Update on glassy-winged sharpshooter & other invasive vineyard pests

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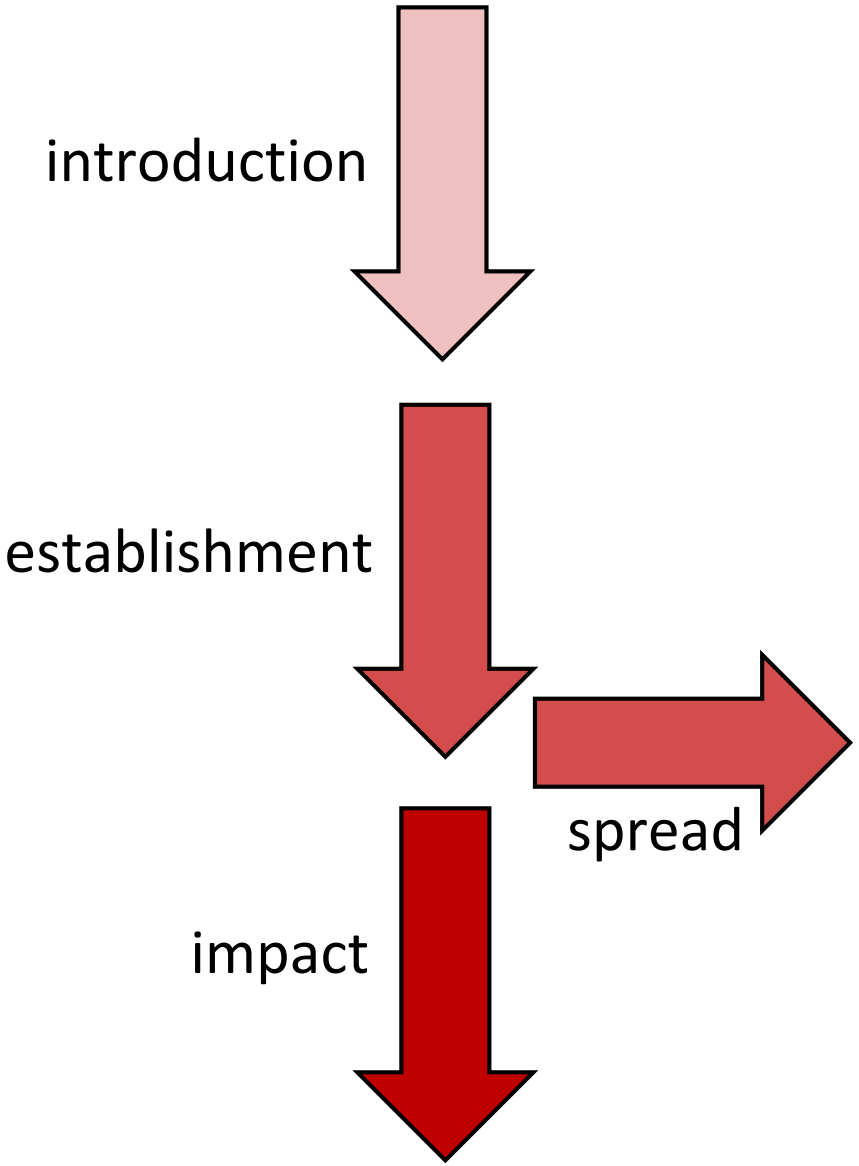
Stages of biological invasions



In California, 8 to 10 exotics introduced each year

~20% become invasive

Multiple stages (hurdles) to biological invasions

Human activities often contribute to invader success

Early detection often improves outcomes

Light brown apple moth

European Grapevine Moth

- other vineyard moth pests

Brown marmorated stink bug

Glassy-winged sharpshooter

Vine mealybug

STATE EXTERIOR QUARANTINES

3250 Citrus Pests (Updated 01-30-15) HTML- PDF
3251 Chestnut Bark and Oak Wilt Diseases (Updated 01-04-12) HTML- PDF
3252 Caribbean Fruit Fly (Updated 08-22-16) HTML- PDF
3254 Cotton Pest (Updated 04-21-04) HTML- PDF
3256 Cherry Fruit Fly (Updated 11-07-08) HTML- PDF
3257 Sweet Potato Weevil (Updated 07-09-08) HTML- PDF
3259 Peach Tree Diseases (Updated 04-26-83) HTML- PDF
3260 Nut Tree Pests (Updated 11-03-89) HTML- PDF
3261 Ozonium Root Rot (Updated 03-09-89) HTML- PDF
3262 Peach Mosaic Disease (Updated 07-10-15) HTML- PDF
3263 European Corn Borer (Updated 02-10-15) HTML- PDF
3264 Colorado Potato Beetle (Updated 09-22-06) HTML- PDF
3265 Persimmon Root Borer (Updated 02-15-91) HTML- PDF
3266 Plum Curculio and Blueberry Maggot (Updated 05-05-11) HTML- PDF
3271 Burrowing and Reniform Nematodes (Updated 04-15-15) HTML- PDF
3272 Cornstalk and Sugarcane Borers (Updated 10-24-13) HTML- PDF
3273 Walnut and Pecan Pests (Updated 08-02-07) HTML- PDF
3274 Cedar-Apple Rust (Updated 12-11-98) HTML- PDF
3275 European Pine Shoot Moth (Updated 09-19-03) HTML- PDF
3276 Peach Rosette Disease (Updated 12-11-98) HTML- PDF
3277 Cereal Leaf Beetle (Repealed 10-01-14)
3280 Japanese Beetle (Updated 09-01-15) HTML- PDF
3281 Hydrilla (Updated 10-28-98) HTML- PDF
3282 Lethal Yellowing of Palm (Updated 04-21-14) HTML- PDF
3286 Tomato Yellow Leaf Curl Virus (Repealed 08-14-11)

STATE INTERIOR QUARANTINES

3400 Peach Mosaic Disease (Updated 07-10-15) HTML- PDF
3401 Ozonium Root Rot (Updated 08-05-98) HTML- PDF
3406 Mediterranean Fruit Fly (Updated 12-22-14) HTML- PDF
3407 Citrus Tristeza Virus (Updated 05-20-14) HTML- PDF - MAP
3408 Gypsy Moth (Update 03-25-11) HTML - PDF
3409 Pink Bollworm (Updated 02-15-84) HTML- PDF
3410 Hydrilla (Updated 02-12-13) HTML- PDF
3414 Cherry Fruit Fly (Updated 12-06-90) HTML-PDF
3417 Mexican Fruit Fly (Updated 07-13-09) HTML- PDF
3419 Date Palm Disease (Updated 03-03-99) HTML- PDF
3423 Oriental Fruit Fly (Updated 12-18-14) HTML- PDF
3428 Chrysanthemum White Rust (Updated 03-03-99) HTML- PDF
3429 Sweet Potato Weevil (Updated 03-03-99) HTML- PDF
3430 Karnal Bunt (Updated 02-23-12) HTML- PDF
3431 Olive Fruit Fly(Updated 08-16-02) HTML- PDF
3432 Red Imported Fire Ant (Updated 08-16-99) HTML- PDF
3425 Melon Fruit Fly (Updated 06-03-11)HTML- PDF
3424 *Bactrocera zonata* (peach fruit fly) (Updated 10-16-06) HTML - PDF
3434 Light Brown Apple Moth (Updated 11-10-15) HTML - PDF
3435 Asian Citrus Psyllid (Updated 10-7-16) HTML - PDF - MAP
3436 *Bactrocera albistrigata* (white striped fruit fly) (Update 02-08-10) HTML - PDF
3437 European Grapevine Moth (*Lobesia botrana*) (Update 08-16-16) HTML – PDF – MAP
3439 Huanglongbing Disease (Update 05-25-16) HTML – PDF - MAP
3441 Guava Fruit Fly (Updated 05-20-15) HTML-PDF- MAP
3442 Malaysian Fruit Fly (Updated 02-04-16) HTML-PDF

STATE MISCELLANEOUS RULINGS

3559 Garlic Production in Mono County (Updated 07-22-98) HTML- PDF

Light Brown Apple Moth (LBAM), *Epiphyas postvittana*

Tortricid leafroller, ¼ inch in length

Native to Australia

Extreme generalist

- 350+ genera, 500+ species of plants
- berries, tree fruits, native trees/shrubs, ornamentals, weeds

