



Pest Management: What's Current?

December 8, 2016

Pest Management: What's Current?

- Bob Curtis, Almond Board of California (Moderator)
- Marylou Verder-Carlos, CDPR
- George Farnsworth, CDPR
- David Haviland, UCCE-Kern County
- Frank Zalom, UC Davis





Bob Curtis,
Almond Board of California

A close-up photograph of a glass jar filled with almonds. In the foreground, a small glass dish contains a small amount of almond oil. The background is a warm, golden-yellow color.

Marylou Verder-Carlos
George Farnsworth,
CDPR



California Environmental Protection Agency
Department of Pesticide Regulation

Regulatory Updates

Marylou Verder-Carlos

George Farnsworth

Assistant Directors

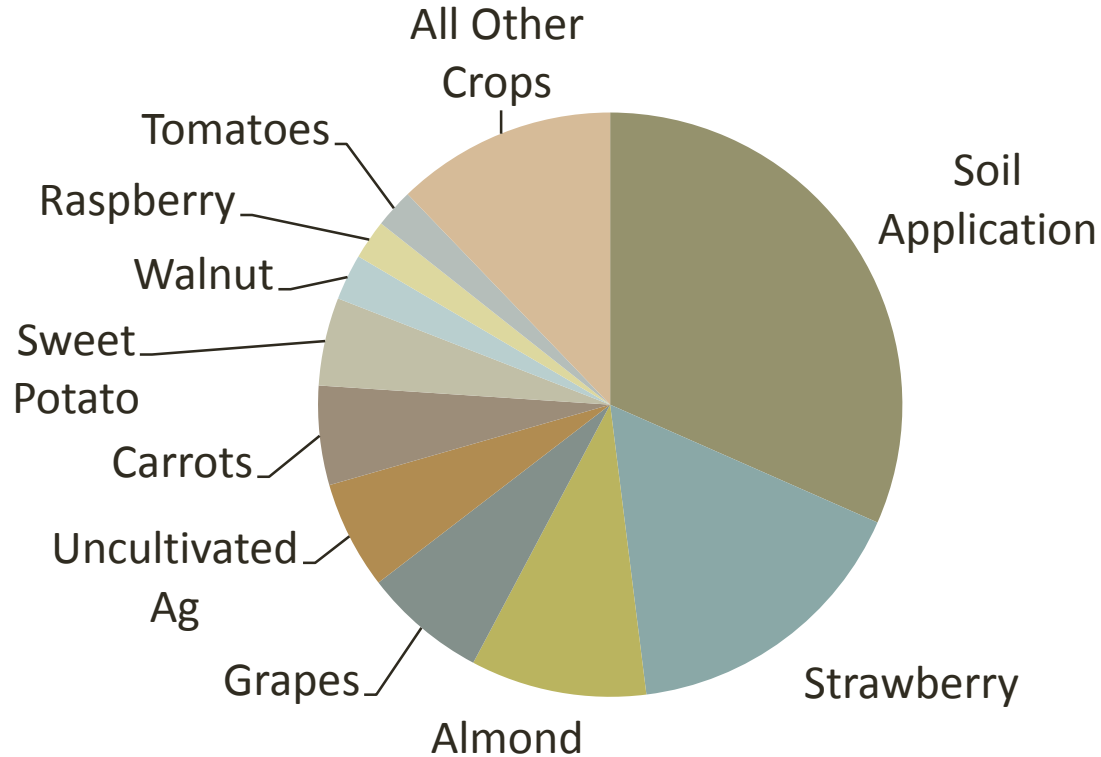
California Department of Pesticide Regulation

1,3-D



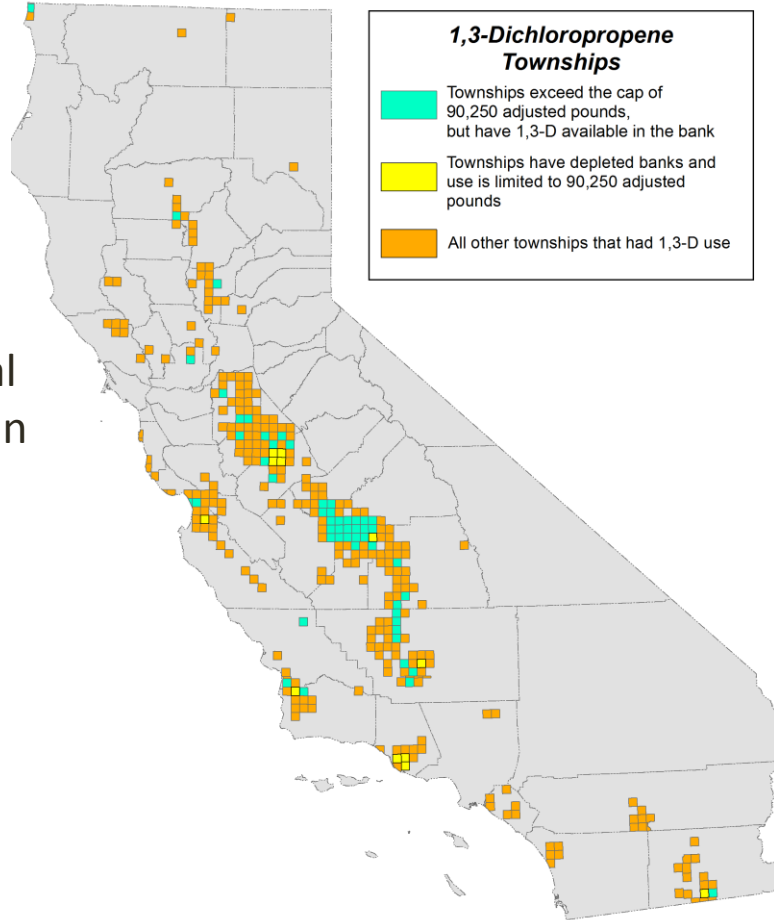
1,3-D – crops

- Used prior to planting several crops



1,3-D background – 2014 use areas

- Use by township
(6x6 mi area)
- Highest use in Central
Coast and San Joaquin
Valley



1,3-D risk management directive for cancer risk

- Goal is risk of no more than 1×10^{-5} (1 excess cancer in 100,000 people), consistent with
 - 2001 risk management directive
 - Prop 65
 - U.S. EPA policy

