Cotton Aphid Management in Pomegranate: Slowing the Spread of Citrus Tristeza Virus in the San Joaquin Valley

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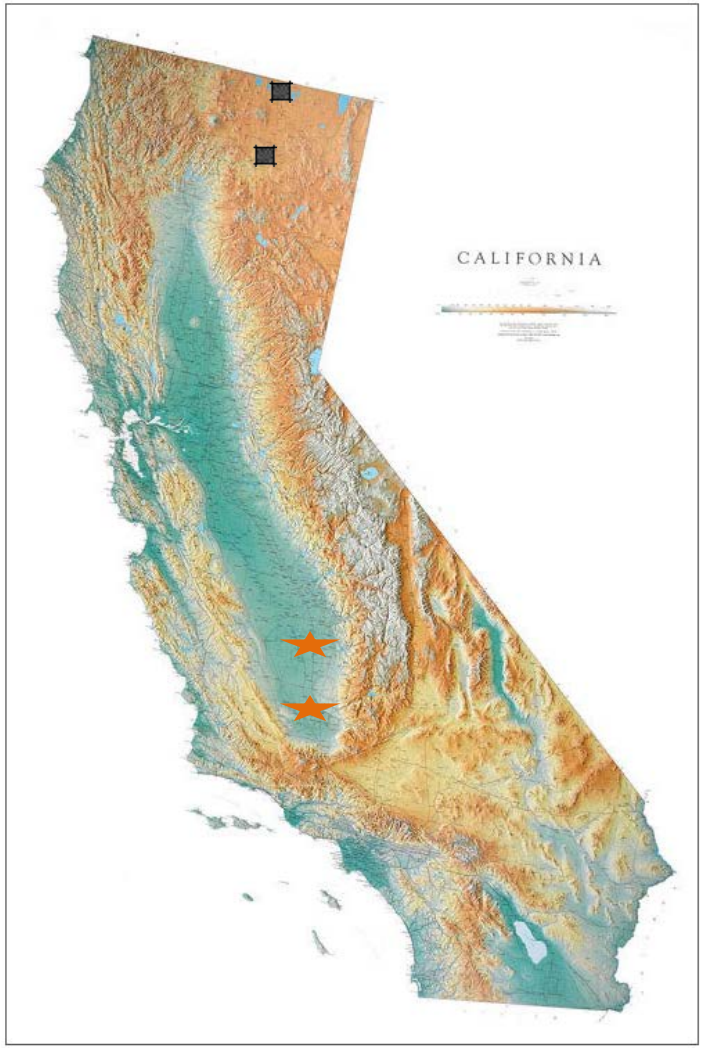
Refined management of Arthropod pests of mint to improve sustainability and protect water quality

Cotton aphid management in pomegranate: Slowing the spread of citrus tristeza virus in the San Joaquin Valley



Aphis gossypii Glover

- melon aphid, cotton aphid, other common names
- at least 300 host plants are known in the U.S. and perhaps 700 host plants world-wide
  - cotton, okra, hibiscus, cowpea, citrus, cucurbits, strawberry, bean, spinach, tomato, clover, asparagus, catalpa, violet, hydrangea, begonia, ground ivy, gardenia, and several weeds
- citrus, eggplant, celery, floriculture and ornamental nurseries, melons, squash, cotton, pomegranates, and dry beans are important crop hosts in California

Aphis gossypii Glover

- Damage
  - reduction / distortion of plant growth
  - contamination of produce
  - virus transmission