First found in CA in 2007

LBAM eradication program established for Bay Area

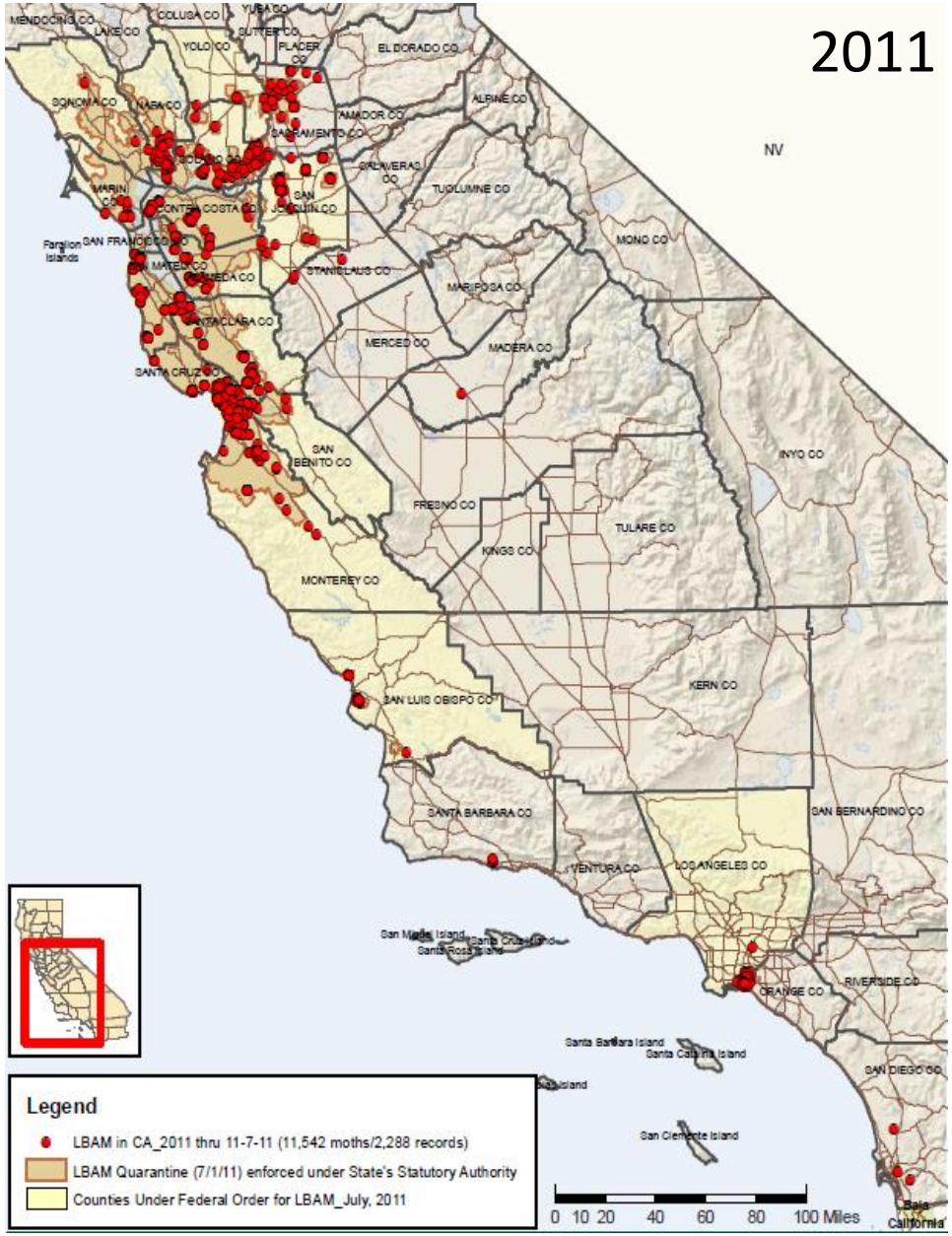
- mating disruption via pheromone sprays

Regulated nursery stock
https://www.cdfa.ca.gov/Plant/lbam/rpts/LBAM_BMP-Rev_3.pdf

- substantial monitoring costs

- increased insecticide use

Regulated movement of bulk green waste



Fairly widespread

Prevalent in cooler, coastal areas, relatively rare inland

Present in natural areas, residential areas

No documentation of major damage?

Limited further spread

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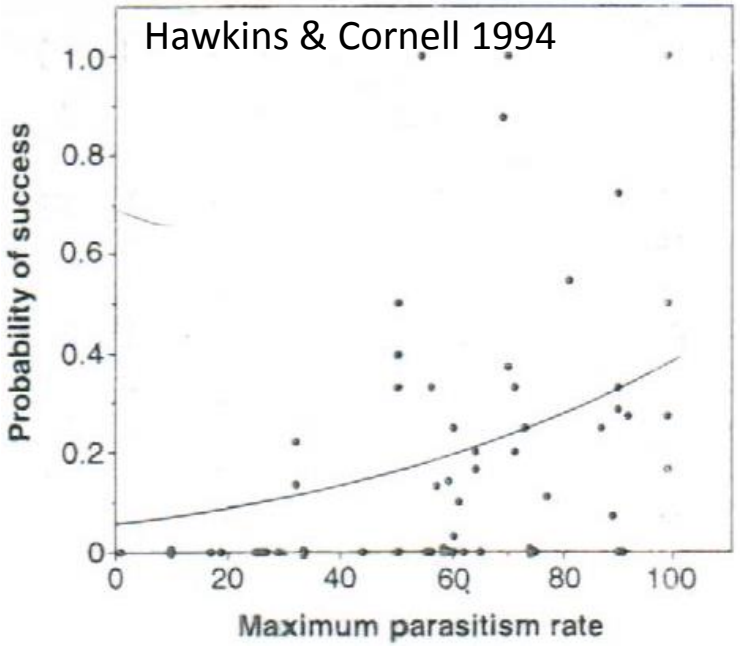
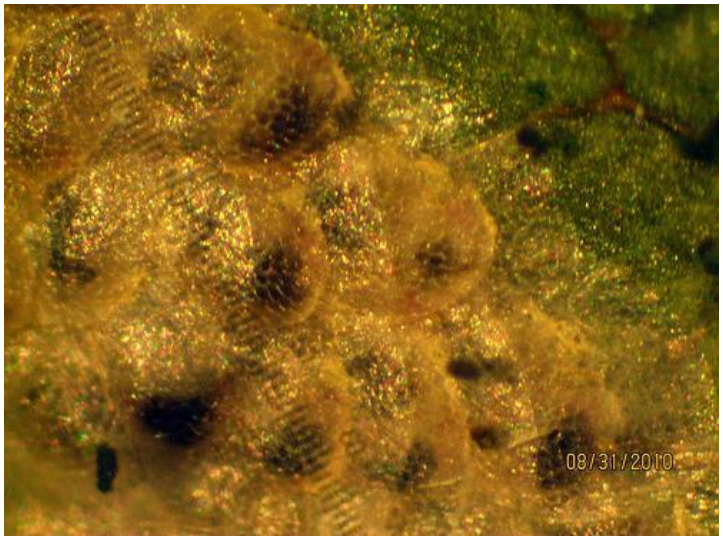
Present in natural areas, residential areas

No documentation of major damage?

Why isn't LBAM more invasive?





