Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

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What IS that Smell??!!

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Stink Bugs in Field and Vegetable Crops

- Cool-season vegetable crops
  - Bagrada bug
- Rice
  - Redshouldered stink bug
  - Brown marmorated stink bug (BMSB)
- Cotton
  - Brown stink bug
- Other

invasive species
native species

Stink Bugs in Field and Vegetable Crops

invasive species

- 6 new species establish in CA annually
- cost of $3 billion annually
- with insects very difficult to predict which species will appear and which will establish
- BMSB – predicted
- Bagrada bug – not really

native species

- changing conditions

Stink Bugs

Why so many problems?

- most are difficult to kill with insecticides
- using more selective products
- not exposed to insecticides due to habits
- most have wide host range
- more riparian habitats, weedy areas which favor stink bugs
- they move indoors for winter in a diapause state
- crawl into tight spaces – perfect for “hitchhiking”
- global travel

Stink Bugs

Some are beneficial acting as predators

Plant feeding stink bugs are seed feeders

Stink Bugs

Also commonly feed on seedlings

Stink Bugs

- are commonly eaten in Laos
- regarded as delicious due to their extremely strong odor
- sometimes pounded together with spices and a seasoning to prepare cheo - a paste mixed with chilies and herbs.

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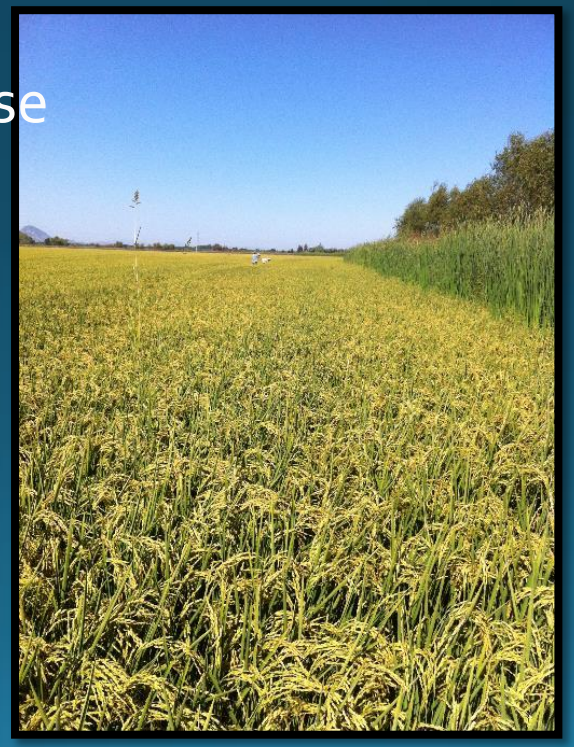
Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Rice
  - reports from one rice production area in Sacramento Valley of some pecky rice
    - low level but consistently seen
    - we searched for insect-related cause



Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Rice
  - reports from one rice production area in Sacramento Valley of some pecky rice
    - found few Redshouldered stink bug
    - one report from Mississippi of this species feeding on rice

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

<u>Redshouldered stink bugs</u>

- pest of tomatoes and other crops
- prefers grasses
- Biology changing?
  - initially was told we could not find them in early Aug. because the second generation was finished
- commonly found them
- studied in rice 2013-14

