



United States Department of Agriculture  
Animal and Plant Health Inspection Service

**Plant Protection and Quarantine**



# Area-Wide Program to Eradicate the European Grapevine Moth, *Lobesia botrana* in California, USA.

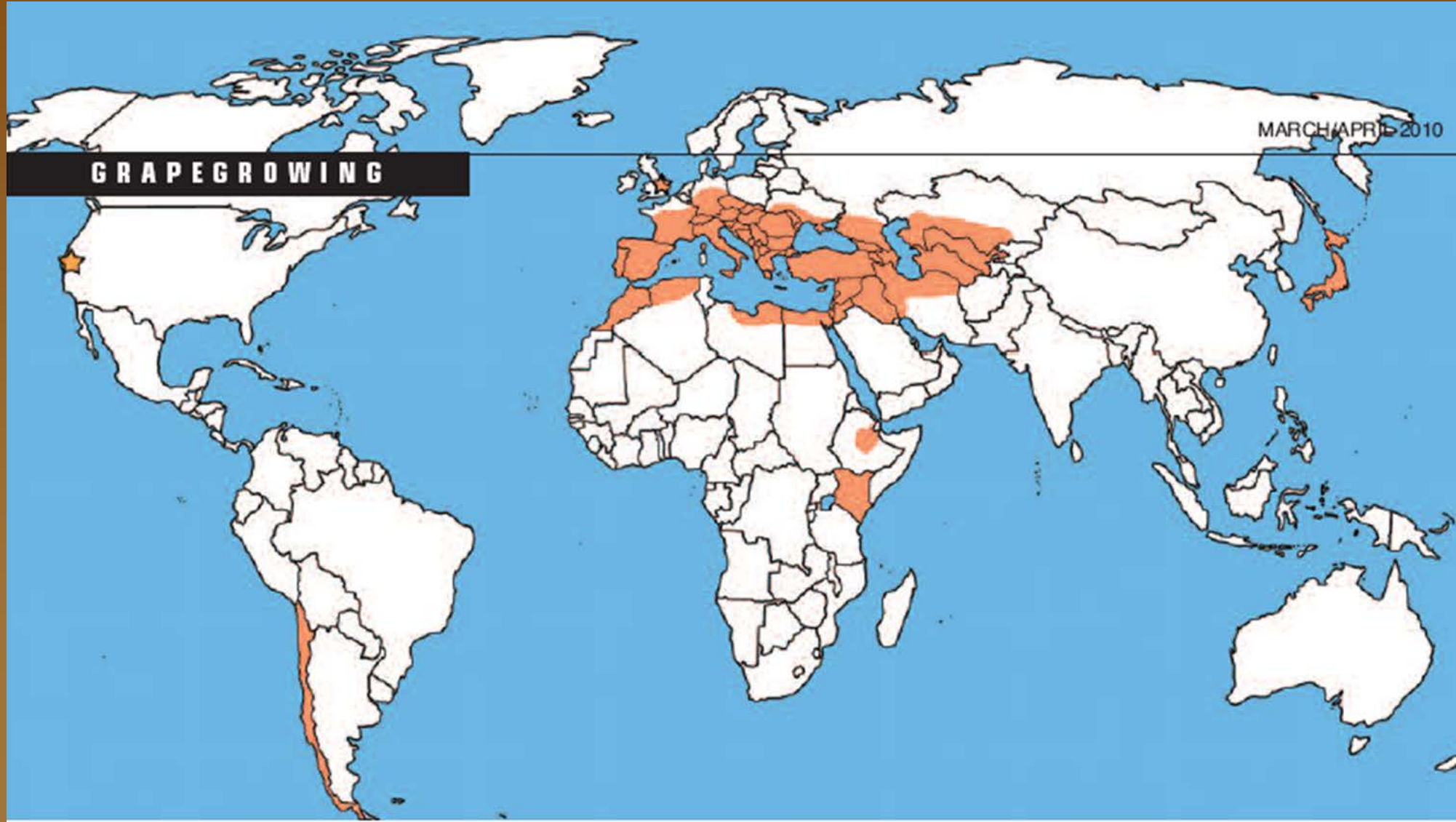
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(gregory.s.simmons@aphis.usda.gov)

Area-Wide Management of Insect Pest 22–26 May 2017, Vienna, Austria

***An Old World Pest On The Move: L. botrana*** first detected in the Americas  
(Chile, April 2008; USA, California, September 2009; Argentina, April  
2010).





# Life cycle

Adult (Moth)



Egg



Larva (caterpillar)