LBAM is attacked by several resident generalist parasitoids

- ~~enemy release~~

Rule of thumb: effective biocontrol requires >30% parasitism

Observed average parasitism:

- 84.4% for eggs,
- 43.6% for larvae,
- 57.5% of pupae

High biotic resistance

European Grapevine Moth, *Lobesia botrana*

Native to S. Italy

Present in parts of Africa, Asia, and the Americas

Prefers grapevines, but feeds on certain fruit trees and ornamental plants

- blackberry, currant, privet, rosemary, stone fruits, olive

Larvae damage flowers and berry clusters

- feeding introduces rots

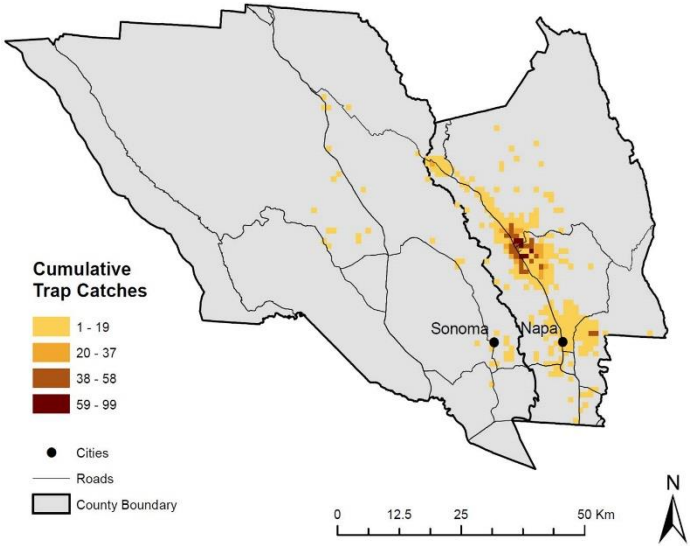
First detected in California in 2009

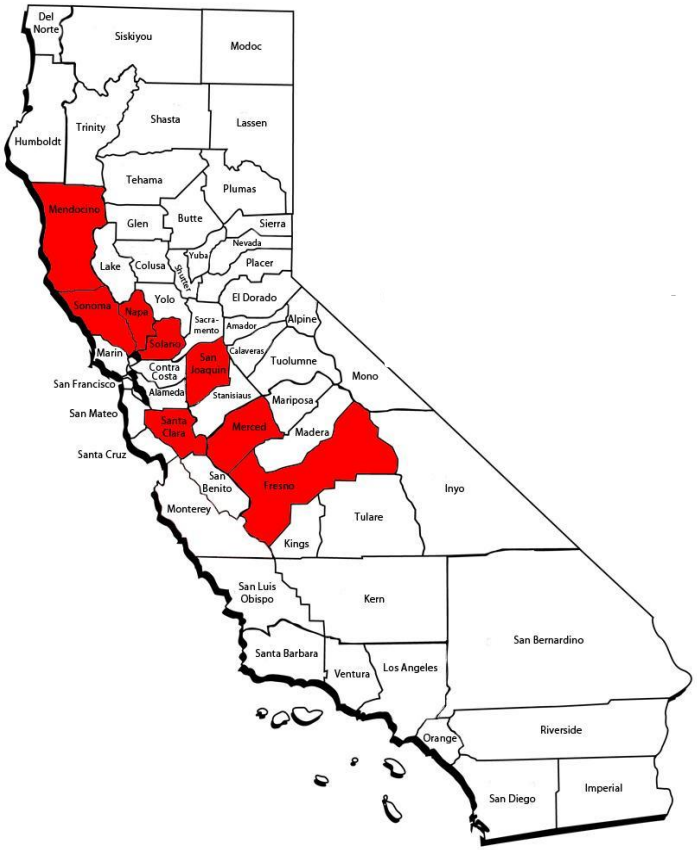
- Likely present for at least a few years

Napa County most severely affected

>100,000 moths captured in 2010

By 2012 had spread to additional 10 counties, as far as Fresno County





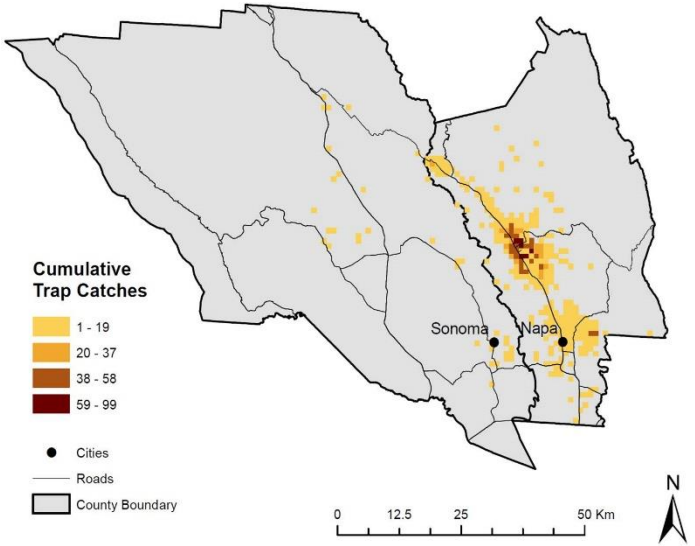
Extensive monitoring in vineyards, nearby residential areas

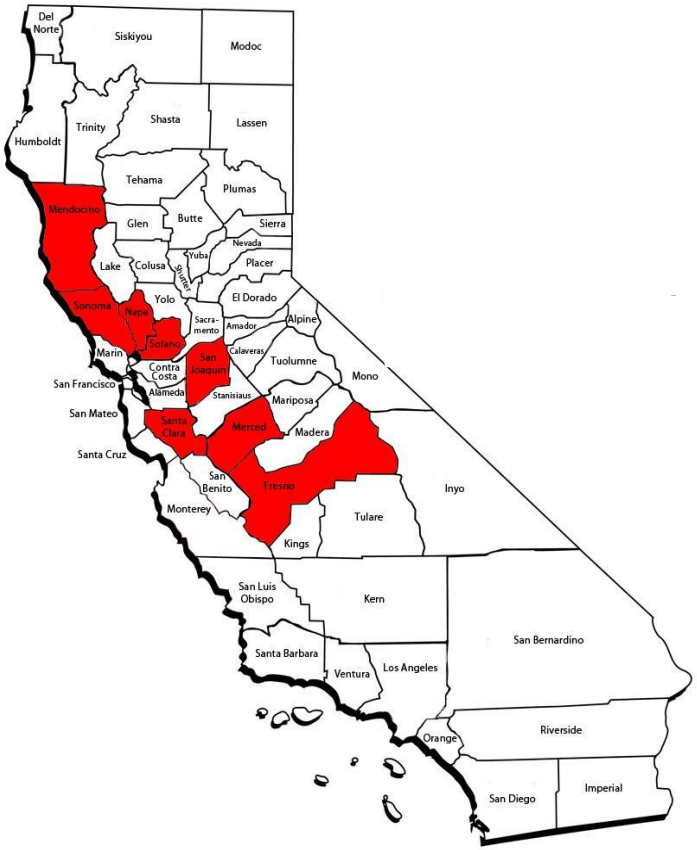
Fruit removal around affected areas

Regulated movement of nursery stock and farm/winery equipment

Insecticide applications around finds

Mating disruption (pheromone lures)