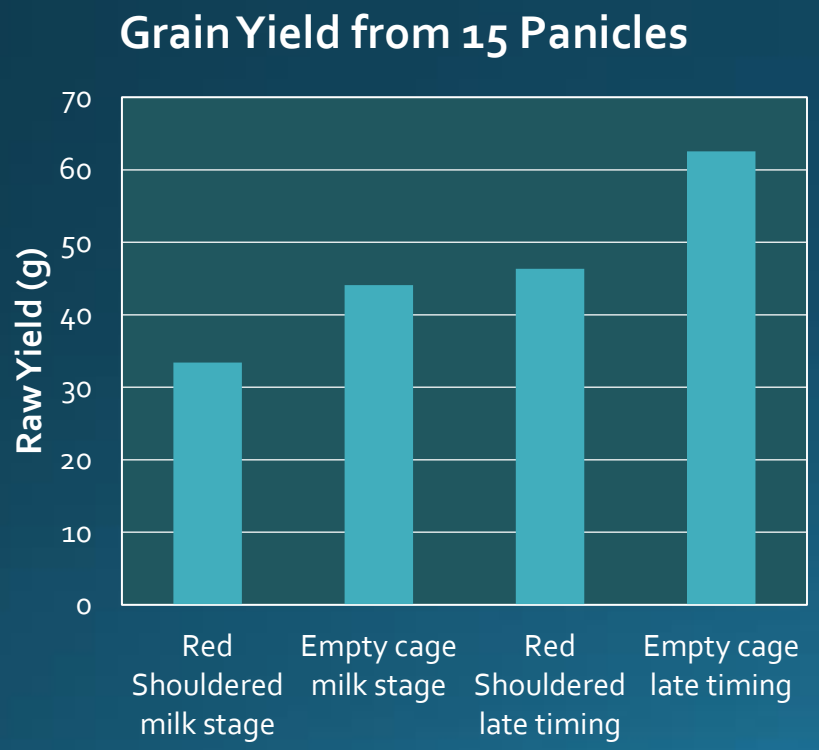
Stink Bugs in Field and Vegetable Crops

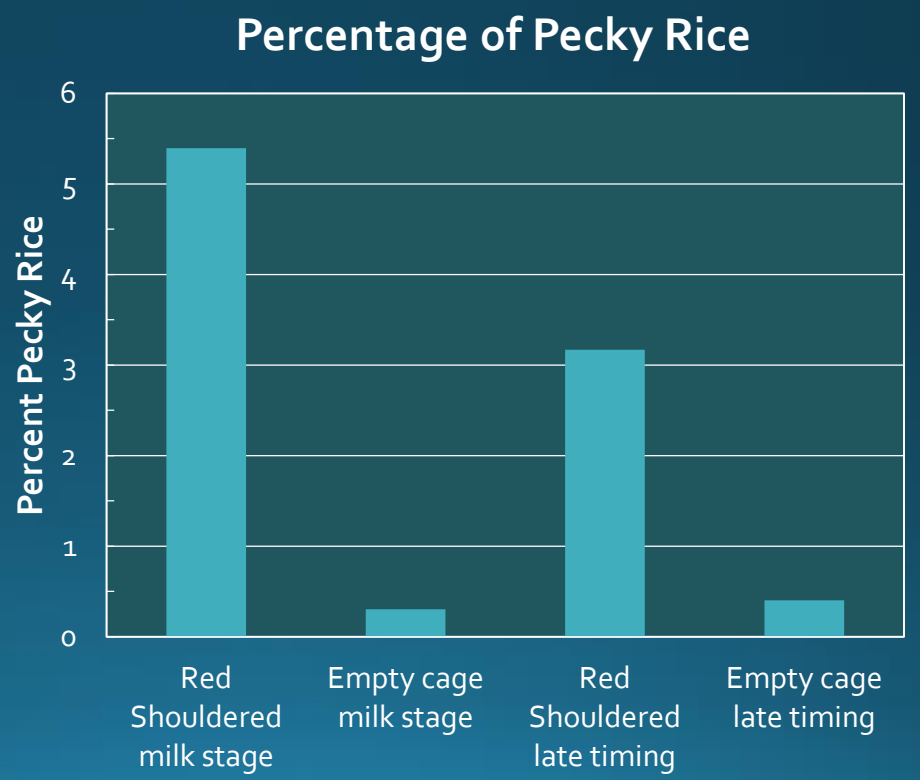
Ongoing Research and Extension Activities

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

redshouldered stink bug panicle study





Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

redshouldered stink bug study

- Surveyed 40 rice fields in Sacramento Valley rice for stink bugs
- Fields with higher stink bug numbers
  - weedy fields (grassy weeds)
  - fields near riparian habitat
  - fields in areas with more crop diversity (row crops)
- nightshade and wild tomatillos
- Johnson grass and sprangletop

	Fields	Positive
Butte	9	4
Colusa	10	4
Glenn	10	1
Sutter	10	3
Yolo	5	3
Yuba	5	0

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native species

Brown Stink Bug

Euschistus servus

42°

38°

36°

33°

Trinity-Klamath Mtn

Sacramento Valley

Central Valley

San Joaquin Valley

Sierra Nevada Mtn

San Francisco

Mojave Desert

Los Angeles

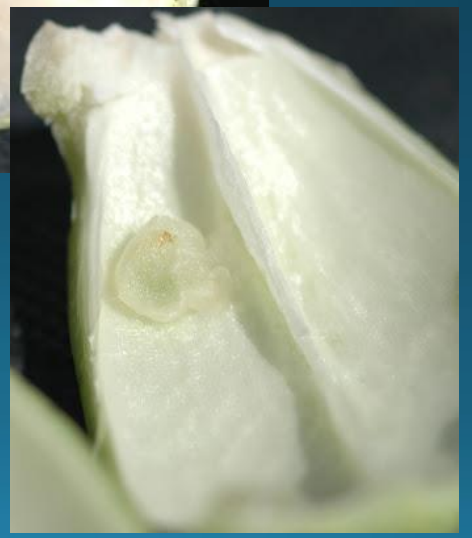
San Diego

Southern Desert Valley

CALIFORNIA REPUBLIC

Cotton Susceptibility to Stink Bugs
Reproductive Structures

Bolls susceptible to stink bug damage for about 25 days past anthesis.
Prefer medium sized bolls, small bolls abscise, larger bolls remain on the plant.



Peter C. Ellsworth,
University of
Arizona

Stink Bugs in Field and Vegetable Crops

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Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug
  - *Bagrada hilaris*
  - first found in June 2008 in Los Angeles Co.
  - establishment of Bagrada bug in California is a new USA and Western Hemisphere record
  - quickly spread across southern California and southern Arizona

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug

images: infonet-biovision.org

Bagrada bug harlequin bug

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug
  - native to East and Southern Africa, Egypt, Zaire and Senegal
  - also found in southern Asia (India) and southern Europe (Malta and Italy)
  - sub-tropical insect

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug
  - causing severe crop, nursery, and landscape losses
  - in agriculture, Bagrada bug is a pest of cole crops and other mustard family plants

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug Hosts
  - is a serious pest of cole crops (cabbage, cauliflower, broccoli, kale, turnip and mustard greens) and cruciferous crops such as radish and arugala
    - one adult can kill a seedling in few days
  - in nurseries - mustard family plants such as alyssum, stock, candytuft, rockcress and wallflower
  - infests weeds such as lambsquarters, purple nutsedge, Euphorbia spp, perennial sowthistle and field bindweed

