Managing insect vectors of grapevine diseases

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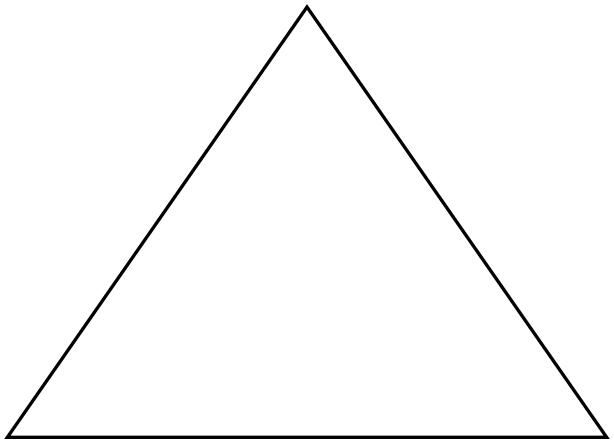
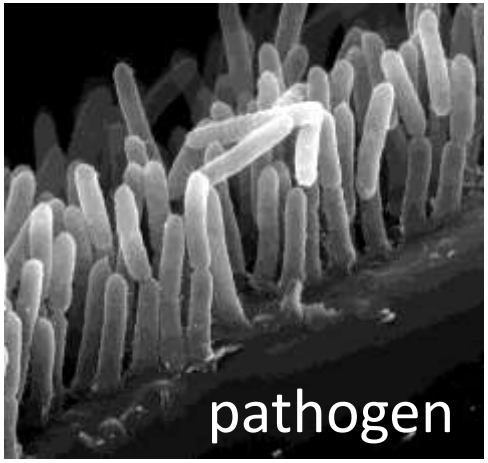
vector




pathogen


host

Managing vector-borne diseases

1. Vector control

   chemical control (conventional or organic)

   biological control

   mating disruption

2. Reduce inoculum supply

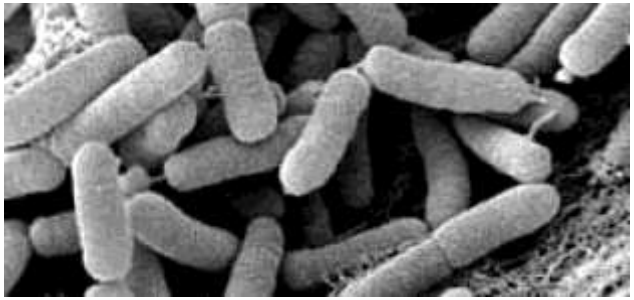
   remove infected vines (roguing)

   eliminate reservoir hosts

3. Host resistance or therapeutics

   resistant hybrids, transgenics

   anti-microbial treatments, bacteriophage, avirulent strain



Pierce's disease

Caused by *Xylella fastidiosa*

Transmitted by xylem sap-feeding leafhoppers or spittlebugs

- vectors cause little direct damage
- no vertical transmission
- no latent period
- infection persistent in adults

Most important PD vectors?

