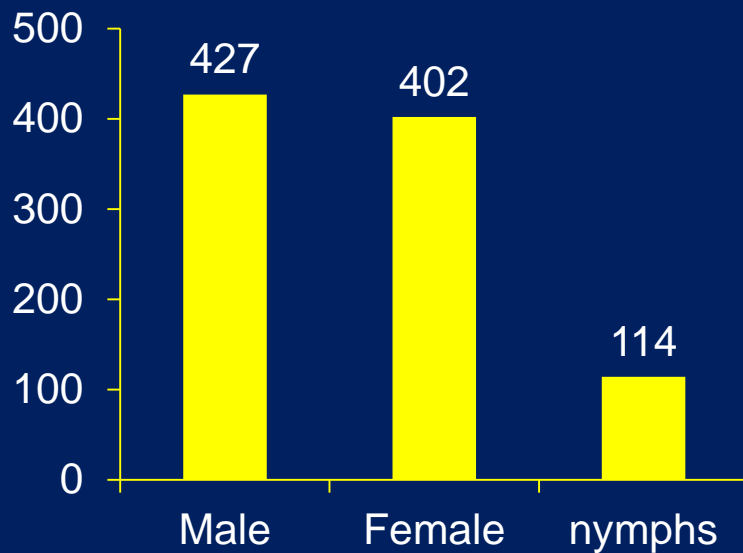


27
March

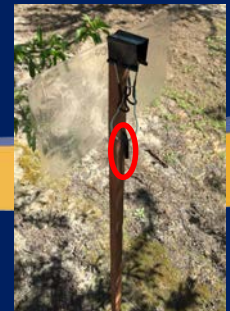
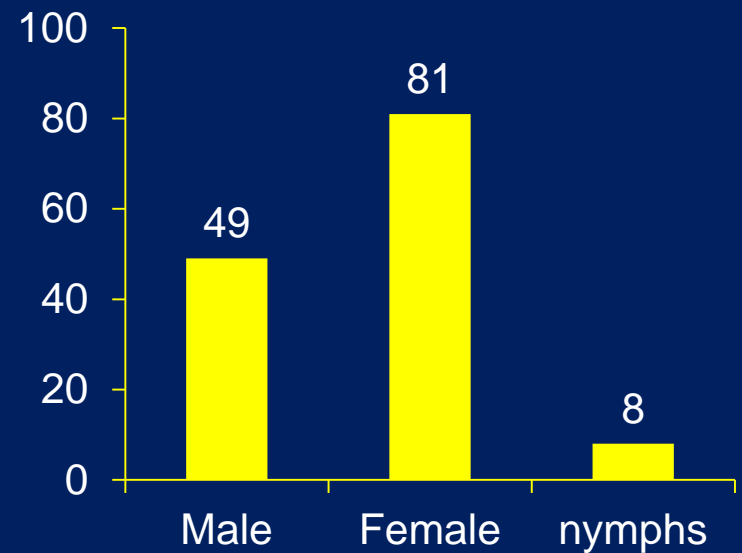
9
May

BMSB Adults Caught in Traps in Almond (2018)

Total seasonal BMSB capture-Letteau site

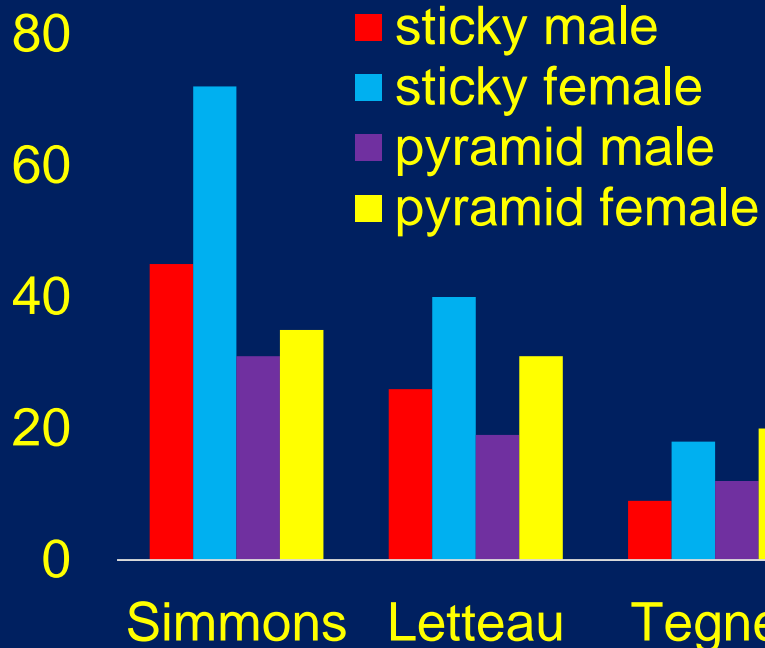


Total seasonal BMSB capture-Tegner site

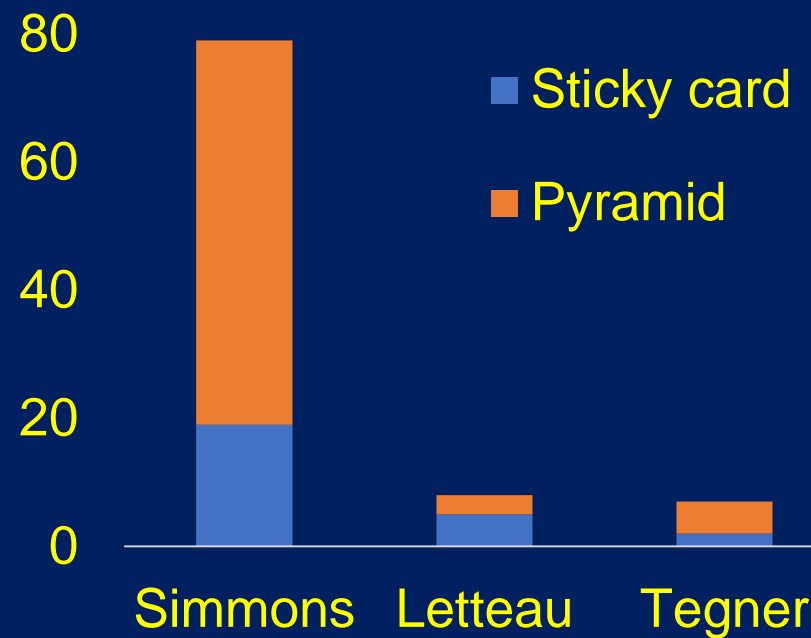


BMSB Adults Caught in Traps in Almond Orchards (2019)