Stink Bugs in Field and Vegetable Crops

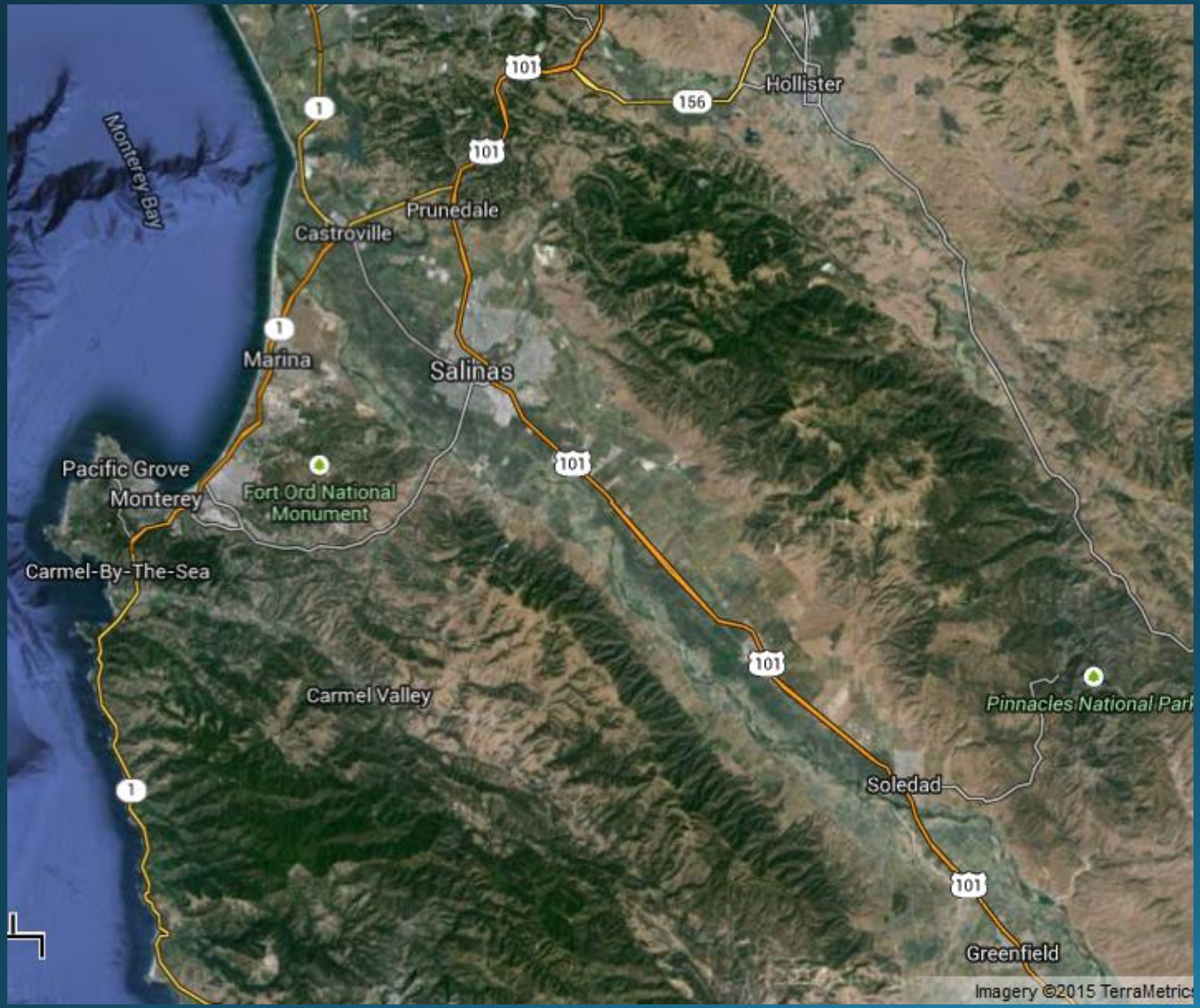
Ongoing Research and Extension Activities

- Bagrada Bug Hosts
  - has also been recorded attacking papaya, potato, maize, sorghum, cotton, corn, and some legumes
  - Bagrada bug may aggregate on many types of plants at times when populations are high and food is scarce -- strawberries
  - southern CA and AZ – cole crops grown in fall to spring
  - where Bagrada bugs are in the summer is not clear

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

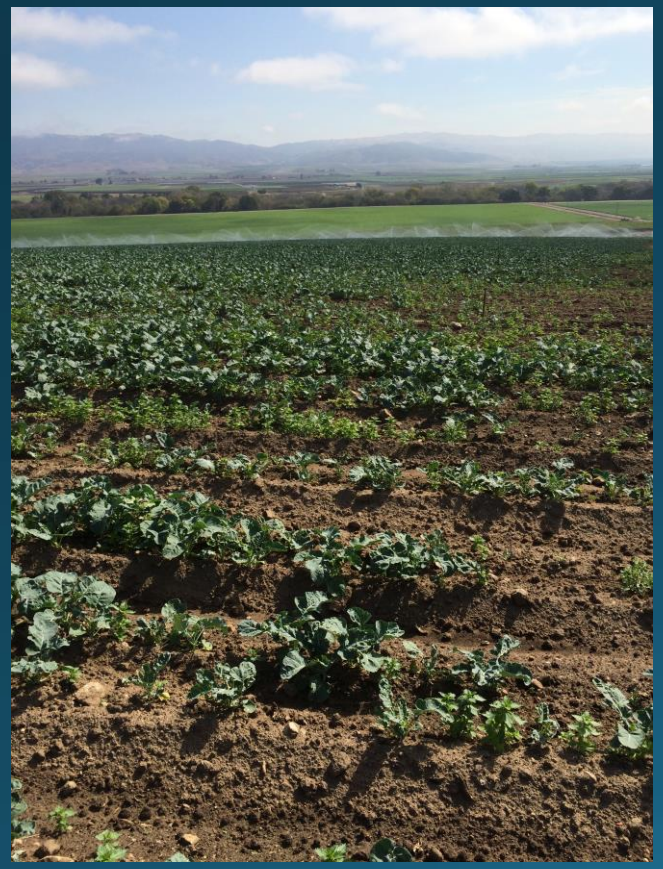
- Bagrada Bug
  - a warm season pest which thrives in the heat
  - optimum average temperatures for Bagrada bug growth range from 86 to 95 °F
  - excellent research has been conducted in desert vegetable system
  - hopeful it would not move up coast
  - but .....

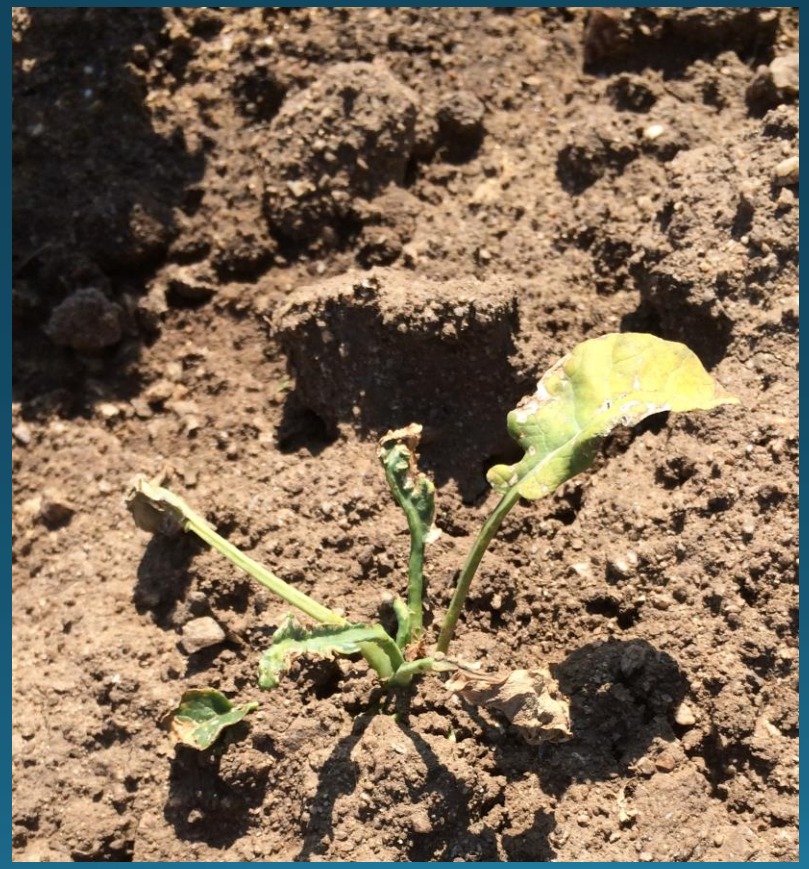

Monterey Bay
101
1
156
Hollister
101
Prunedale
Castroville
1
Marina
Salinas
101
Pacific Grove
Monterey
Fort Ord National Monument
Carmel-By-The-Sea
101
Carmel Valley
Pinnacles National Park
Soledad
1
101
Greenfield
Imagery ©2015 TerraMetrics

