



**Update on a leafhopper, a bug and a moth**


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North Coast IPM Advisor

### Virginia Creeper Leafhopper

- Native to northern mid-west.
- Moved through Canada, reported in British Columbia in early 1950s & WA in 1970s.
- First reported in Chico in 1984.
- Late 80's and early 90's reported in other northern counties; 2006 from Winters; and 2007 from Sacramento and Sierra foothills.
- In 2012, when first identified in Lake and Mendocino Counties, it was at damaging levels.



### Adults



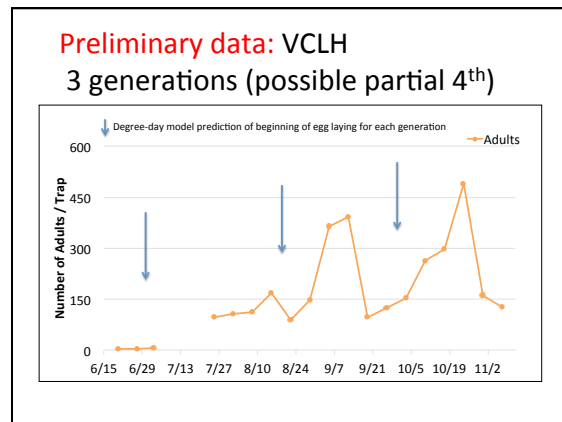
Adults (~1/8" long) have reddish-brown zigzag markings on the wings.

**Overwinter**

- Adults begin overwintering by October/November. Spend winter under leaf litter, grasses or weeds in or near vineyard.

**Spring**



- Active in warm spring weather.
- As they begin to feed ovaries develop.
  - Feeding on grapes is not necessary for full ovary development.
  - Ready to oviposit when fully expanded grape leaves are present.
  - Egg laying takes about 4 weeks.
- Nymph developmental threshold 54.5°F (while for Western grape leafhopper: 50.5°F).



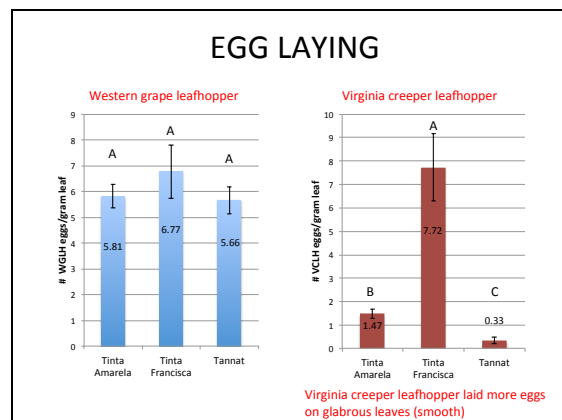
### Leafhopper eggs

Female leafhopper lays minute bean-shaped eggs under epidermis primarily on underside of expanded leaf.

- **Western grape leafhopper:**
  - Lays single eggs
- **Virginia creeper leafhopper:**
  - Lays eggs side-by-side in batches of 2 to 7 (sometimes singly)
  - Covers eggs with bluish-gray secretion.
  - Egg laying is influenced by leaf trichome density (hairs).

Photos: Jack K. Clark



### Virginia creeper leafhopper nymphs






Photo: Jack K. Clark

- Nymphs very small (~1/32 to 1/8"), same size as Western grape leafhopper.
- First stage is colorless with dark reddish brown eyes.
- 2<sup>nd</sup> and 3<sup>rd</sup> stage have 4 orange markings on the thorax and dark red eyes.
- 4<sup>th</sup> and 5<sup>th</sup> stage nymphs have 4 reddish-brown markings on the thorax and dark red eyes.
- Cast-off skin of fifth molt (with reddish-brown markings) sticks to leaf, signaling adult emergence.



Virginia creeper leafhopper – 5<sup>th</sup> stage nymph

Red eyes

White eyes

Western grape leafhopper – 5<sup>th</sup> stage nymph

Photo: Jack K. Clark

### High populations of Virginia creeper leafhopper


- Overlapping generations.
- Egg parasitism of VCLH not seen in North Coast.
- If left uncontrolled, heavy feeding will cause leaves to lose their green color, dry up and fall prematurely.





