# Mites and Brown Marmorated Stink Bug in Strawberry

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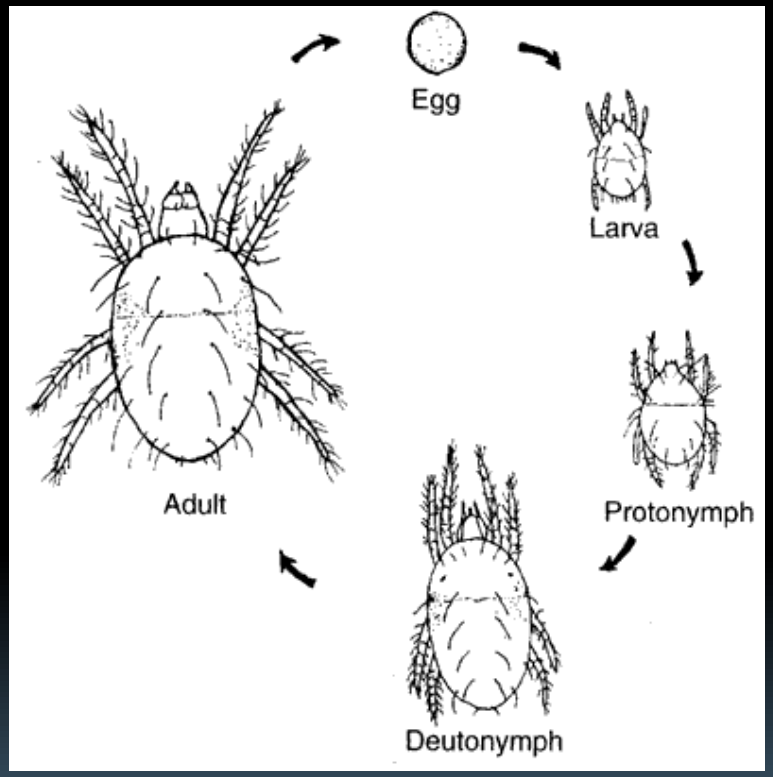
# Phytophagous mites

* Twospotted spider mite (*Tetranychus urticae*)
* Cyclamen mite (*Stenotarsonemus pallidus*)
* Lewis spider mite (*Eotetranychus lewisi*)
* Carmine spider mite (*Tetranychus cinnabarinus*)

# Life cycle



# Twospotted spider mite

- Serious pest in strawberry
- Feeds from underside of leaves on plant juices
- Webbing
- Rarely hibernates (Diapause)
- Large dark blotch on either sides of the abdomen
- Young immature lack blotches
- Polyphagous – weeds
- Dispersal: wind

# TSSM-damage

* Reduced yield – Population build up during critical plant stage (February to March) with no visible symptoms

* Yellow spots on upper leaves
* Stunting and dropping
* Red-purple leaves
* Distorted leaves – brown and dry
* Day-neutral cultivars are susceptible to mite infestations
* Correlation between inadequate chilling and severe mite infestations

# Lewis spider mite

- Emerging pest in Ventura Co.
- Feeds from underside of leaves on plant juices
- Polyphagous - primarily pest of ornamentals (Poinsettias)
- No hibernation
- Webbing
- Several blotches on either sides of the abdomen
- Dispersal: wind

# Key differences

| Lewis spider mite | Twospotted spider mite |
|---|---|
| 0.36 mm | 0.5 mm |
| Several small spots | Single spot on either side |

# Cyclamen mite

* Sporadic pest of strawberry
* Very small (0.01 inch long)
* Shiny
* Female: Threadlike structure

  Male: Pincerlike
* Males: hold females using their pincerlike hind legs


* Improper leaf expansion – leaves crinkled, stunting
* Fruits appear "seedy"
* Predatory mites – *Typhlodromus bellinus* and *T. reticulatus*

# Mite Management

* Monitoring (**KEY**)
* **Cultural management**
  - – Vigorous plant growth: Irrigation and fertilization
  - -- Adequate chilling before planting
  - -- Enhances biological control
  - -- Release predatory mites
  - -- Dust management
* **Chemical management**
  - -- Selective miticides (based on monitoring)
  - -- Alternate materials to delay resistance build-up
  - -- Avoid use on broad spectrum insecticide early in the season (prevent secondary outbreaks)

# Biological control

* Predatory mites
  -- *Phytoseiulus persimilis*
  -- *Galendromus occidentalis*
  -- *Amblyseius californicus*
  -- *Neoseiulus fallacis*
  -- *Amblyseius andersoni*
* Six-potted thrips
* Minute pirate bug
* Big-eyed bug
* Predatory beetles – *Stethorus picipes* and *Oligota oviformis*
* Damsel bug
* Lace wing, dusty wing