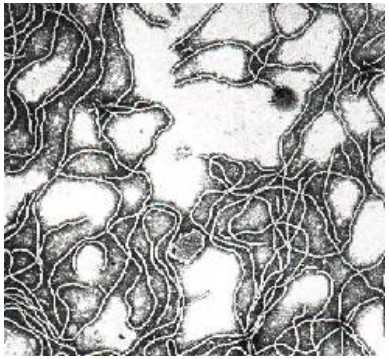
Citrus tristeza virus

Quick decline of a tree on sour orange rootstock

Cotton aphid as vector of citrus tristeza virus

Citrus tristeza virus-infected citrus tree

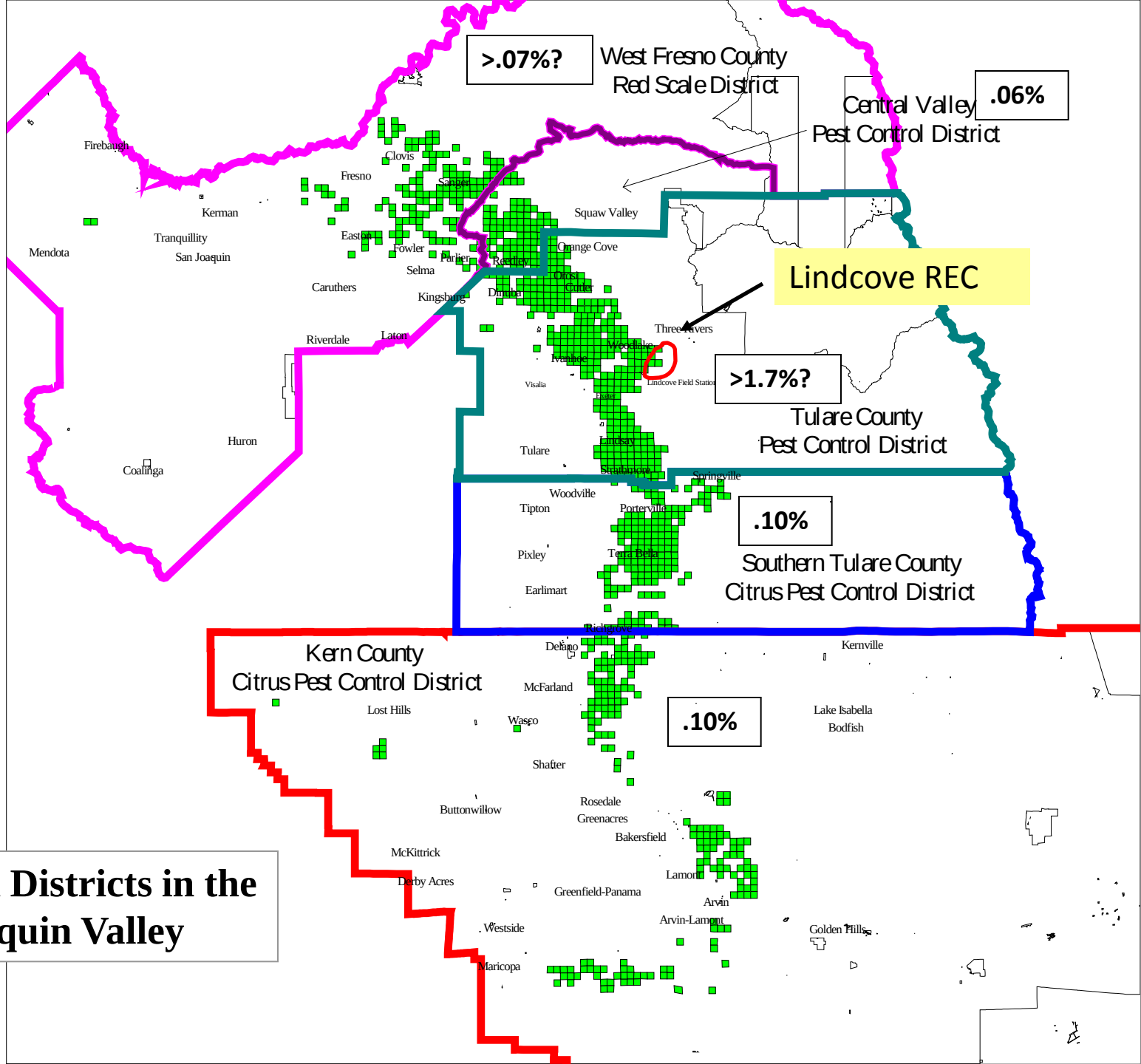
Citrus tristeza virus



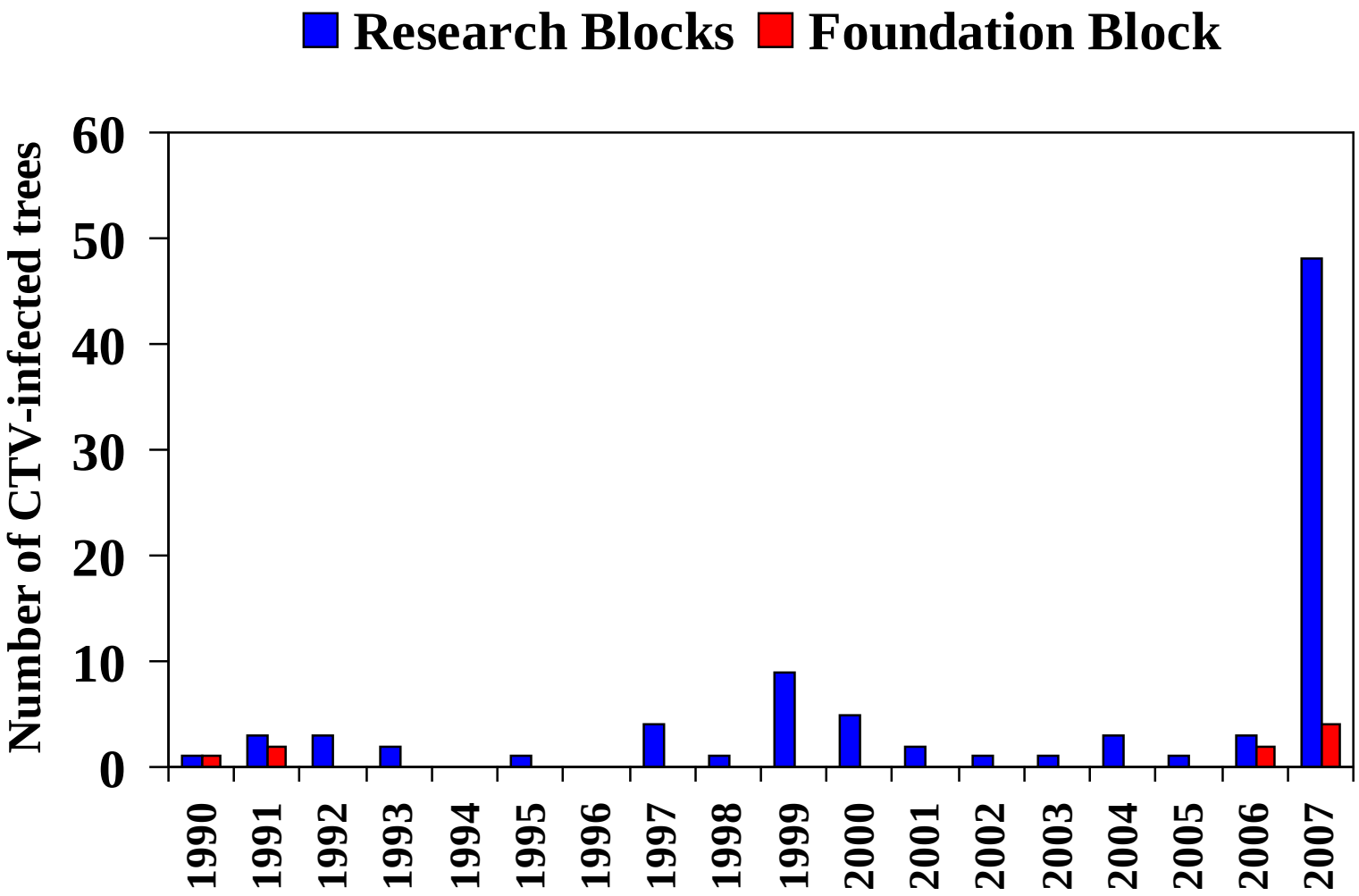
Spread citrus tristeza virus to other citrus trees

Latency period of 1-2 years before the CTV titer is high enough to detect it in the tree

Pest Control Districts in the San Joaquin Valley

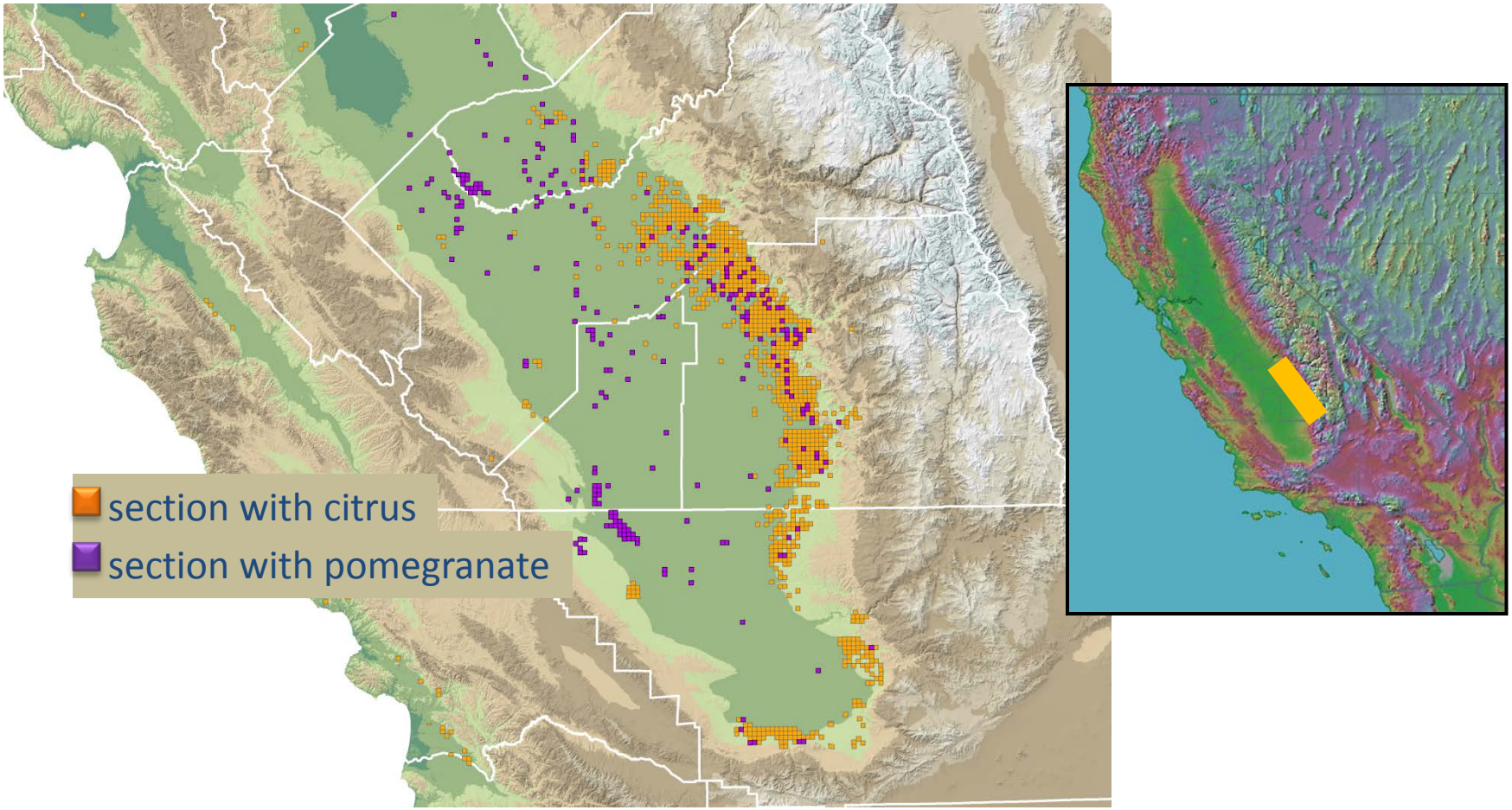


Number of CTV-infected trees removed at the Lindcove Research and Extension Center Collection in April-May