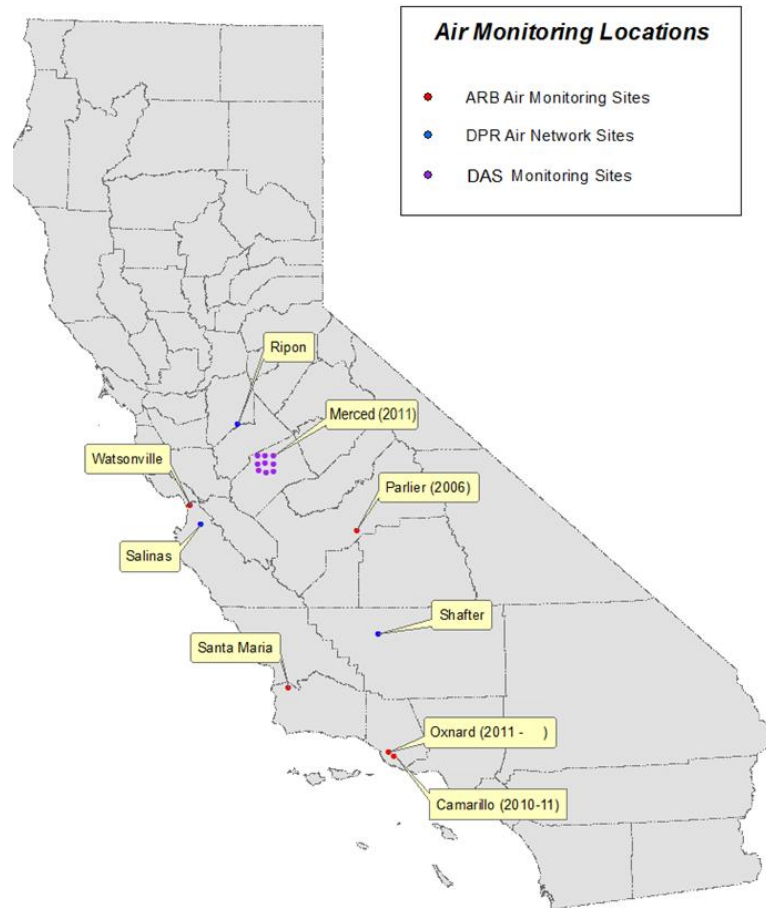
Risk Management Directive Issue	2001 RMD	2016 RMD
Goal for acceptable cancer risk	1×10^{-5}	1×10^{-5}
Exposure period	70 years	70 years
Probability of acceptable risk	95%	95%
Regulatory target concentration	0.14 ppb	0.56 ppb

1,3-D township cap program for cancer risk

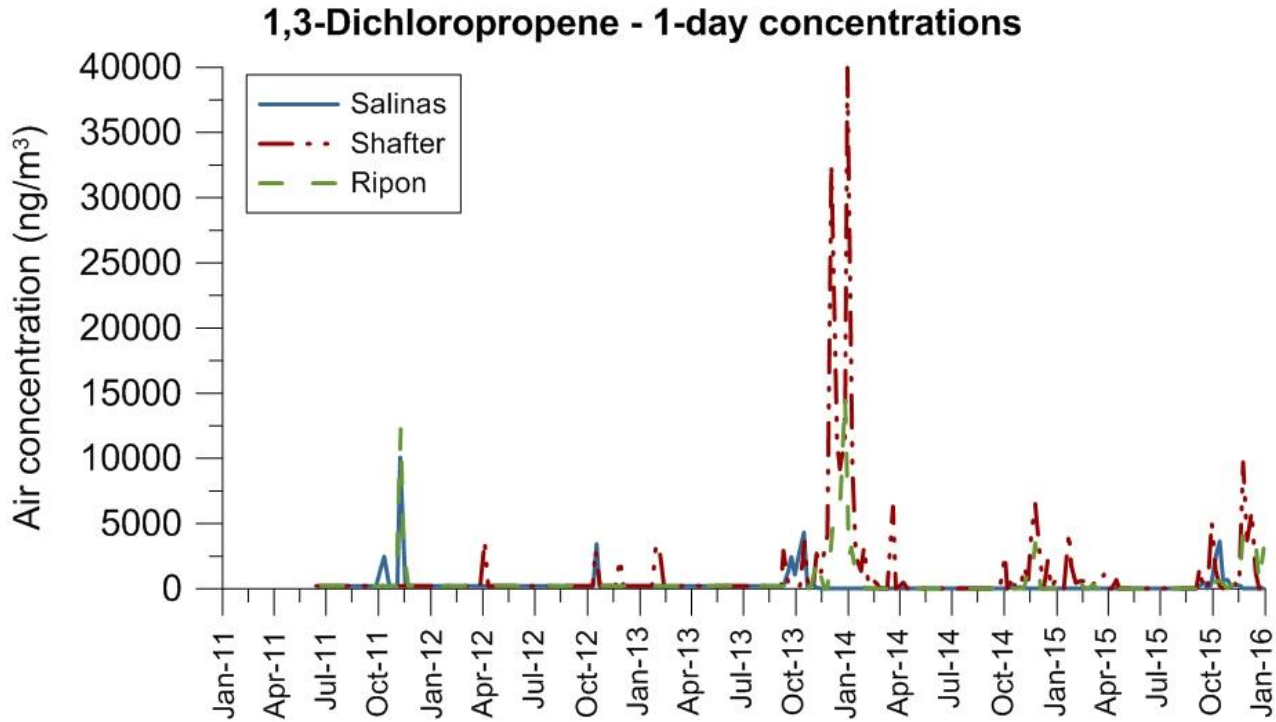
- 2002-2016 program is a 2-tier annual use limit to achieve 0.14 ppb regulatory target
- Beginning Jan 2017 program will be a single annual limit to achieve 0.56 ppb updated regulatory target

Program Element	2002-2016	2017
Annual allocation	90,250 adj lbs	136,000 adj lbs
Annual maximum use	180,500 adj lbs	136,000 adj lbs
Use adjustment factors	0.3x – 2.3x	Unchanged
Bank of unused allocation	Yes	No
Application dates prohibited	None	December

Township cap determined from air monitoring and use data



Higher air concentrations during December



Summary of 1,3-D cancer risk mitigation

- Beginning Jan 2017
 - Township cap will be 136,000 adjusted pounds each year
 - Bank will be discontinued
 - December applications will be prohibited
- Updated township cap program means that if
 - 100,000 people lived in a 6x6 mile township for 70 years; and
 - 136,000 adjusted pounds of 1,3-D were applied in the township every year for 70 years; then
 - there is less than 5% chance that 1 person in the township would develop cancer from 1,3-D

Additional information and questions

- http://www.cdpr.ca.gov/docs/whs/1_3_d.htm
- Contact
 - Randy Segawa
 - 916-324-4137
 - Randy.Segawa@cdpr.ca.gov
 - Pam Wofford
 - 916-324-4297
 - Pam.Wofford@cdpr.ca.gov

**Proposed Regulation to
Address Pesticide Use Near Schools
and Child Day Care Facilities**

Background – pesticide use near schools

- Proposed regulation addresses concerns about children
 - CA Department of Public Health report on pesticides applied near schools
 - Children’s sensitivity to potential drift
 - Drift incidents
- Current statewide requirements are only for pesticides applied **at** schools (Healthy Schools Act)
- Current requirements for applications **near** schools vary by county



Purposes of proposed regulation

- Provide minimum standards for agricultural pesticide applications near schools and day care facilities
- Provide an extra margin of safety in case of unintended drift or problem applications occur – reduce acute exposures to children from unintended drift
- Increase communication between growers and schools/day care facilities
- Provide information to schools and day care facilities in preparing for and responding to pesticide emergencies

Scope of proposed regulation

- **Pesticide applications included:** applications for production of an agricultural commodity within $\frac{1}{4}$ mile (1,320 feet) of a schoolsite
- **Schoolsites included:** same as Healthy Schools Act
 - Public K-12 schools
 - Licensed child day care facilities, except family day care homes
- **People included:**
 - Grower (operator of the property to be treated)
 - Pesticide applicator
 - Principal of school
 - Administrator of child day care facility
 - County agricultural commissioner (CAC)