# Predatory mites

* Tear-drop shaped
* Clear to amber colored
* Shiny
* Fast-moving
* Chelicerae/palps wave as they move


# *Phytoseiulus persimilis*

* Effective against twospotted spider mite but not on Lewis spider mite

* Host specific on twospotted spider mite

* Its population crashes as soon as the two spotted spider mite declines

# *Galendromus occidentalis*

* Not naturally abundant in strawberry
* Female: clear to red
* Most dependable predator
* Survive in warmer conditions (120 F)
* Persists in field even when spider mites are lower
* Tolerates organophosphate and carbamate insecticides
* Tolerates dry conditions

# *Amblyseius californicus*

* Common in strawberry
* Reproduce at low spider mite density
* Survive on feeding pollen
* Persists in the field for longer time
* Susceptible to pesticides

# Strategies for using predatory mites (PM)

* Early in the season when > 5 mites per leaflet
* PMs are ½ to 2/3 on leaflets then no release is needed
* At least 4 days after miticide appl.
* Conduct bioassays
* Monitoring after releases

# Other predators



# Miticides

| AI | Formulation | Amount | Comments |
|---|---|---|---|
| BIFENAZATE | Acramite 50WS | 0.75–1 lb | It has low toxicity to predatory mites and predatory insects |
| ACEQUINOCYL | Kanemite 15 SC | 21–31 fl oz | |
| SPIROMESIFEN | Oberon 2SC | 12–16 fl oz | |
| ETOXAZOLEH | Zeal 50DF | 2-3 oz | Effective against both twospotted and carmine spider mites but not against cyclamen mite |
| HEXYTHIAZOX | Savey | 6 oz | |
| ABAMECTIN | Agri-mek 0.15EC | 16 fl oz | |
| DICOFOL | DICOFOL 4E | 2 pt | Toxic to predaceous mites but relatively nontoxic to general predators and parasites |

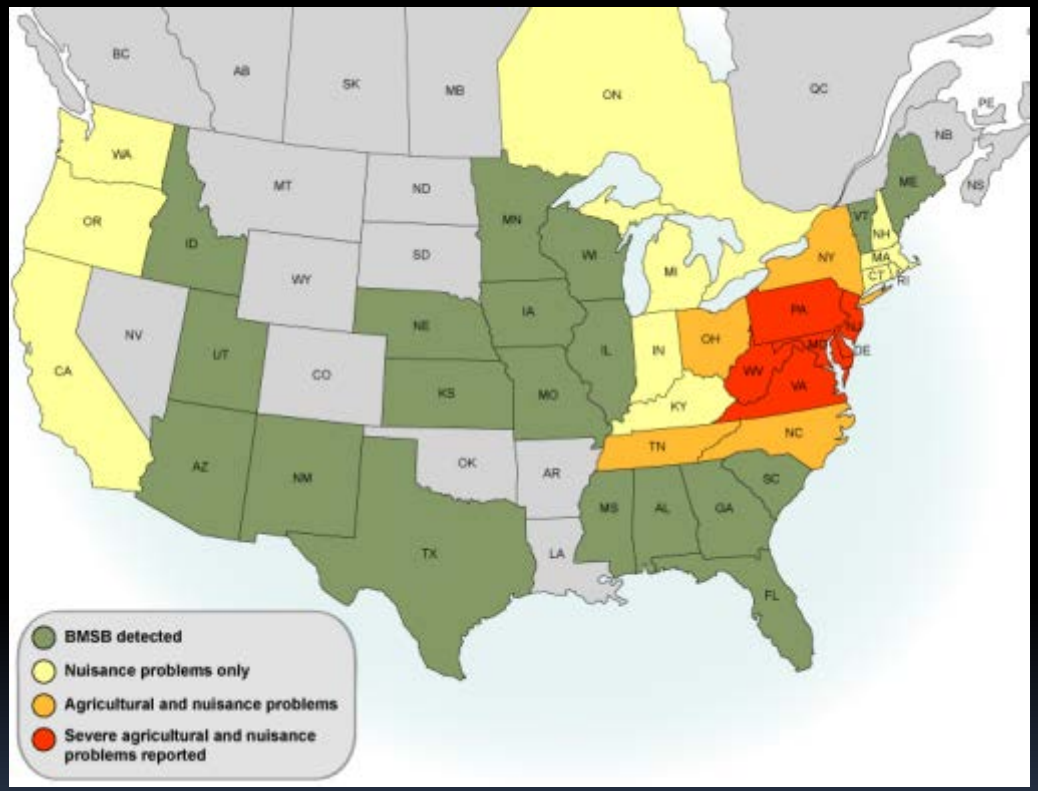

Spider Mites
Egg
Juvenile
© 1999 Nature's Control
Spider Mite Predators

# Brown marmorated stink bug

# In the U.S.

- BMSB is an invasive species, native to China, Japan, Korea, and Taiwan
- First identified in the U.S. in 2001
- Now detected in 41 states and District of Columbia