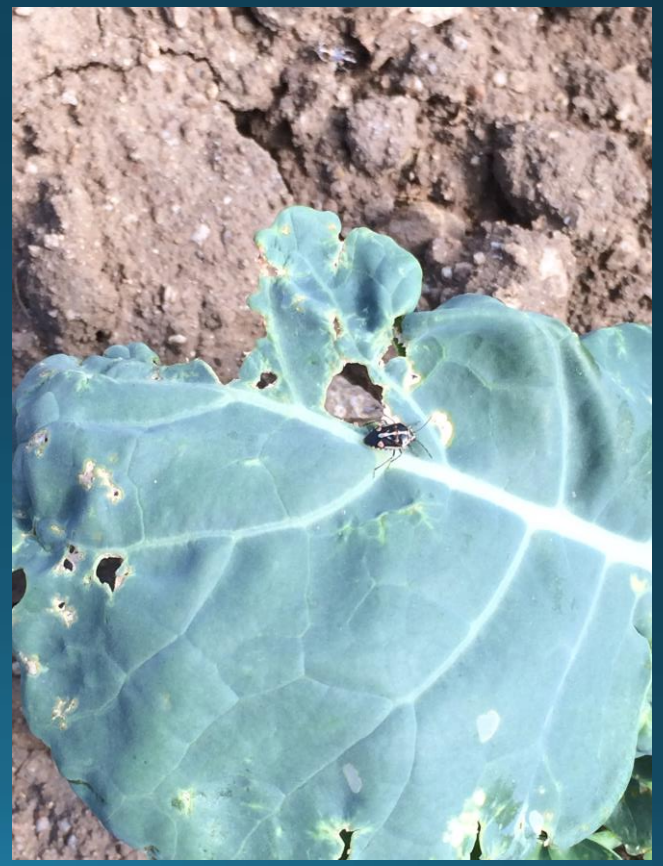
Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug







Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

Objective 1.) Bagrada bug biology in Salinas Valley.

- Investigate the host use pattern of Bagrada bug in the Salinas Valley
- Investigate the number of generations per year of Bagrada bug in Salinas Valley

Objective 2.) Infestation & damage severity of Bagrada bug to broccoli and cauliflower in Salinas Valley.

- Identify windows of vulnerability of broccoli and cauliflower to injury by Bagrada bug throughout the growing period
- Identify yield impacts to broccoli and cauliflower by Bagrada bug

Objective 3.) Design management plans for Bagrada bug on broccoli and cauliflower in the Salinas Valley.

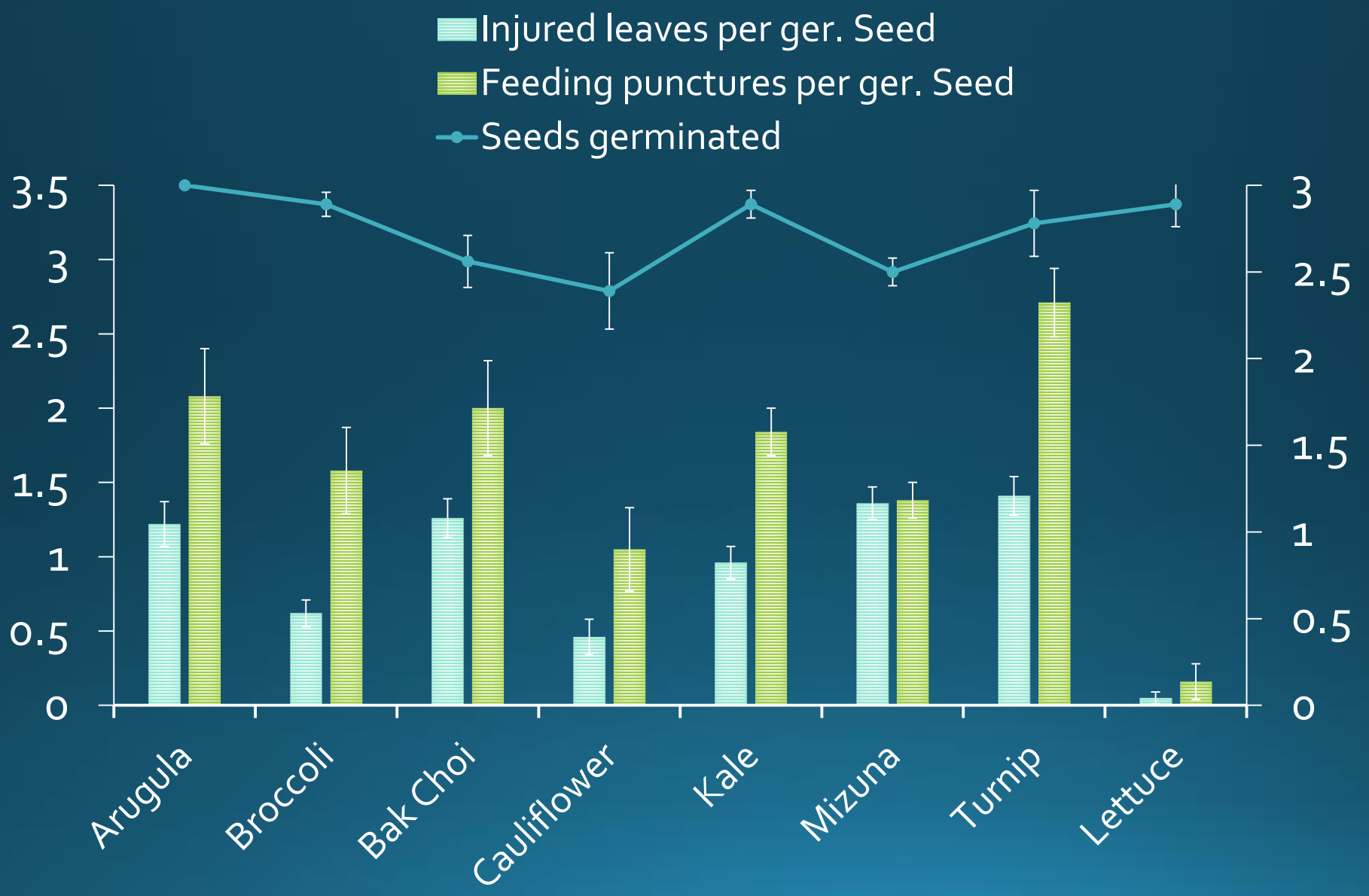
- Relay cropping to reduce the damage from Bagrada bug
- Conventional insecticides for Bagrada bug management
- Biological insecticides for Bagrada bug management