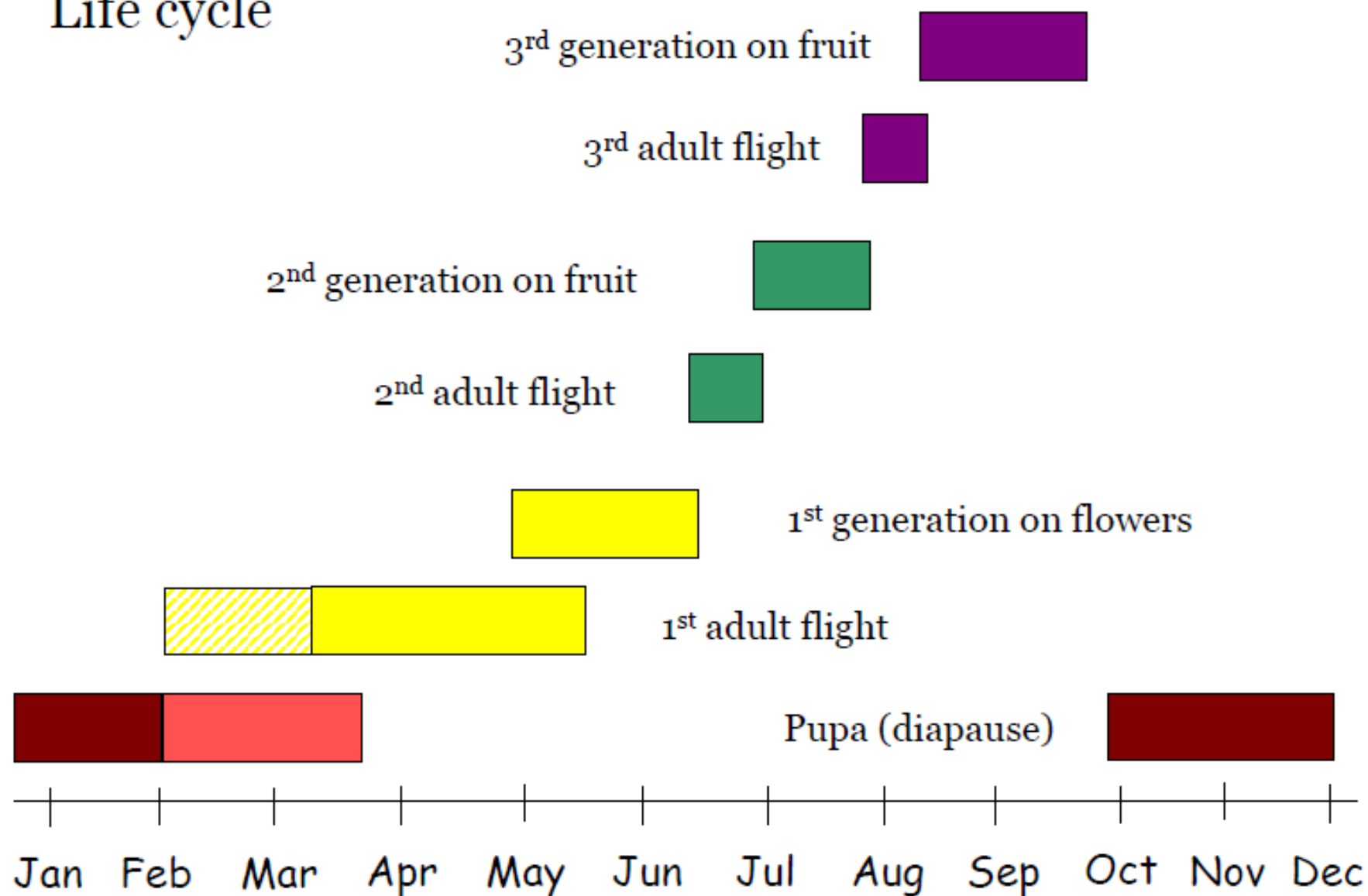


Pupa



M. Cooper

# Life cycle





# 3<sup>rd</sup> generation



Eggs laid on ripening fruit

Larvae feed in ripening fruit

Botrytis bunch rot develops

Pupae overwinter under bark, in  
soil crevices

M. Cooper

# *Lobesia botrana* invasion in California

- Detected in September 2009
- Crop losses of 50% reported in some fields
- Area-wide control program initiated in 2010
- At peak in 2011, 10 counties quarantined, > 6,000 km<sup>2</sup> with >62,000 ha of grapes
- Pesticide and mating disruption and treatments 9,000 ha with >6,000 ha with mating disruption
- “Ground zero” in midst of iconic wine area by Napa River. Close to wild areas many alternate hosts nearby

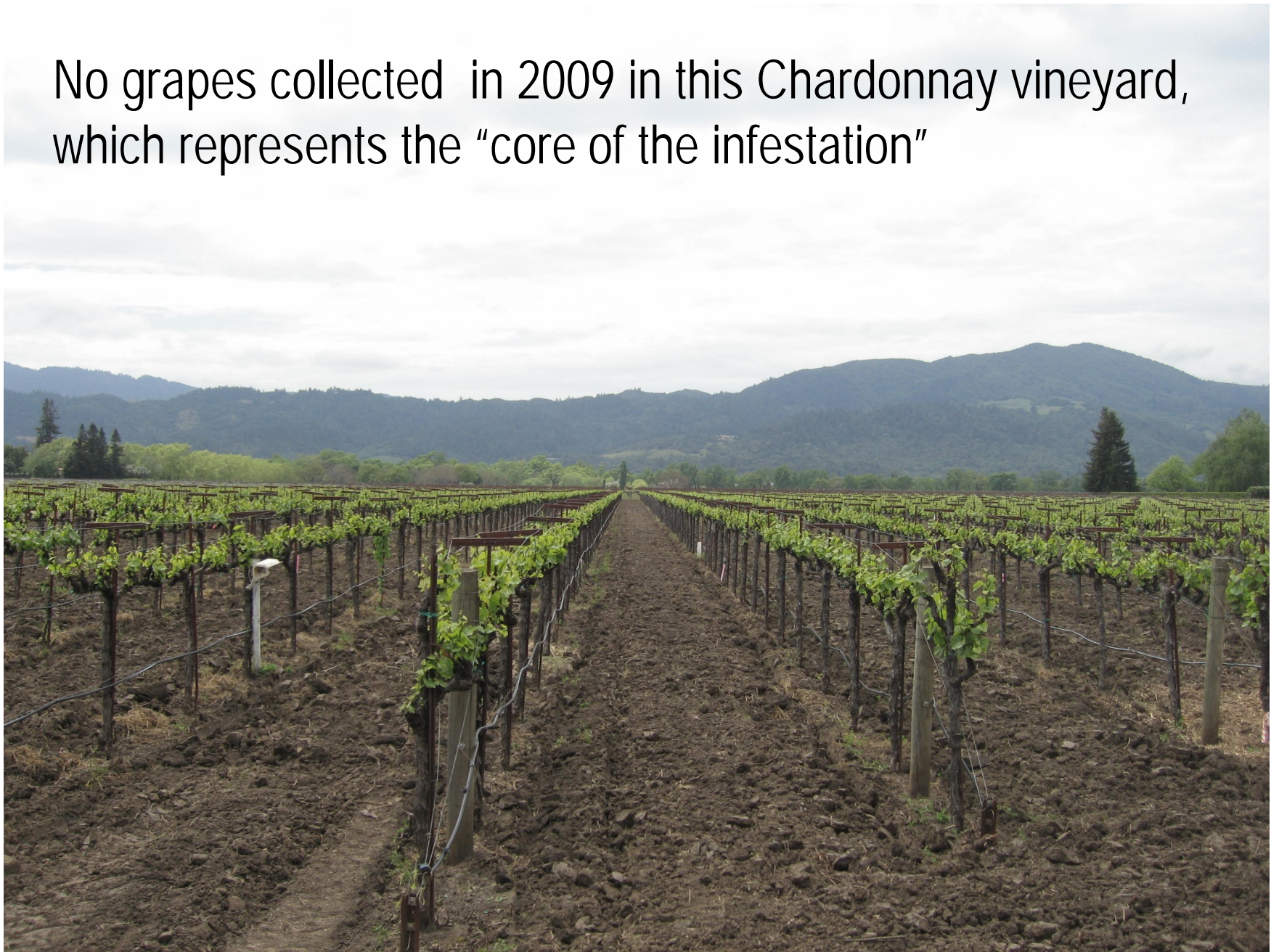


Damage observed in September 2009 in Oakville, Napa County.  
*Growers noticed unusual damage in 2008 but not identified until 2009*