- Nuisance in 10 others
- Serious agricultural pest in the mid-Atlantic region




(Hoebeke & Carter, 2003)

# Life history



- 5 nymphal stages
- 1-2 generations per year
- ca. 100 host plants

  -fruits, vegetables, legumes, and ornamentals

# Brown marmorated stink bug eggs

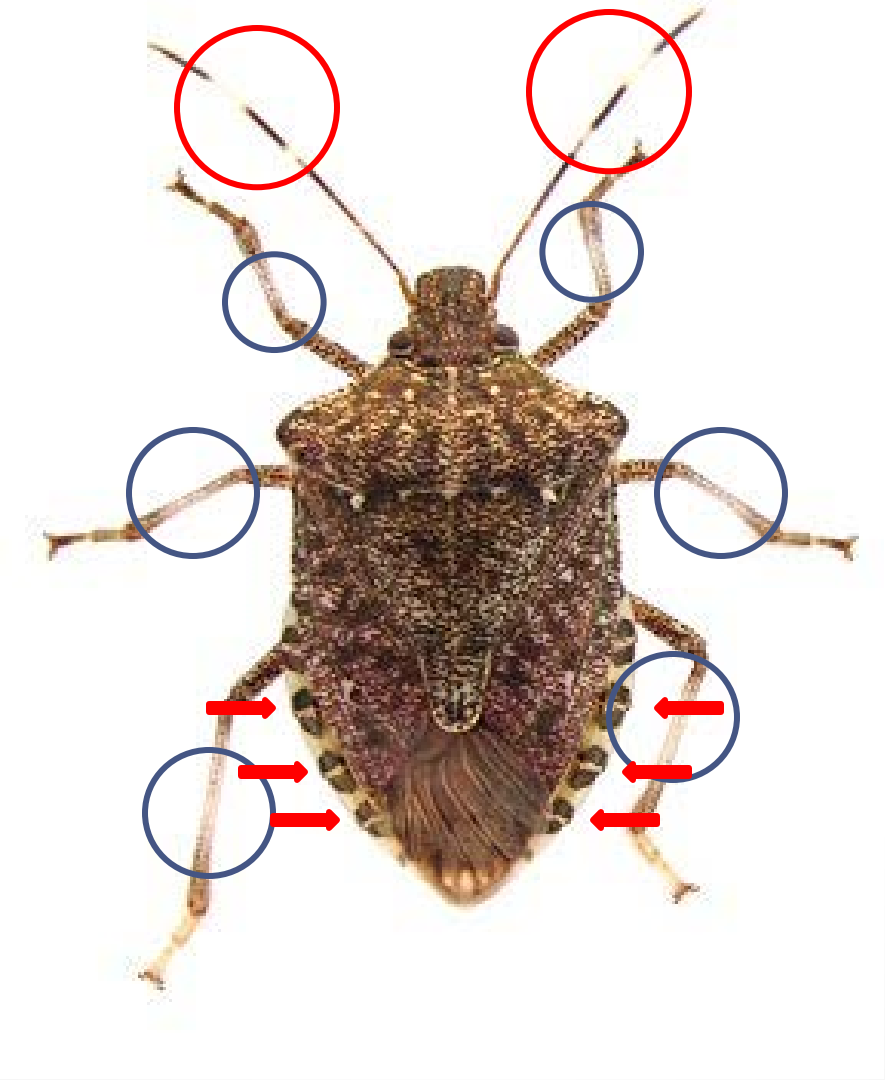


UGA1113011


© Wil Hershberger

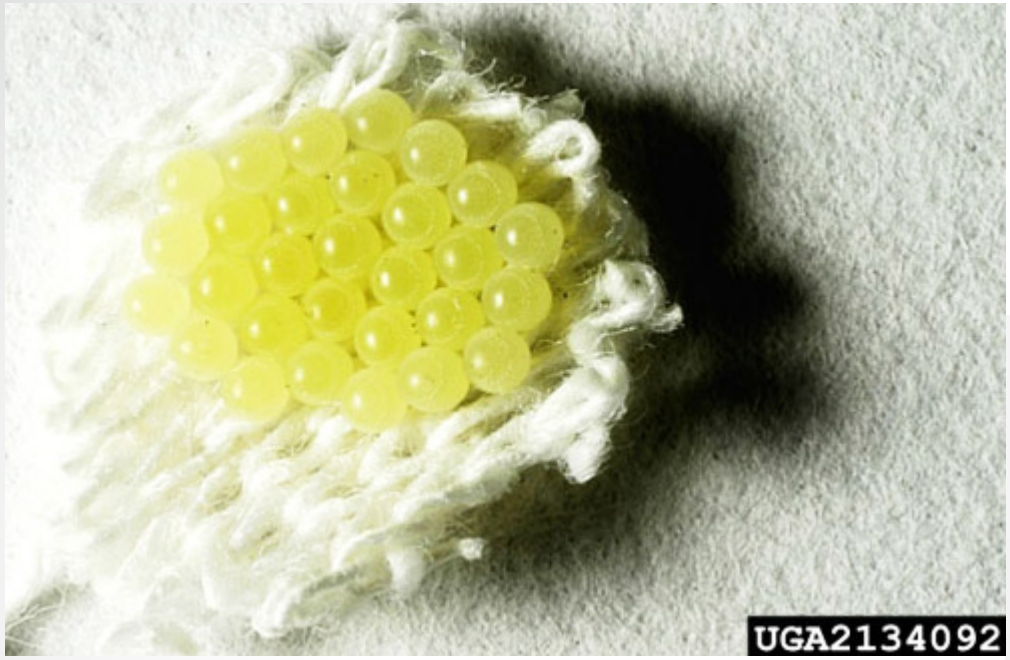
# Nymphs

# Diagnostic features



# Consperse stink bug


# Brown stink bug




Brown stink bug