Objective 4.) Extend results.

- Bagrada Bug
- Specialty Crop Grant program
- L. Godfrey, S. Joseph, R. Smith, S. Dara
- started late 2014

Bagrada bug aggregation

Soilless assay: Trial 1, after 7-d



Overall
Bagrada bug preference to germinating seeds

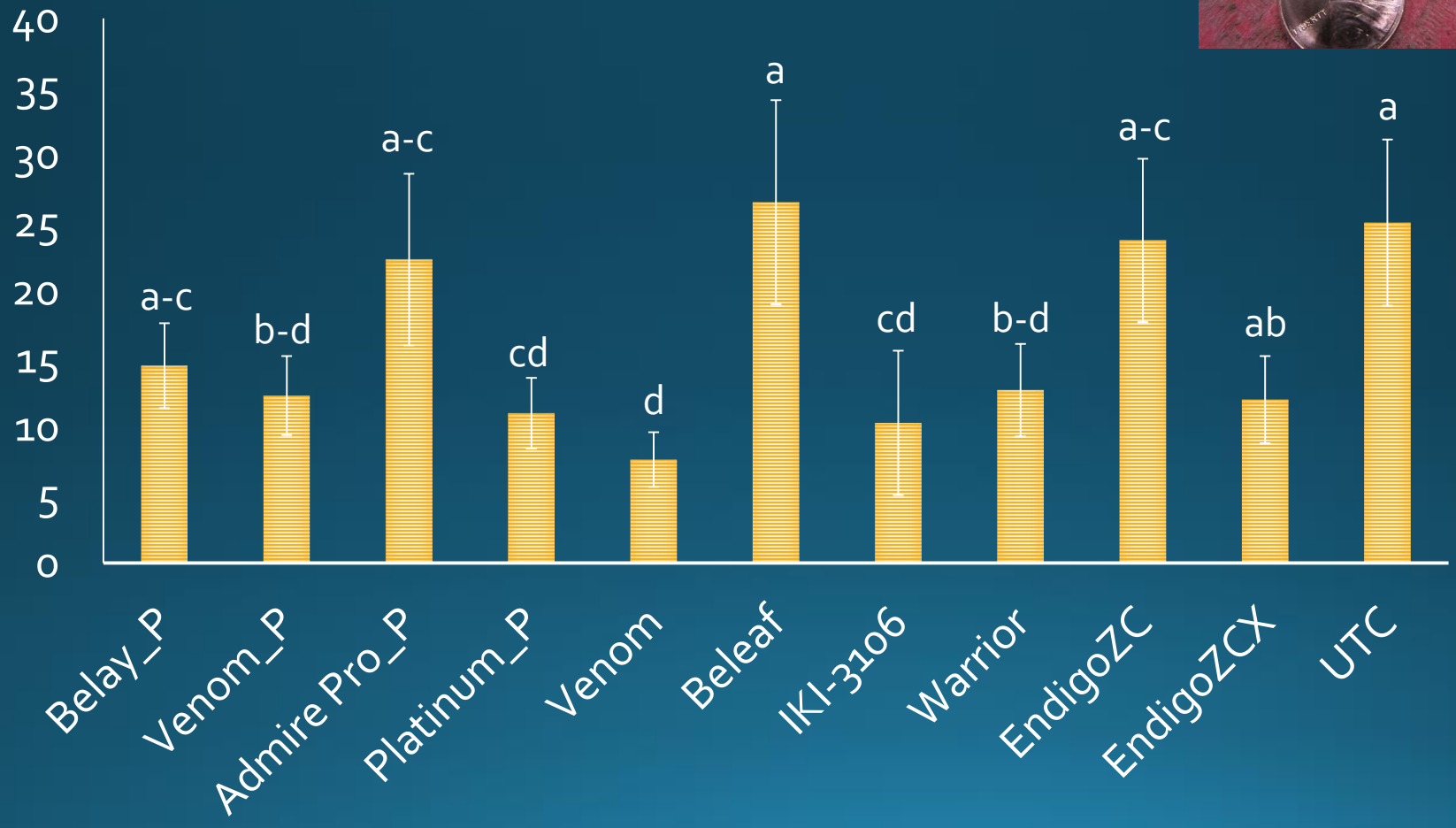
	Preferred	Not preferred
Broccoli		xxx
Cauliflower		xxxx
Turnip	xxxx	
Mizuna	xx	
Bok Choy	xxx	
Arugula	xxxx	
Kale	x	
Lettuce		xxxx
Sweet Alyssum		x

Trial 2: Spray trial

Insecticide	Application timing	No. of applications	Rate per acre
Belay	At plant	1	12 fl oz
Venom	At plant	1	6 oz
Admire pro	At plant	1	10.5 fl oz
Platinum	At plant	1	3.67 oz
Venom	Plt emer	2	4 oz
Beleaf	Plt emer	2	2.85 oz
IKI-3106	Plt emer	2	22 fl oz
Warrior	Plt emer	2	1.92 fl oz
EndigoZC	Plt emer	2	4.5 fl oz
EndigoZCX	Plt emer	2	4.5 fl oz
UTC			