Pomegranate Production

- Pomegranates
  - acreage increasing significantly
  - 12-15,000 acres in 2006 to 29,000 acres in 2009



Aphis gossypii Glover

Not a new insect to CA

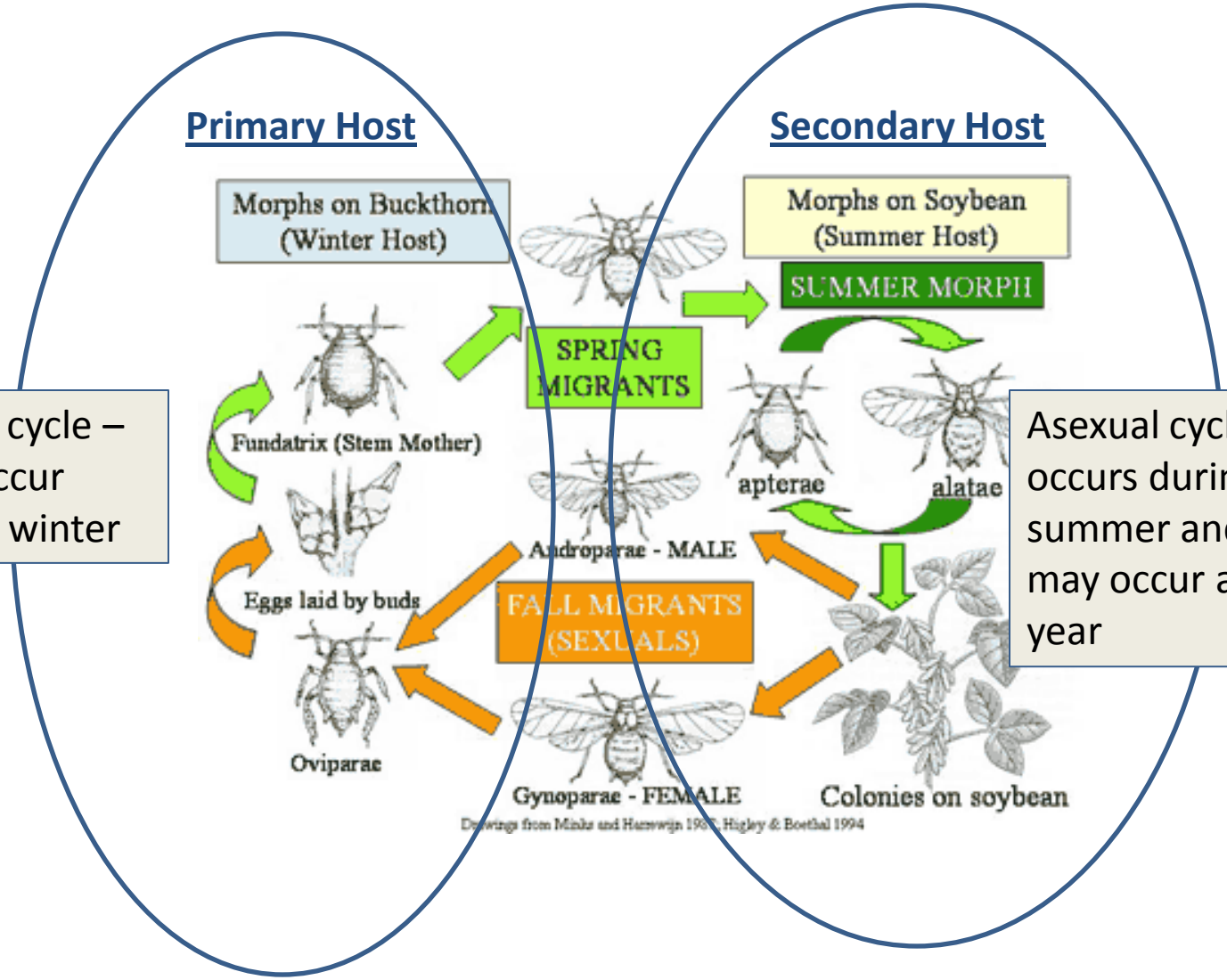
- Gordon Smith, 1942. "…*certain localities at the southern extremity of the San Joaquin Valley and along the eastern side of the valley have this pest to contend with throughout the growing season almost every year*."
- 1990's- saw early-season (spring) infestations of cotton aphids in the eastern Tulare Co. area first

- What is unique about this area?
- in early 2000's we found cotton aphids overwintering on pomegranates – as eggs
- examined other "unusual" crops in this area – persimmons, olives, pecans, Asian pears, various other fruit crops and found none

Aphid Life Cycles

Catalpa, Rhamnus, Hibiscus reported hosts

Sexual cycle – may occur during winter

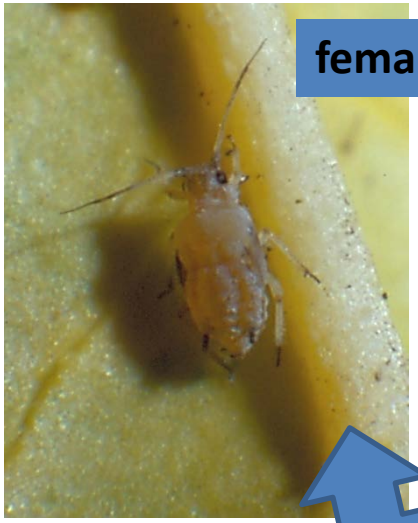


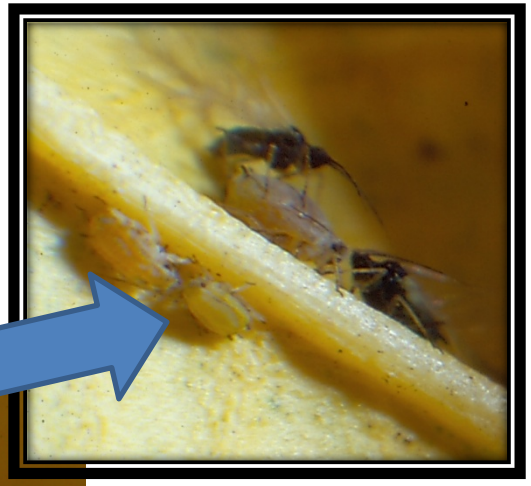
Asexual cycle – occurs during summer and may occur all year