Total no. of adults



Total no. of nymphs



Kernel damage by BMSB (var. Nonpareil)

April- May



Nonpareil wk11
June 6-06-18



June

6-13-18 - 6-20-18



Nonpareil wk14
6-27-18



1st wk July



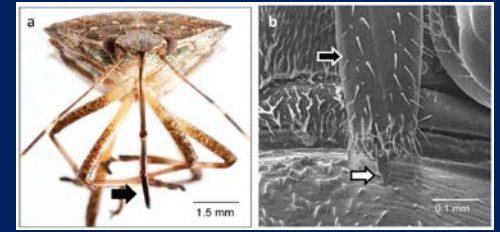
2nd wk July



Control



Damage to Apple and other Fruits



Pfeiffer and Felton 2014



Photo: Doug Pfeiffer



Photo: J. Rijal



Photo: Chuck Ingels

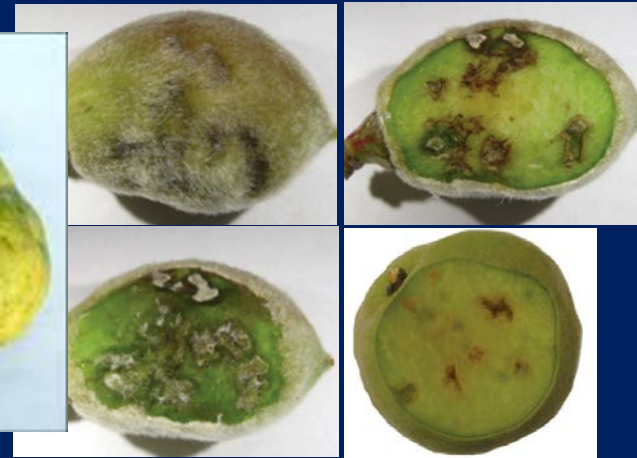
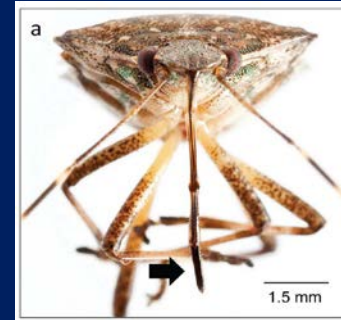


Photo: Tracy Leskey

BMSB damage to apple

- BMSB feeding through the skin of tree fruits can cause injury
- Injuries are not immediately apparent but develop gradually after feeding has occurred.
- Feeding symptoms: stylet insertion, discolored depressions, internal necrosis on apple



Bitter pit vs. BMSB damage in apple

- 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

BMSB Threat to Grapes



Photo: Michigan State, stopbmsb.org, S. Basnet (VT)