Blue-green sharpshooter

- dominant in coast range
- very efficient

Glassy-winged sharpshooter

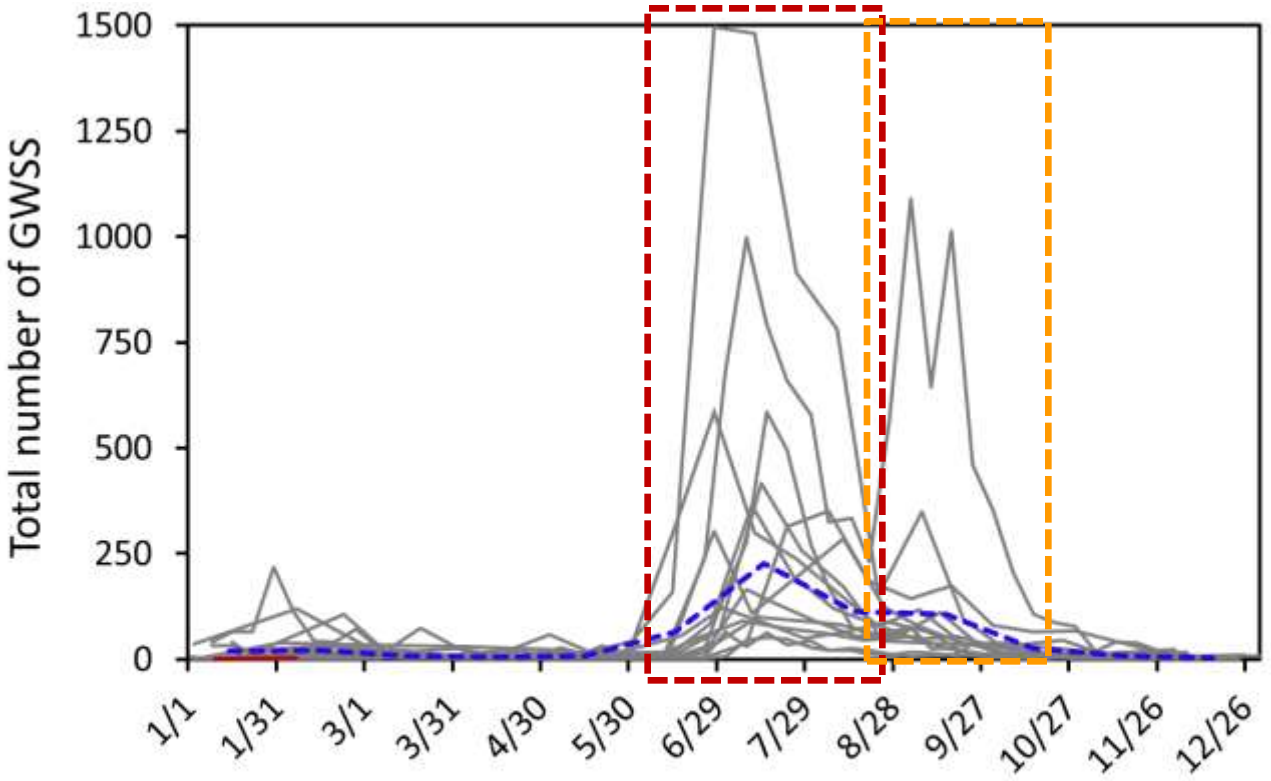
- relatively inefficient vector, but…
- multiple generations a year
- extremely broad host range
- can reach extremely high densities

PD/GWSS management strategy

- GWSS monitoring
- biological control
- chemical control
- weed management for vector/Xf inoculum
- roguing of diseased vines