Brown marmorated stink bug

Consperse stink bug

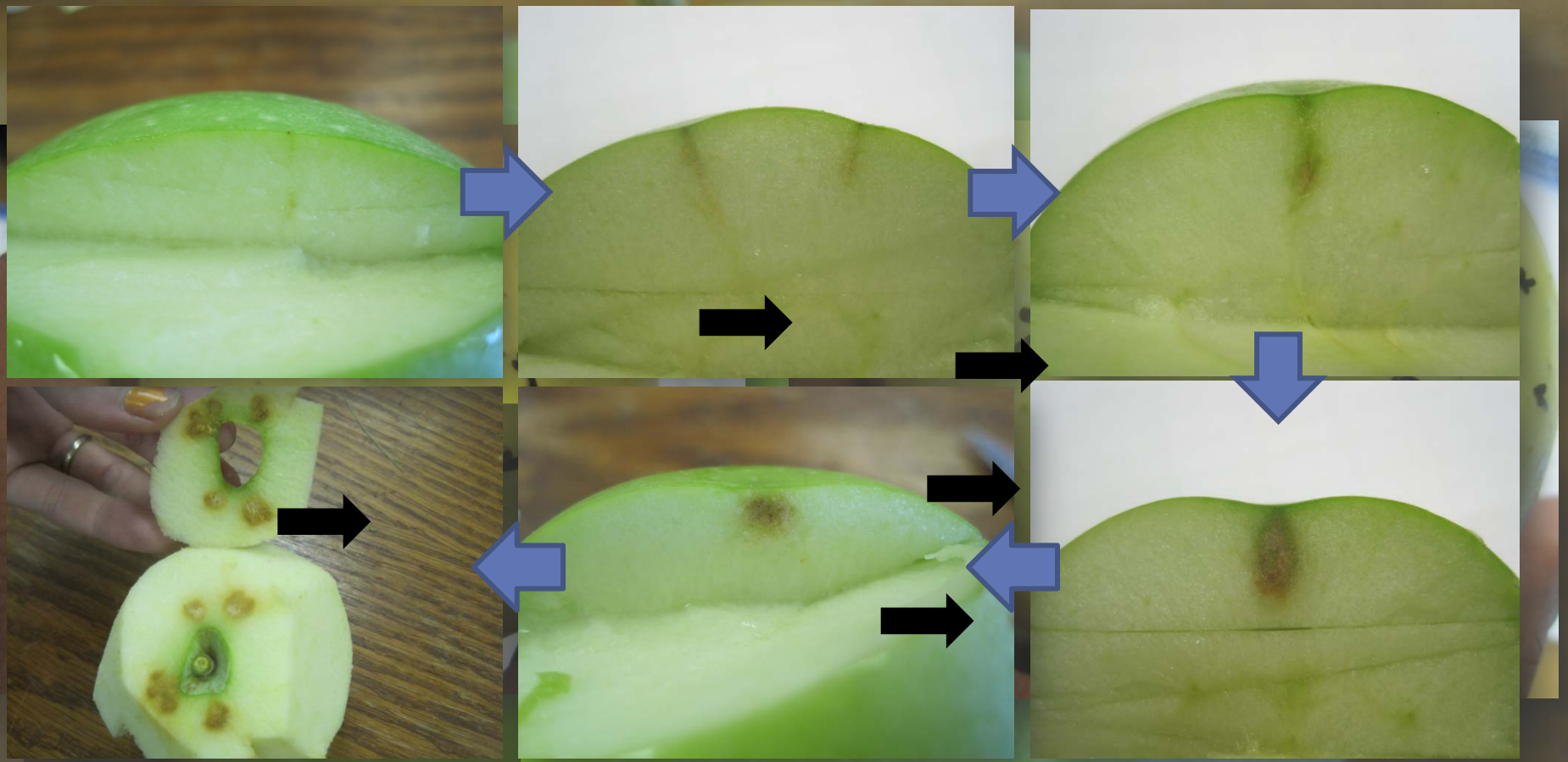
# BMSB damage

- Crop damage from feeding
  - Piercing- sucking mouthparts
    - Physical damage
    - Enzymatic / toxicity damage
    - Secondary infection
  - Vegetative plant structures
    - Stems, leaves, petioles, rachis
  - Reproductive plant structures
    - Fruits, vegetables
    - Seeds, pods & nuts