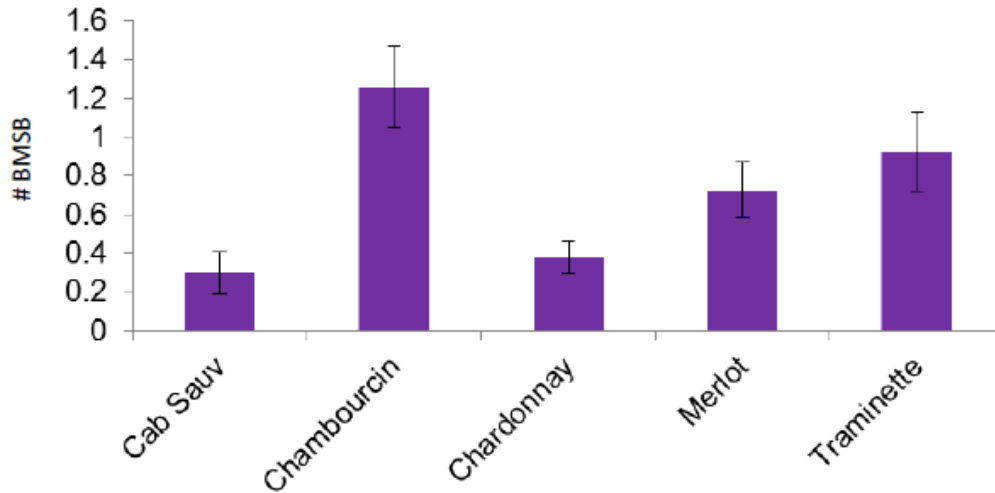
BMSB Feeding Damage to Grapes

Sour rot

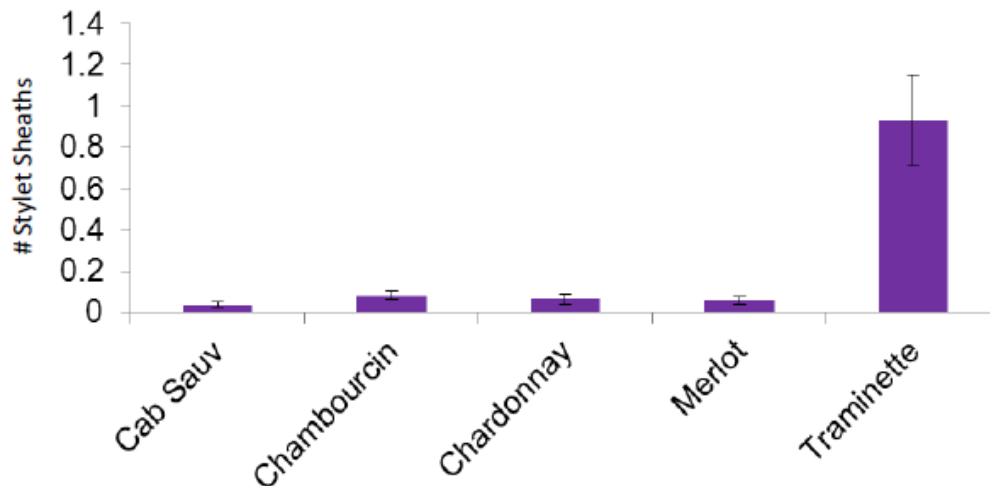
BMSB in Grapes

New Jersey

Avg. # BMSB on clusters after 24 hours



Avg. # stylet sheaths/berry



- Significantly more BMSB seen on Chambourcin, Merlot, and Traminette
- Significant difference in stylet sheaths by variety
- Presence doesn't indicate feeding

BMSB Threat to Grapes

High

- High dispersal capacity and border-driven pest



Mid-veraison reduced berry weight and/or sour rot

Pre-harvest: Ripe Fruit Becomes Increasingly Attractive To BMSB and can remain in clusters

Moderate



Feeding on Fruit at berry touch can result in aborted berries

Low

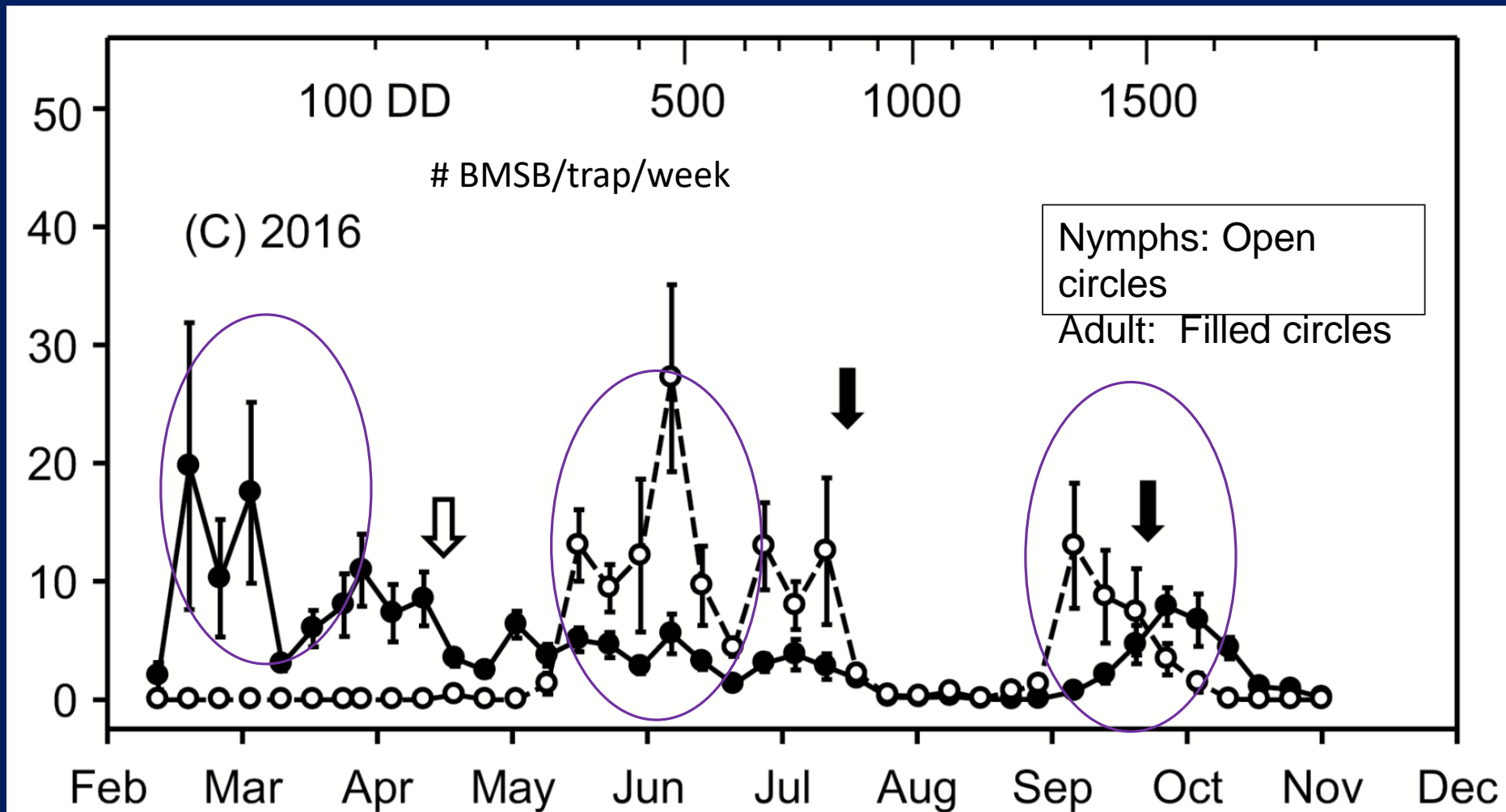


Feeding on Fruit at pea or peppercorn size can result in aborted berries and Reproduction Can Occur if Invading Populations Not Managed.