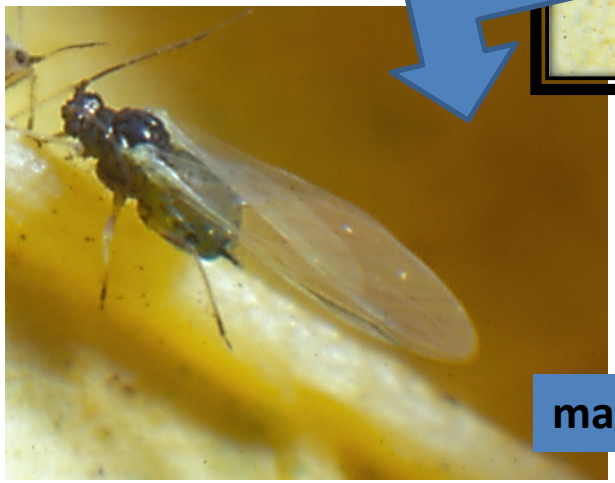
Project objectives

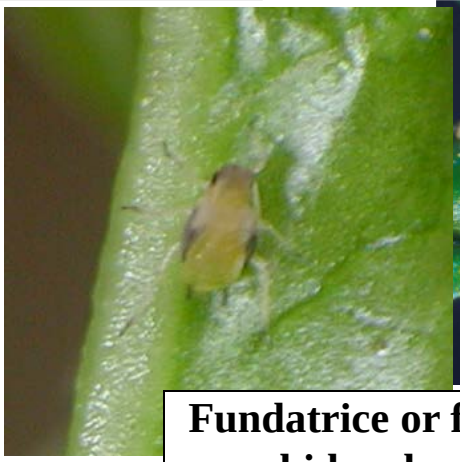
1. Investigate the phenology and life history of cotton aphid
2. Investigate reduced-risk insecticide efficacy
3. Non-chemical management of cotton aphids
   - Pheromones
   - Biological control
4. Map pomegranate and citrus acreage
5. Extend results