# BMSB damage – Tree fruits

- Corking damage to apples and peaches
- Most damage is below the surface, damaged tissues from saliva
- Damage worsens in storage
- Increased potential for decay from pathogens

# Feeding injury on apple



# Feeding injury on peach


# BMSB damage – Small fruits

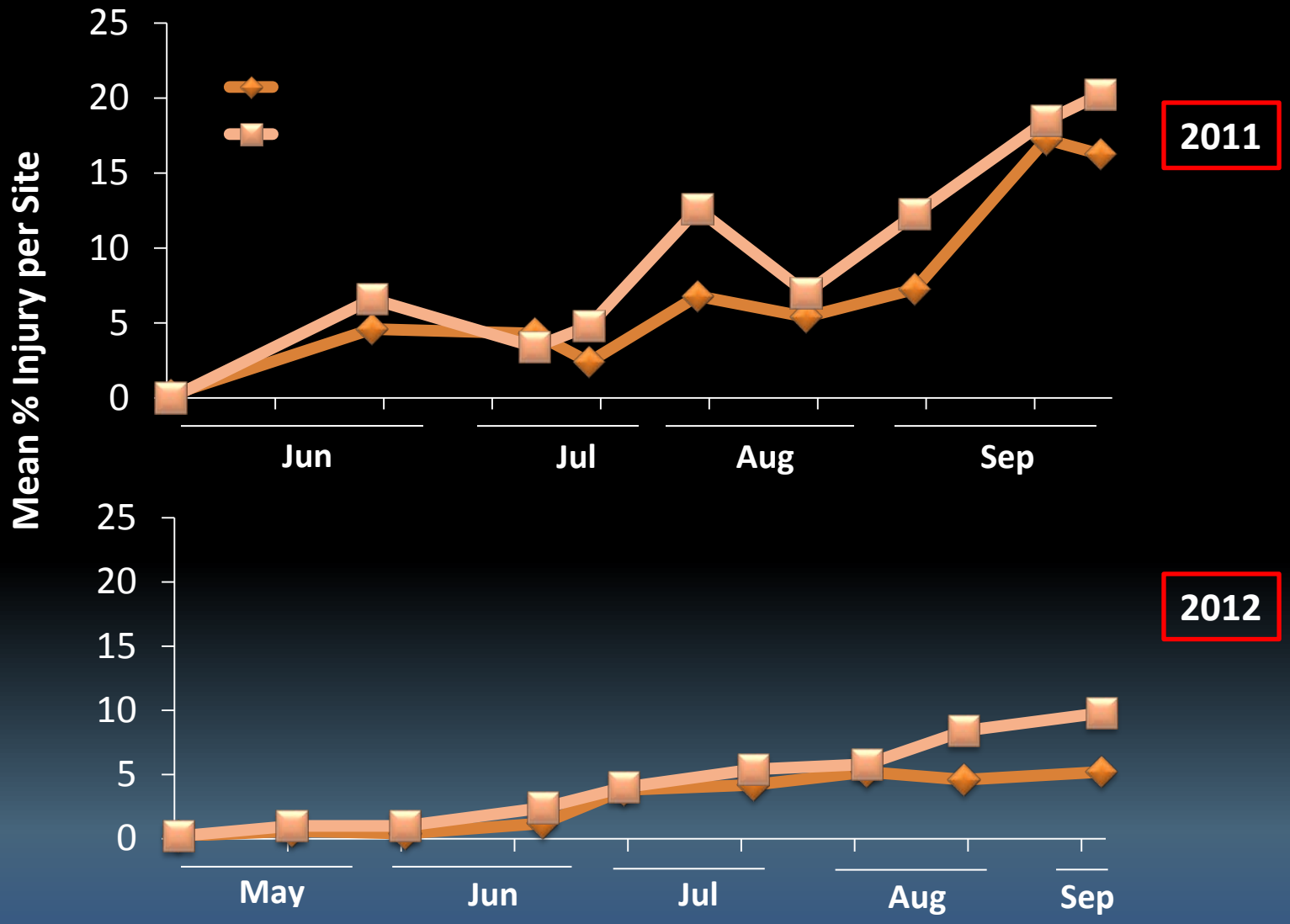
- Discoloration
- Necrotic/dead tissues
- Possible vector for plant disease or decay yeasts