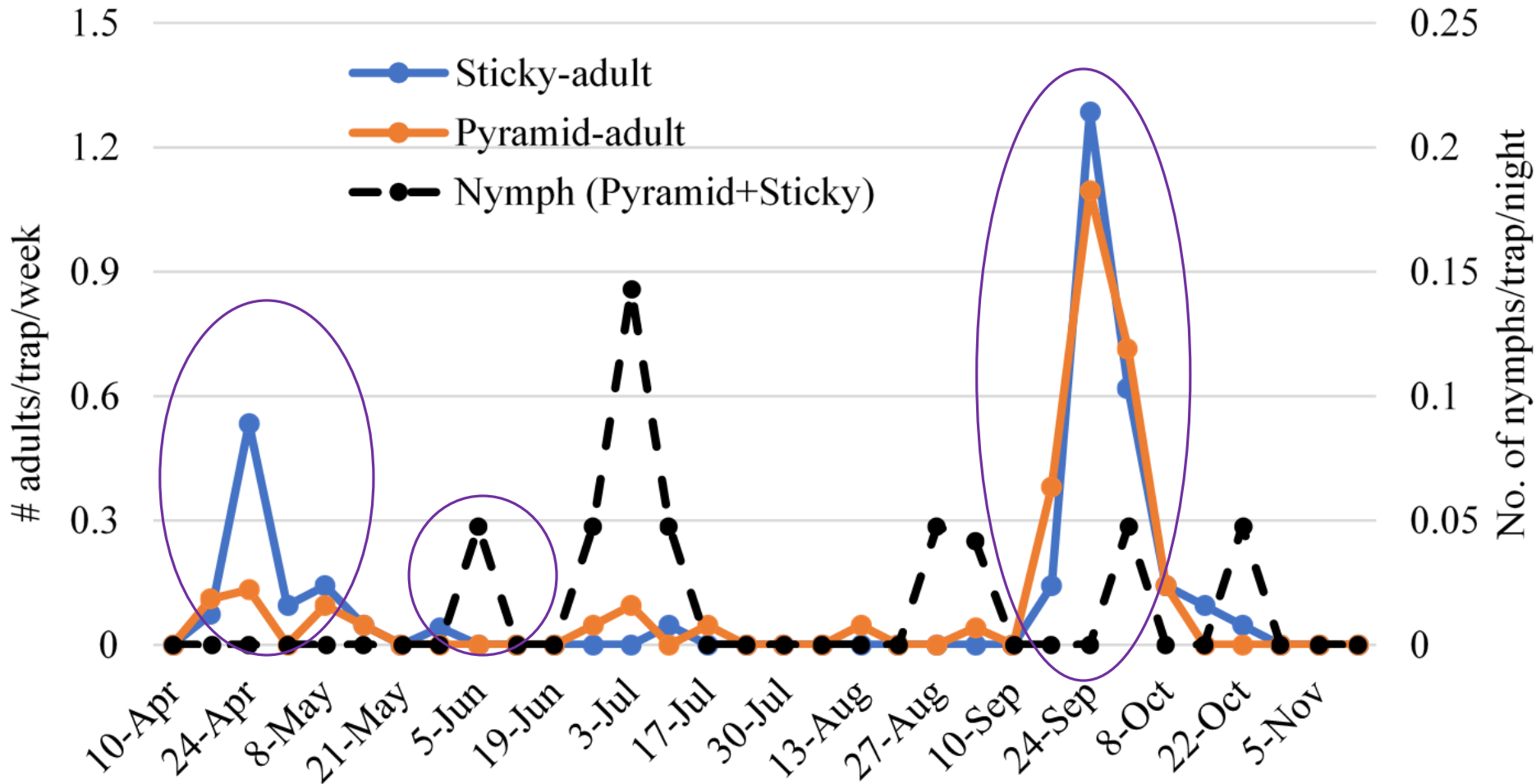


J	F	M	A	M	J	J	A	S	O	N	D
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BMSB Phenology in Sacramento



BMSB Phenology in Modesto

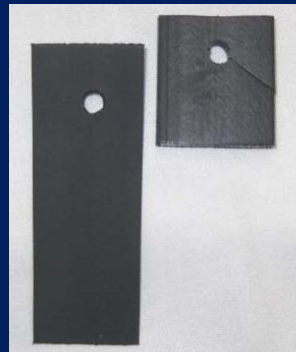


Monitoring/Scouting of the Vineyards

- Broder-driven pest, more risks for the vineyards that has potential host trees in proximity
 - tree of heaven, catalpa, Chinese pistache, English holy, etc..
- Smaller vineyards are at more risk than the large-sized ones
- Scouting the vineyards/borders, and fruit clusters is very important
- Data suggest that **1–2 adults feeding on clusters for 1 week** can reduce berry quality, although a specific threshold has not been developed.
- Use of the BMSB trap is recommended

BMSB Monitoring in Crops (2017-2018)