Proposed application restrictions – distance between applications and schoolsite

- Production ag applications prohibited within a minimum distance of a schoolsite, Mon – Fri, 6:00 am – 6:00 pm
- Minimum distance varies with type of application equipment and type of pesticide
 - 9 types of application equipment
 - 4 types of pesticides
- Grower and applicator shall assure distance is:
 - At least $\frac{1}{4}$ mile (1,320 feet) for potentially higher drift applications
 - At least 25 feet for lower drift applications
 - No minimum distance for negligible drift applications

Proposed applications requiring **at least ¼ mile** to schoolsite, Mon – Fri, 6:00 am – 6:00 pm

- Aircraft
- Airblast (orchard, vineyard) sprayer equipment
- Sprinkler chemigation
- Dust, but no distance restriction if applied with soil injection equipment
- Fumigant

Proposed applications requiring **at least 25 feet to schoolsite, Mon
– Fri, 6:00 am – 6:00 pm**

- Ground-rig sprayer, but ¼ mile if dust or fumigant
- Field soil injection, but ¼ mile if fumigant
- Other equipment (e.g. drip chemigation), but ¼ mile if dust or fumigant

Proposed annual notification content

- Summary of regulation and required statements
- Map showing location of field(s) and school
- Grower and CAC contact information
- National Pesticide Information Center (NPIC) website
- List of pesticides expected to be used
- Options available to school/day care facility

Proposed application-specific 48-hour notification requirements

- 48-hour notification is required for applications prohibited within 25 feet of a schoolsite
- Notice of intent (NOI) for a restricted material may be used for 48-hour CAC notification
- Grower/applicator must make application within 4 days or new notification
- Notification is not required if classes are not scheduled or day care facility is closed for entire day
- Option for grower, school/day care facility, and CAC to negotiate alternative notification requirements

Estimated timeline

- November 15 and 16, 2016: Public hearings in Oxnard and Tulare and December 1 Salinas
- December 9, 2016: Public comment period ends
- Spring 2017: Possible 2nd comment period
- July 2017: Regulation submitted to Office of Administrative Law for review
- September 2017: Regulation becomes effective

Summary of proposed regulation

Type of Requirement	<u>Requirement Based on Drift Class</u>		
	Higher	Lower	Negligible
Minimum Distance Between Application and Schoolsite, Mon-Fri, 6:00am-6:00pm	¼ mile	25 feet	None
Annual Notification of Pesticides Expected to be Used Within ¼ mi of Schoolsite	Yes	Yes	Yes
48-hr Notification of Applications Within ¼ mi of Schoolsite, Mon-Fri, 6:00am-6:00pm	No (not applicable)	Yes	No

Additional information and submitting comments

- Additional information is available at <http://www.cdpr.ca.gov/docs/legbills/regsdeve.htm>
- www.cdpr.ca.gov
 - “Quick Links”
 - “Regulations”
 - “Regulations Under Development”

David Haviland, UCCE-Kern County





IPM Update- Southern Perspective

David Haviland,
UC Cooperative Extension, Kern Co.



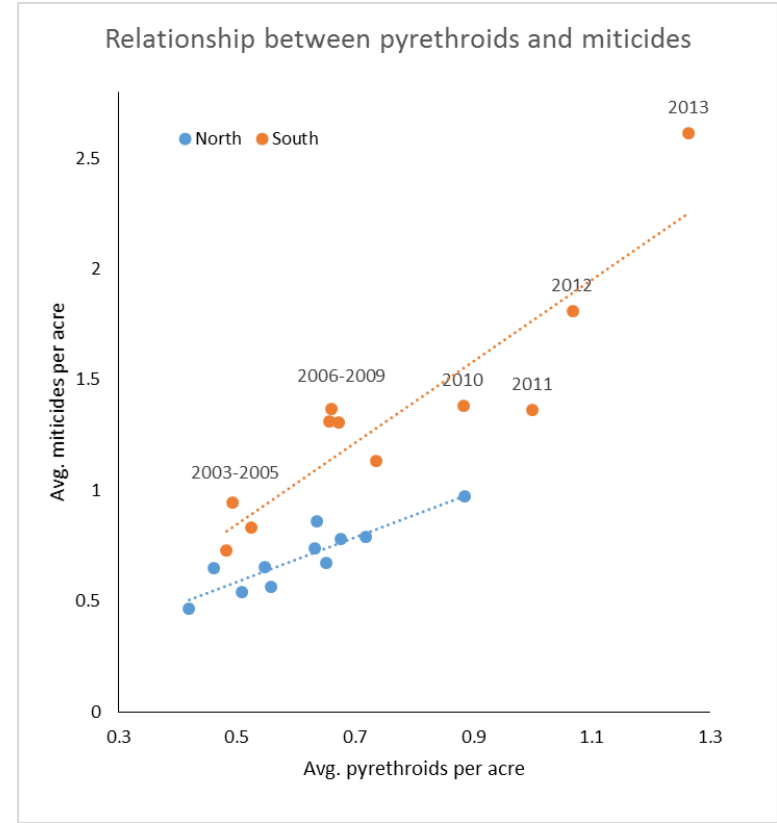
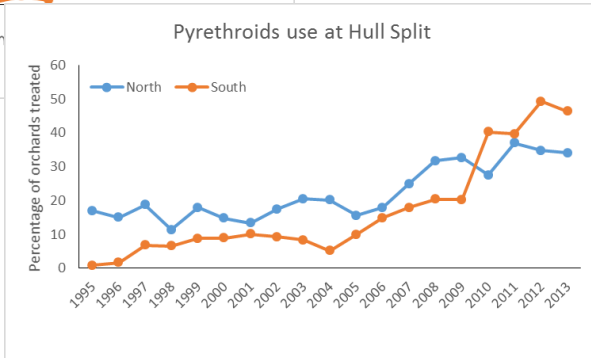
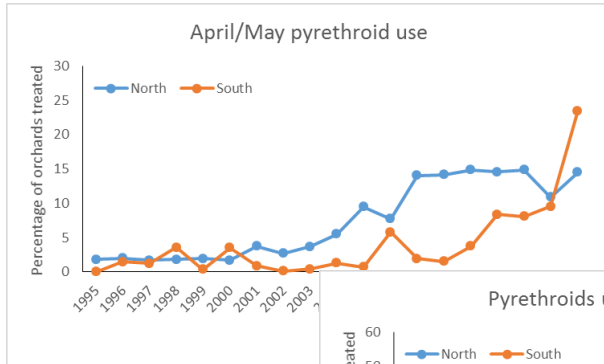
Monitoring and spray timing

- Egg traps
 - Used to monitor egg-laying in spring
 - April/May spray timing, or to set a biofix
- Pheromone traps
 - Extensive research in this area
 - Higbee, Beck, Tollerup, Burks, Siegel
 - Effective for monitoring flights
 - General feel for flight intensity and duration
 - Not effective for biofix establishment
 - Not used for treatment thresholds
- Other lures
 - Ongoing research to develop lures based on plant volatiles, especially for orchards using mating disruption



Role of pyrethroids in almonds

- Initially provided excellent NOW control
- Efficacy slipping
- Use causes other concerns