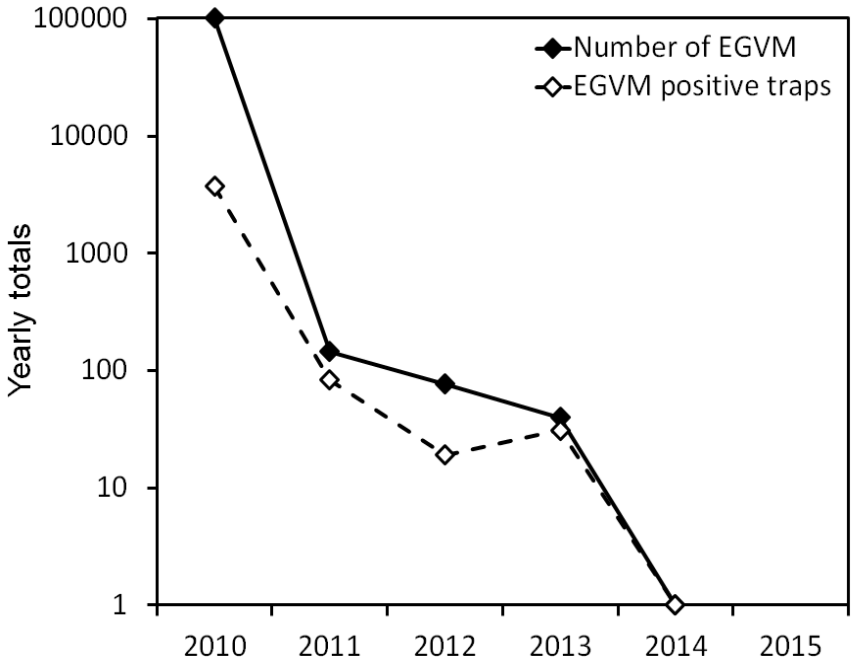


By 2014, detections had dropped to 1 moth in total

Declared eradicated in 2016

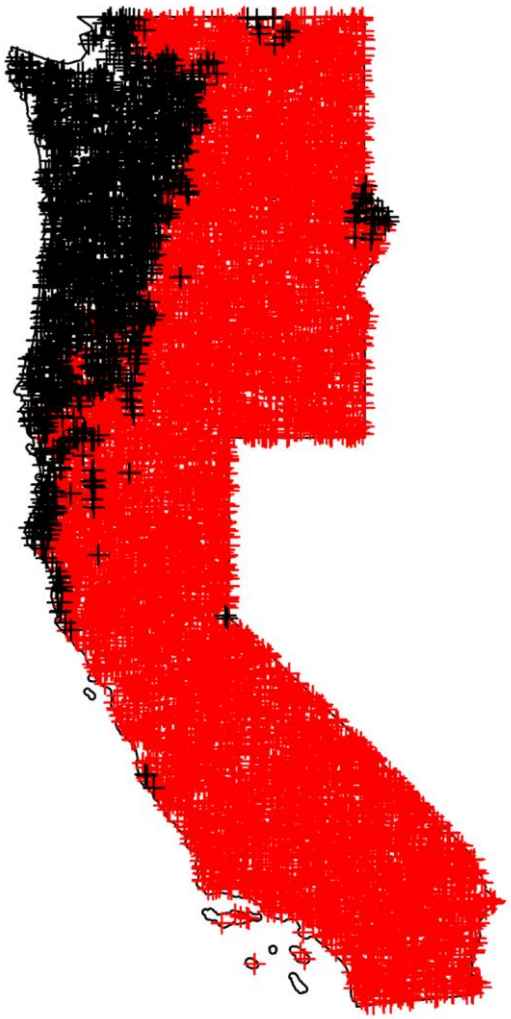
Model of an effective response to invasive species

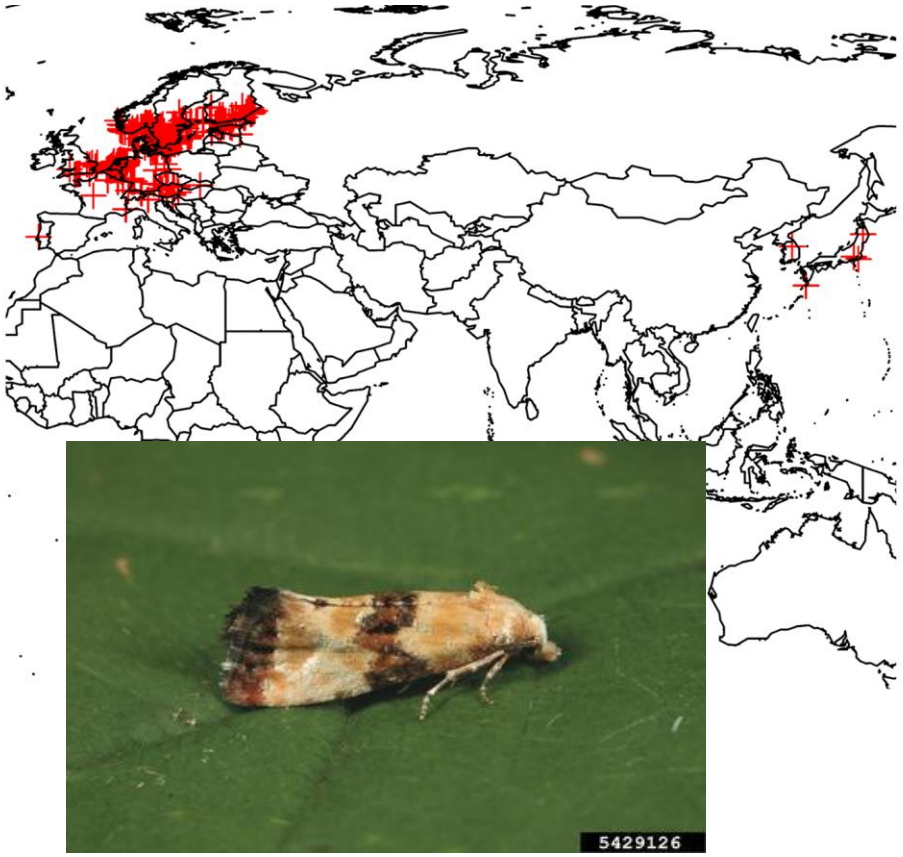
- cooperation among growers, researchers, county, state, federal agencies
- existing, effective tools
- proper implementation of control measures



Other pest moths

European grape berry moth
(*Eupoecilia ambiguella*)





minimal climate overlap with most of CA vineyards

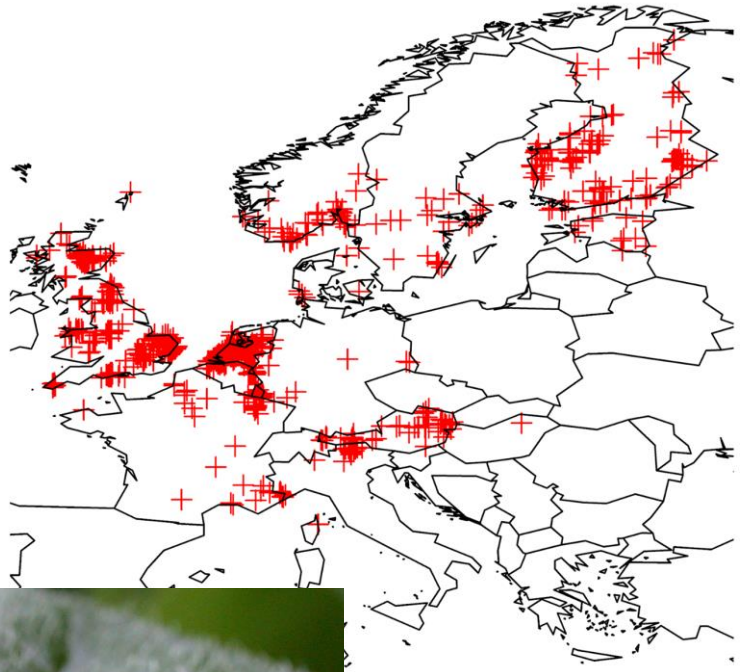
Other pest moths

Grape berry moth
(*Paralobesia viteana*)

no climate overlap with California vineyards

Other pest moths

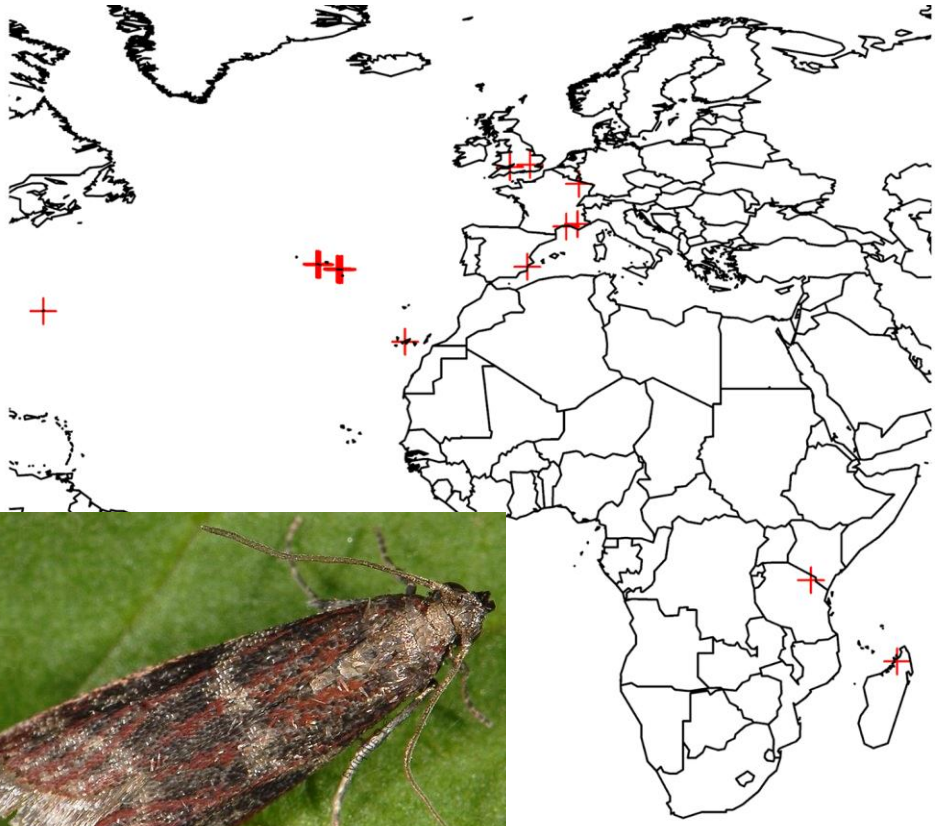
Grape tortrix moth
(*Argyrotaenia ljungina*)



no climate overlap with California vineyards

Other pest moths

Honeydew moth
(*Cryptoblables gnidiella*)



some climate overlap with coastal, S. CA vineyards

Brown marmorated stink bug, *Hyalomorpha halys*

Native to eastern Asia

Wide host range

- fruits and vegetables (apple, pear stone fruit, grapes, berries, tomato, beans)
- ornamental trees and shrubs (holly, redbud, magnolia, Catalpa)