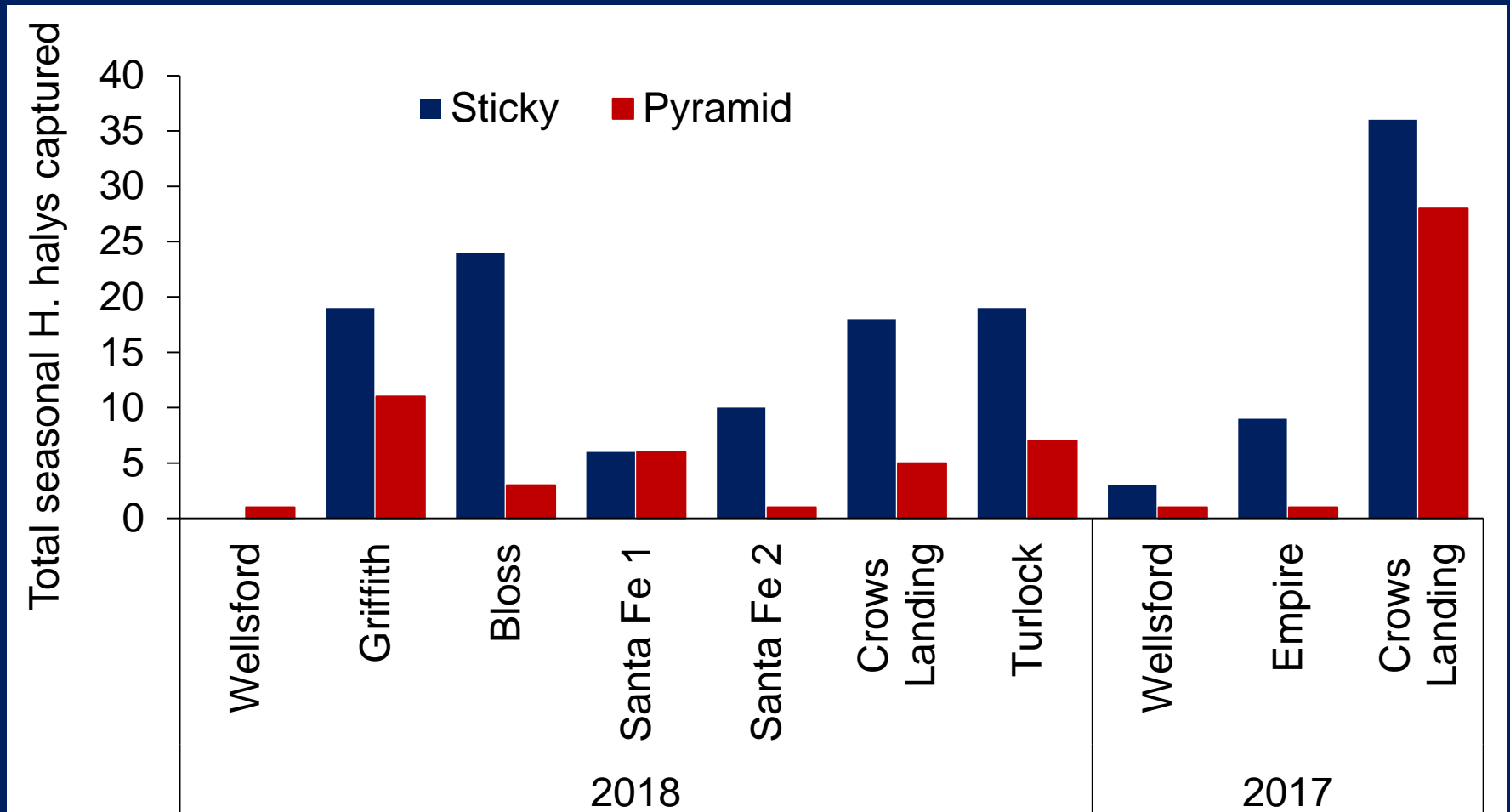
Pyramid Trap



Sticky Panel Trap (6x12 inch)



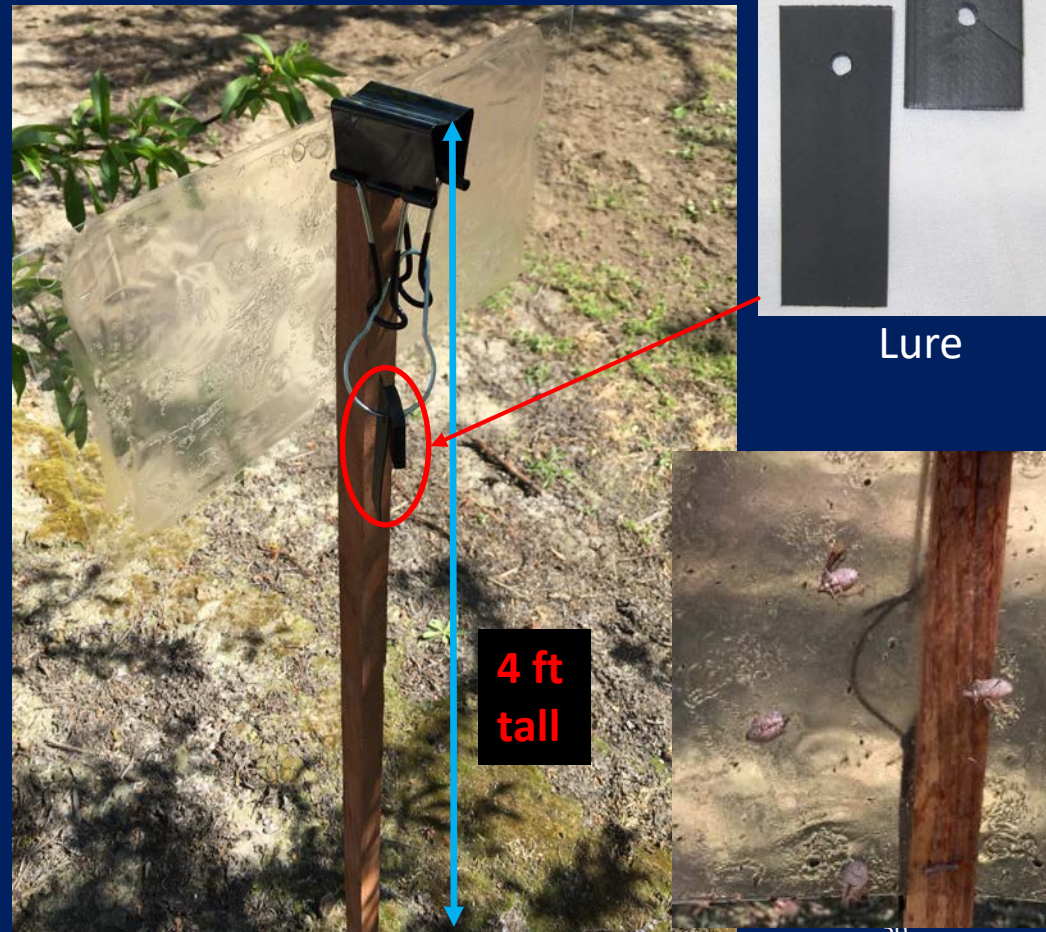
BMSB Adults in Traps in Peach (2017-18)