Management is based on patterns of GWSS abundance

Lots of yearly and seasonal variability



- Summer 1° peak in activity, Fall 2° peak in some years

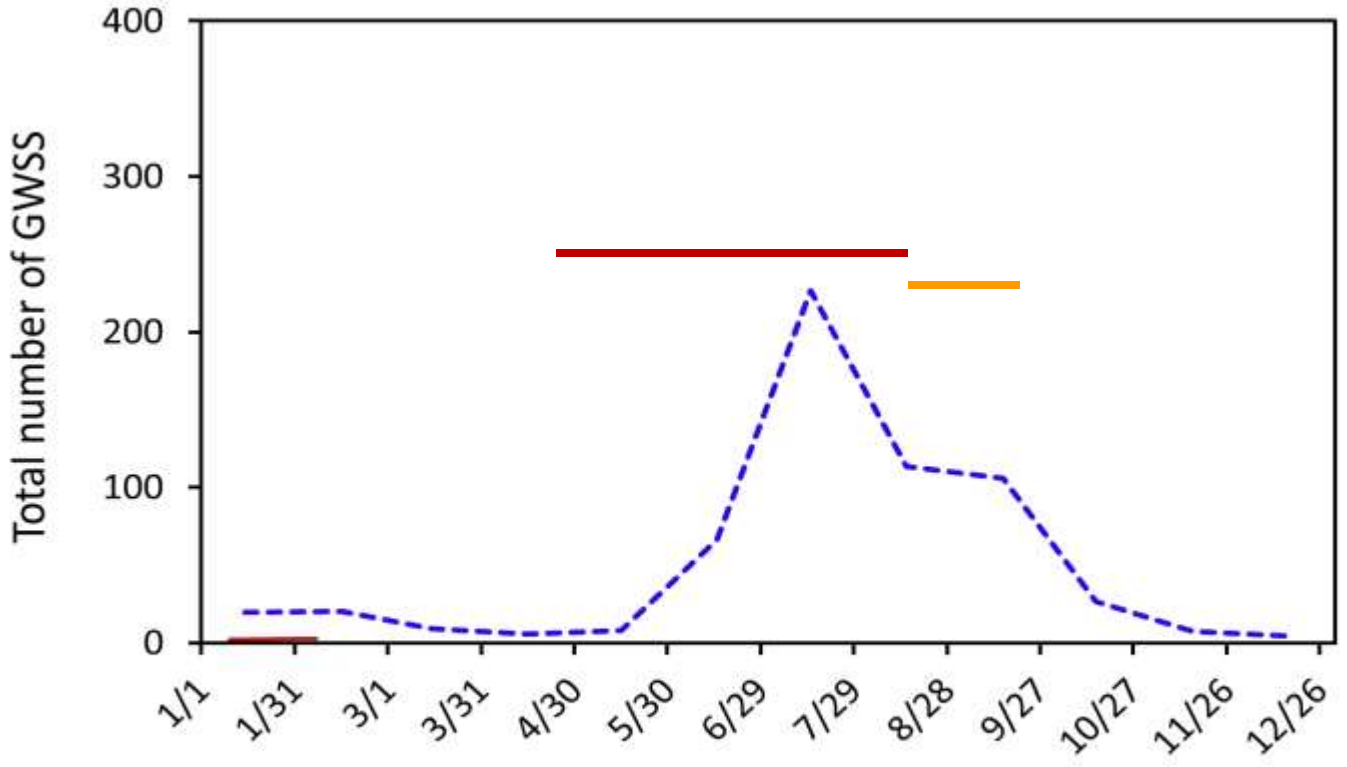
GWSS monitoring

Monitoring guides treatment decisions

Deploy traps on margins near GWSS sources

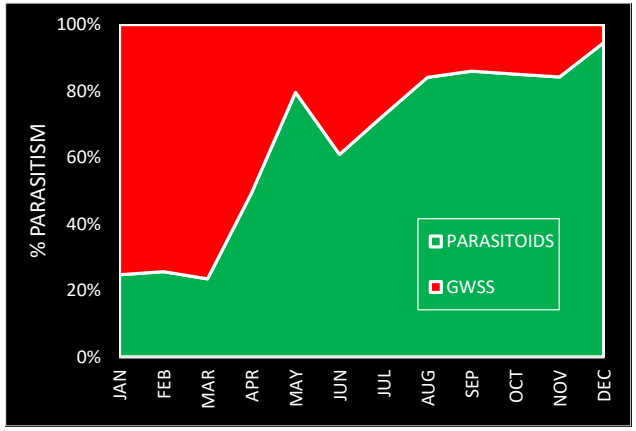
- citrus groves, ornamentals
- ≥ 2, up to 1 per 5-10 ac
- keep trap above vine canopy
- check 1 - 2x a month

Goal is to suppress GWSS populations through ~mid-August



- one or more treatments from mid-Spring through mid-Summer
- late-Summer applications rarely needed? (high recovery)