# BMSB damage – Small fruits

- In raspberries, first detected in 2012 in VA
- In 2013, displaced brown stink bug
- Both adult and nymphs feed the ripe or ripening berries
- Only adults were collected
- No egg mass was found on raspberries
- Abundant from July to September

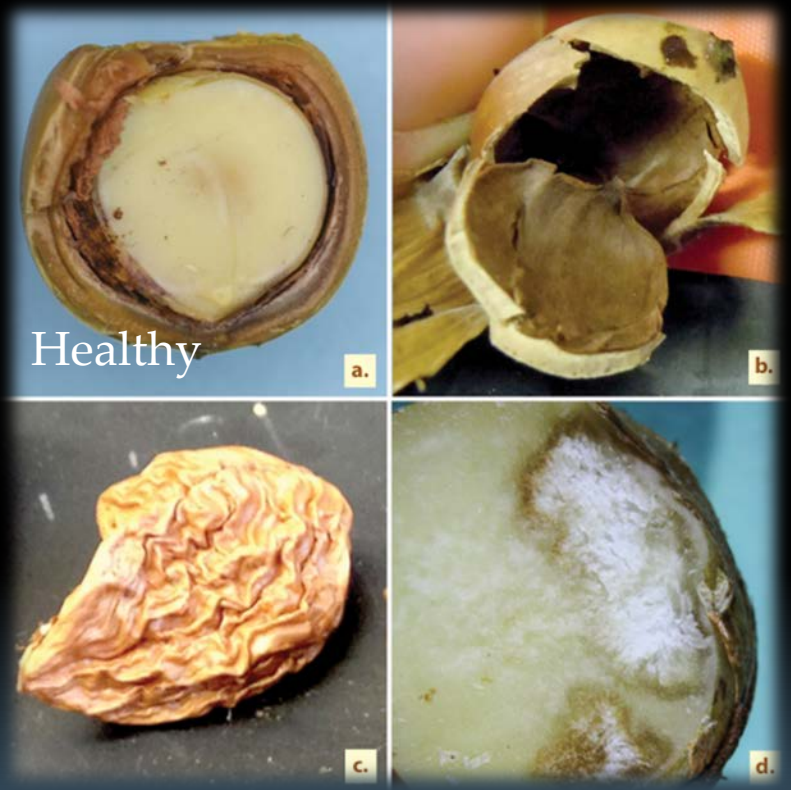
Basnet et al. 2014

# Percentage BMSB injury on apple fruits



# BMSB damage – Tree nut

- Feeding through shell
  - a) Blank nuts
    - early feeding
  - b) Shriveled nuts
    - mid-development
  - c) Corking damage
    - mature nuts



BMSB damage to hazelnut, courtesy C. Hedstrom

# BMSB damage – field crops

- Sweet corn is a high-preference crop
- Up to 100% of ears with injury, Beltsville MA 2011