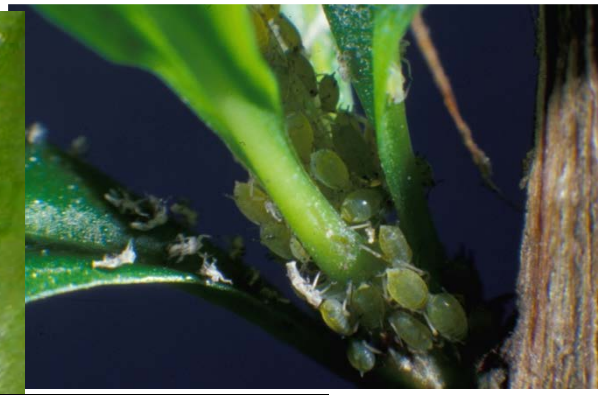
Aphis gossypii Overwintering





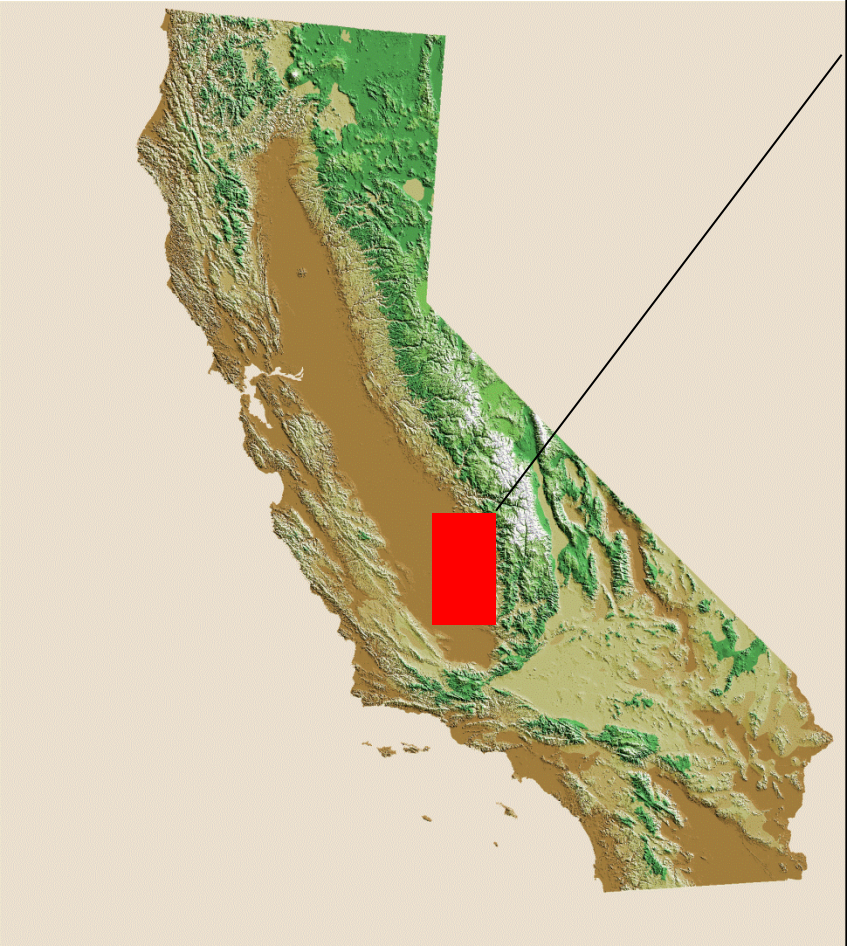


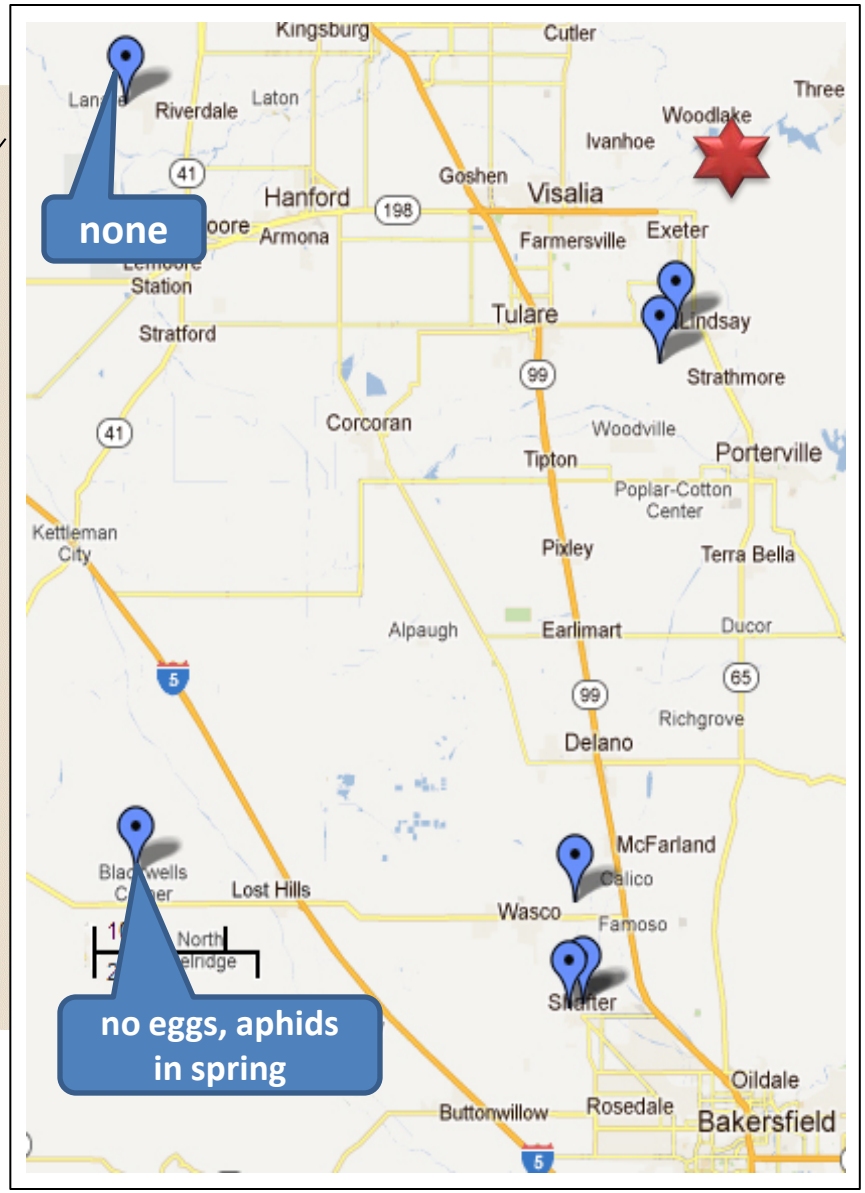




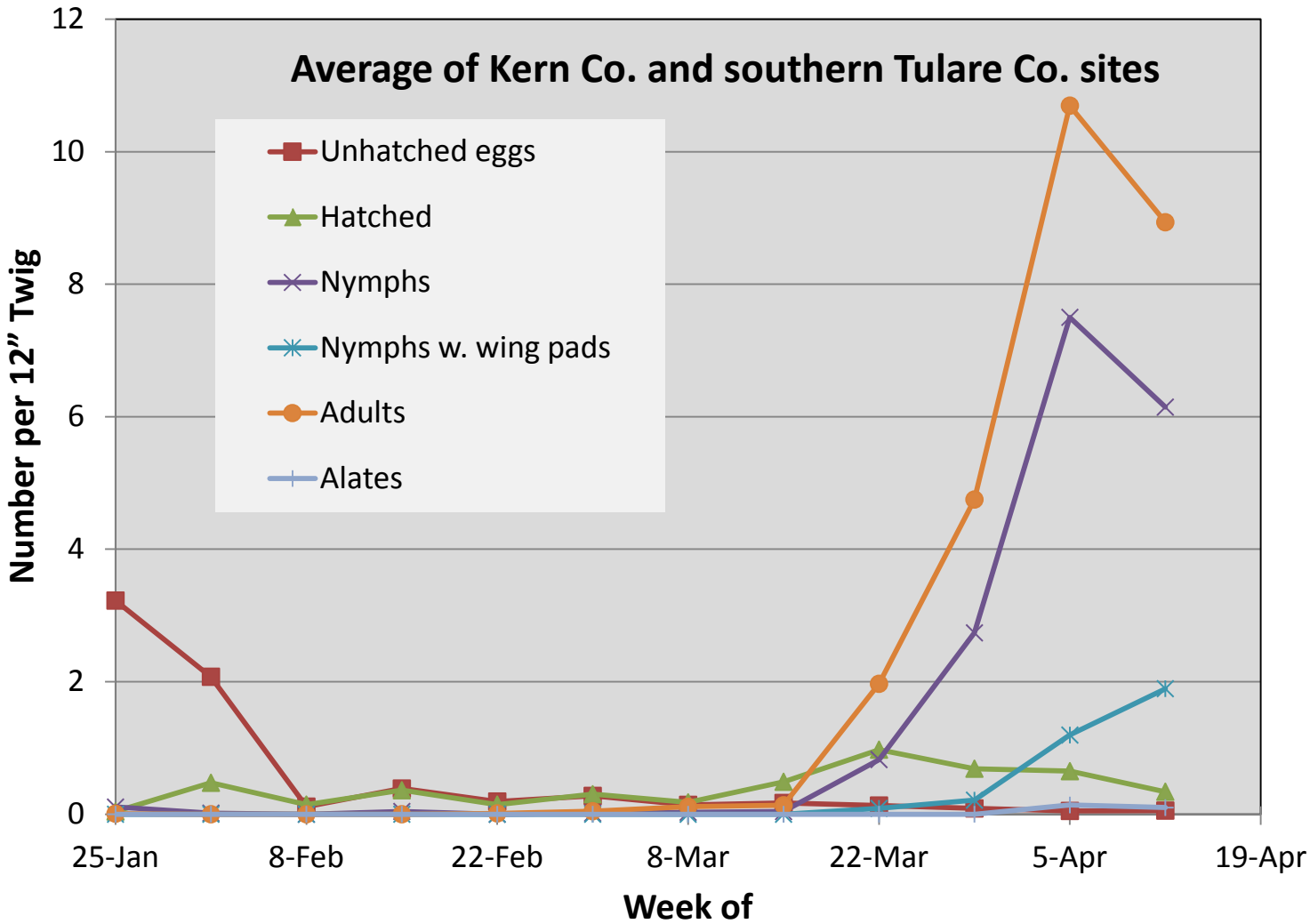
Fundatrice or first generation aphids eclosed from eggs

Kern Co. and southern Tulare Co. sites





2009-10


Average of Kern Co. and southern Tulare Co. sites
Unhatched eggs
Hatched
Nymphs
Nymphs w. wing pads
Adults
Alates
Number per 12" Twig
0
2
4
6
8
10
12
25-Jan
8-Feb
22-Feb
8-Mar
22-Mar
5-Apr
19-Apr
Week of

Sites Near Lindcove REC

	Lemon Cove	RH 22-9	RH17-8	Berghius
1st nymphs on twigs				
2009	March 10	Feb 25		
2010	-	March 9	Jan 20	Feb 9
2011	-	March 14	March 14	
1st winged nymph				
2009	April 14	April 8		
2010	-	March 22	March 22	March 29
2011	April 4	April 4	March 30	

Environmental Effects on Egg Hatch

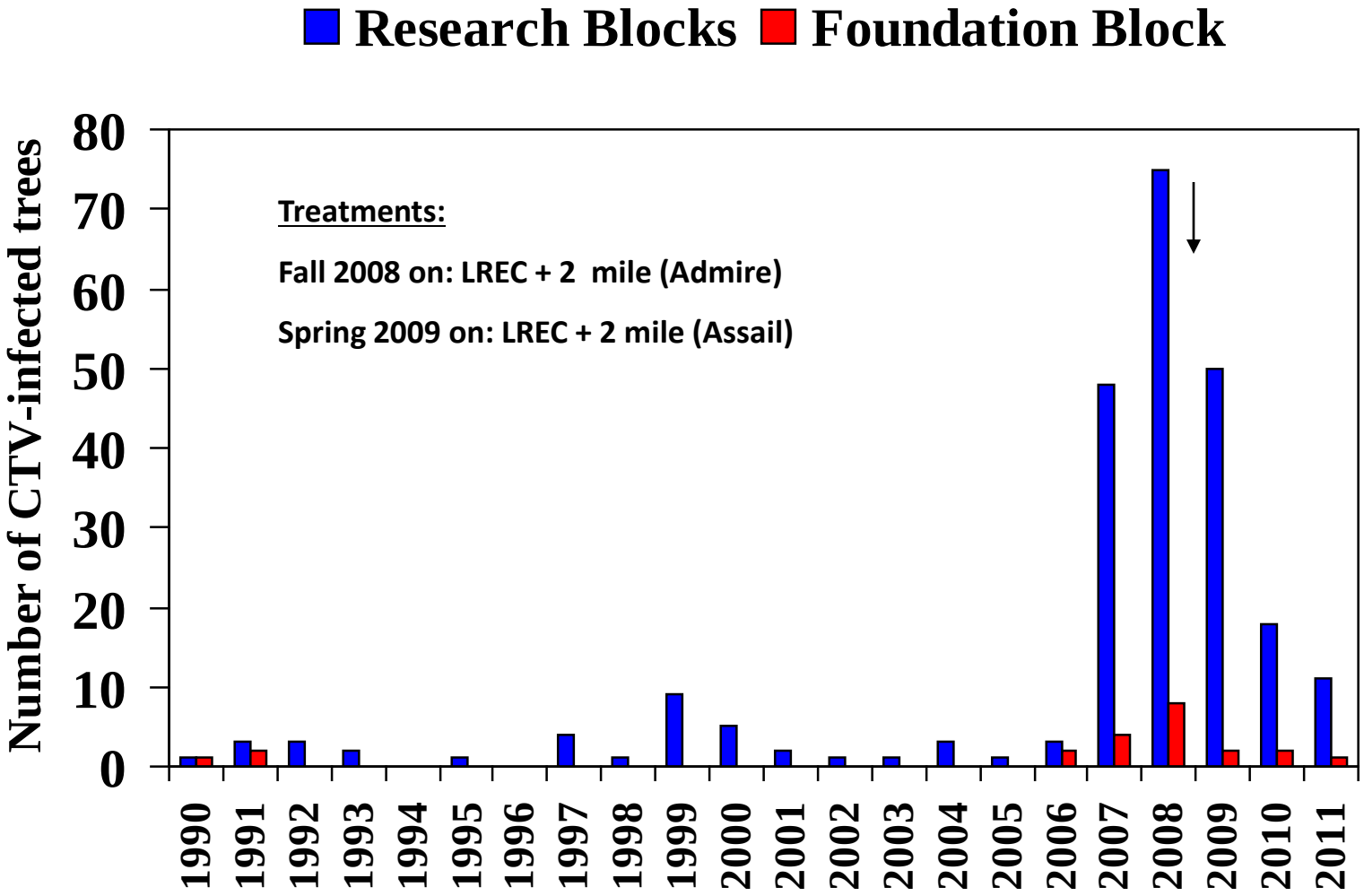
- Collect aphid eggs from pomegranates in Tulare Co.
- Expose in Davis lab to various conditions
- Recorded timing of egg hatch