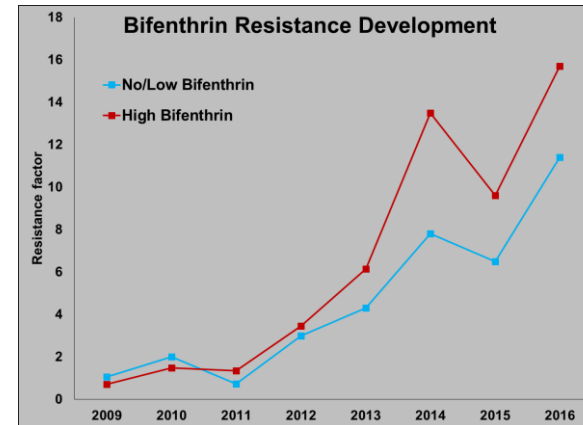


CDPR Pesticide Use Reports- 1995-2013

NOW sprays- pyrethroid resistance

- Three primary modes of action for navel orangeworm
 - Pyrethroids- Brigade, Warrior II, etc.
 - IGRs- Intrepid
 - Diamides- Altacor
- Efficacy similar among all three groups
- Pyrethroids are broad spectrum
 - Also effective on leaffooted/stink bugs
 - Reduced biocontrol of mites and scale
 - Issues with off-site movement to waterways
- Resistance management needed
 - Prudent use or rotate chemistries
 - Consider affects of pistachio growers

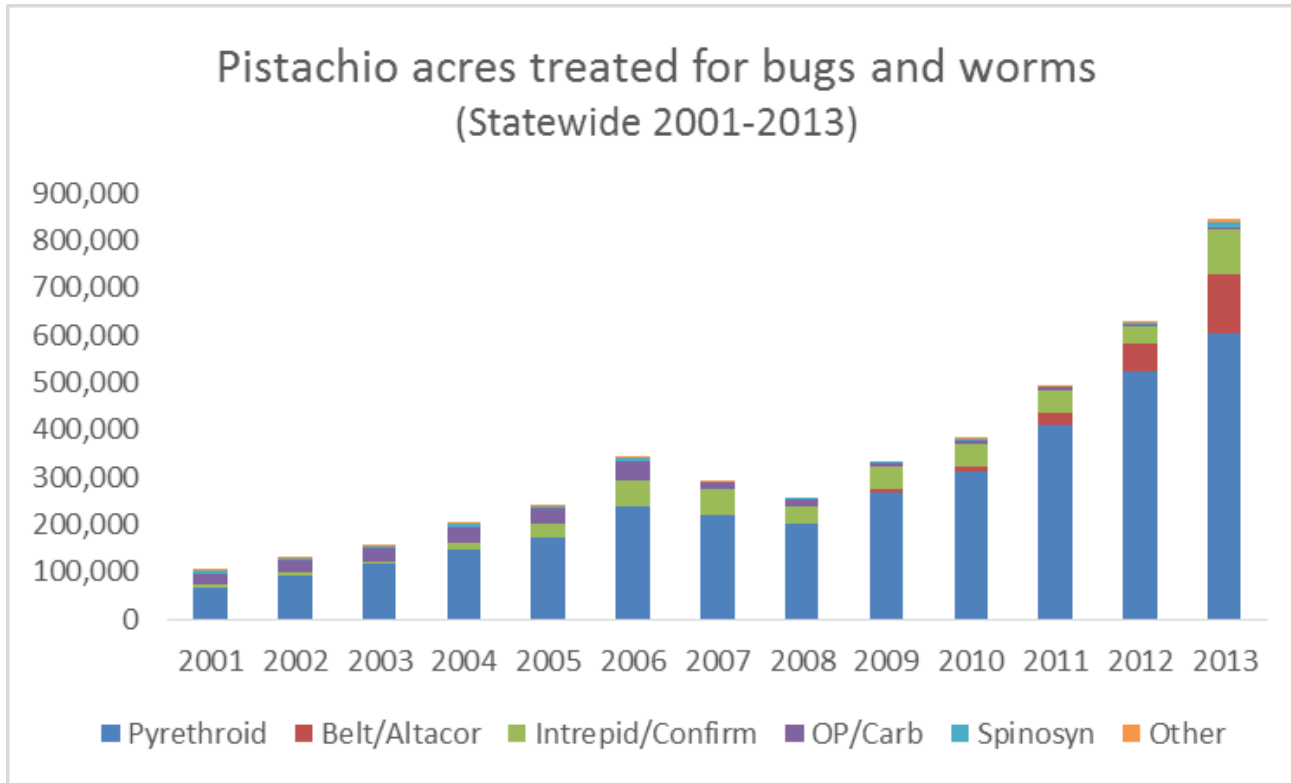
Males and females pooled					
Low or no bifenthrin			High bifenthrin		
Year	LC50	RF	Year	LC50	RF
2009	0.6	1.05	2009	0.4	0.7
2010	2.1	2	2010	1.575	1.475
2011	1.05	0.725	2011	1.9	1.35
2012	2.1	3	2012	2.45	3.45
2013	5.85	4.3	2013	8.35	6.15
2014	7	7.8	2014	12.1	13.5
2015	5.1	6.5	2015	7.6	9.6
2016	8.1	11.4	2016	11.1	15.7



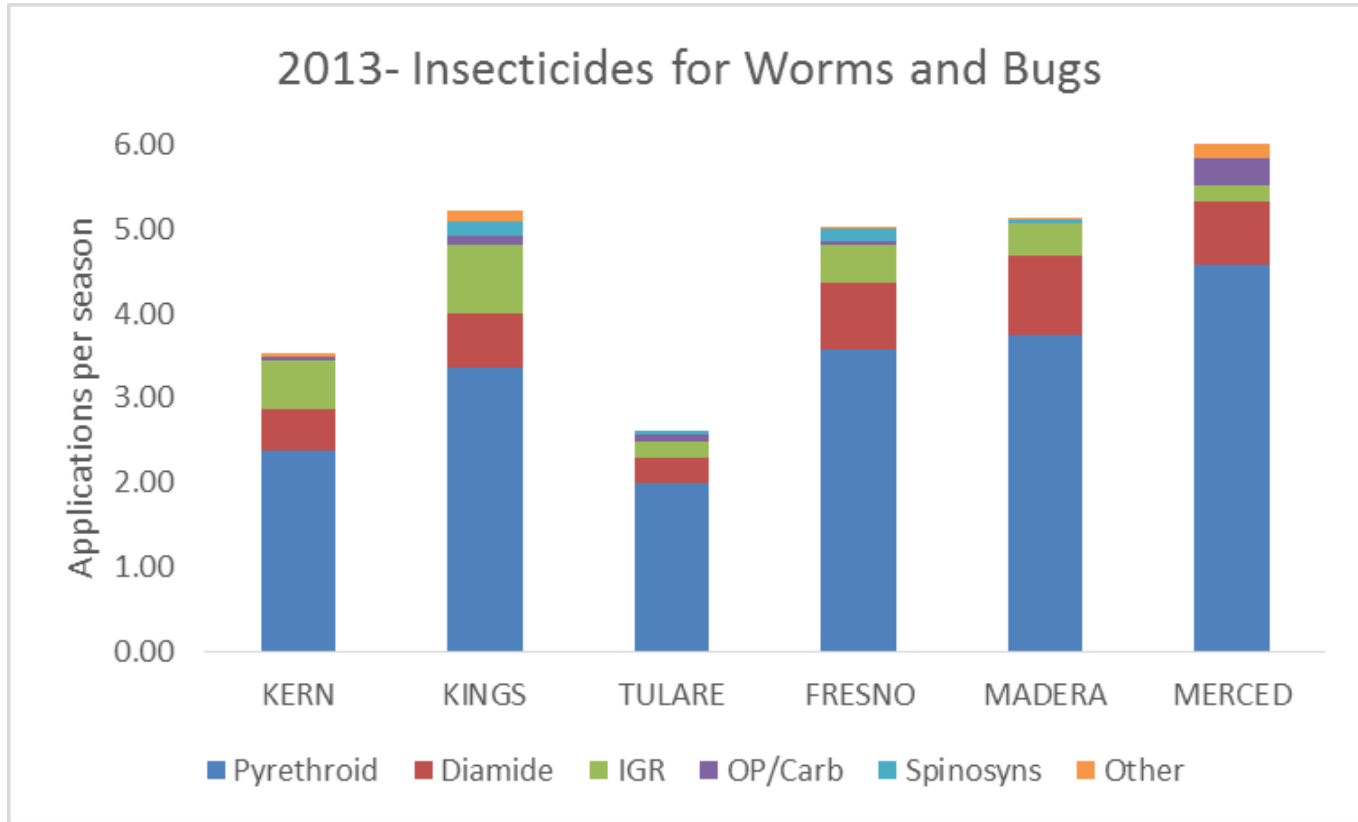
Resistance development in populations with a history of low vs high bifenthrin use.