Invaded the eastern US in 2001

First detected in Pasadena in 2006

Brown marmorated stink bug, *Hyalomorpha halys*

Feeding damages fruits and seed pods

- necrosis, deformation

Contaminant during harvest

Significant nuisance pest

- moves seasonally from orchards, shade trees into homes

- form high density aggregations in crevices or inside homes

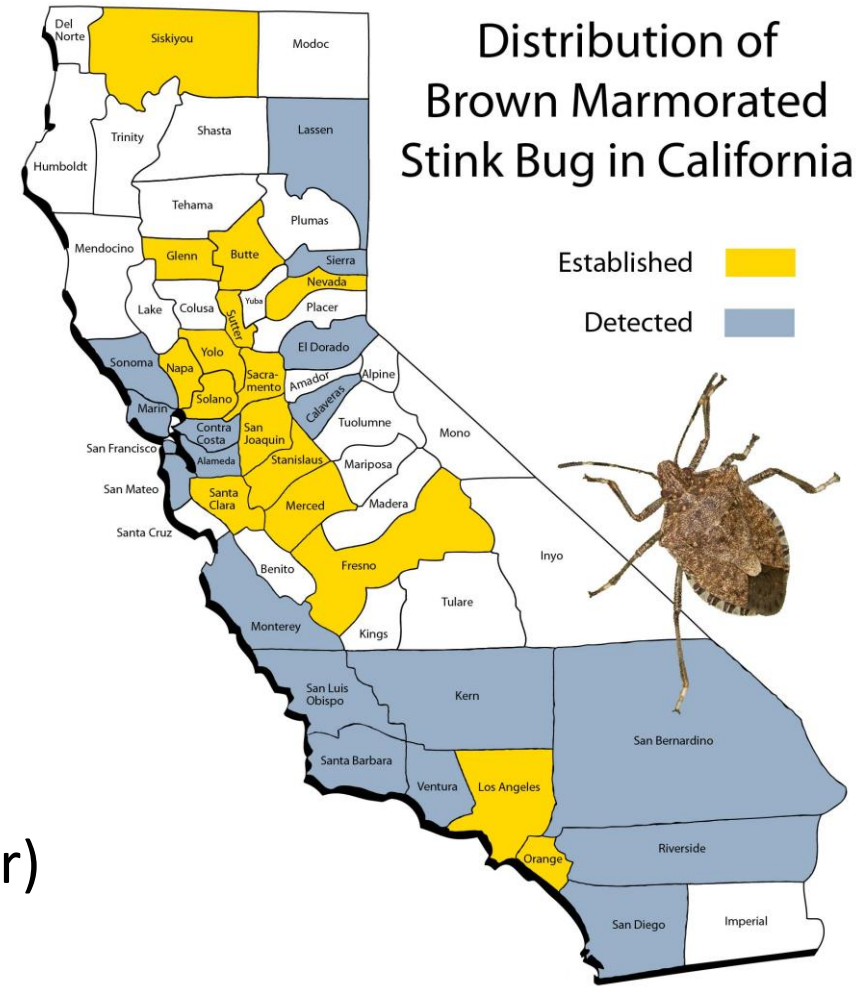
BMSB has been detected in many locations throughout California

- almost exclusively in urban/suburban areas
- few finds in commercial agriculture

No reports of major damage

- localized infestations
- more significant as a nuisance?

Exotic that is not very invasive (so far)



Glassy-winged sharpshooter, *Homalodisca vitripennis*

Xylem-sap feeder

Native to southeastern U.S.

Wide host range (200+ species)

- grapevines, citrus, olive, ornamental trees and shrubs, weeds

Causes little direct damage

Transmits *Xylella fastidiosa,* which cases Pierce's disease

GWSS area-wide monitoring

- biweekly to monthly counts of ~200 traps throughout Temecula Valley citrus
- “early warning” system; identify areas where GWSS is most active

For GWSS area-wide monitoring updates:
http://cisr.ucr.edu/temeculagwss/

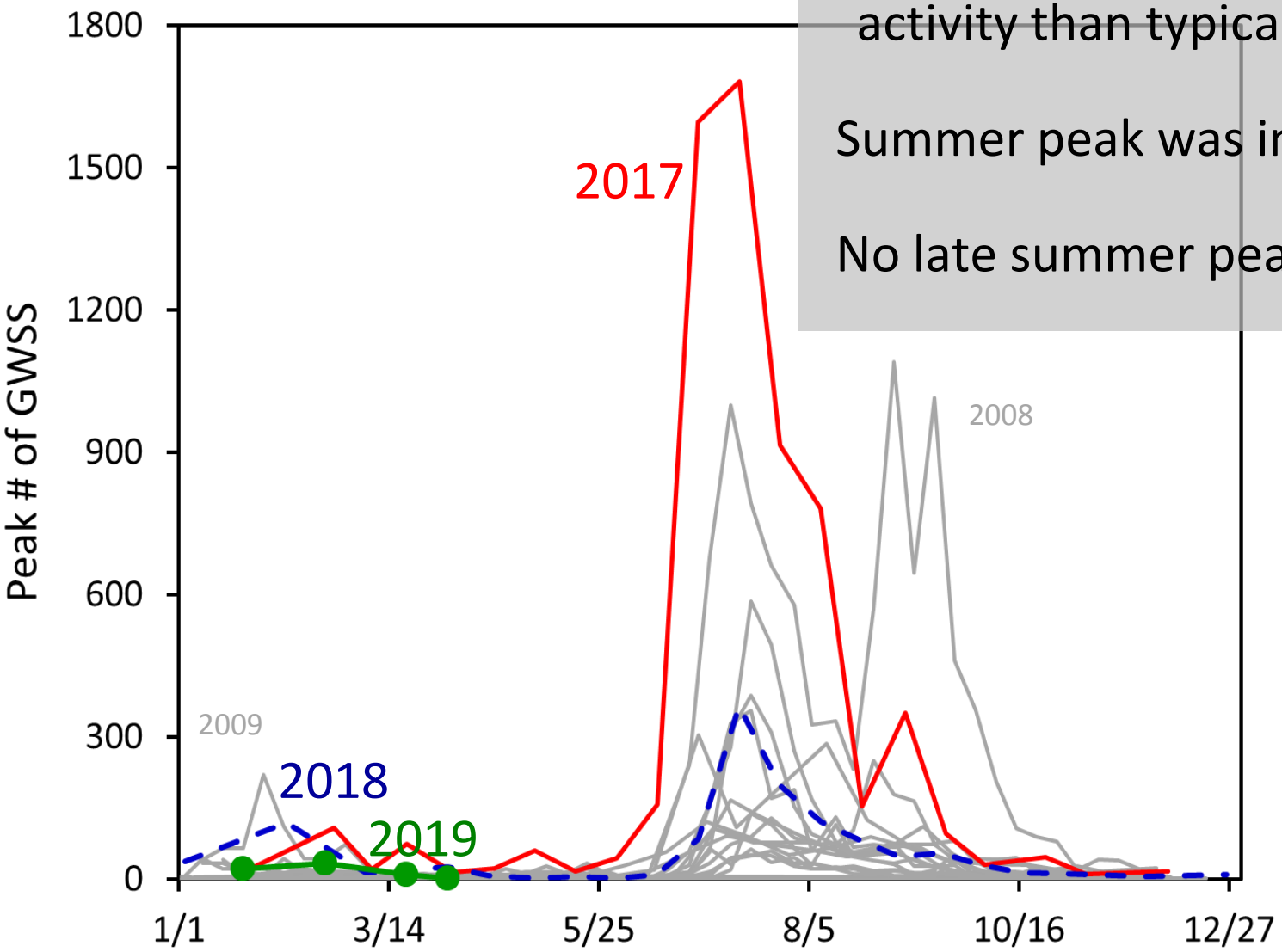
mattd@ucr.edu

CDFA mapping:
http://apps4.cdfa.ca.gov/PiercesMaps/Default.aspx

The current situation: GWSS in Temecula

- peak number in 2017 was 50%+ higher than prior 15 years
- 2018 GWSS counts more “average”