BMSB Monitoring with Traps

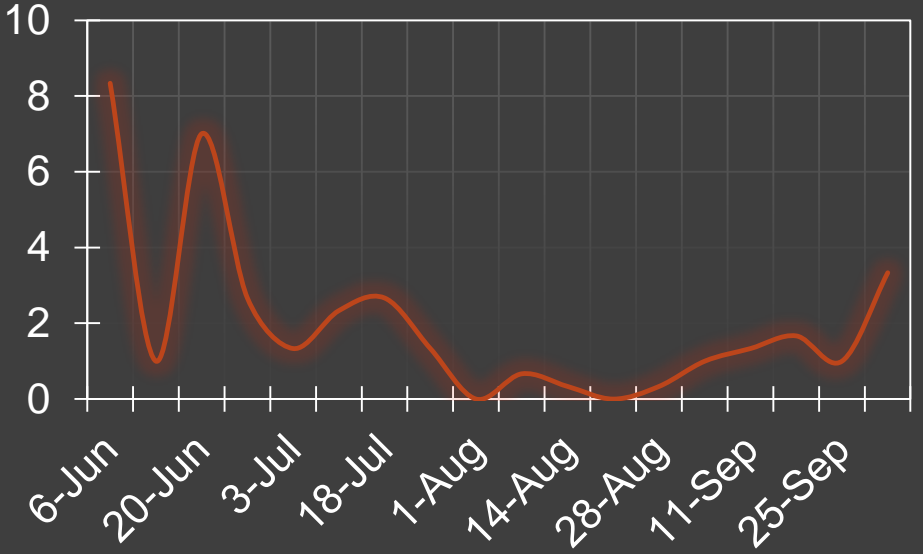
- Put couple of traps (minimum 3 traps with BMSB lure) in border rows beginning March
- Change lure in every 6-12 weeks,
- Check and change the sticky panel as needed

Sticky Panel Trap



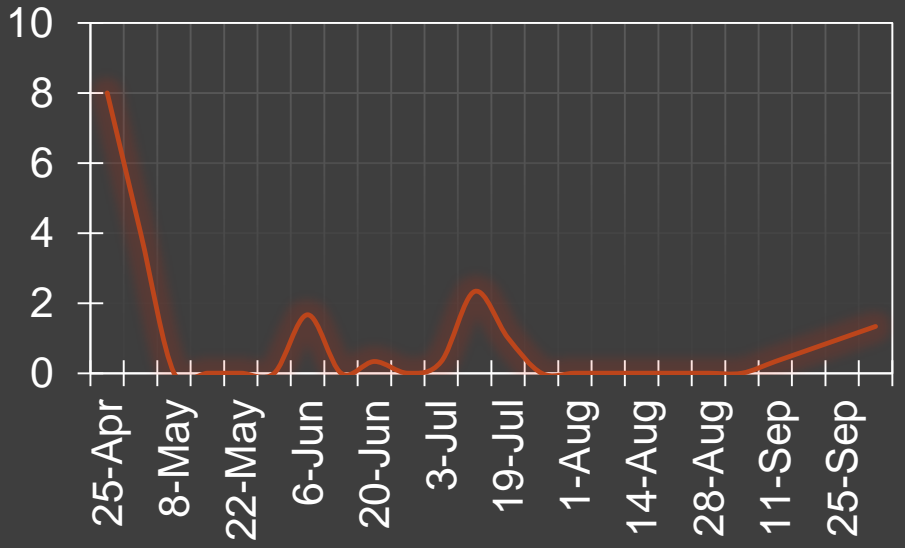
BMSB Phenology Based on Adult Trapping

No. of adults/trap/week-Site 1



- Found in traps as soon as mid-March
- Potential for a season-long damage

No. of adults/trap/week-Site 2



BMSB Monitoring

- Visual sampling for gummy nuts, live BMSB
- Beat tray sampling at least 5 trees in the border row

- a beating sheet and a padded pole or dowel to strike the branches



© Wil Hershberger



Photo by : Petr Kosina

Management is Insecticide-driven

- BMSB do not cause structural damage or reproduce in homes.
- They do not harm people or pets.
- No disease risks but produce malodorous chemical.
- Many insecticides for BMSB have short residual, so alternate-row-middle application (7-day interval) may be better.
- Virtually all effective insecticides against BMSB are detrimental to natural enemies.
- Trap-based threshold is being developed in the East Coast in apple. Weekly 10 adults/trap is action threshold in apple



Insecticides for BMSB

- Ensure that the product is registered for use on the target crop in your state
- This list is not a substitute for pesticide labeling.
- Always follow the pesticide label