B. Higbee
Wonderful Orchards

Pistachios



Pistachios

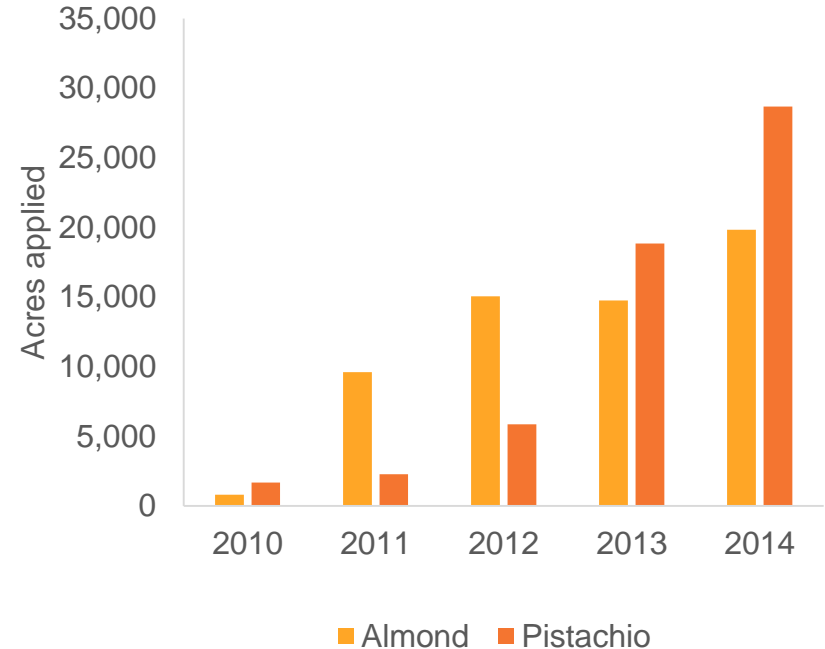


Mating Disruption

- NOW pheromone dispensed as an aerosol
- Inhibits ability of males to find females
- Research shows a benefit down to 20-acre plots, though bigger is better
- Can be used in addition to spray programs or as a replacement for sprays
 - High pressure orchards, near schools, etc.
 - Insecticide law of diminishing returns
- Typically provides ~50% reduction in damage
- Three products available in 2017
 - Suterra, Semios, Pacific Biocontrol

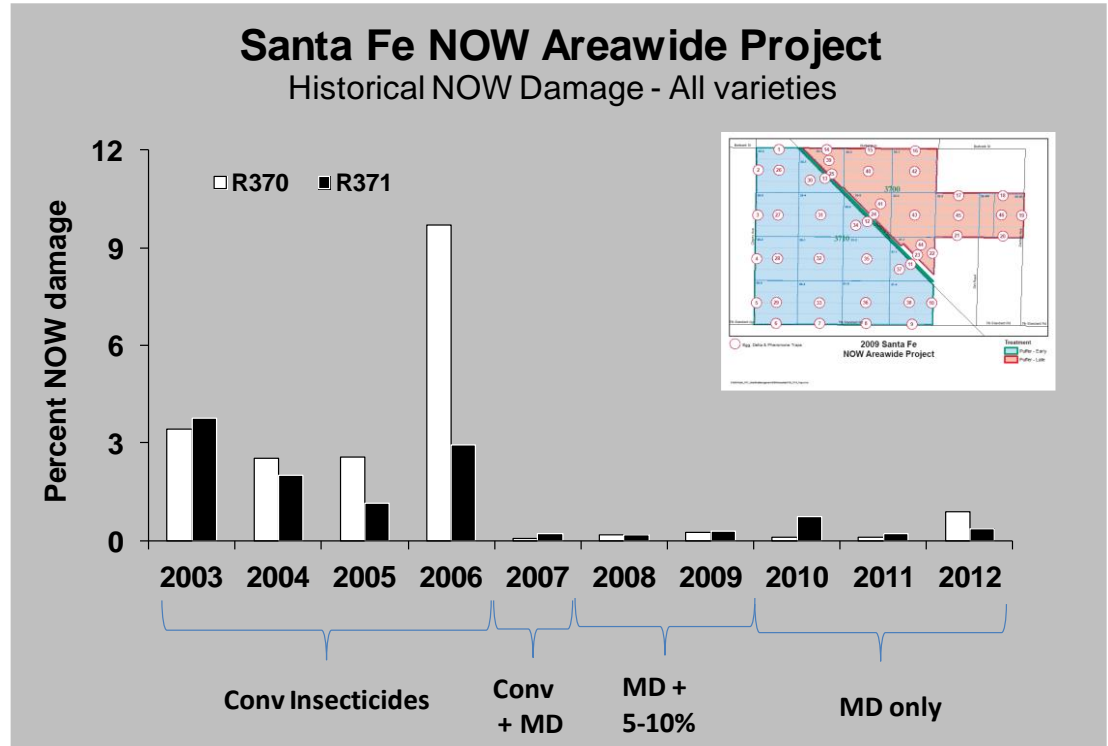
Mating Disruption Acres

Kern, Kings, Tulare, Fresno, Madera, Merced Co.