The current situation: GWSS in Temecula

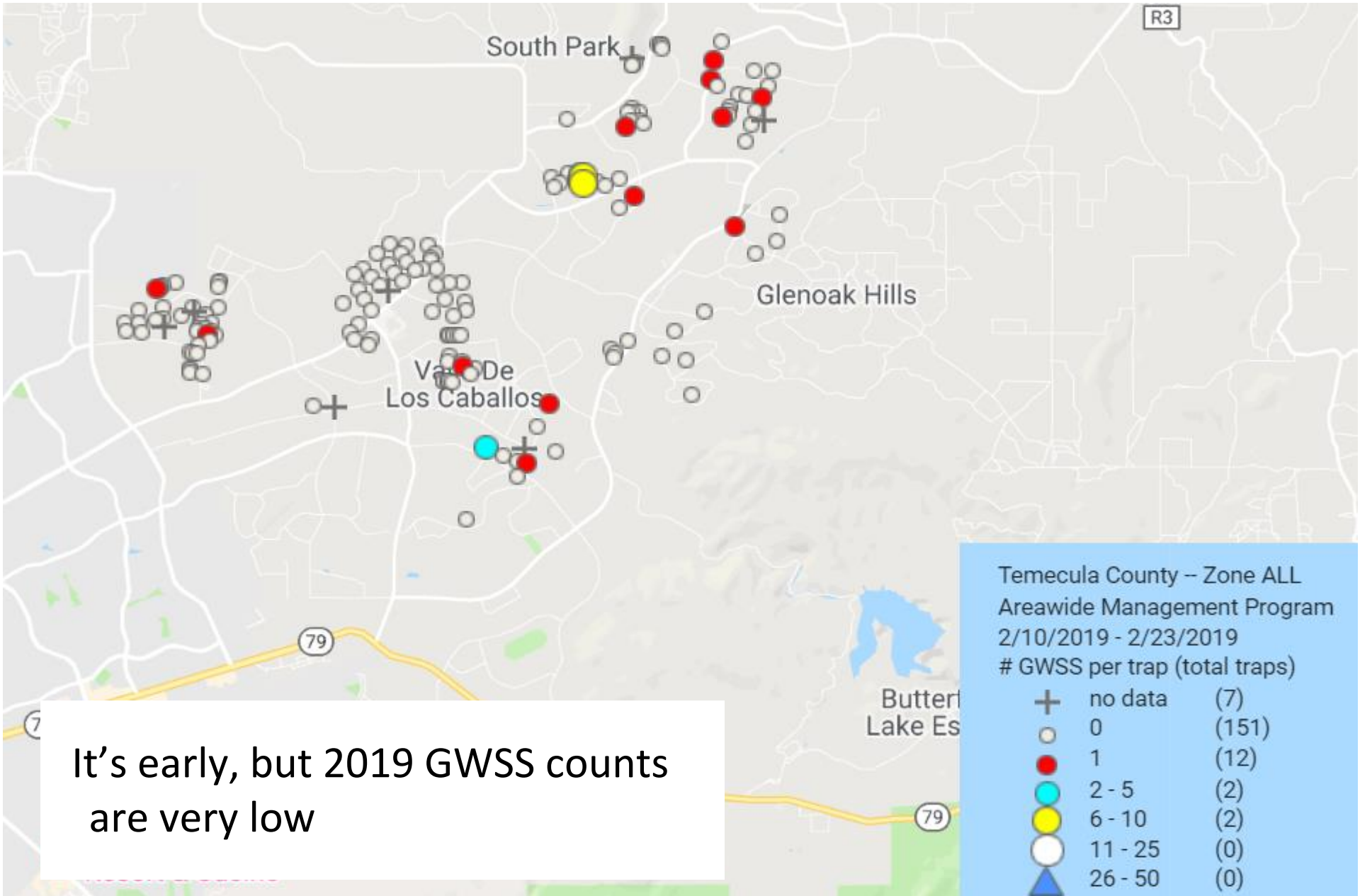


2018 showed more early season activity than typical

Summer peak was intermediate

No late summer peak

The current situation: GWSS in Temecula



It's early, but 2019 GWSS counts are very low

Vine mealybug, *Planococcus ficus*

Native to Mediterranean

Invasive in California, C. America, S. America, South Africa

Prefers grapevines (figs, dates, apple, avocado, citrus)

High densities result in copious honeydew, sooty mold, contamination of clusters

Vector of grapevine leafroll associated viruses

Distribution in California

First detected in Coachella Valley, mid-1990s

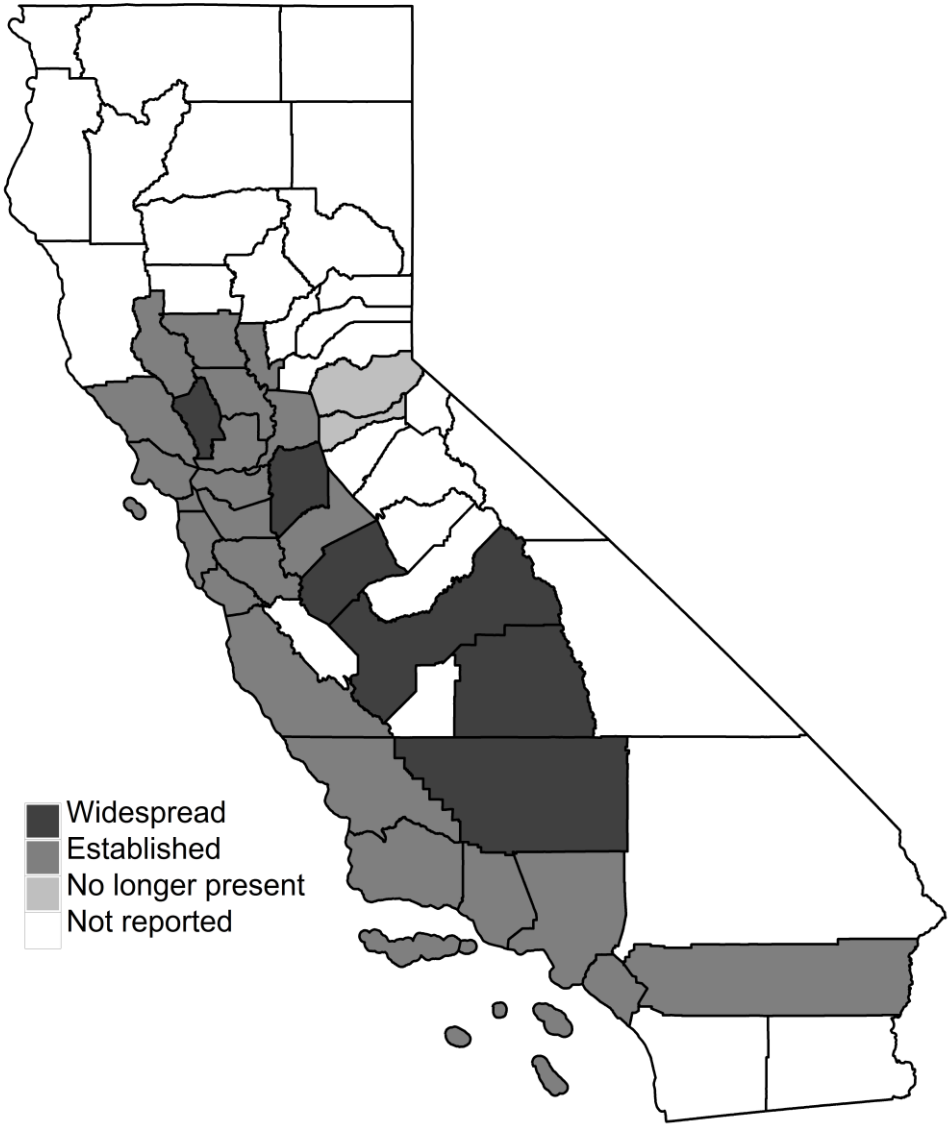
Established or widespread in most grape-growing areas