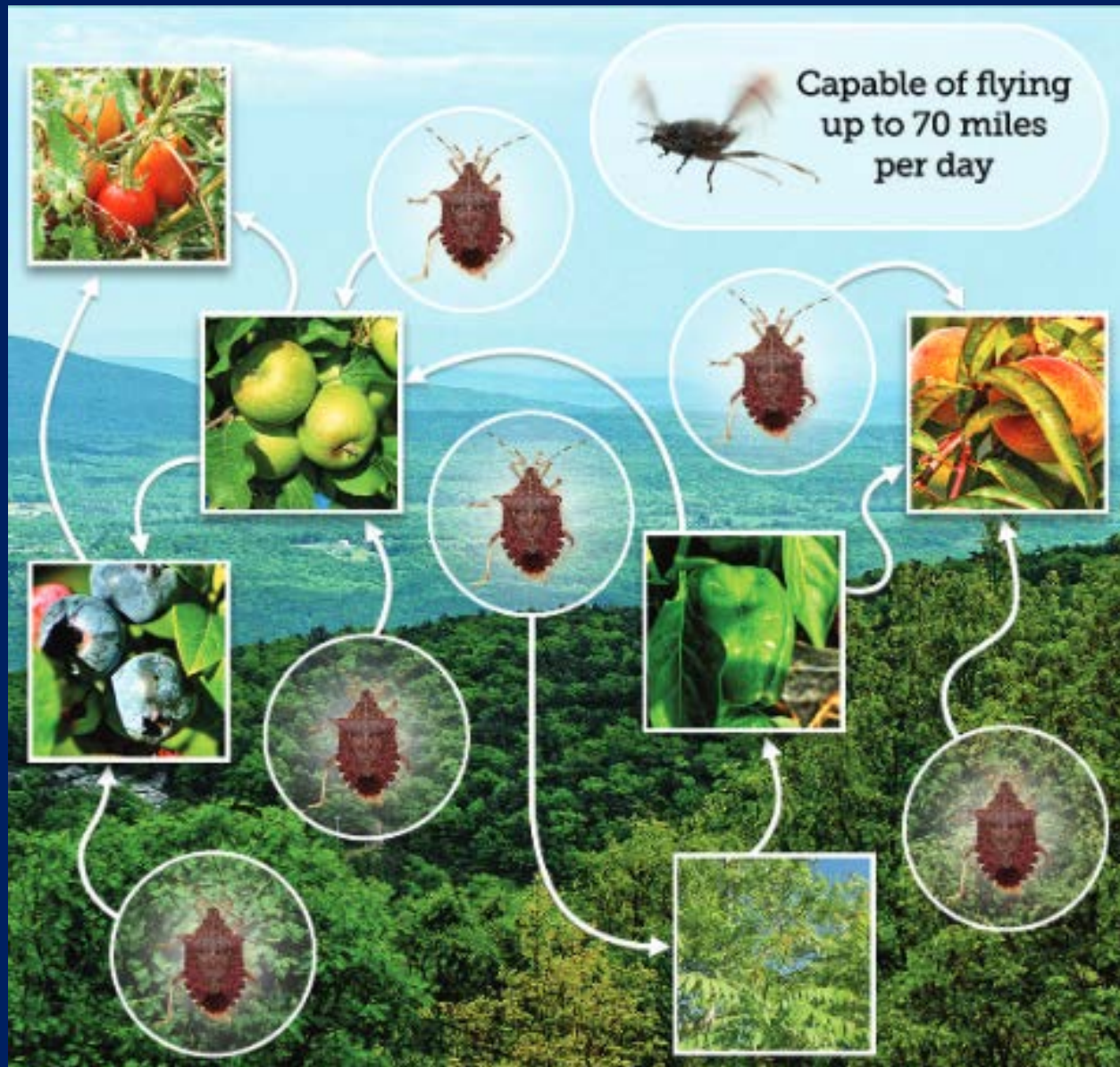
Bergh et al. 2016

Crops listed on pesticide label with pre-harvest interval (days).
 “NL” indicates not labeled on that crop.

Active Ingredient (IRAC class*)	Product Name(s)	Peach	Nectarine	Apricot
beta-cyfluthrin (3A)	Baythroid XL	7	7	7
beta-cyfluthrin (3A) + imidacloprid (4A)	Leverage 360	7	7	7
bifenthrin (3A)	Bifenture, Brigade, Sniper	NL	NL	NL
clothianidin (4A)	Belay	21	NL	NL
cyfluthrin (3A)	Tombstone	7	7	7
diflubenzuron (15) + lambda-cyhalothrin (3A)	DoubleTake	NL	NL	NL
dinotefuran (4A)	Scorpion ¹ , Venom ¹	3	3	NL
fenpropathrin (3A)	Danitol	3	3	3
gamma-cyhalothrin (3A)	Declare, Proaxis	14	14	14
imidacloprid (4A)	Admire Pro, Alias, Wrangler	0	0	0
lambda-cyhalothrin (3A)	Warrior II, Lambda-Cy, Silencer	14	14	14
lambda-cyhalothrin (3A) + thiamethoxam (4A)	Endigo	14	14	14
methomyl (1A)	Lannate	4	1	NL
permethrin (3A)	Permethrin 3.2EC, Perm-UP	14	14	NL
thiamethoxam (4A)	Actara	14	14	14
zeta-cypermethrin (3A)	Mustang Maxx	21	21	21

1A = carbamates
 3A = pyrethroids
 4A = neonicotinoids

BMSB: Landscape-level Threat



BMSB outside source matters...



Hope!



Management of brown marmorated stink bug in US specialty crops

HOME

- ABOUT US
- STINK BUG BASICS
- WHERE IS BMSB?
- MANAGING BMSB
- MORE RESOURCES

HOME » Stink Bug Bulletin » Asian wasp, enemy of stink bugs, found in the United States

Asian wasp, enemy of stink bugs, found in the United States

The Asian wasp *Trissolcus japonicus* has been found in the wild in the United States. The wasp, native to the regions of Asia where the brown marmorated stink bug (BMSB) originates, is known to attack the eggs of BMSB and possibly other stink bugs. The wasp doesn't sting or otherwise harm humans, but scientists are working to determine how it might affect stink bugs of all kinds. Kim Hoelmer, an entomologist with the USDA Agricultural Research Service, wrote:

"A survey of resident egg parasitoids of the brown marmorated stink bug, *Halyomorpha halys*, conducted during the summer of 2014 by Megan Herlihy and Don Weber (ARS-Beltsville Area Research Center, or BARC) using sentinel stink bug egg masses revealed that an Asian egg parasitoid of BMSB, *Trissolcus japonicus*, was present in the wild at one of his study sites at BARC in Beltsville, Maryland. The specimens were identified by Dr. Elijah Talamas (ARS, Systematic