Mating Disruption- Santa Fe Project

- 2,500 acres, Kern Co.
- Conventional converted to mating disruption
- After 2007, 75-100% reduction in insecticide applications for NOW
- MD costs amortized by reduction in spray costs and decreases in damages
- Help reduce pyrethroid resistance
- Avoidance of crop residues, avoid spraying near highways
- 2013-2016 No longer research, maintained under MD w/ <1% damage



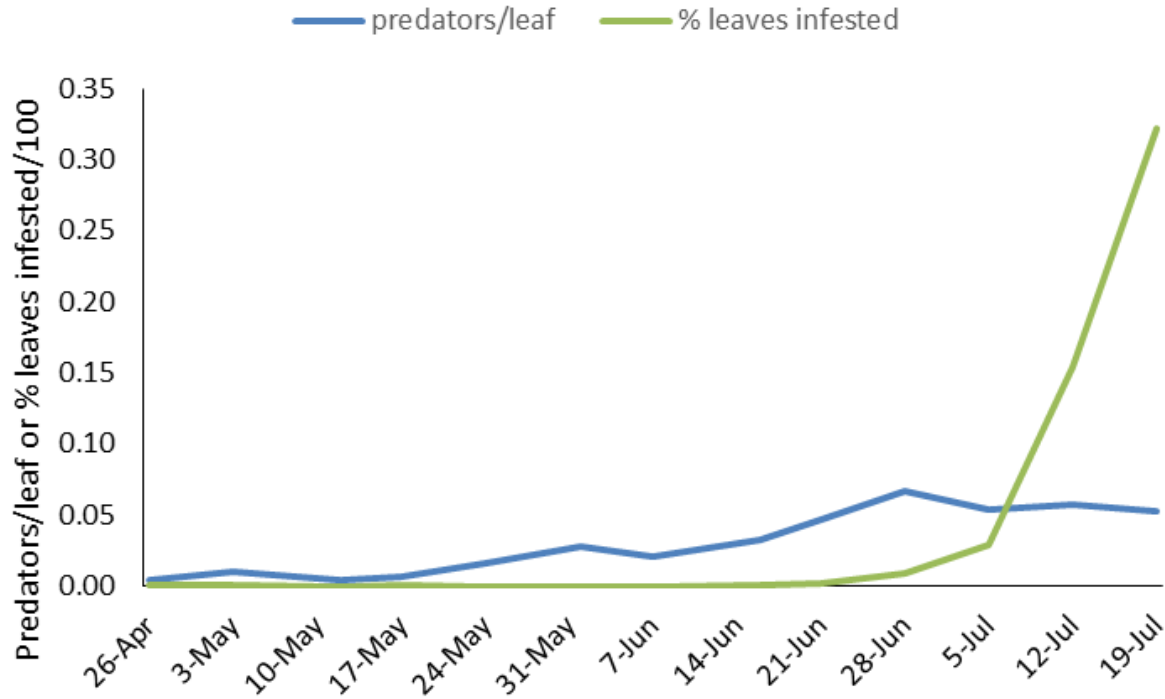
B. Higbee, Wonderful Orchards

Spider mite management-

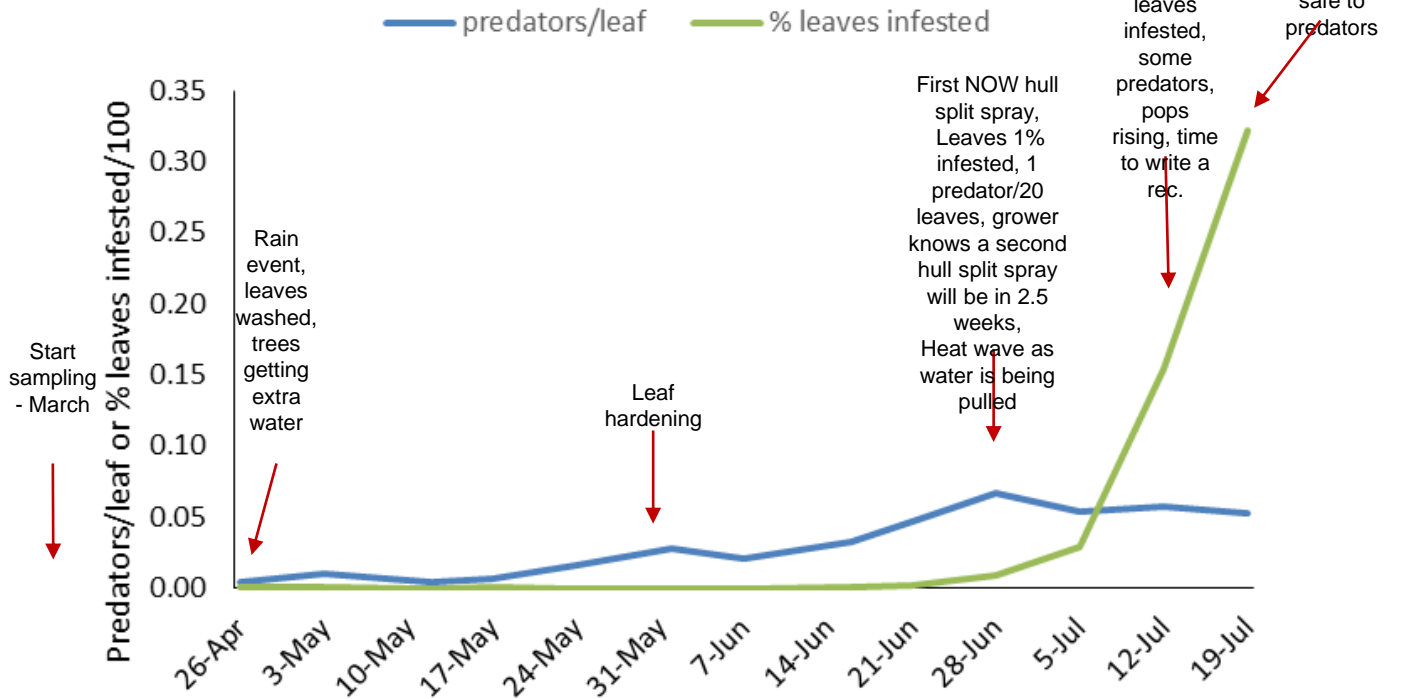
- Ideal program
 - Monitor weekly
 - Presence-Absence sampling
 - Treat at threshold (25% to 40% infested)
 - Use a product that conserves beneficials
- Key beneficials
 - Sixspotted thrips, Stethorus beetles, phytoseiids, pirate bugs, lacewings
- Conservation of beneficials
 - Don't starve them (avoid preventative sprays)
 - Don't kill them
 - Pyrethroids (all beneficials)
 - Abamectin (thrips)
 - Delegate, Intrepid Edge (sixspotted thrips)
 - Miticides (varying effects on phytoseiids)