GWSS Biological control



D. Morgan

Native and introduced egg parasitoids

- *Cosmocomoidea* (=*Gonatocerus*) spp.
- not commercially available

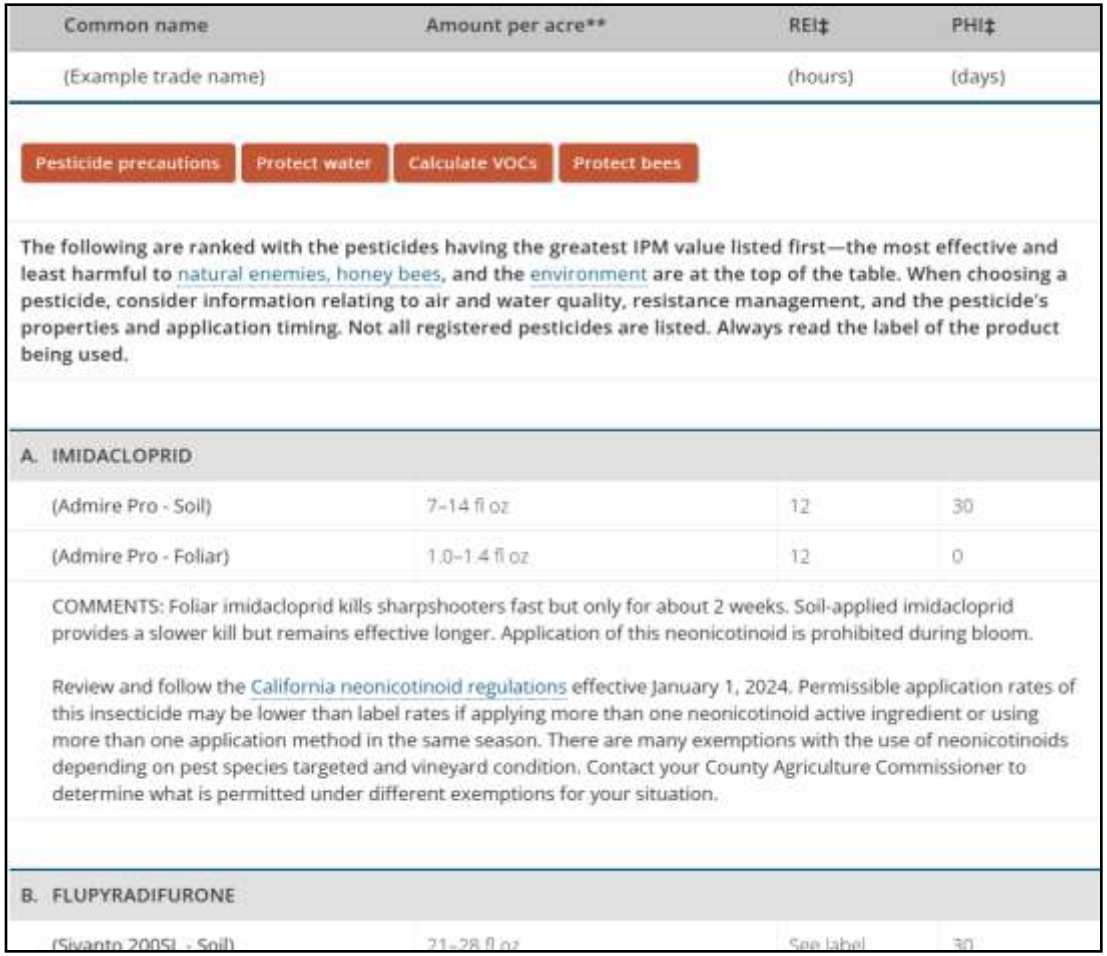
CDFA mass release program in invasive range

- Southern California releases stopped in 2012

High parasitism rates Summer - Fall

GWSS chemical control

Insecticides include conventional systemics and foliars, and organics
https://ipm.ucanr.edu/agriculture/grape/sharpshooters/



Common name	Amount per acre**	REI‡	PHI‡
(Example trade name)		(hours)	(days)

Pesticide precautions | Protect water | Calculate VOCs | Protect bees

The following are ranked with the pesticides having the greatest IPM value listed first—the most effective and least harmful to natural enemies, honey bees, and the environment are at the top of the table. When choosing a pesticide, consider information relating to air and water quality, resistance management, and the pesticide's properties and application timing. Not all registered pesticides are listed. Always read the label of the product being used.

A. IMIDACLOPRID			
(Admire Pro - Soil)	7–14 fl oz	12	30
(Admire Pro - Foliar)	1.0–1.4 fl oz	12	0

COMMENTS: Foliar imidacloprid kills sharpshooters fast but only for about 2 weeks. Soil-applied imidacloprid provides a slower kill but remains effective longer. Application of this neonicotinoid is prohibited during bloom.