October 2012 Photo: Glenn McGourty

Photo: Rhonda Smith


### Western grape leafhopper egg parasites: *Anagrus* spp.



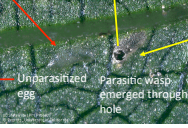
Western grape leafhopper




*Anagrus* sp. wasp




Parasitized egg



Parasitic wasp emerged through hole




Unparasitized egg



Leafhopper nymph emergence

High parasitism of Western grape leafhopper egg keeps populations in check

### Leafhopper eggs parasitized by *Anagrus* species



**Virginia creeper leafhopper**

- Anagrus daanei*
- Anagrus tretiakovae*

**Western grape leafhopper**


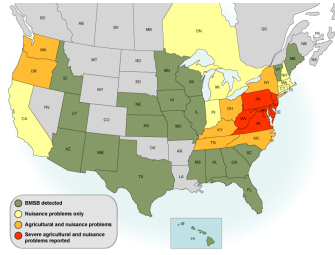
- Anagrus erythroneura*
- Anagrus daanei*

|   | <i>Anagrus erythroneura</i> | <i>Anagrus daanei</i> | <i>Anagrus tretiakovae</i> |
|---|-----------------------------|-----------------------|----------------------------|
| <b>Virginia creeper leafhopper eggs</b> |                             |                       |                            |
| Parasitism in British Columbia & WA     |                             | ✓                     | ✓                          |
| Parasitism in Yolo County               |                             | ✓                     | X                          |
| Parasitism in Lake and Mendocino        |                             | X                     | X                          |
| <b>Western grape leafhopper eggs</b>    |                             |                       |                            |
| Parasitism in Lake and Mendocino        | 87%                         | 13%                   |                            |

### Management

- Virginia creeper leafhopper**
  - High 1<sup>st</sup> generation nymph populations warrant treating the 1<sup>st</sup> generation nymphs.
- Target: young nymphs.
- Control in Organic Vineyards.
  - If population are high, may need to treat twice the first nymphal generation.
    - Pyganic
    - Oils (stylet oil, neem oil)
- Any conventional insecticide recommended for Western grape leafhopper will control Virginia creeper leafhopper.

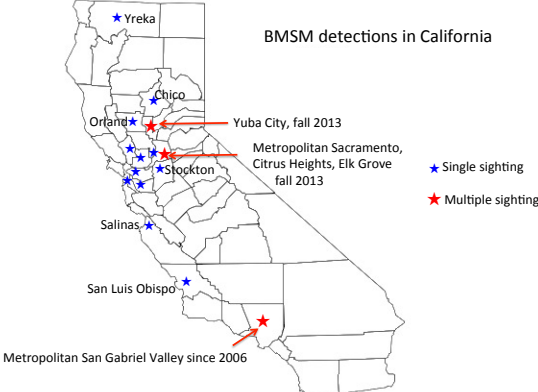
### Brown marmorated stink bug in the U.S.

- Native to China, Japan, Korea, and Taiwan
- First detected in the U.S. in 1996

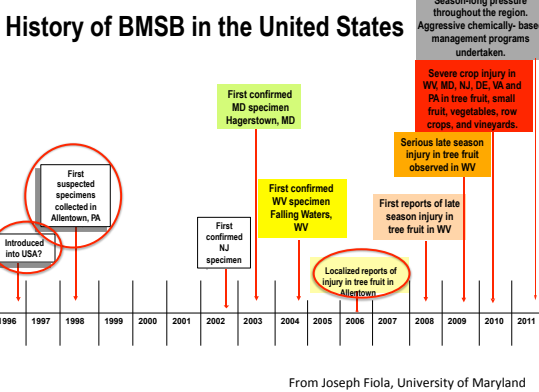
(T. Leskey, USDA ARS, 2014)

### BMSB detections in California



- ★ Single sighting
- ★ Multiple sightings


### History of BMSB in the United States



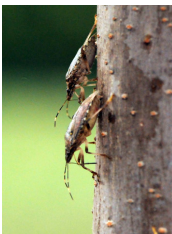
From Joseph Fiola, University of Maryland

### Ornamental hosts

Ornamentals with seed pods:  
e.g. Tree of Heaven



Feeding through the bark of an elm tree



M. Raupp, UMD

### BMSB overwinter in dead trees



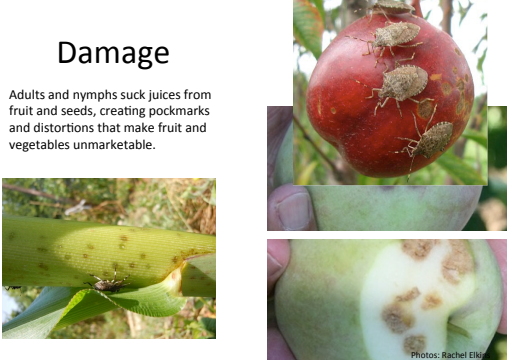
### Overwinters in the woods



Soybeans

### Damage

Adults and nymphs suck juices from fruit and seeds, creating pockmarks and distortions that make fruit and vegetables unmarketable.