Case study- Wasco 2016

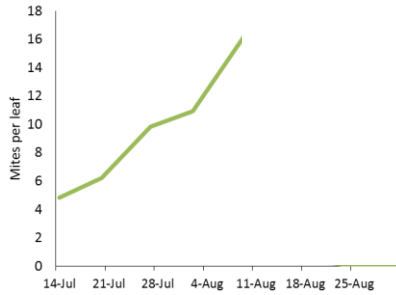


Case study- Wasco 2016

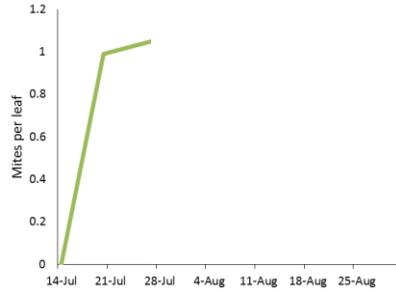


2016 Case Studies

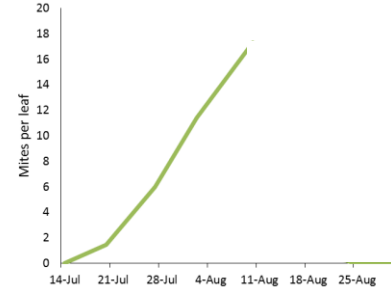
Shafter



Edison



McFarland

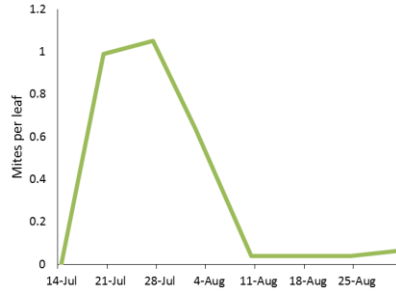


2016 Case Studies

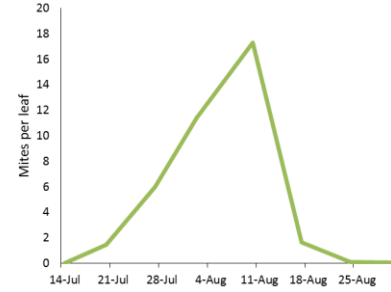
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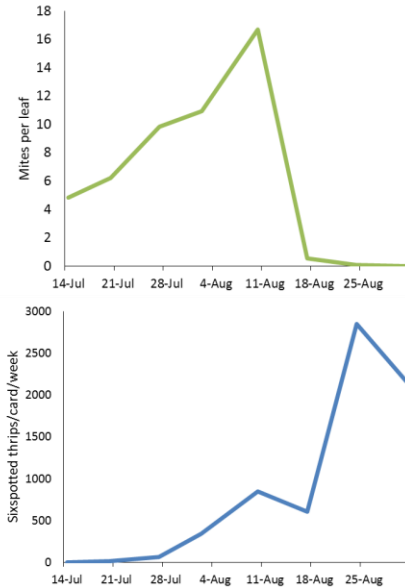


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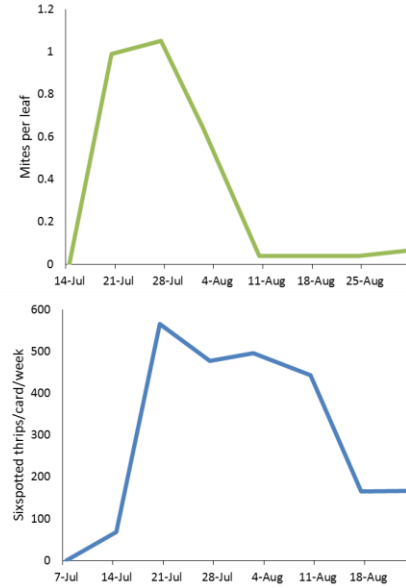


2016 Case Studies

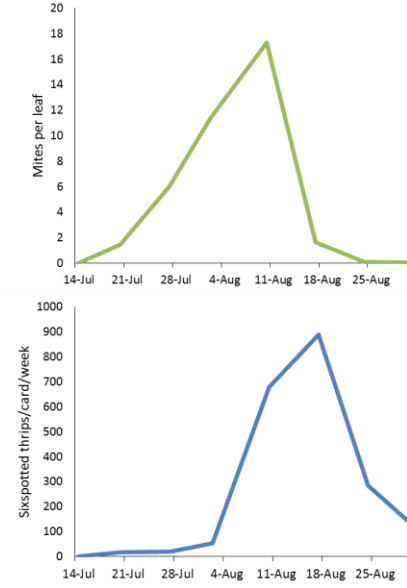
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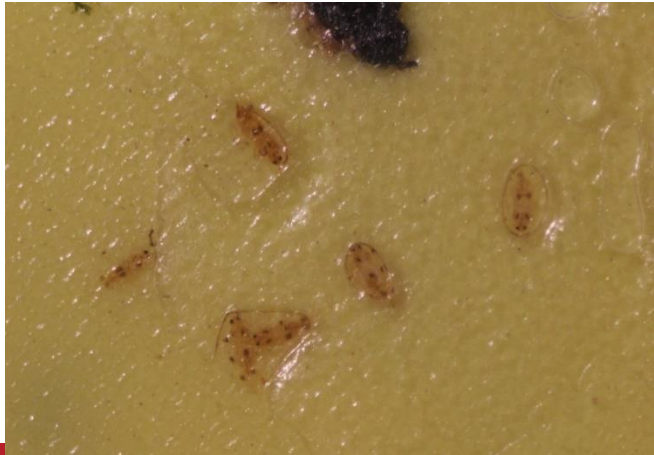
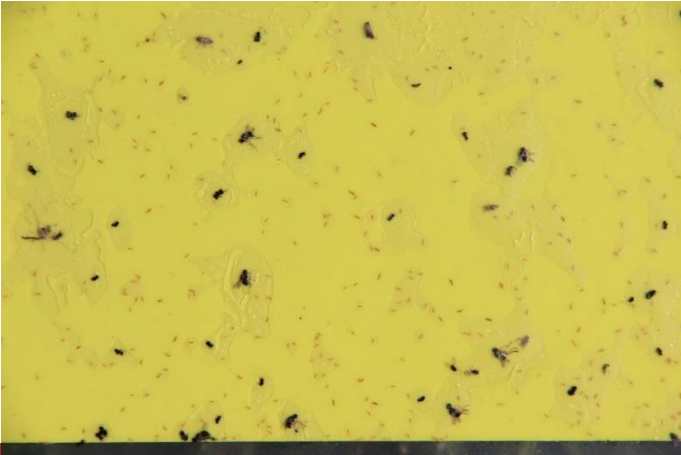


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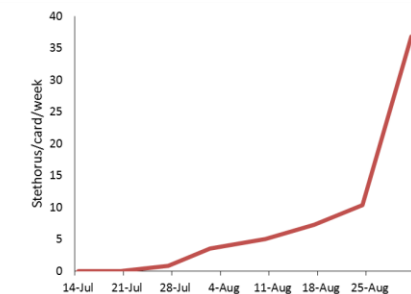
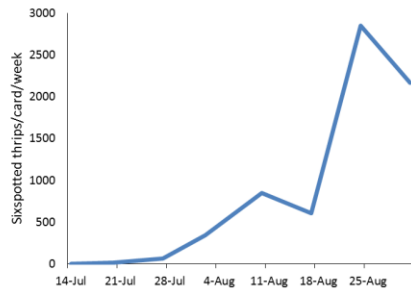
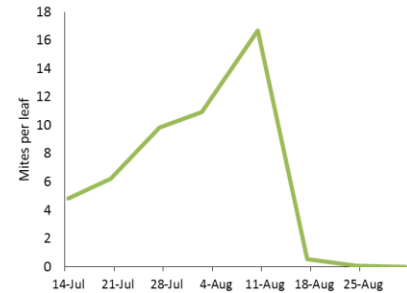
Sixspotted thrips