Review and follow the California neonicotinoid regulations effective January 1, 2024. Permissible application rates of this insecticide may be lower than label rates if applying more than one neonicotinoid active ingredient or using more than one application method in the same season. There are many exemptions with the use of neonicotinoids depending on pest species targeted and vineyard condition. Contact your County Agriculture Commissioner to determine what is permitted under different exemptions for your situation.

B. FLUPYRADIFURONE			
(Sivanto 200SL - Soil)	21–28 fl oz	See label	30

Spring soil application of systemic neonicotinoid:

- imidacloprid, thiamethoxam, dinotefuran
- long residual efficacy (months); anti-feedant effect

late Summer/Fall foliar applications:

- acetamiprid, fenpropathrin, flupyradifurone, …
- as needed based on monitoring
- moderate residual efficacy (weeks)
- PHI may complicate applications made around harvest

pyrethrins (Pyganic)

- very short residual efficacy (contact)
- retreat on 7 – 10 d basis, based on monitoring

kaolin clay (Surround)

- reduces attraction to plant, disrupts feeding, reduces oviposition
- retreat on 1 - 3 wk basis, based on monitoring

Vine mealybug, *Planococcus ficus*

First detected in California in mid-90s

Prefers grapevines (figs, dates, avocado, citrus)

Vector of grapevine leafroll associated virus

- reduced yields, poor quality

High population densities + copious honeydew

- sooty mold, contamination of clusters

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

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

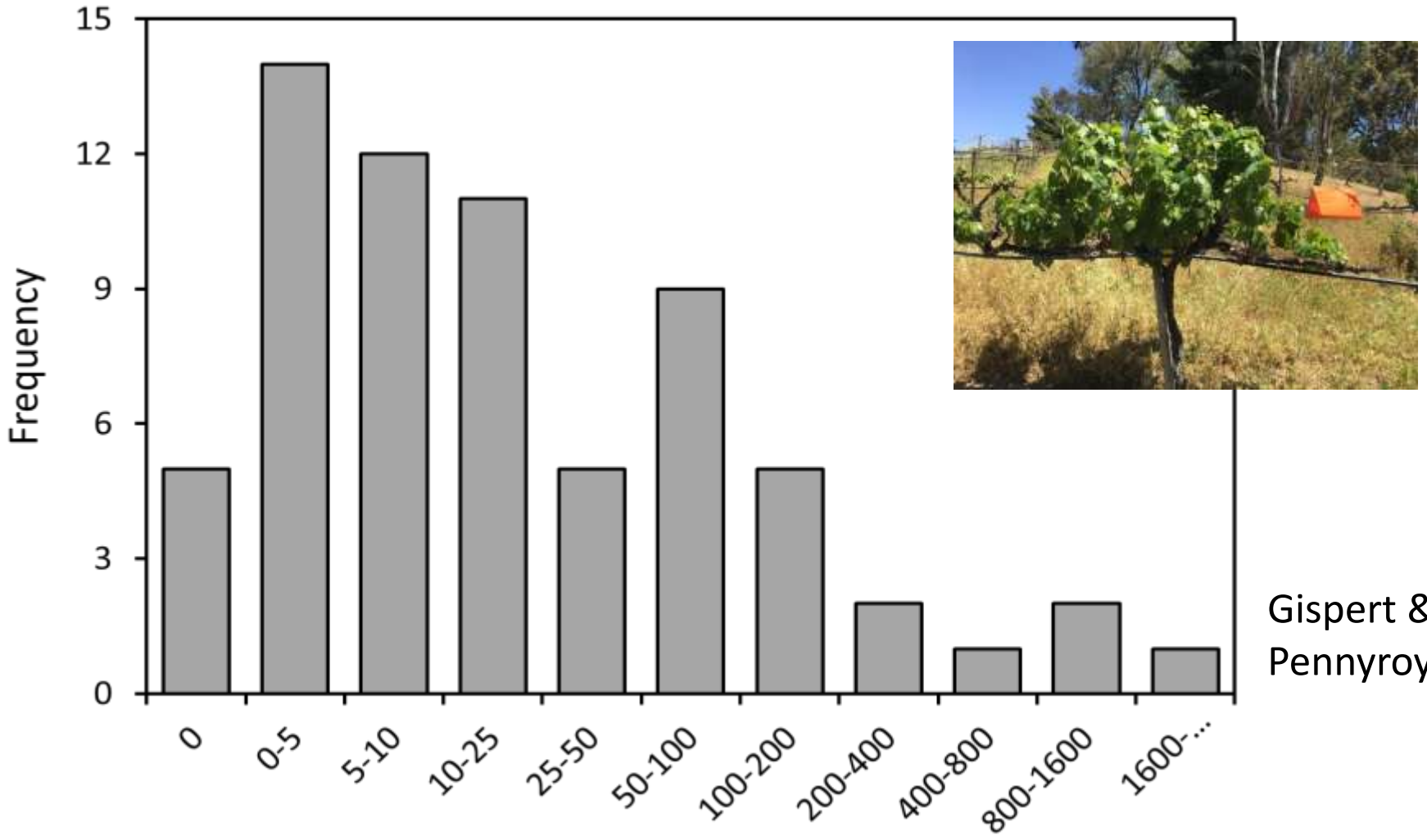
Grape mealybug, *Pseudococcus maritimus*