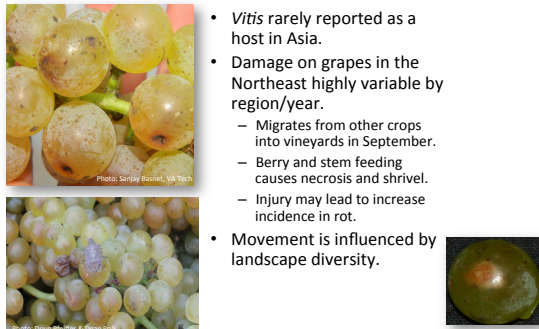


Photos: Rachel Ellis

Damaged flesh under the skin turns hard and pithy

### Damage on grapes

- *Vitis* rarely reported as a host in Asia.
- Damage on grapes in the Northeast highly variable by region/year.
  - Migrates from other crops into vineyards in September.
  - Berry and stem feeding causes necrosis and shrivel.
  - Injury may lead to increase incidence in rot.
- Movement is influenced by landscape diversity.



Photos: Surajy Basnet, VA Tech; Kathy Kamminga, VA Tech

### Would BMSB taint wine?

Odor: *trans-2-decenal* (smells like fresh cilantro)

- Joseph Fiola, University of Maryland found:
  - White grapes: between 5-10 BMSB/25 lbs can impart a perceptible aroma in juice at press; aroma decreases over first 3 months; no distinguishable aroma after 4 months.
  - Red grapes: between 10-20 BMSB/25 lbs did not impart a distinguishable aroma following fermentation.
- P. Mohekar *et al.*, Oregon State University:
  - 0.3-3 BMSB/pinot noir cluster produced wine with measurable levels of taint post fermentation.

### How serious a pest in grapes?

- First sightings in metropolitan areas.
- Lag time before invading natural environments and agriculture.
- Mobility into vineyards influenced by diversity of landscape and crops.
- Impact depends on vineyard size (edge effect).




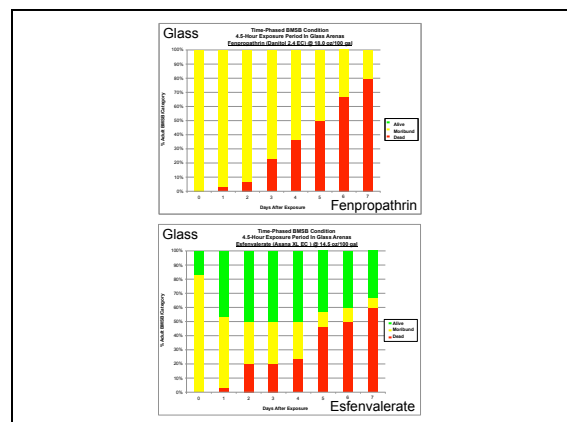
Photo: Kathy Kamminga, VA Tech

### Management at landscape level



Photos: Rachel Ellis

- Highly mobile.
- Invades adjacent crops quickly, causing unexpected damage.
- Controlled with border sprays.
- Hard to kill.



### Insecticide efficacy

- Wide range of insecticide effect within chemical classes.
- BMSB is hard to kill by contact with residue even at high doses of most effective insecticides.
- Recovery was demonstrated for some pyrethroids and neonicotinoids.
- Success in laboratory evaluations does not always translate to field....but failure does.

### Adults

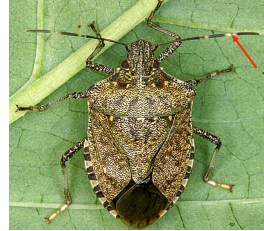


Photo: Deepak Matadha, Rutgers University



~ 3/4 " in length  
Larger than most stink bugs  
Two white bands on antennae  
Brown markings on wing tips