2 WAP: On cotyledon leaves

Mean number of feeding sites per plot



Summary

- Venom (Dinotefuran) is fast acting on bagrada bug
- At plant banded application is effective but delayed efficacy
- Admire Pro and Platinum showed the most delayed efficacy
- In general, pyrethroids and neonicotinoids have a better efficacy on bagrada bug

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug Management
- Cultural control
  - remove weedy mustards
  - trap crops/relay cropping??
- Biological control
  - being researched
- Mechanical
  - Bug-vacs
  - screening for greenhouses

Stink Bugs in Field and Vegetable Crops

Ongoing Research and Extension Activities

- Bagrada Bug Management
- Insecticides
  - somewhat easier to kill with insecticides than other stink bugs
  - Pyrethroids
  - Organophosphates and carbamates
  - Neonicotinoids – foliar and seed treatments
- re-invasion common and quick
- some evidence bugs drop off leaves to avoid insecticides
- organic control – very limited

Stink Bugs in Field and Vegetable Crops

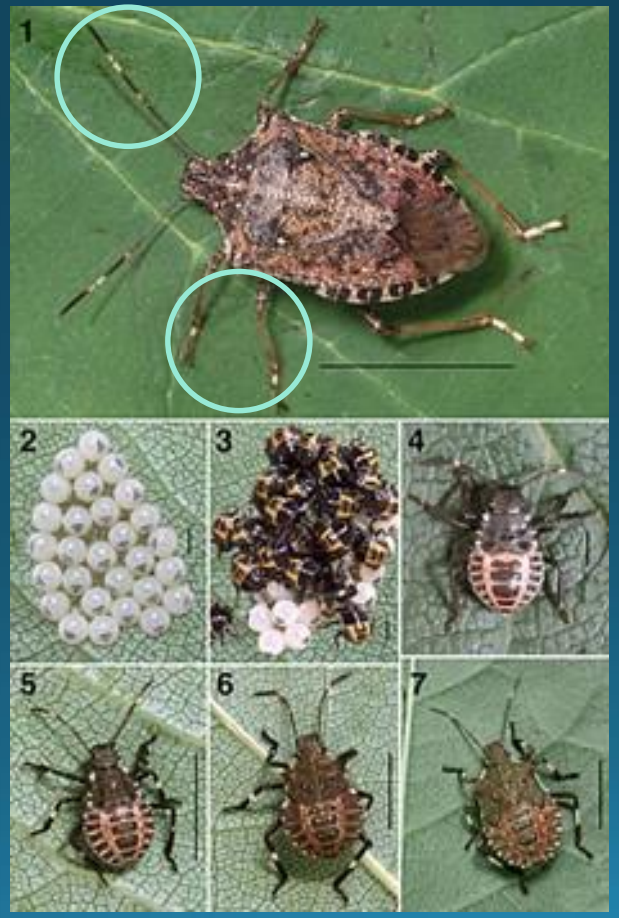
Ongoing Research and Extension Activities

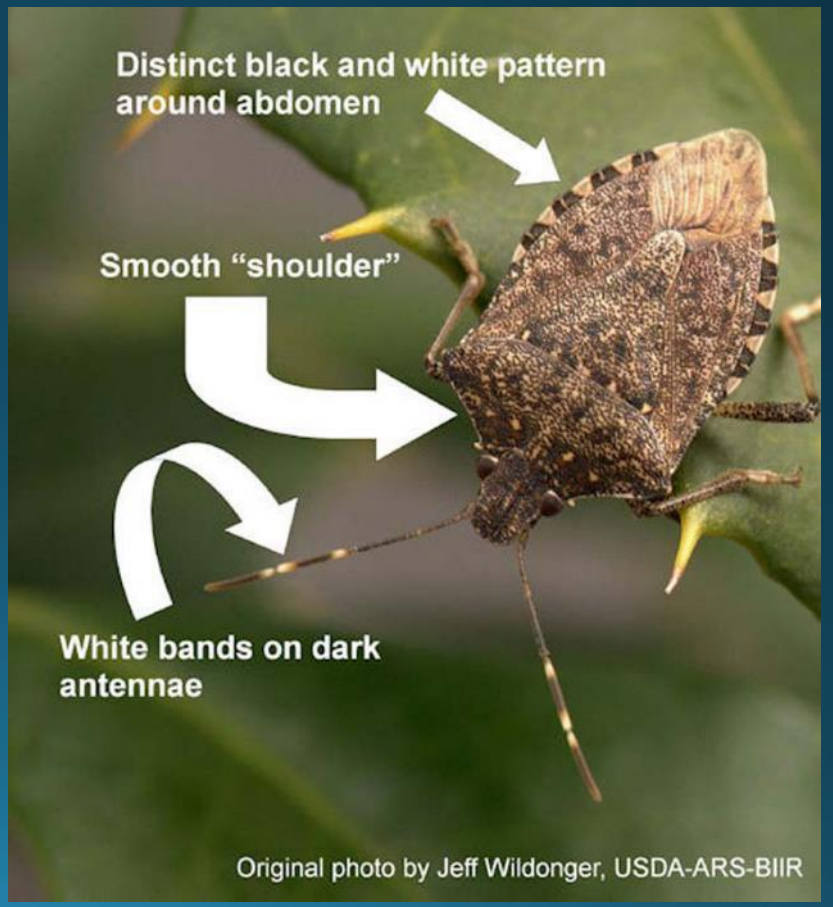
- Bagrada Bug Management
- drop to soil if disturbed
- will be become active until 75-80 °F
- infestations are very localized