Citrus mealybug, *Planococcus citri* (Risso)

Vine mealybug, *Planococcus ficus*

Longtailed mealybug, *Pseudococcus longispinus*

Pink hibiscus mealybug, *Maconellicoccus hirsutus*



Gispert & Pennyroyal

- 92% (62/67) of Riv/SD sites detected VMB males

VMB monitoring

Look for ants, sooty mold

Winter & Spring: crown and trunk

After bloom: cordons, canes, basal leaves

After veraison: inspect clusters

Pheromone traps

- deploy in Spring, 2 traps per 20 – 40 ac
- check every 2 wk

VMB biological control

Predatory beetles & midges

- mealybug destroyer (*Cryptolaemus montrouzieri*)

Anagyrus pseudococci

- imported mealybug parasitoid
- 20-90% parasitism of VMB late season
- supplement by Spring releases from commercial insectaries

Ant control is important

VMB chemical control

https://ipm.ucanr.edu/agriculture/grape/vine-mealybug

Conventional:

- multiple seasonal treatments, mating disruption
- *early Spring*: buprofezin (IGR; Applaud)
- *Bloom*: spirotetramat (Movento)
- *Summer/post harvest*: buprofezin, spirotetramat, soil-applied neonicotinoid

Organic:

- oils, biocontrol, mating disruption

Mating disruption for VMB

https://ipm.ucanr.edu/agriculture/grape/vine-mealybug

Limited effectiveness in small blocks (< 5 ac)

Most effective when VMB populations are low (post-treatment)

Deployed using dispensers or in sprayable form

- dispensers: 120 – 250 per ac, deployed in Spring
- sprayable: monthly from late Spring – early Fall