### Blue-green metallic depressions on head and shoulder



Photo: Susan Ellis, Bugwood.org



Photos: Susan Ellis, Bugwood.org

### 1<sup>st</sup> stage nymphs



Photo: Gary Herron, USDA-ARS

### Eggs



Eggs are barrel-shaped, laid in groups



### Mature nymphs



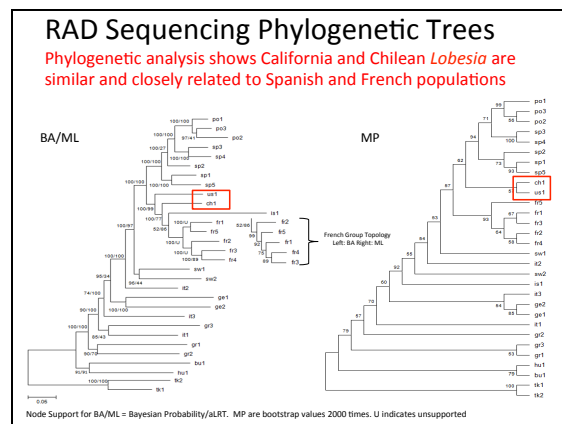
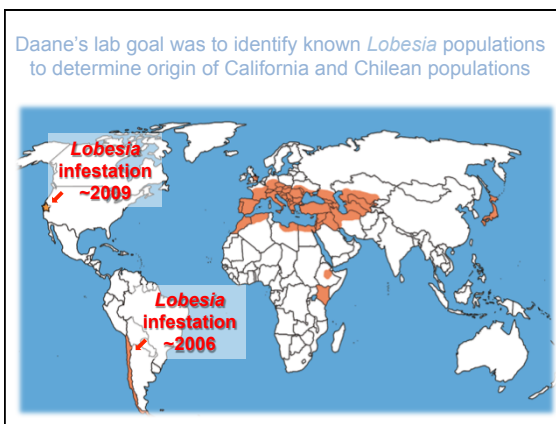
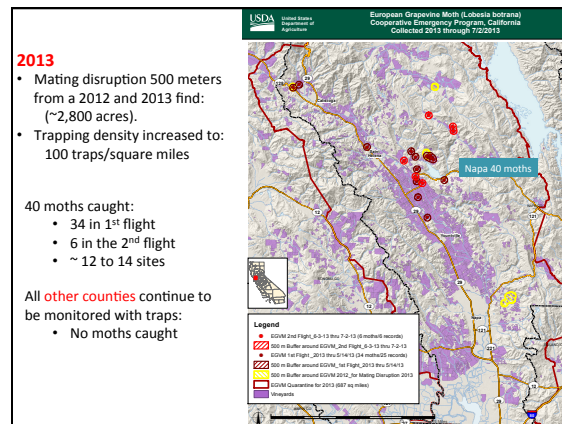
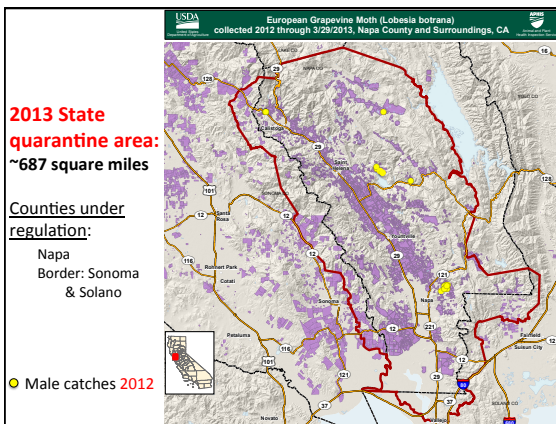
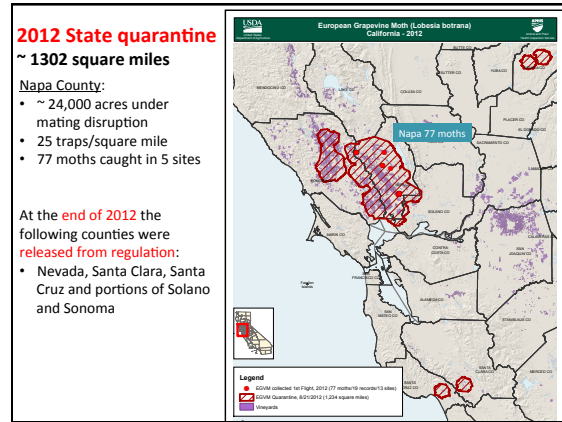
Photo: Deepak Matadha, Rutgers University



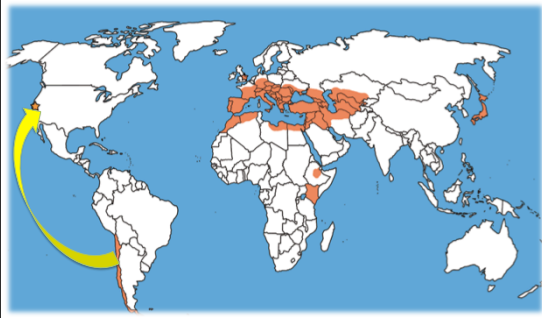
Spines in front of eyes and on shoulder edges

### European grapevine moth





How to prevent future introductions?



**YouTube videos:**

BMSB - <http://ucanr.edu/p/39604>

VCLH - <http://ucanr.edu/p/39602>

Or

<http://cesonoma.ucanr.edu>

Left column, choose: Integrated Pest Management

Bottom left, choose: ID and monitoring videos