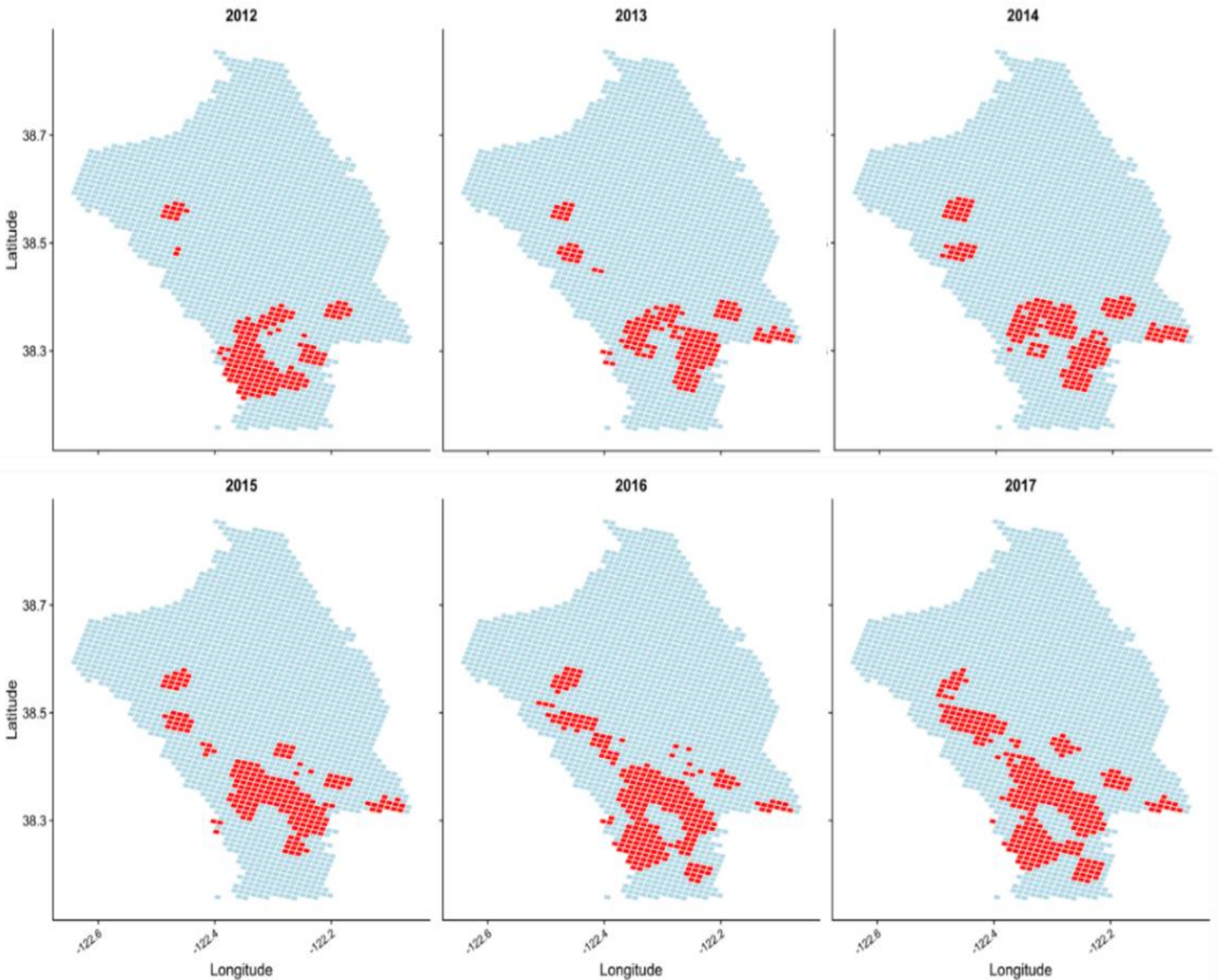
Infestations typically persistent

- Sierra foothills?

Capable of rapid, idiosyncratic spread

- contaminated farm equipment




2012
2013
2014
2015
2016
2017
Latitude
38.7
38.5
38.3
-122.6
-122.4
-122.2
Longitude

http://ipm.ucanr.edu/PMG/GARDEN/PLANTS/INVERT/spmealybugs.html

Obscure mealybug, *Pseudococcus viburni* (= *P. affinis*)

Grape mealybug, *Pseudococcus maritimus*

Citrus mealybug, *Planococcus citri* (Risso)

Vine mealybug, *Planococcus ficus*

Longtailed mealybug, *Pseudococcus longispinus*

Pink hibiscus mealybug, *Maconellicoccus hirsutus*

Monitoring for VMB

Look for ants, sooty mold

Winter and Spring: crown and trunk

- inspect under bark

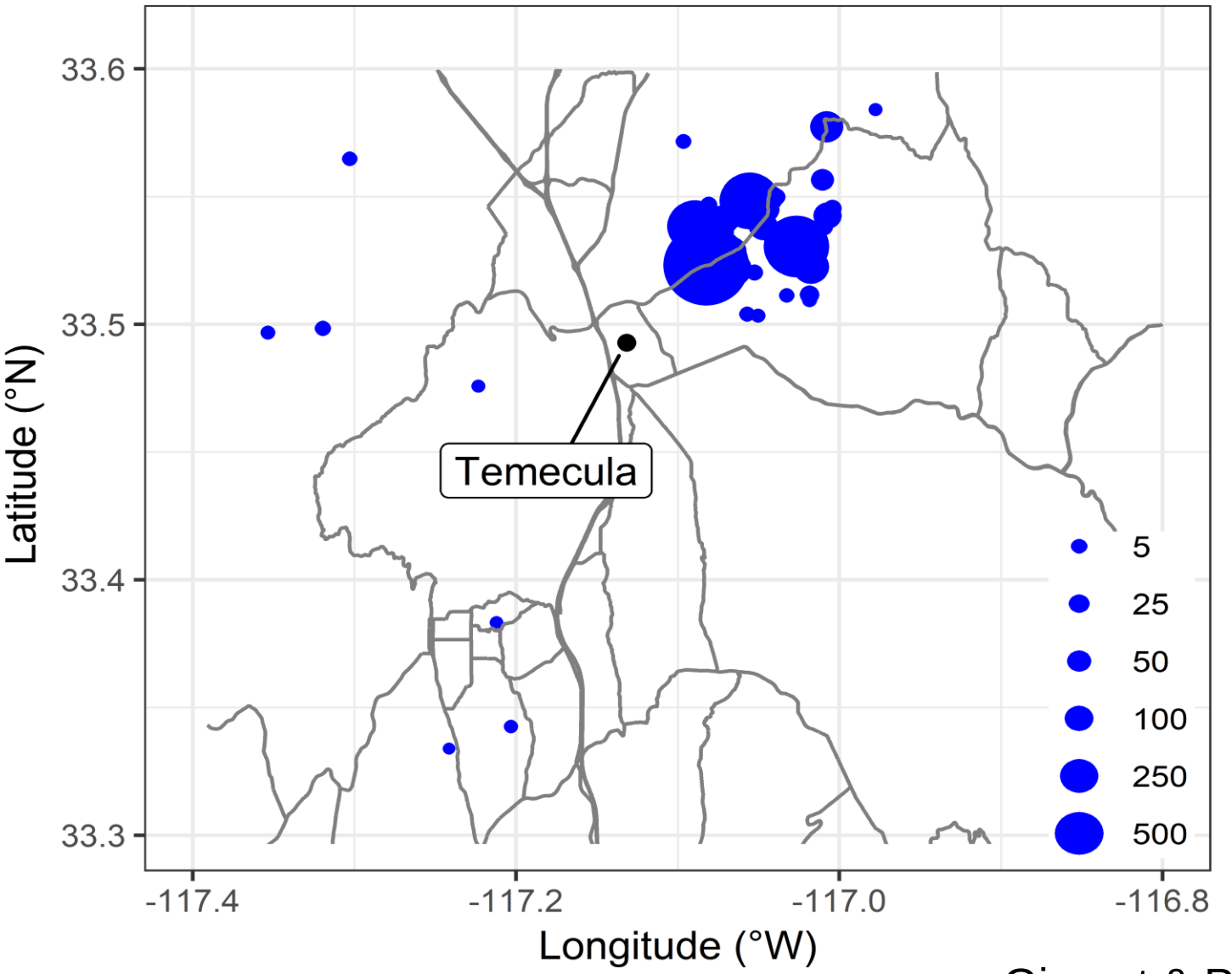
After bloom: cordons, canes, basal leaves