Grapevine red blotch disease

Grablovirus, Geminiviridae

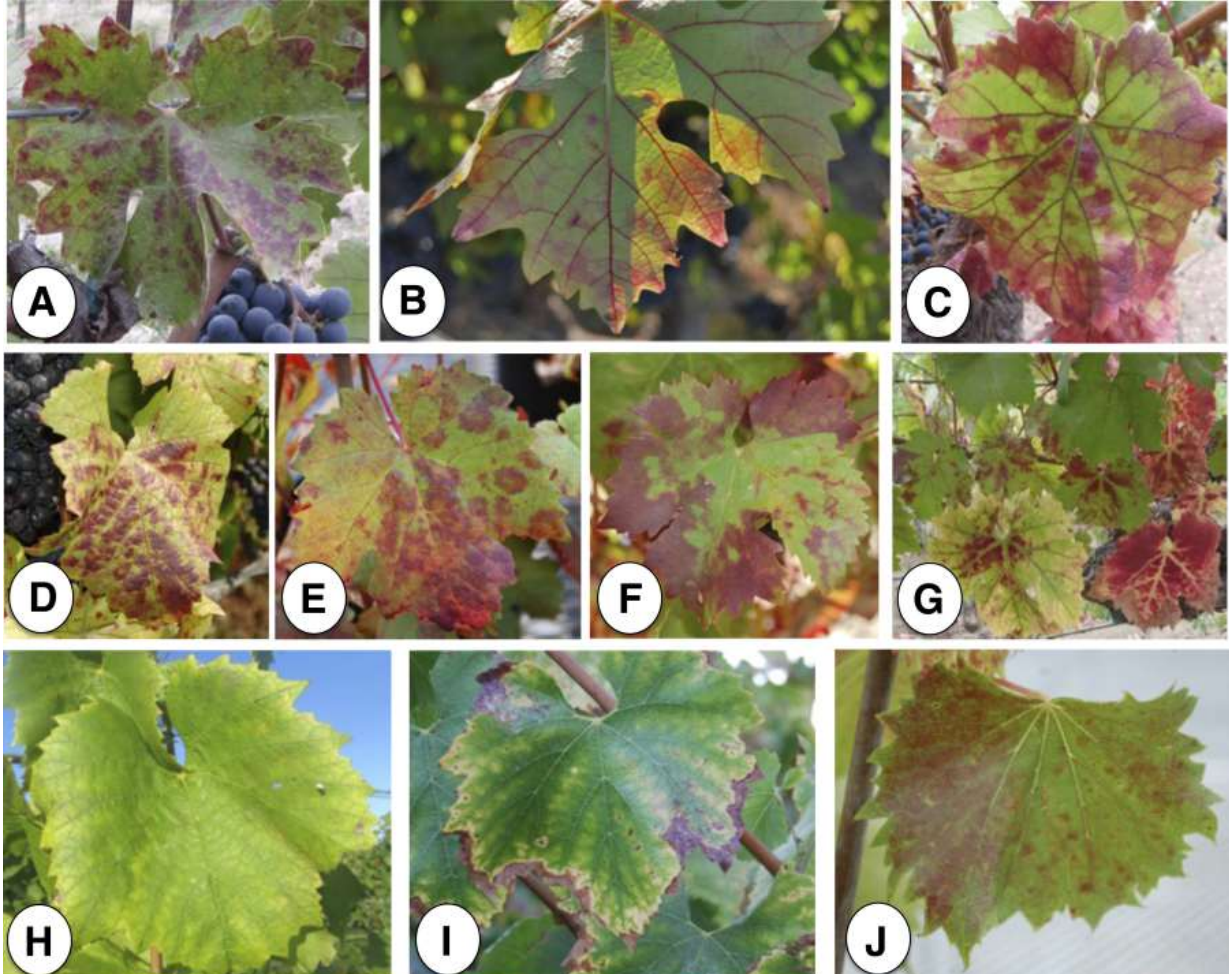
First detected in Napa Co in 2008

- OR, WA, Northeast US

Long incubation period (3 years)

Symptoms variable

- red or yellow blotches, red veins, necrosis, no obvious rolling
- impacts berry color, sugars, pH, flavor profile



Sudarshana et a. 2015

Three-cornered alfalfa hopper (*Spissistilus festinus*)

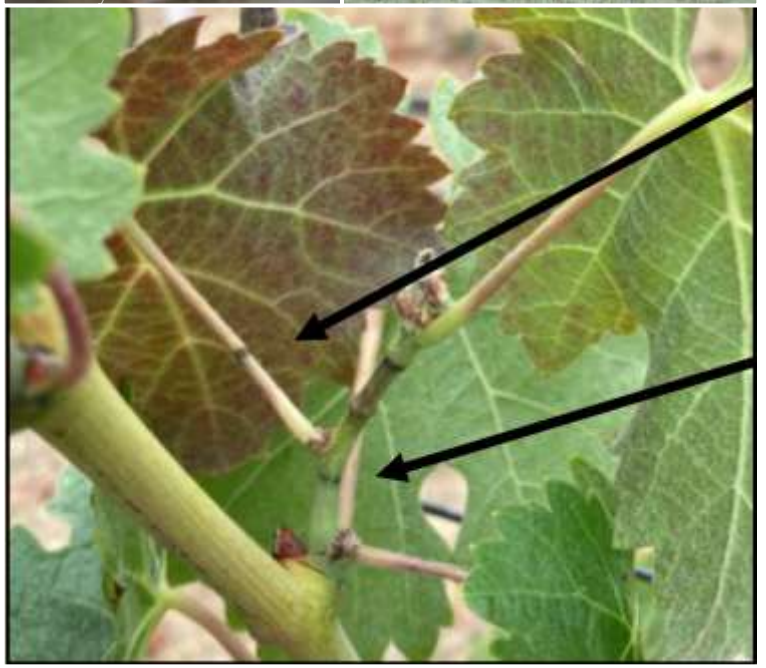
Multiple phloem-feeders positive for GRBV