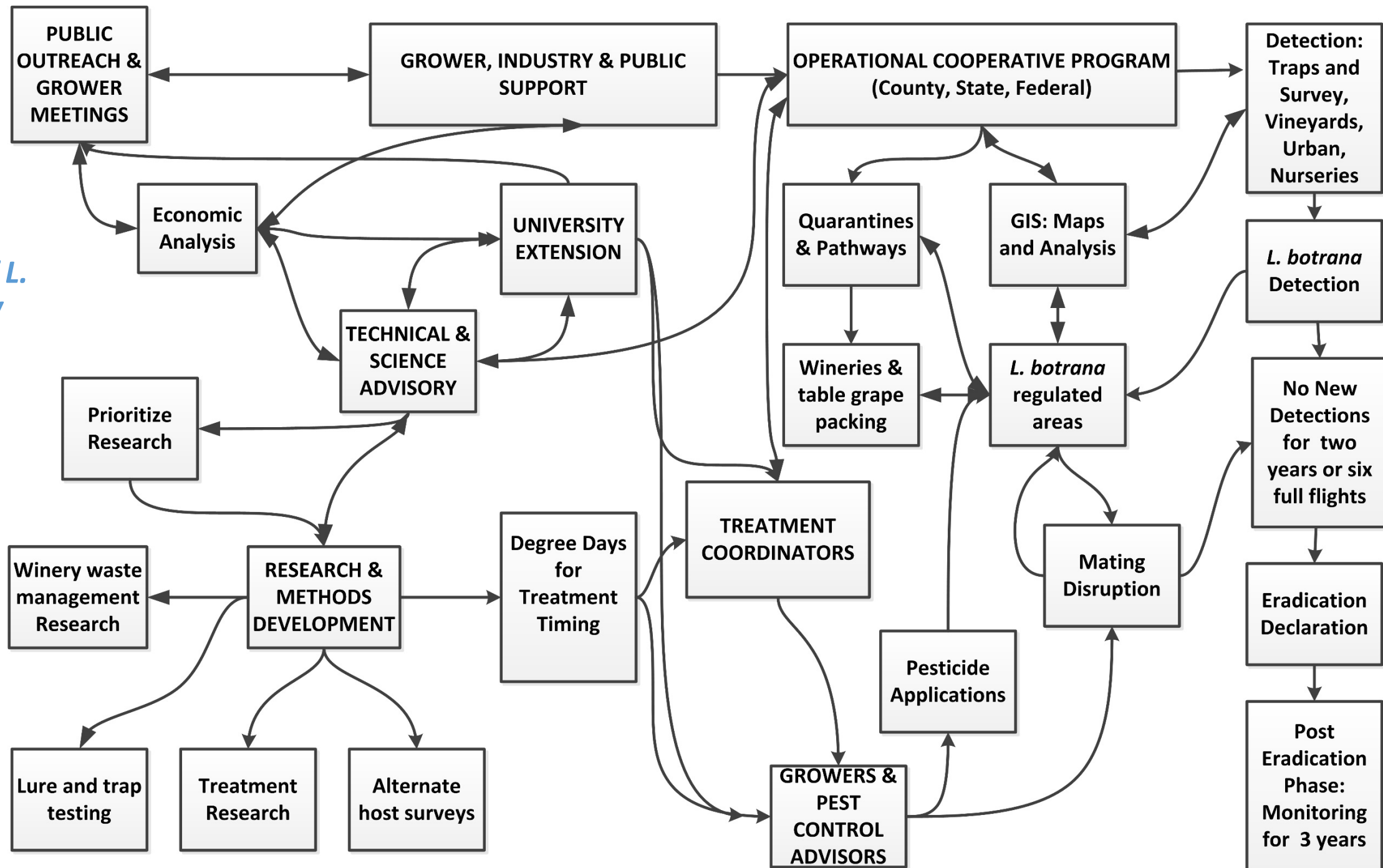
No grapes collected in 2009 in this Chardonnay vineyard,  
which represents the “core of the infestation”



# Program response

- Establishment of Technical Working Group of subject matter experts
- Establishment of Cooperative AW eradication program (see Cooper et al. California Agriculture, 2014:  
<http://calag.ucanr.edu/Archive/?article=ca.v068n04p125>)
- Begin outreach and communication programs
  - Industry, AG Commissioners, University, CDFA, USDA,
- Detection and delimitation program, traps and survey
- Regulation of movement of fruit, plants, green waste and winery wastes
- Mating disruption & coordinated pesticide applications
- Accelerated & targeted research effort

*Structure of L. botrana AW Eradication Program*





APHIS-PPQ formed a Technical Working Group in November 2009 to provide technical recommendations to the operational program. Members were Univ. California, industry, APHIS-PPQ, & international experts.





# Napa Valley December 2009

18.4 km

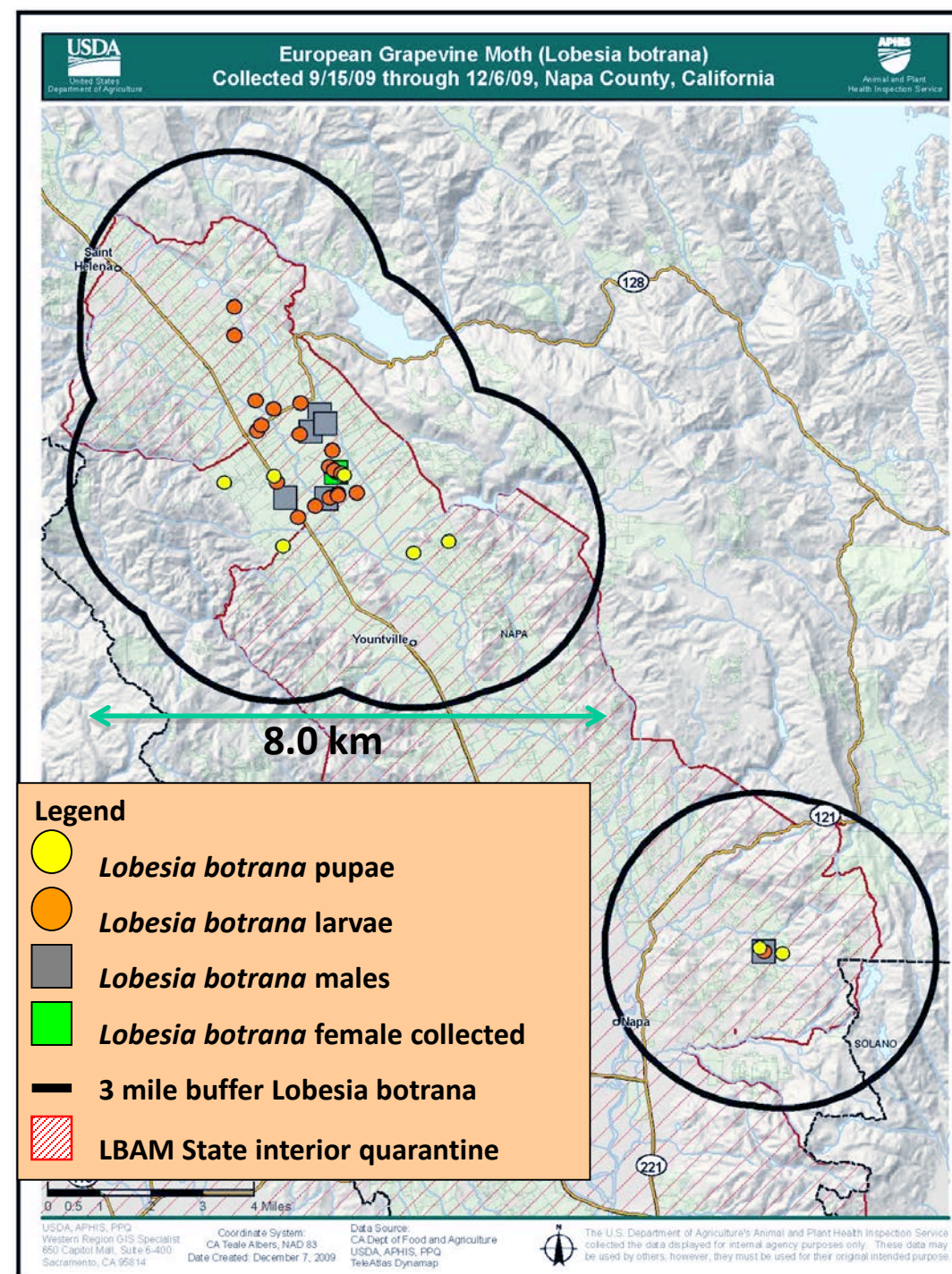
248 pheromone traps  
& visual surveys:

6 males

1 female

15 larvae

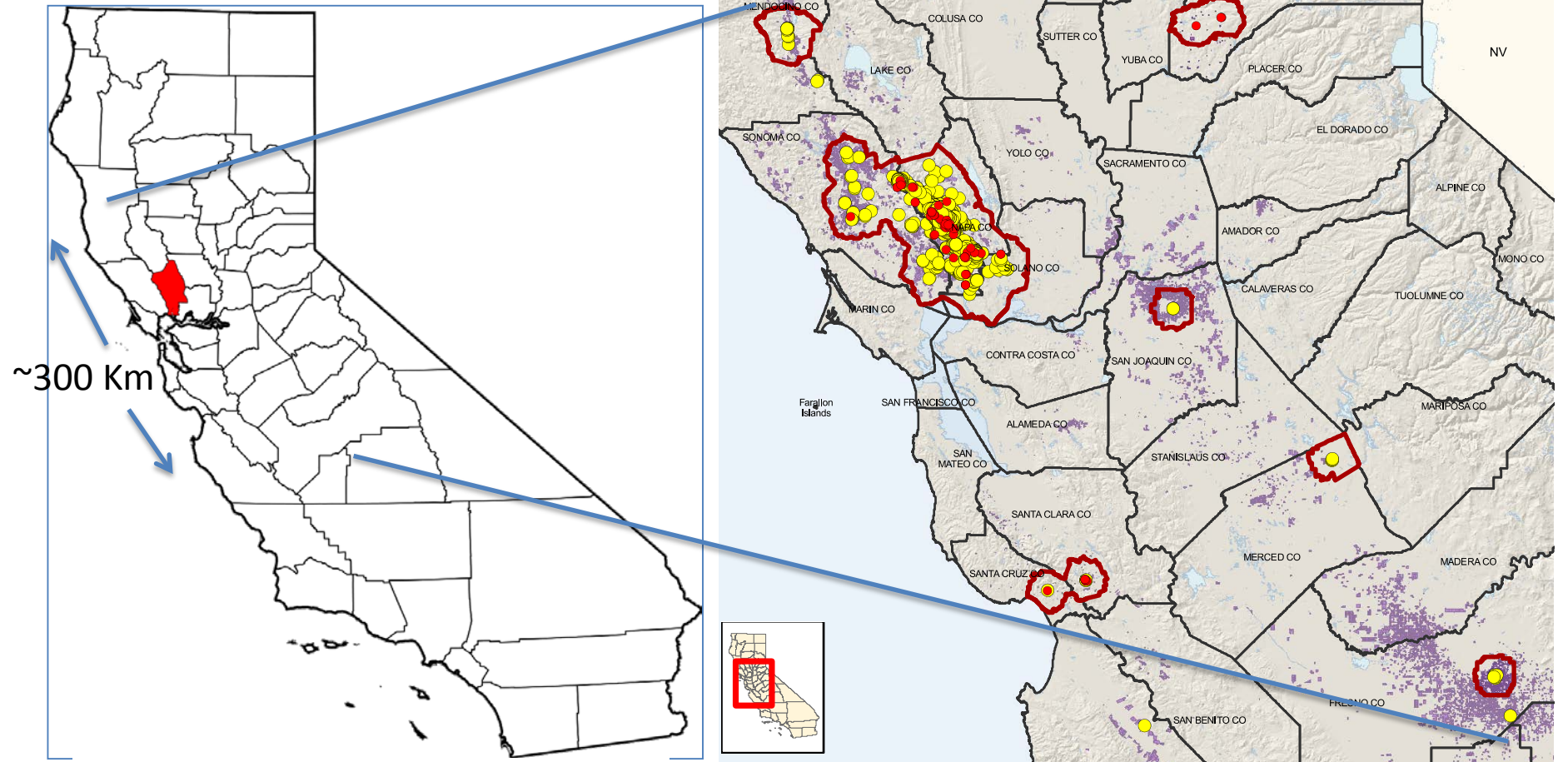
8 pupae



2009: detected in the Napa Valley

2011: detected in 11 counties

(10 counties in quarantine)