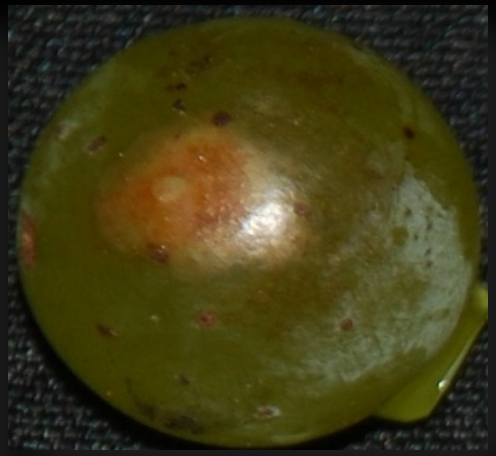


Photo: Sanjay Basnet, VA Tech

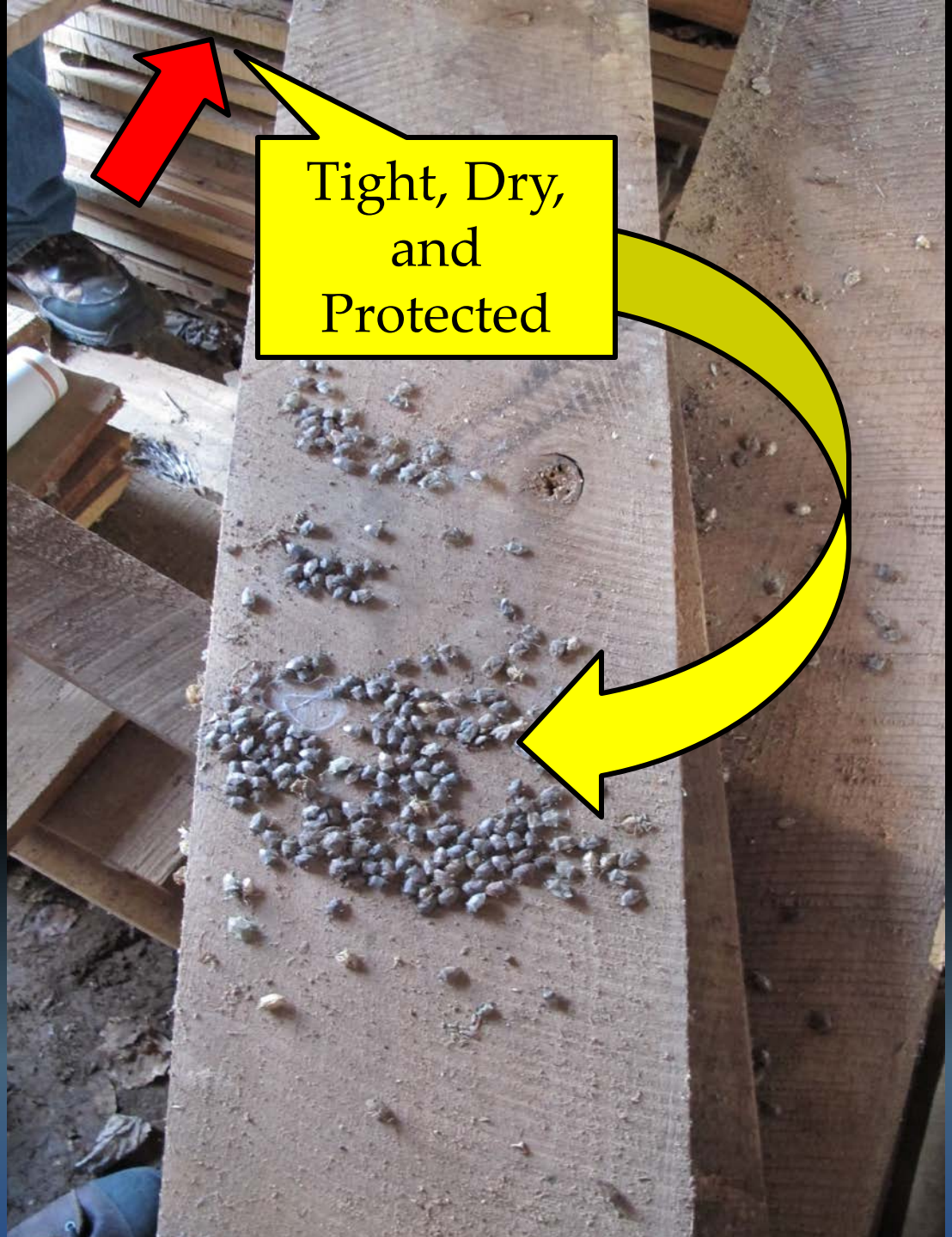
Photo: Kathy Kamminga, VA Tech

Photo: Kathy Kamminga, VA Tech

# Overwintering adults

The formation of aggregations during diapause is a remarkable habit exhibited by many heteropterans. *H. halys* adults also form aggregations when overwintering. This is often troublesome for homeowners because large numbers of bugs enter into buildings and form aggregations within them (Watanabe et al., 1994b). Consequently, this behav-