Cold Period		
Temperature	Duration	Hatching temperature
none	none	20 ^{0}C
1 ^{0}C	1, 2, or 3 months	13, 15, 20, 25, or 30 ^{0}C
6 ^{0}C	1, 2, or 3 months	13, 15, 20, 25, or 30 ^{0}C
Outdoors (Davis)	1, 2, or 3 months	13, 15, 20, 25, or 30 ^{0}C

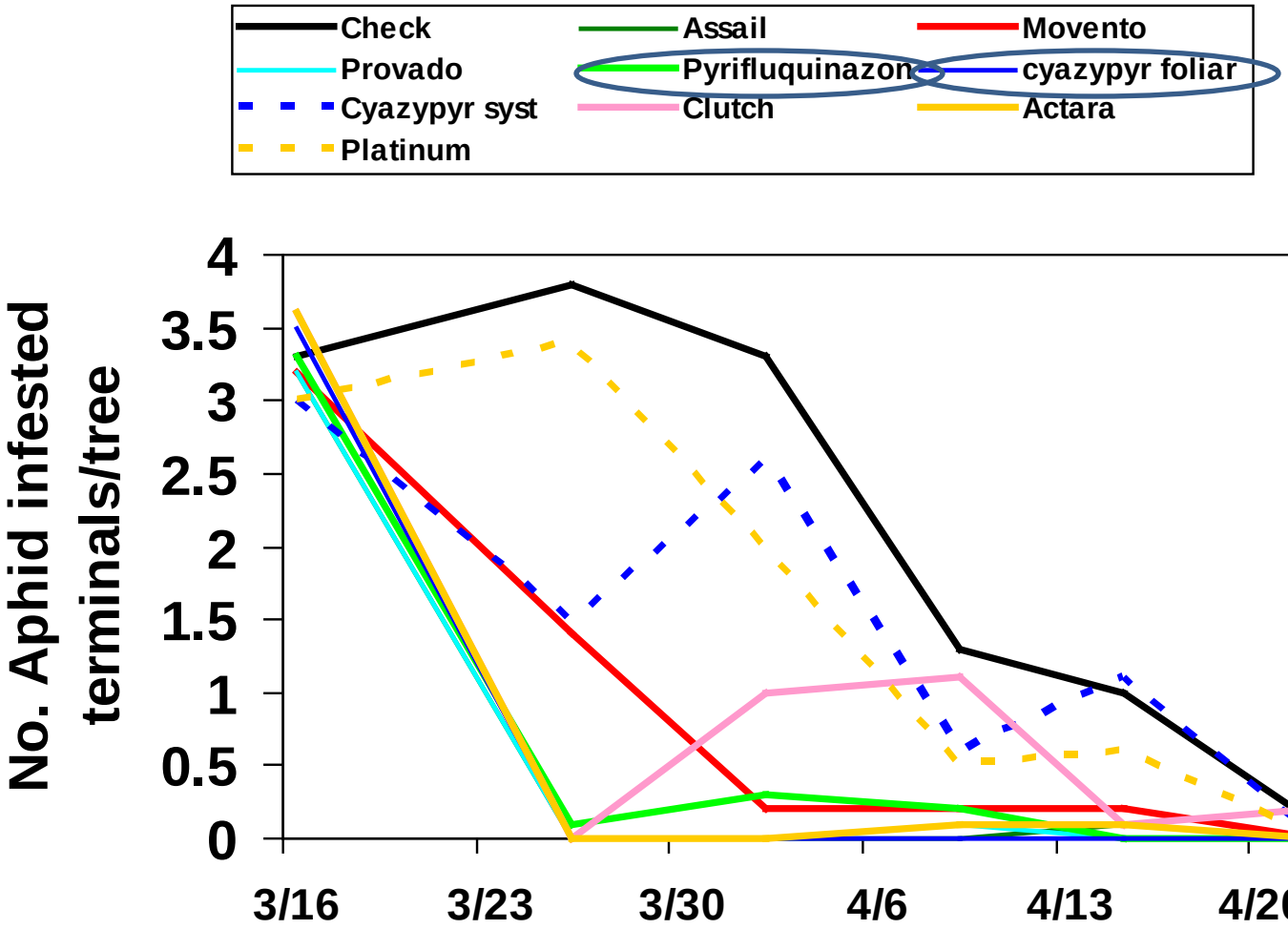
Results

- Eggs require cold period before hatch
- 6 ^{0}C for 3 months best
- For hatching (incubation) 25 and 30 ^{0}C too warm
- After egg hatch – 400 degree-days above 3 ^{0}C needed to reach adulthood

Number of CTV-infected trees removed at the Lindcove Research and Extension Center Collection in April-May



Aphid Management



Water Volume: 200 gpa
Application date: 18-20 Mar 2009
Hand sprayed 6 trees/treatment, sampled 25 terminals/tree