● Male catches 2010

● Male catches 2011

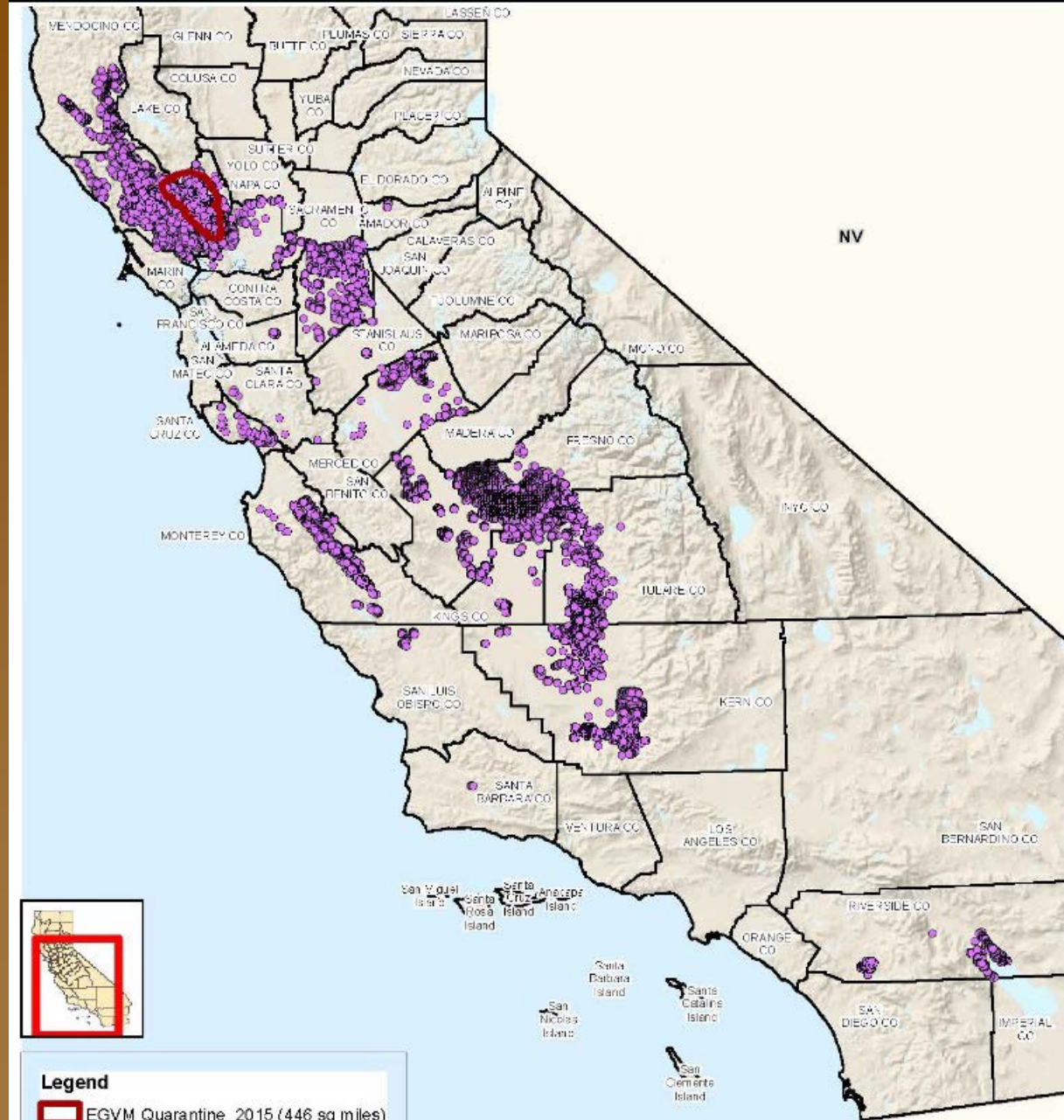


- State-wide monitoring effort (map = example from 2015)
- 39 traps/km<sup>2</sup> in regulated areas
- 10 trap/km<sup>2</sup> for the rest of production areas
- Total > 33,000 traps for statewide survey, ~ 9,000 traps in Napa



United States  
Department of  
Agriculture

## Traps for European Grapevine Moth (*Lobesia botrana*) California 2015



# Treatment & Response Program (1)

## *If L. botrana detected:*

- 500 M radius treatment area & 4.8 km quarantine/regulated area
- AW applications of pesticides to target eggs & larvae on 1<sup>st</sup> & 2nd flights for two years post detection.
  - IGRS, Diamides, Indoxacarb, Spinosyns & *Bt* were on approved treatments list.
- Mating disruption (MD) used for two full flights after detection at 500 m radius.
  - Hollow tube dispensers at 500/ha.
  - Visual surveys for larvae in MD treated fields



## Treatment & Response Program (2)

- Flower & fruit stripping/Bt in urban areas + some MD
- Trapping is increased within 500 m of previous finds to 39 traps/km<sup>2</sup> (from 10 traps/km<sup>2</sup> )
- No mating disruption after first year
- Removed from quarantine after 6 full flights ( 3 years) with no detections

# Program Detection Trapping

Traps were deployed:

Quarantine/regulated area:

- 2010/11: 8 km from a find
- 2012/16: 4.8 km from a find

Traps deployed in vineyards:

- Quarantine area: ~25 traps/mi<sup>2</sup>
- Outside quarantine: ~9 traps/mi<sup>2</sup>

Traps deployed in urban areas:

- ~5 traps/mi<sup>2</sup>



# Two main treatments strategies used in tandem for commercial vineyard treatments

- Treatments:
  - To Vineyards within 500 meters of a find
    - In 2010-12: insecticide & MD treatments any find since 2009
    - In 2012-2016: Insecticide treatments finds previous 2 years, MD finds from previous year.
- 1. Application of Insecticides:
  - 1<sup>st</sup> generation: 1 conventional or 2 (or 3) organic insecticides.
  - 2<sup>nd</sup> generation: 1 conventional or 2 organic insecticides.

Insecticides used:

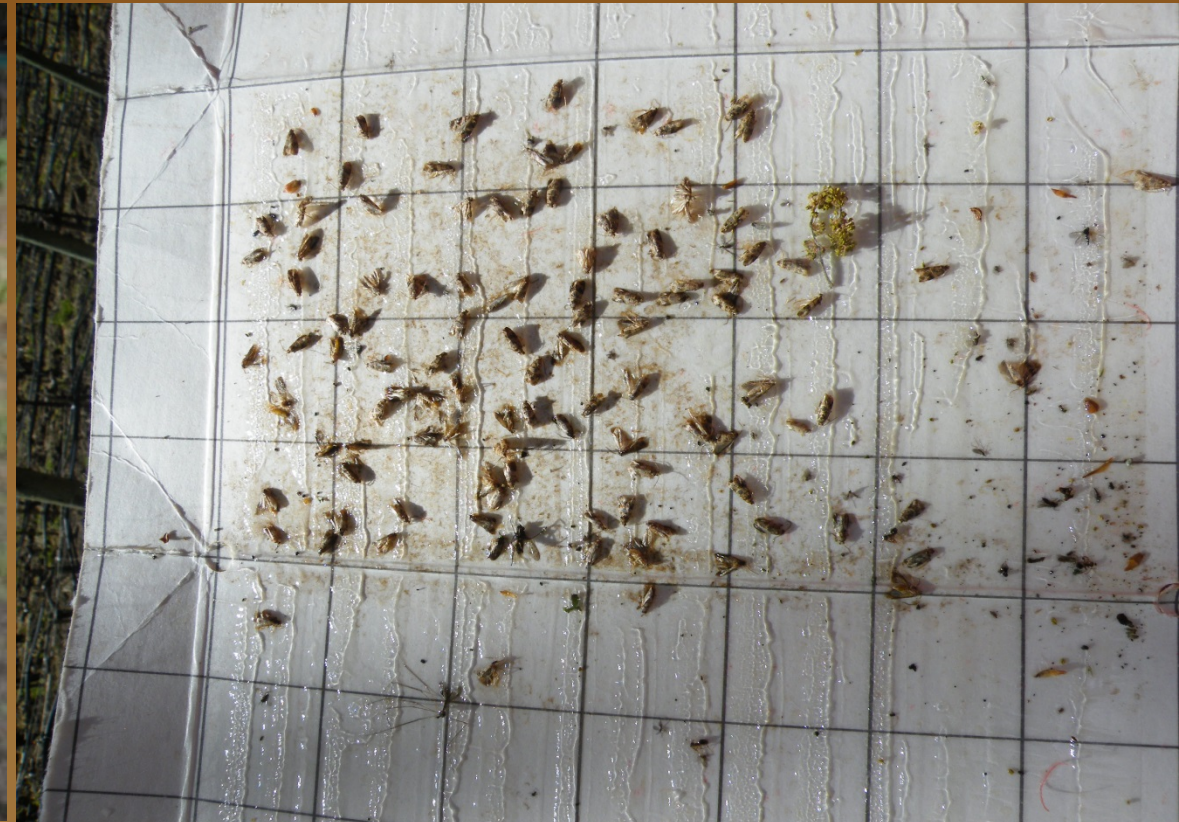
  1. Conventional: methoxyfenozide, chlorantraniliprole
  2. Organic: Bt, spinosad
- 2. Mating disruption – *L. botrana* pheromone (E,Z)-7,9-Dodecadien-1-yl Acetate) in hollow tube dispensers, 500/Ha, applied early spring before 1<sup>st</sup> flight