3 Oct. 2012

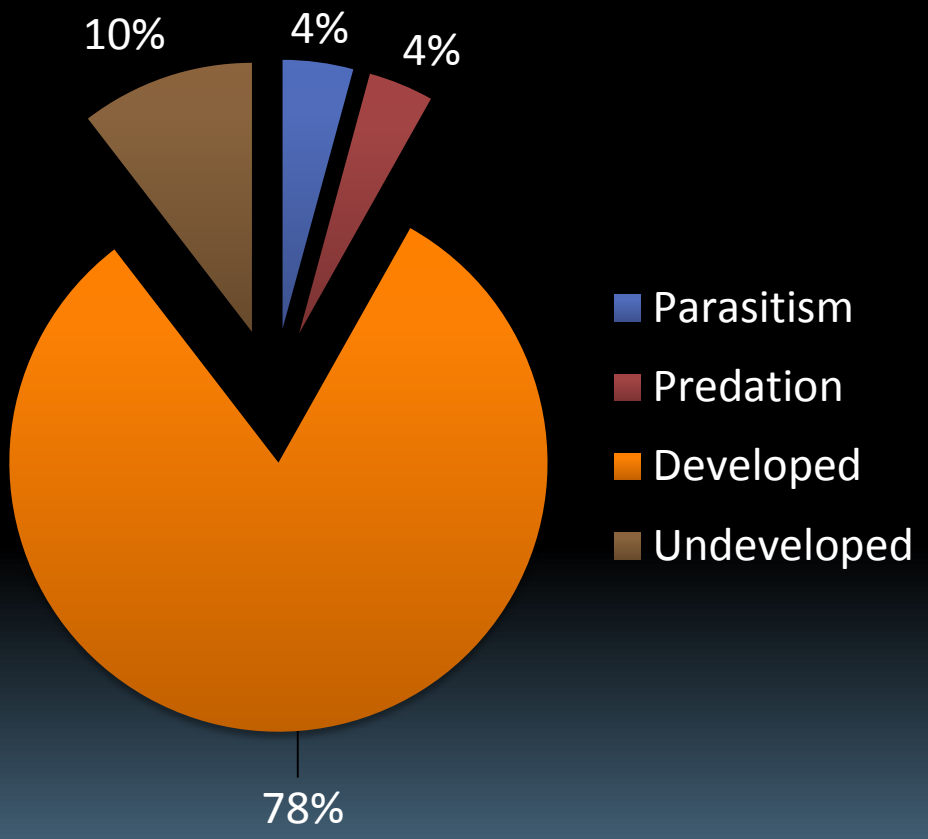

Tight, Dry,
and
Protected

# Monitoring BMSB

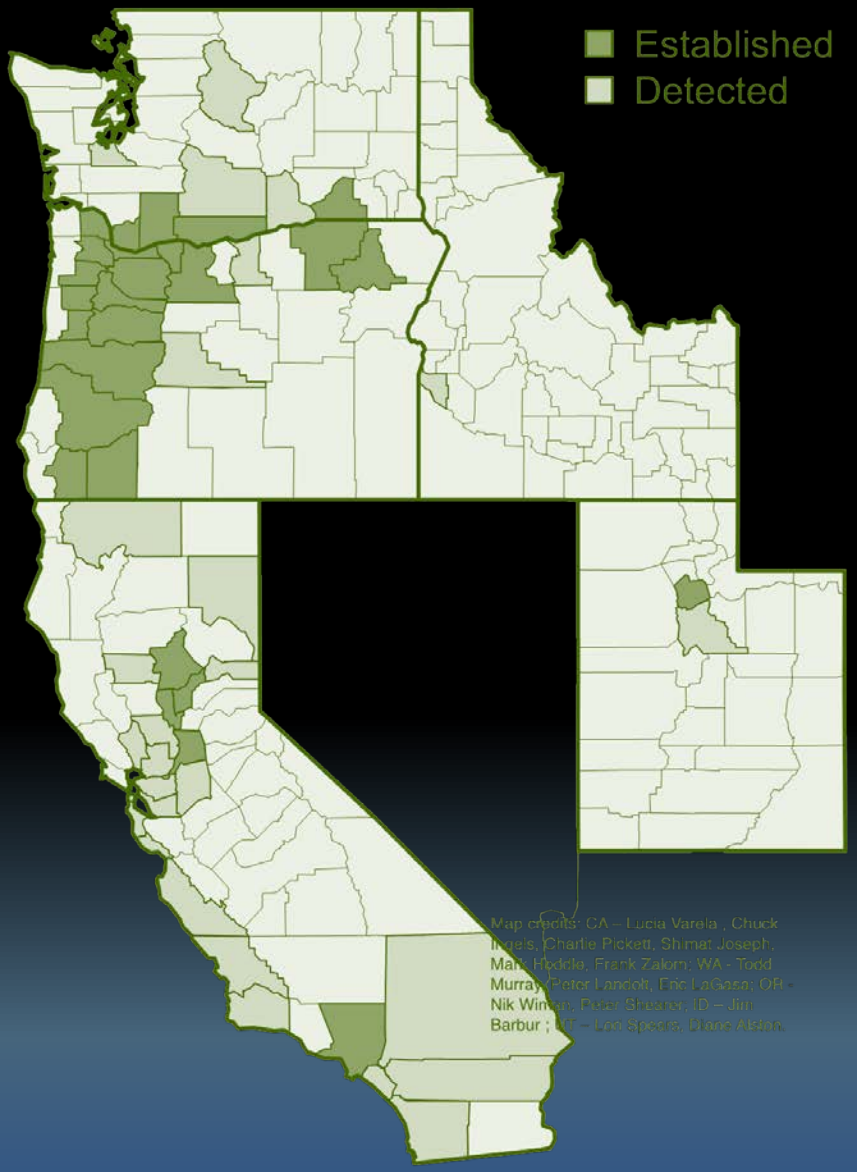
Using pheromone lure

# Natural enemies

- >50% Egg parasitism in China
- In US, insufficient levels to inhibit population growth (~ 4%)



# Current distribution




- Increasing range and populations in the western U.S.
  - Coastal
  - Inland
  - Intermountain
- New environment types
  - Dry, irrigated crop production
  - New crops

# Questions?