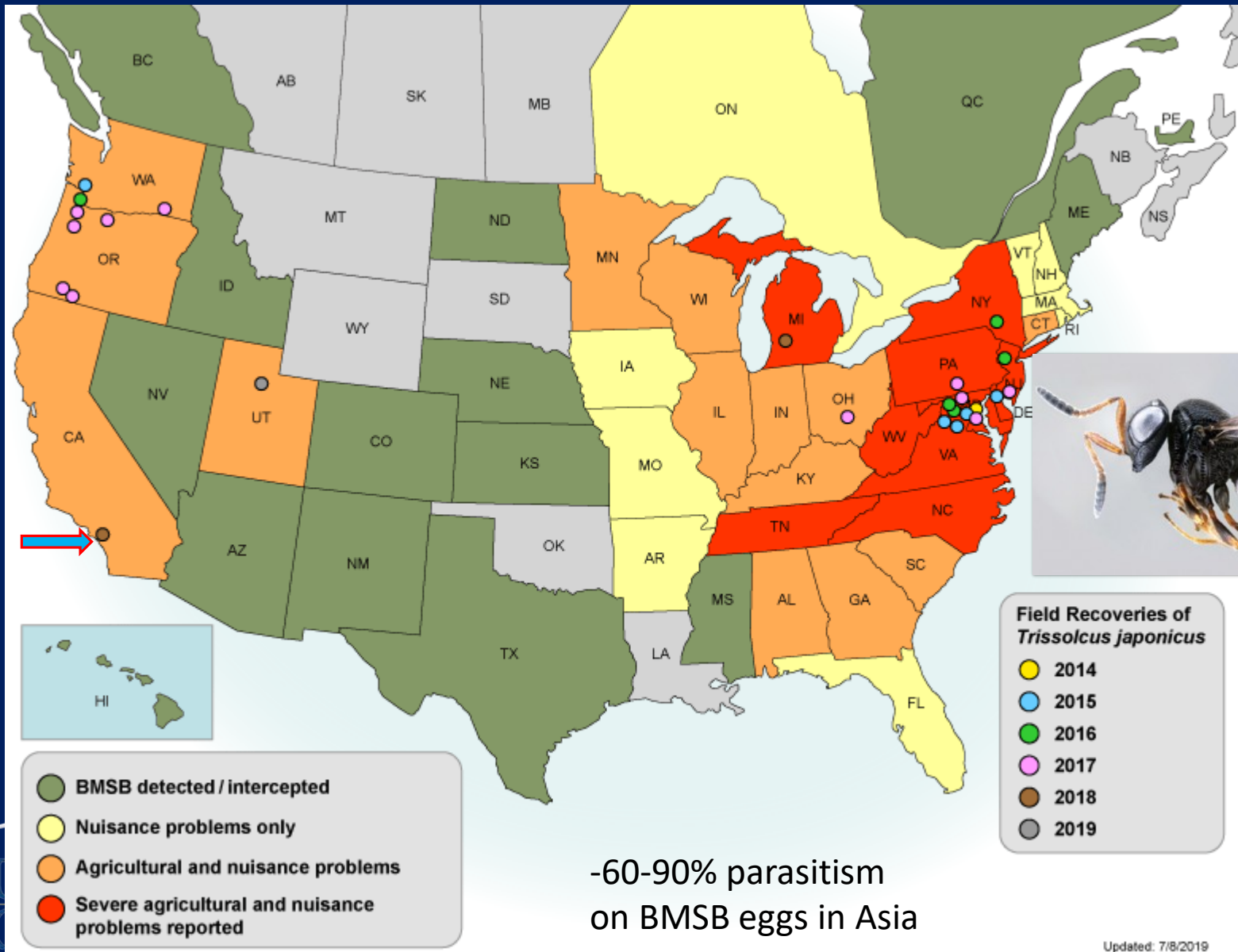
One of the recovered Beltsville specimens of *Trissolcus japonicus* emerges from a BMSB egg. Source: Elijah Talamas, USDA Agricultural Research Service, Systematic Entomology Laboratory



BMSB parasitoid (Samurai Wasp) *Trissolcus japonicus*

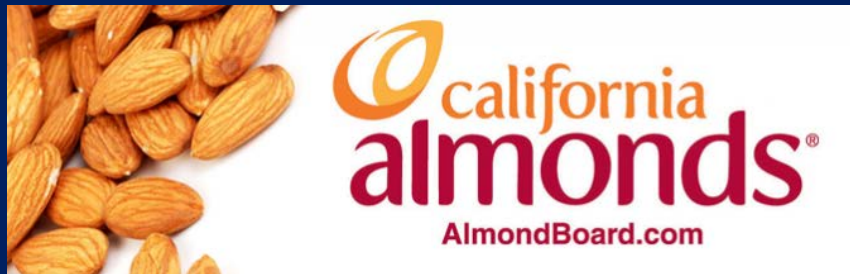
Photos: <http://blogs.cornell.edu/jentsch/2016/09/19/bmsb-news-the-invasive-parasitic-wasp-trissolcus-japonicus-recently-found-in-new-york-state/>

Biological Control: U.S. Map of Field Recoveries of *Trissolcus japonicus*



Thanks to:

- Cooperator Growers,
- Pest Control Advisors
- Field and Lab Technicians



USDA-NIFA SCRI 2016-51181-25409



University of California

Agriculture and Natural Resources

Cooperative Extension

Codling moth basics

- Codling moth is the major pest of apple and pear
- Damaging stage: larva tunnels into fruit
- Monitoring stage: adult moth
- Use of pheromone traps and the degree-day model (based on daily temperatures) are critical
- Insecticides and pheromone-based mating disruption are currently the main management tactics
- Insecticides are targeted at newly hatched larvae and/or eggs.
- Mating disruption devices need to be applied immediately before or at biofix (first moth activity)
- Biological control is minimally effective because larvae are protected inside fruit
- Insect development and spray timing information are available on IPM Guidelines for codling moth in Apple