Stink Bugs in Field and Vegetable Crops

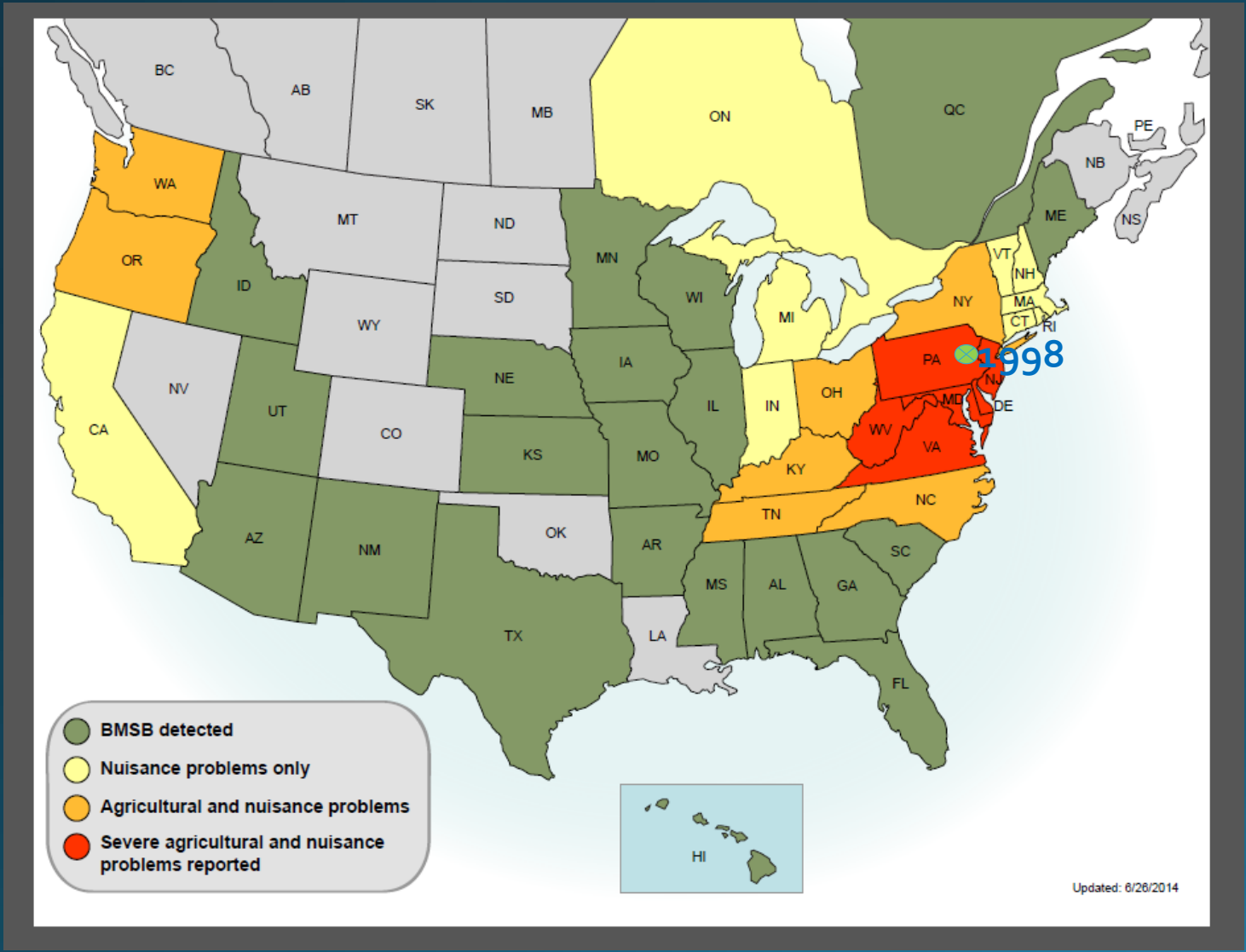
Ongoing Research and Extension Activities

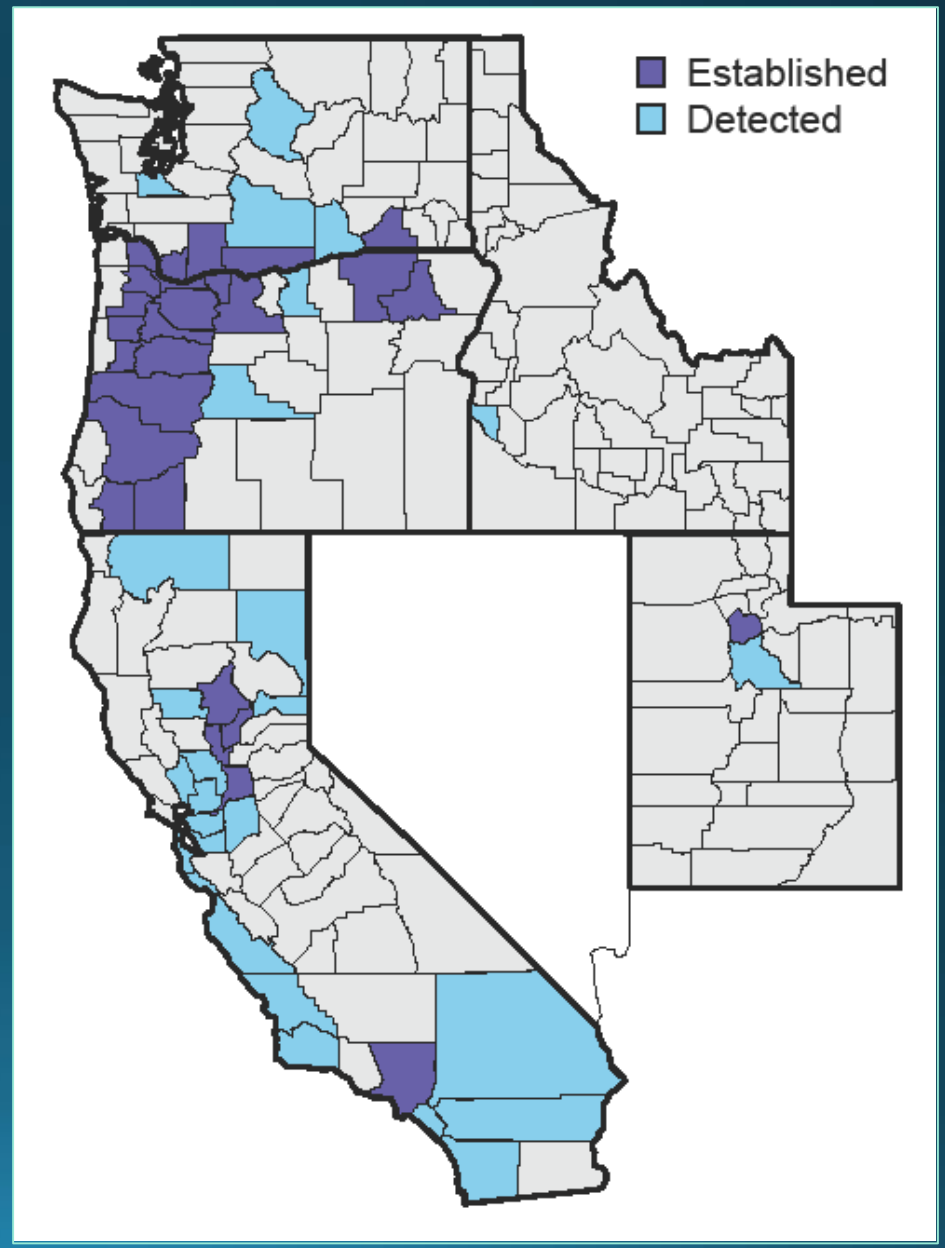
- Brown marmorated stink bug (BMSB)
- had to do work in Contained Research Facility
- colony of BMSB in quarantine