University of California Recommendations (see <http://cesonoma.ucdavis.edu/files/85697.pdf> & <http://ipm.ucanr.edu/EXOTIC/eurograpevinemoth.html#MANAGEMENT>)

Insecticide	OMRI	Ovicide/ Larvicide	Toxicity Predator/Parasitoid
Insect growth regulator (Ecdysone mimic)—IRAC grp. 18			
Intrepid (methoxyfenozide)	N	Y / Y	low/low
Microbial (disrupts midgut membranes)—IRAC grp. 11			
Dipel ( <i>Bt</i> Kurstaki)	Y	N / Y	low/low
Biobit ( <i>Bt</i> Kurstaki)	Y	N / Y	low/low
Diamides (nerve and muscle targets)—IRAC grp. 28			
Altacor (chloranthraniprole)	N	Y / Y	low/low
Belt (flubendiamide)	N	N / Y	low/low
Sodium channel blockers (paralysis)—IRAC grp. 22			
Avaunt (indoxacarb)	N	N / Y	low/ med
Spinosyns (nicotinic AChR—nervous system block, paralysis)—IRAC grp. 5			
Success (spinosad)	N	N / Y	low/ med-high
Entrust (spinosad)	Y	N / Y	low/ med-high
Delegate (spinetoram)	N	N / Y	med/ high



For first flight (April-May 2010), traps captured 99,266 males in Napa & 78 in other 9 counties of CA.







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A Commitment to Service

# Treatment in Residential & Non-commercial properties

Napa County Agricultural Commissioner's Office

- Outreach to non-commercial growers to ensure treatments are applied
- Outreach to residential properties
- California Department of Food and Agriculture
- Placed mating disruption in 2013 non-commercial and residential areas
- Survey of properties for EGVM hosts
- Removal of flower/ fruit or Bt



treatments



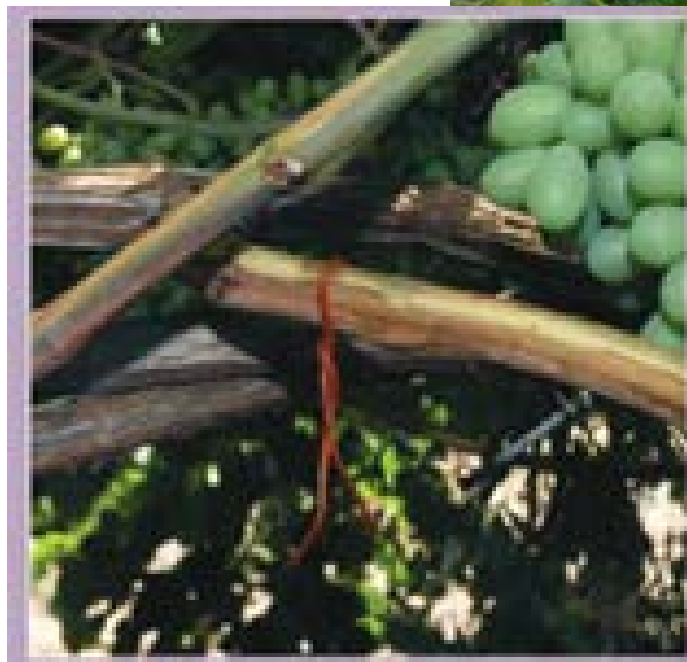


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# Mating Disruption in 2014

Napa County Agricultural Commissioner's Office

- Ag Commissioner's office distributed 8 km<sup>2</sup> worth of mating disruption to commercial growers.
- This represented 92 sites and 75 different growers within 500 meters of 2013 finds.
- Staff inspectors verified all 92 sites.
- All 92 sites have reported their pesticide use.





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# Treatment Verification

## Napa County Agricultural Commissioner's Office

- Total of 132 sites within 500 meters of a 2013 or 2012 find needed treatment
- Approx. 3,300 acres including vineyards and olives
- 85 distinct Operators
- All vineyards were treated

### 1<sup>st</sup> Flight Treatments Verified

- Napa ag staff verified 111 applications (Olives and Grapes)
- 84%

### 2nd Flight Treatments Verified

- Napa Ag staff verified 107 applications out of 128 (Grapes only)
- 84%







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# Quarantine Compliance

Napa County Agricultural Commissioner's Office

## Pre-harvest Meetings

- Treatments, Sanitation, Trapping or slack-filling
- Mechanical harvesting
- Harvest inspection
- USDA Systems Approach

Articles about sanitation & quarantine compliance





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# Outreach & Education

## Napa County Agricultural Commissioner's Office

- Meetings
  - Countywide grower meetings
  - Pest Control Advisors
  - Vineyard Management Companies
  - Grower groups
  - Wineries-vineyard & grower relations
  - Individual growers
- Ads & Articles
  - Napa Valley Life
  - Napa Register
  - Industry & County newsletters
  - Craig's List, Wine Business Mo.
- E-mail updates



If you've got just  
*one vine*, you could have the  
**EUROPEAN GRAPEVINE MOTH**

**KICK THE MOTH OUT!**

find out how...  
 **KICK THE MOTH OUT!** on Facebook  
or **WWW.BUGSPOT.ORG** on the Web

A PROJECT OF THE NAPA COUNTY AGRICULTURAL COMMISSIONER'S OFFICE.



# Outreach: Hundreds of growers meetings and field day training



University field day training field monitoring (400 growers in one day)



With funding from USDA NRCS outreach materials were developed to help recognize all EGVM life stages in the vineyard.