After veraison: inspect clusters

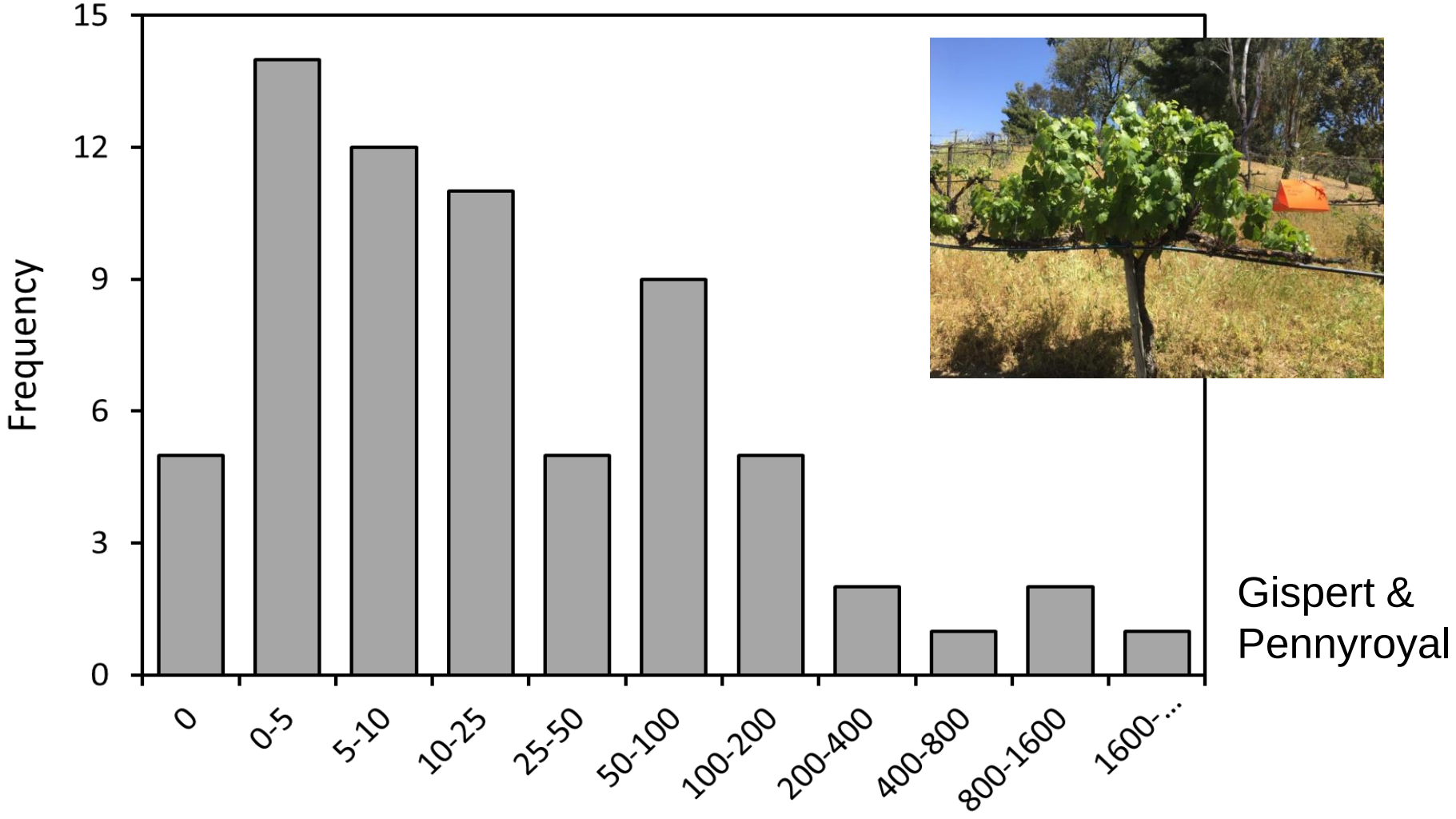
Pheromone traps (starting in Spring?)

- follow up with visual surveys

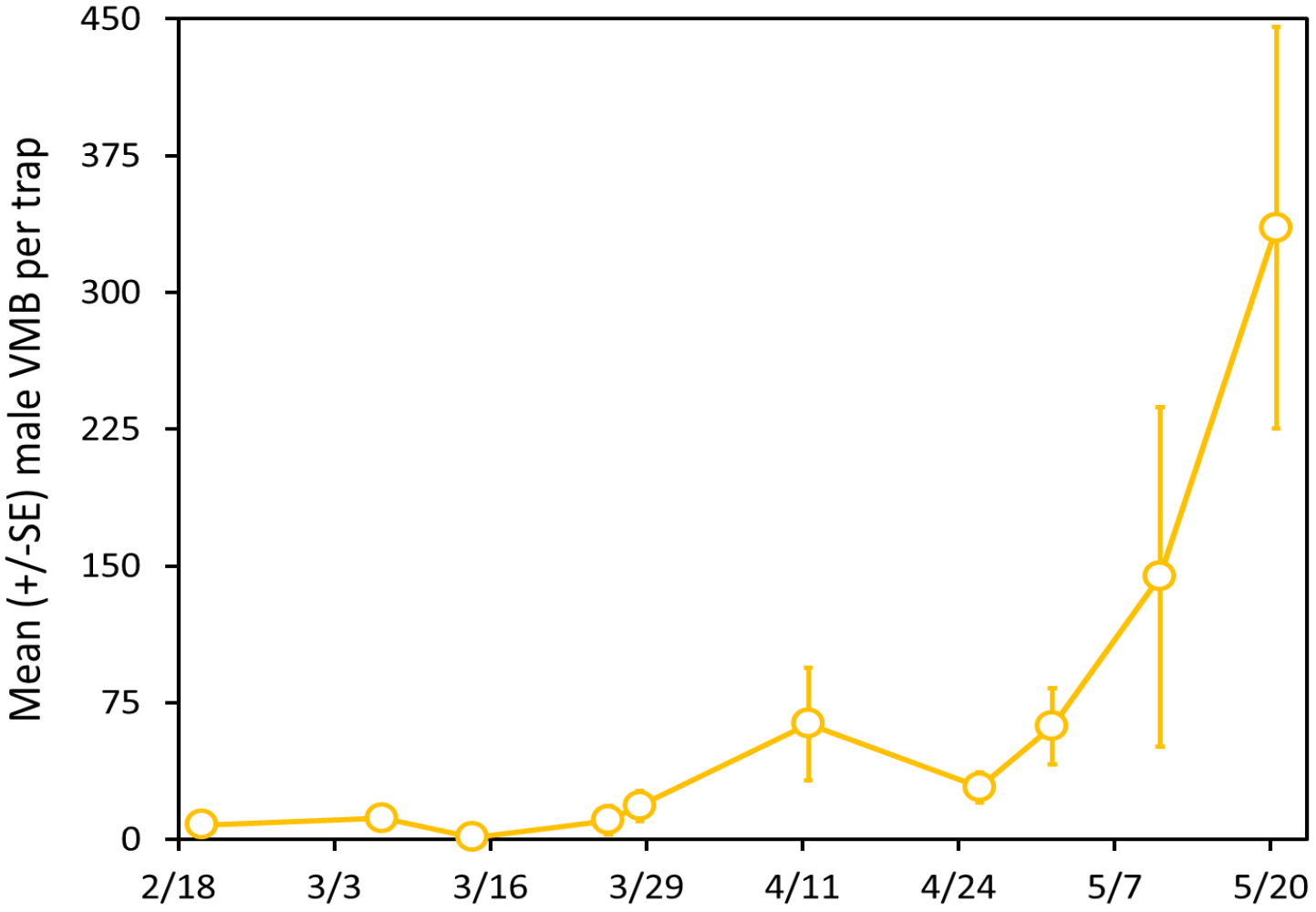
VMB in the Temecula area



Gispert & Pennyroyal



- 92% (62/67) of sites captured some VMB males
- A handful of sites had very high (100s) capture rates



Gispert & Pennyroyal

- VMB capture rate increased starting in April
- start monitoring early-to-mid Spring

- delay-dormant: organophosphate for ants
- Spring and Summer: buprofezin (IGR), neonicotinoid, spirotetramat
- biological control: *Anagyrus* spp., mealybug destroyers
- mating disruption: late Spring through harvest?
- harvest VMB-free areas first, clean equipment

Information on invasives in California

UC Riverside Center for Invasive Species Research:
http://cisr.ucr.edu/

UC IPM:
http://ipm.ucanr.edu/PMG/selectnewpest.grapes.html

CDFA quarantine information pages:
https://www.cdfa.ca.gov/plant/pe/interiorexclusion/quarantine.html