Brown Marmorated Stink Bug





Brown Marmorated Stink Bug

- fall BMSB adults aggregate in large numbers on the sides of buildings or on trees
- move to protected places and overwinter as adults in a state of facultative diapause (resting stage)
- adults become active in the spring; and after feeding for about 2 weeks, they mate
- females begin to lay eggs in clusters of 20 to 28 with a range of 212 to 486 per lifetime
- mid-Atlantic states, there are one or two generations per year
- number in California is unknown

Brown Marmorated Stink Bug

Damage

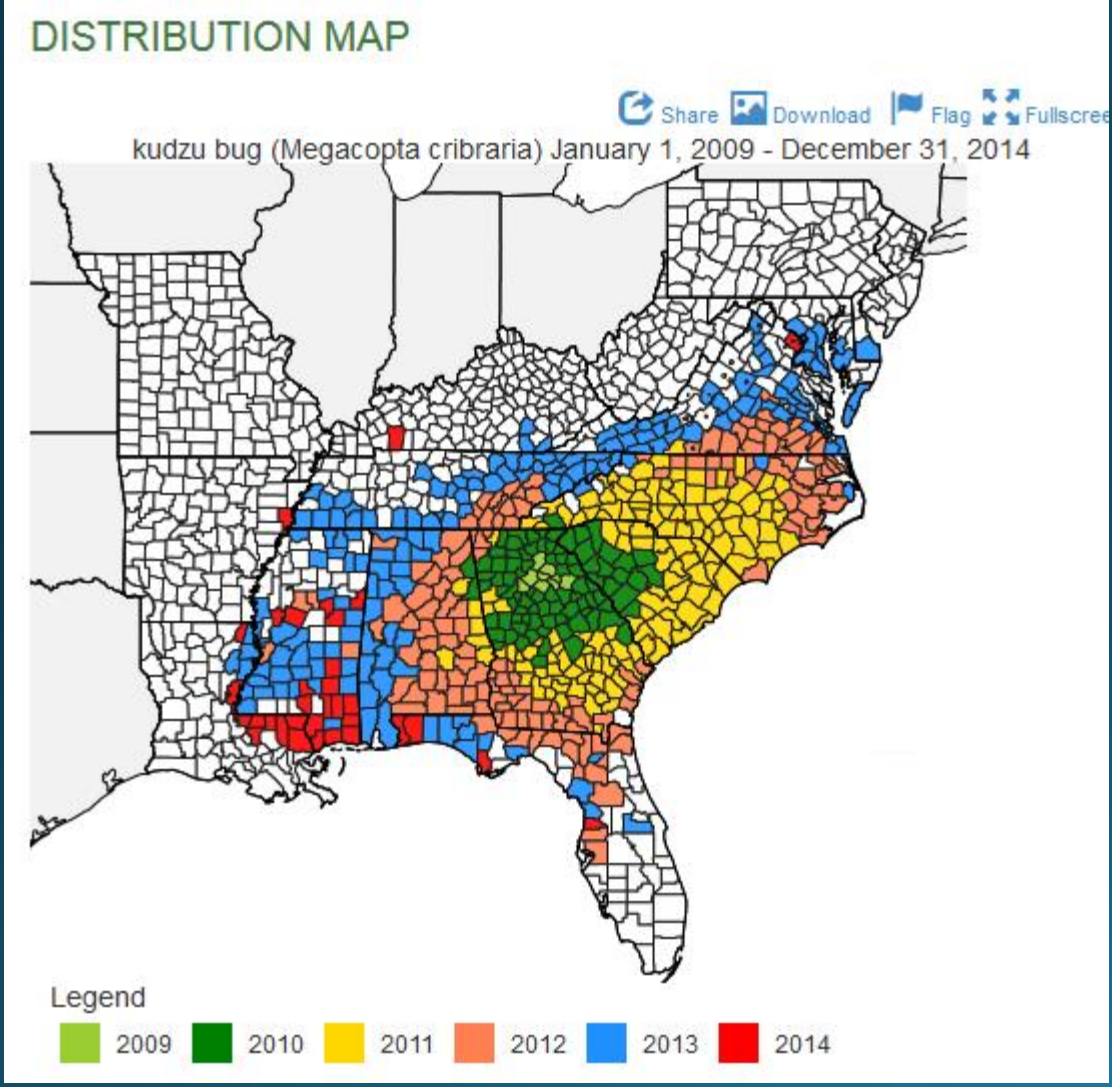
- feed on over 100 host plants, including tree fruit, vegetables, shade trees, and leguminous crops.
- in the mid-Atlantic, the crops most affected are apple, pear, peach, nectarine, lima bean, snap pea, pepper, sweet corn, tomato, field corn, and soybean
- other identified crop hosts include raspberry, blueberry, cotton, grape, hazelnut, pecan, cucumber, and pole and bush bean.
- mid-Atlantic states in 2010 - a major outbreak that resulted in damages to fruit, vegetable, field and ornamental crops that exceeded $100 million

Kudzu Bug

Kudzu Bug

- not a stink bug but a close relative – a Plataspidae
- called a bean plataspid
- pest of soybeans in the SE U.S.
- aggregate on houses in the spring and fall

Kudzu Bug


DISTRIBUTION MAP
Share
Download
Flag
kudzu bug (Megacopta cribraria) January 1, 2009 - December 31, 2014
Legend
2009
2010
2011
2012
2013
2014

Stink Bugs

Why so many?

- most are difficult to kill with insecticides
- using more selective products
- not exposed to insecticides
- most wide host range
- more riparian habitats, weedy areas
- move indoors for winter
- crawl into tight spaces – perfect for “hitchhiking”
- global travel