TCAH only confirmed vector in California, so far

- 40-60% infective during Summer

Considered minor pest of grapes

- girdling damage



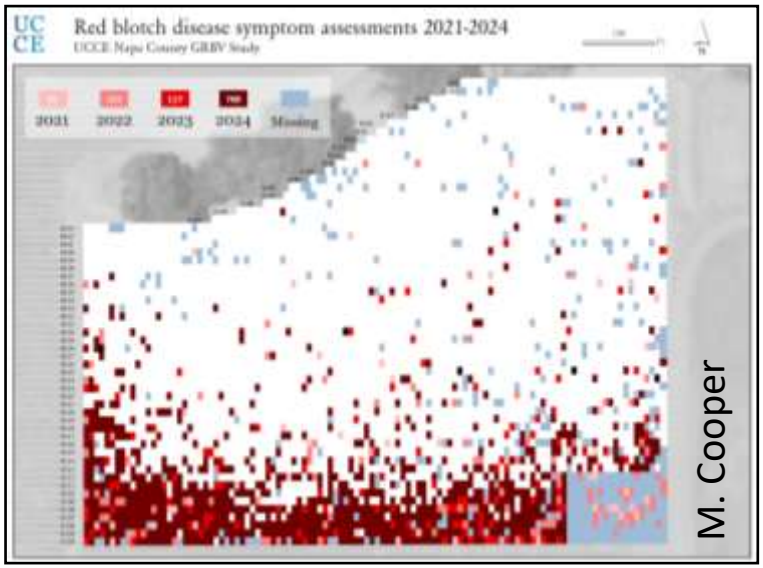
GRBD management

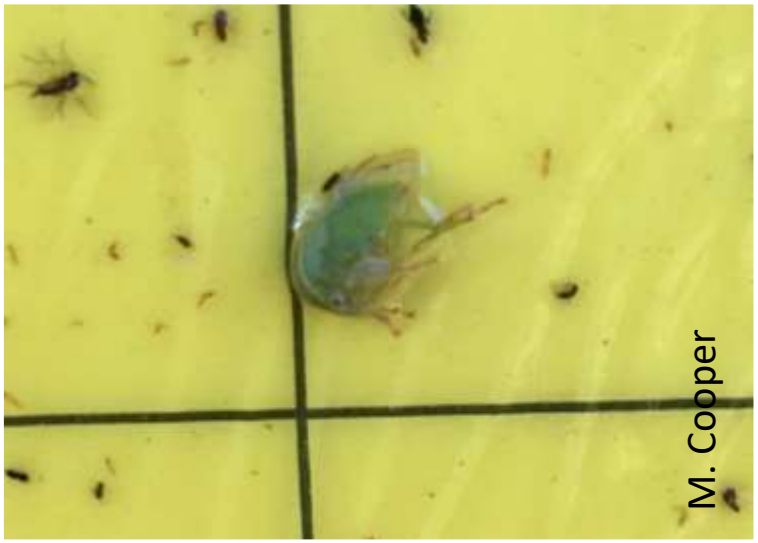
Management largely focused on roguing strategies

- rogue and replace if < 30% prevalence
- vineyard replacement if > 30%
- effectiveness of “zonal roguing”?

Limited information on vector management

- host plants, cover cropping





Temecula Valley GWSS monitoring program:
http://cisr.ucr.edu/temeculagwss/

UC IPM sharpshooter management:
http://ipm.ucanr.edu/PMG/r302301711.html

UC IPM vine mealybug management:
https://ipm.ucanr.edu/agriculture/grape/vine-mealybug

Napa County UCCE Red Blotch site:
https://ucceviticulturenapa.wixsite.com/uccevitnapa/red-blotch

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