- ✓EGVM brochure.
- ✓Guide to Moths & Worms in Grapevine Clusters.
- ✓Bilingual poster.
- ✓Online presentations in English & Spanish.
- ✓Postcards
- ✓Radio programs

**DON'T LET THE EUROPEAN GRAPEVINE MOTH RIDE WITH YOU.**

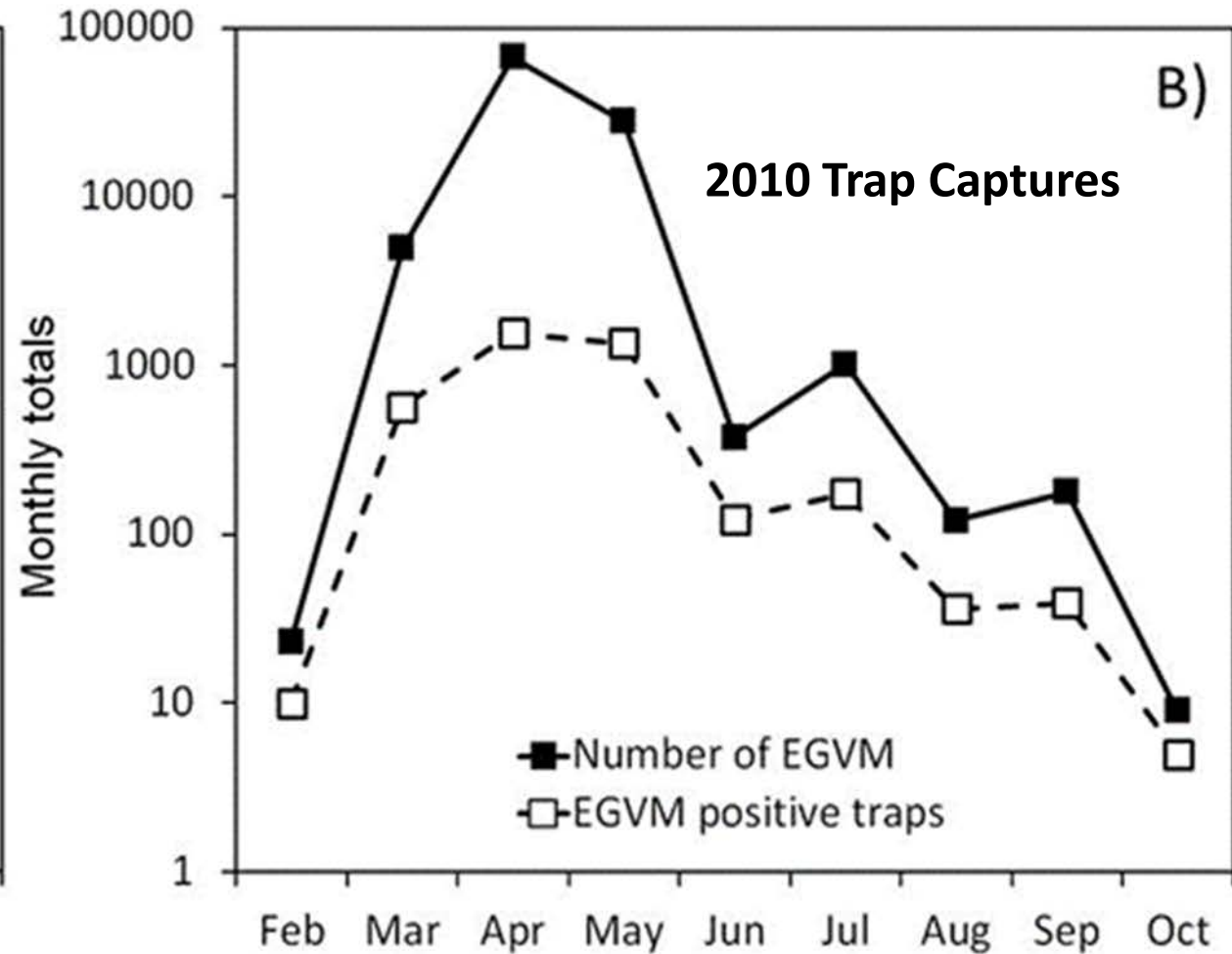
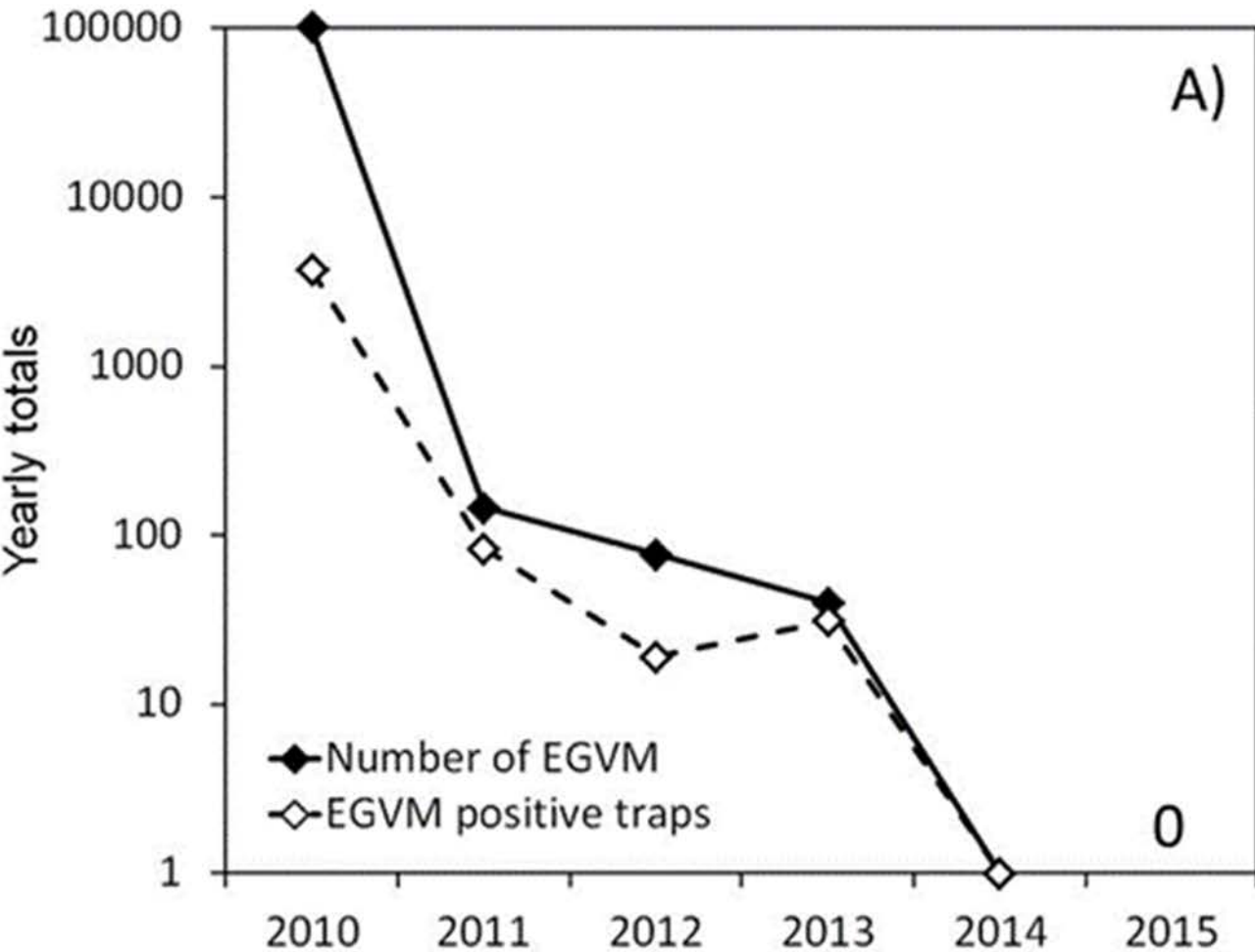
DON'T TRANSPORT GRAPES OR OTHER VINE MATERIALS FROM A QUARANTINED AREA.  
AND ALWAYS CLEAN YOUR EQUIPMENT BEFORE MOVING IT BETWEEN FIELDS.