2009 LREC

Aphid Management

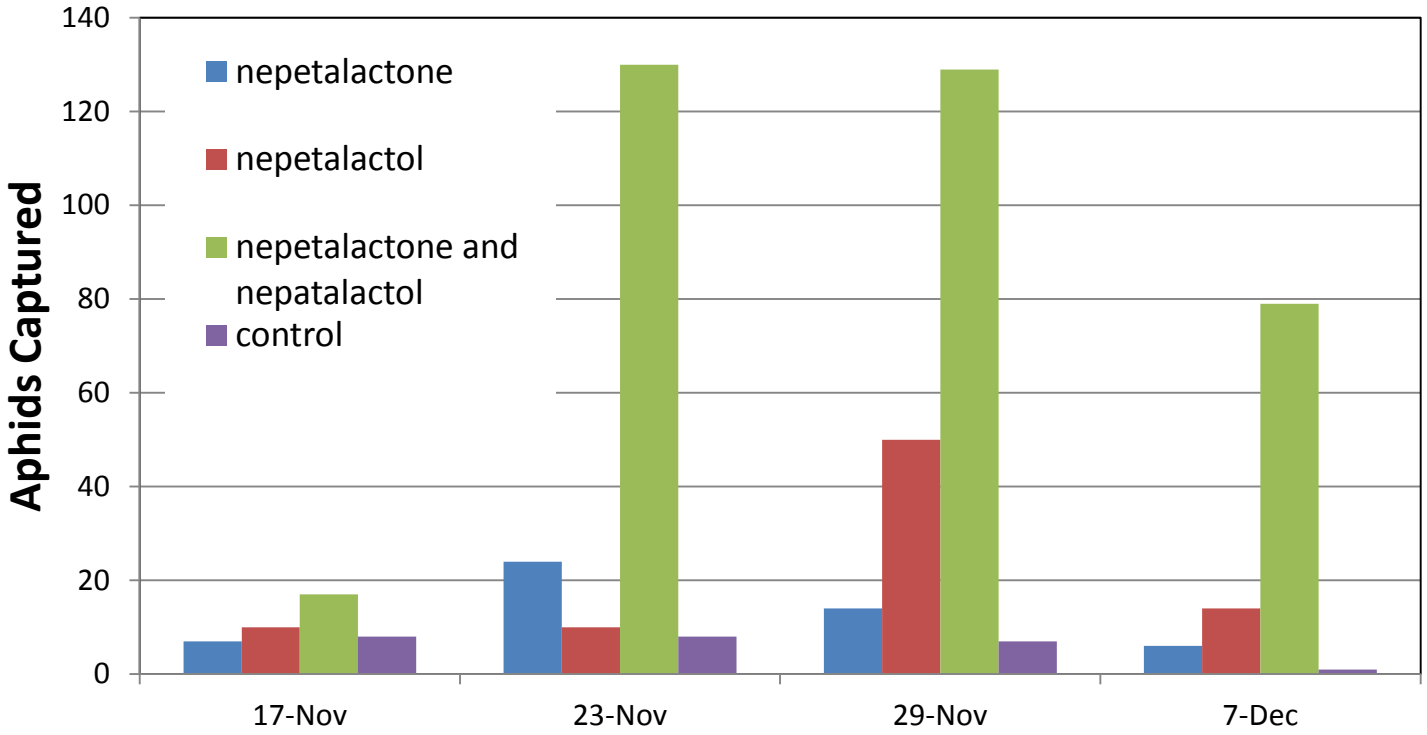
Pheromone Uses for Aphid Sampling

1. nepetalactone
2. nepetalactol
3. nepetalactone and nepetalactol (1:1)
4. none

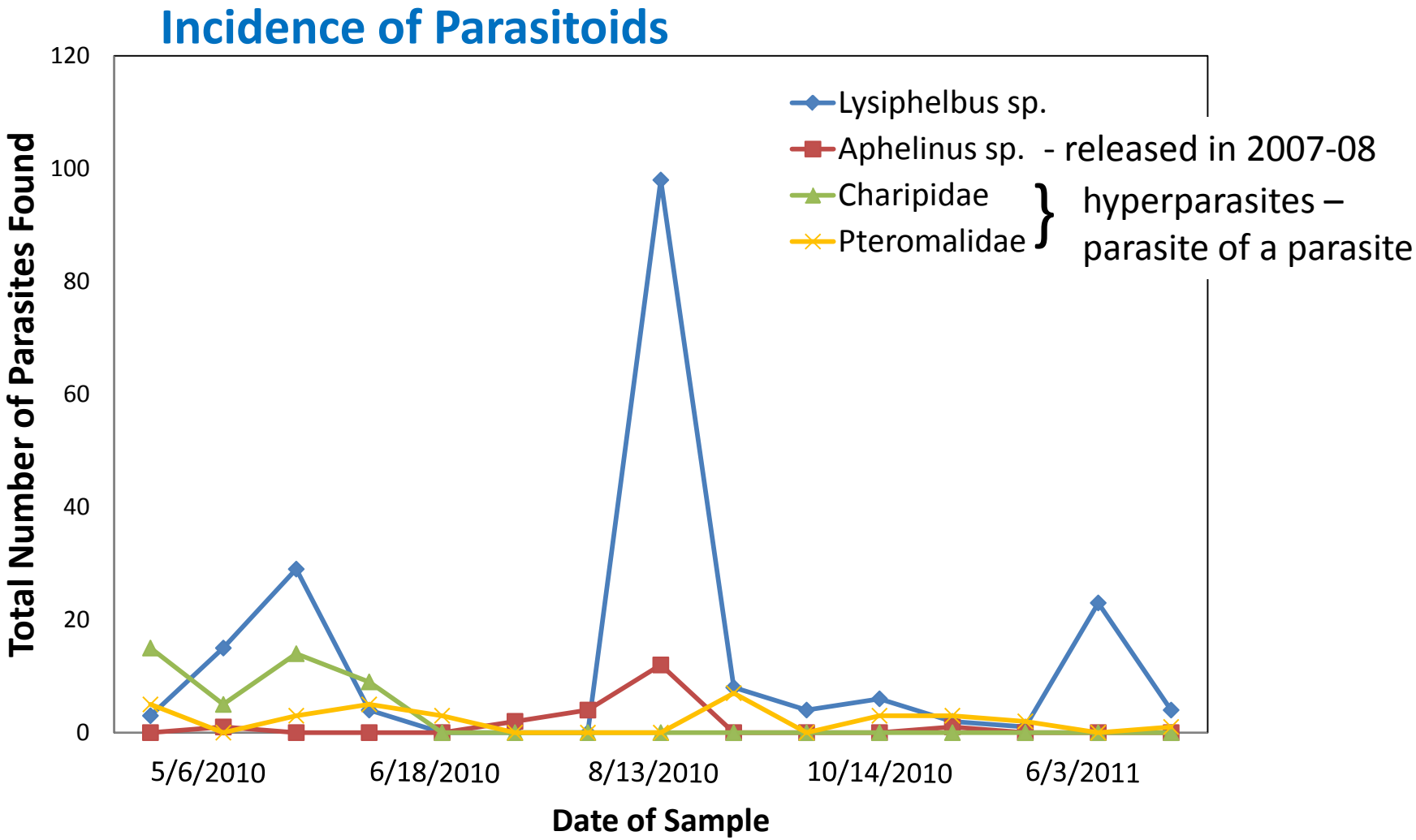
Aphid Sex Pheromones

2011-12

"A. gossypii" only



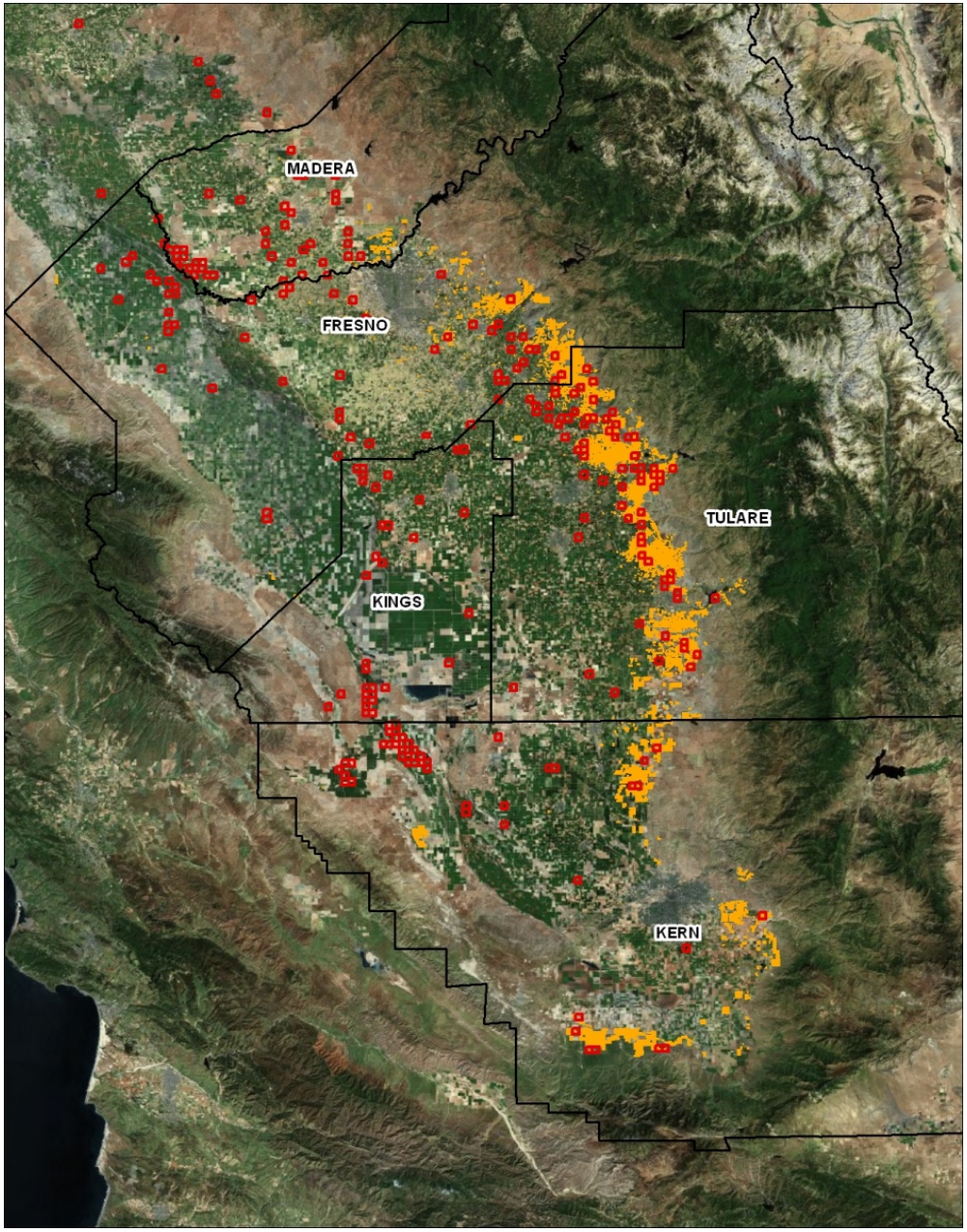
Aphid Management



Mapping pomegranate and citrus acreage in SJV

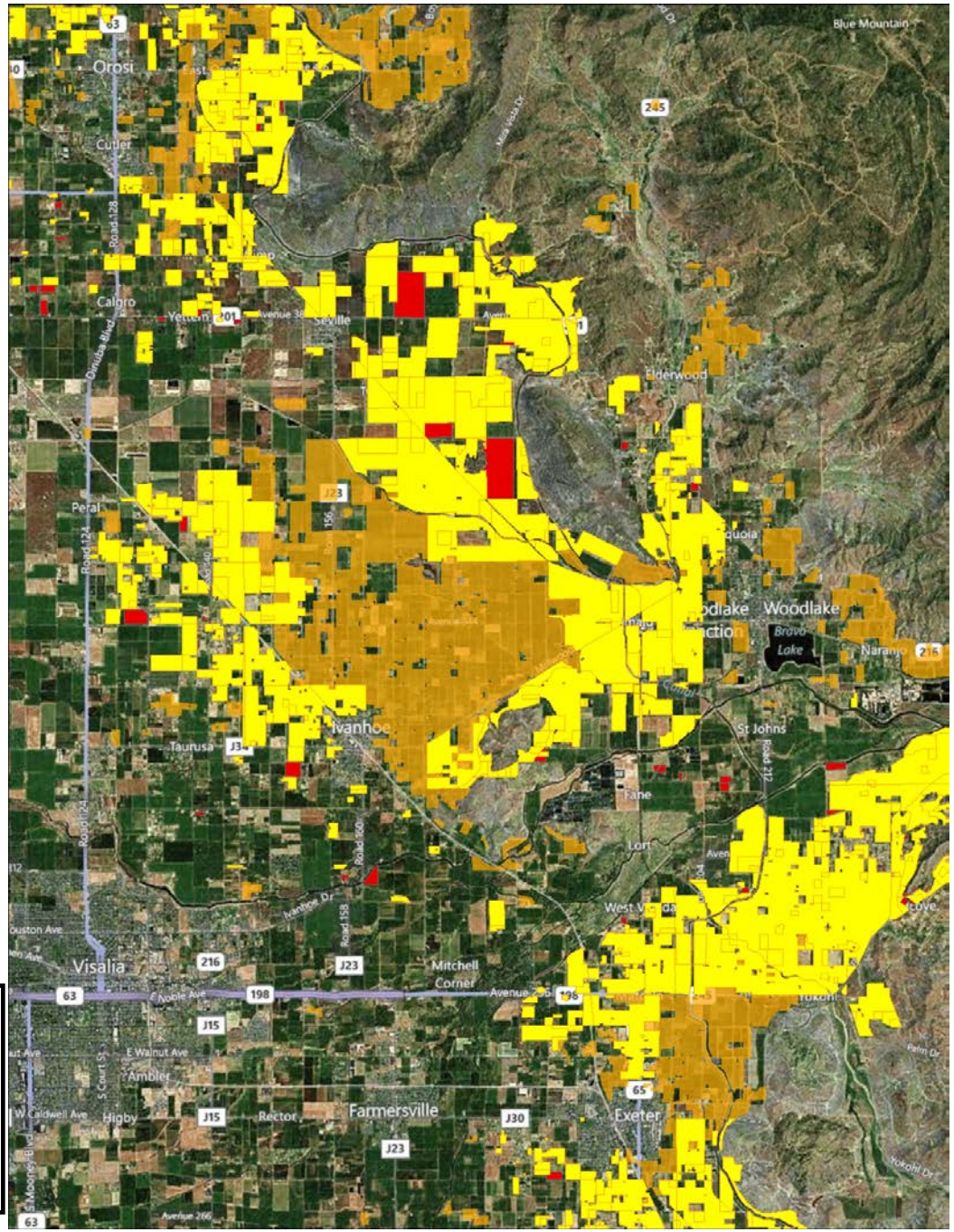
Completed Survey:

- 268 square miles
- 406 individual fields
- 29935 total acres



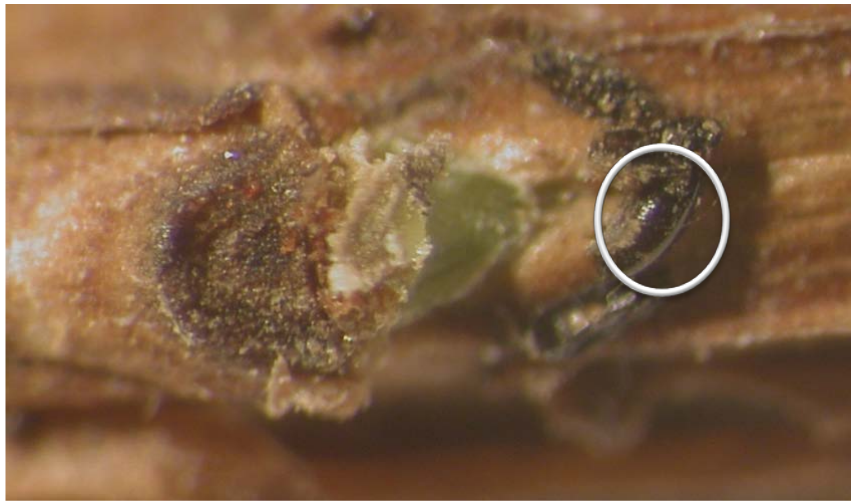
Distance from Pomegranate	Acres Effected	% Effected
0.5 mi	51595	24%
1 mi	86655	40%
2 mi	146442	67%

Citrus proximity to pomegranates: 1.0 mi



Extending Results to Citrus and Pomegranate Industries

Planned and Completed

1. training session/field day for pomegranate and citrus growers
2. update to UC Pest Management Guidelines
3. Journal articles
4. Citrograph article
5. presentations at
   - Entomological Society of America meeting
   - Northern CA Entomology Society
   - UC-Davis Pest Control Adviser training session

Funding:
California Specialty Crop
Block Grant Program