[HUNGRYPESTS.COM/EVGM](http://HUNGRYPESTS.COM/EVGM)

**Hungry Pests**



# Total EGVM moths on traps: Napa County 2010-2015 (A) & 2010 (B)





## **Eradication Declared in August 2016**

- **North America free of *Lobesia botrana***
- **European Grapevine Moth Post-Eradication Response Guidelines developed.**
  - **Plan to trap and survey at high levels for at least three years**
  - **[https://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/eg\\_moth/downloads/post-eradication-guidelines.pdf](https://www.aphis.usda.gov/plant_health/plant_pest_info/eg_moth/downloads/post-eradication-guidelines.pdf)**



# Research & Methods Development

- Detection methods in mating disrupted field & MD formulations & application methods
- Pesticide research
- Post harvest treatments of table grapes & regulatory treatments of green wastes & wine wastes
- Degree day models under California conditions
- Alternate hosts surveys
- Mass-rearing technology & SIT, Syria, Israel, Chile, USA, Argentina (others?) last CRP
- Economic analysis, ex-ante & post-ante
- Post program spatial analysis

# Grape crush & sampling









# Phenology Study in wild host riparian area





Topographic map of the study area. The map shows Bear Canyon Creek, Rafterford, and various landmarks including Lake Naz 1418 Dam, Lake Heintz, and the Rafterford Dam. Traps are numbered 2 through 39, with red triangles indicating their locations. The map includes a scale bar for 0.5 miles and a copyright notice for Garmin Corporation 1995-2002.

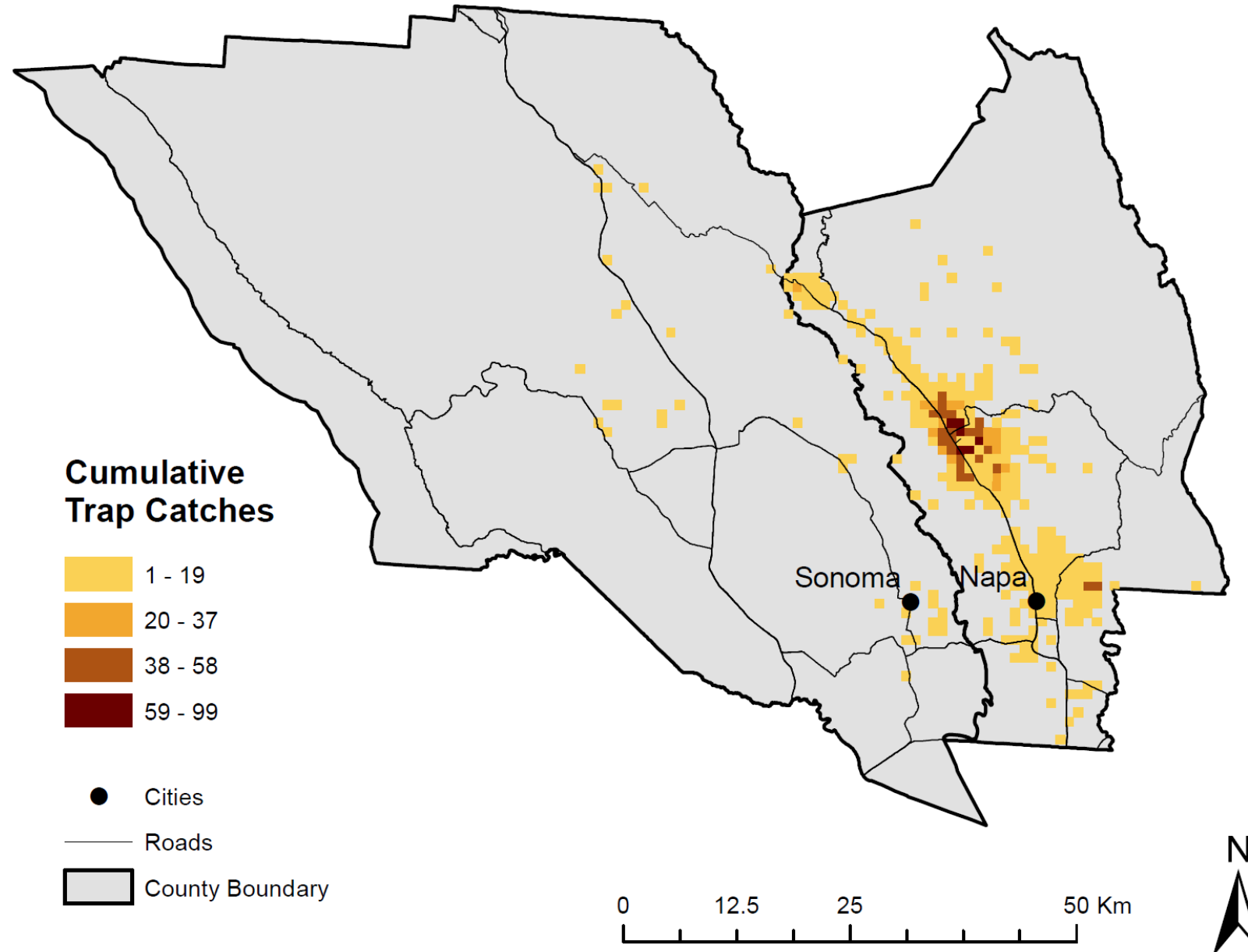
# ALTERNATIVE HOST PLANT SURVEYS

## FOCUS PLANT SPECIES





# Spatial analysis of trap data to determine habitat suitability modeling for post program analysis



# Example of creative outreach for communication about grapes pests by Napa County Agricultural Commissioner's office, "FaceBug" Campaign

## DON'T "FRIEND" THE BUG!



### DON'T BRING PLANTS INTO NAPA COUNTY

Don't lower your guard and fall for the smooth talk. Sometimes you just can't be friends. The best way to keep the Glassy-Winged Sharpshooter *out* of the county is by not bringing plants *in*. Buy all your plants from certified plant retailers inside Napa County, where shipments have been inspected before sale.



Egg masses travel on the underside of plant leaves

Thanks to our grapegrowers, landscapers, certified plant retailers and YOU, the sharpshooter has not yet established itself in the Napa Valley. But to keep it out, we must keep working together. For more information about how you can help, please call us at 1.866.BUG.SPOT or visit [WWW.BUGSPOT.ORG](http://WWW.BUGSPOT.ORG).

*A project of the Napa County Agricultural Commissioner's Office.*