7 days
1740 thrips

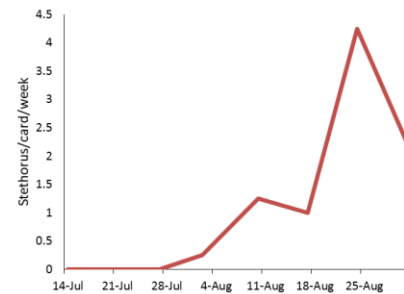
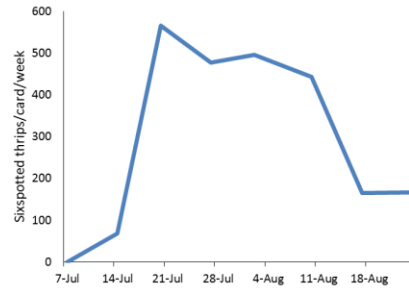
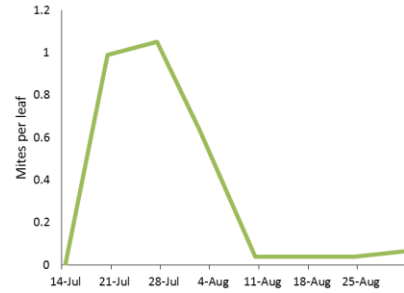


2016 Case Studies

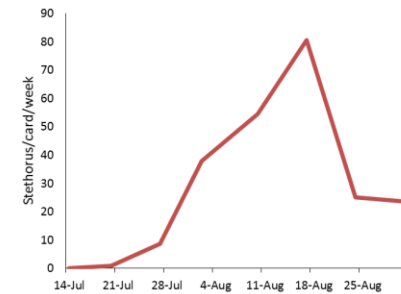
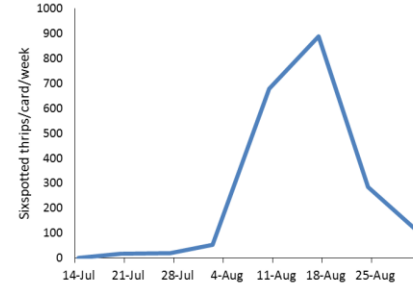
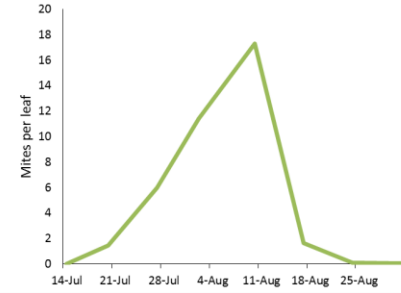
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Edison



McFarland



South Valley IPM

- Avoid bloom sprays to protect bees
- Use all tools to monitor for NOW to determine number of treatments and treatment timing
- Utilize Intrepid and Altacor as primary insecticides for NOW
- Judicious use of pyrethroids
- Monitor for mites, treat only if at a threshold
- Conserve beneficials, especially sixspotted thrips
- Biocontrol for San Jose Scale
- Ant treatments only if needed
- Leaffooted bug treatments only if needed
- Make IPM/Sustainability a habit





Frank Zalom,
UC Davis

Pest Management: What's Current

A View From the North

Frank Zalom
Dept. of Entomology and Nematology
UC Davis



Prior to the 1960s, peach twig borer was the key pest of California almonds...



For perspective -

- Almond production was below 100,000 acres until 1964
- Majority of almond production was in the Sacramento Valley and Northern San Joaquin Valley until the early 1970s



Peach twig borer
Anarsia lineatella

UC Statewide IPM Project
© 2000 Regents, University of California

Damage by peach twig borer reached 10% in some years, this led many growers to apply insecticides in May, but ...

... depending on the insecticides applied in spring, spider mite populations often increased to damaging levels



UC Statewide PM Project
© 2000 Regents, University of California



As an alternative, dormant season insecticide sprays were applied annually for peach twig borer control ...



By 1984, 93% of almond growers applied a dormant spray, typically consisting of an organophosphate plus oil

Klonsky, K., F.G. Zalom and W.W. Barnett. 1990. Evaluation of California's almond IPM program. Calif. Agric. 44(5): 21-24.

Dormant season sprays that contain horticultural oil also control European red mite, brown almond mite and San Jose scale



European Red Mite
Panonychus ulmi



San Jose scale
Diaspidiotus perniciosus



Brown Almond Mite
Bryobia rubrioculus

Navel orangeworm became the key pest of almonds in the late 1960s, probably because of a rapid change in mechanical harvesting practices...



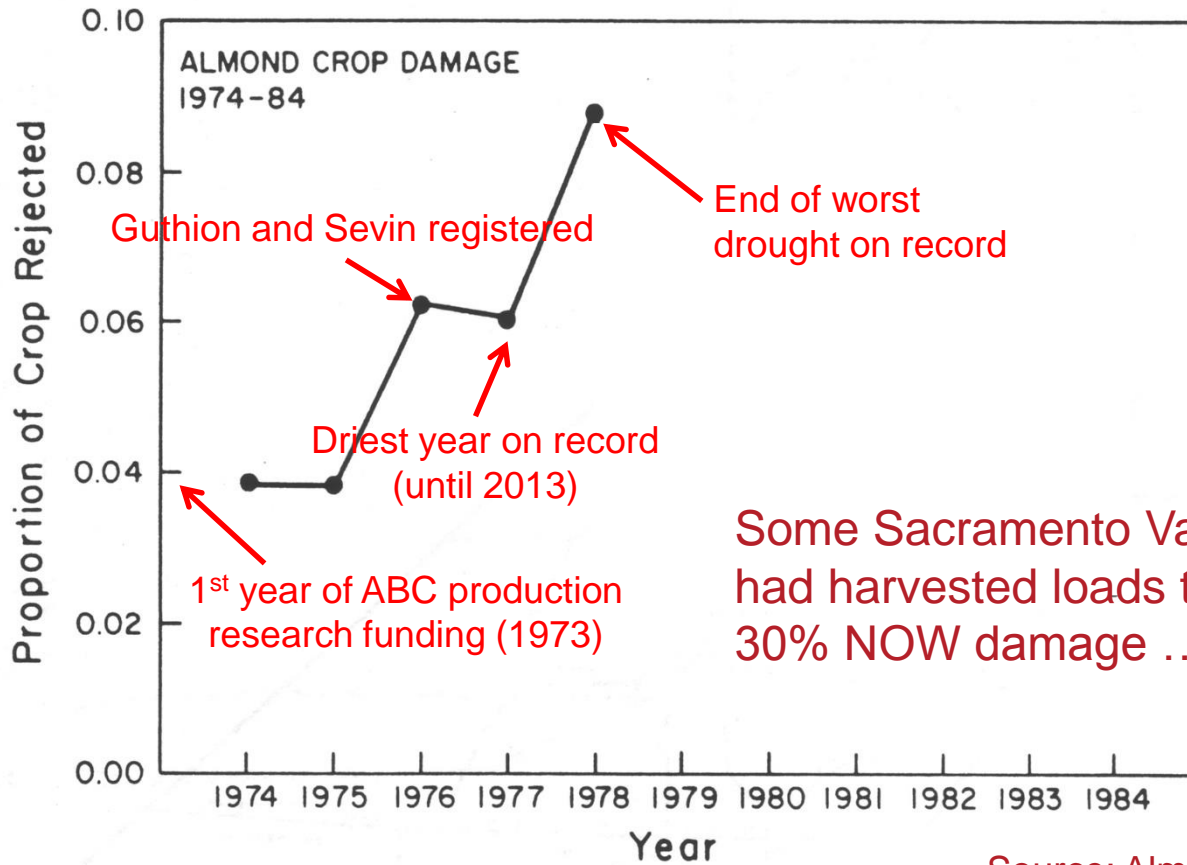
then



now

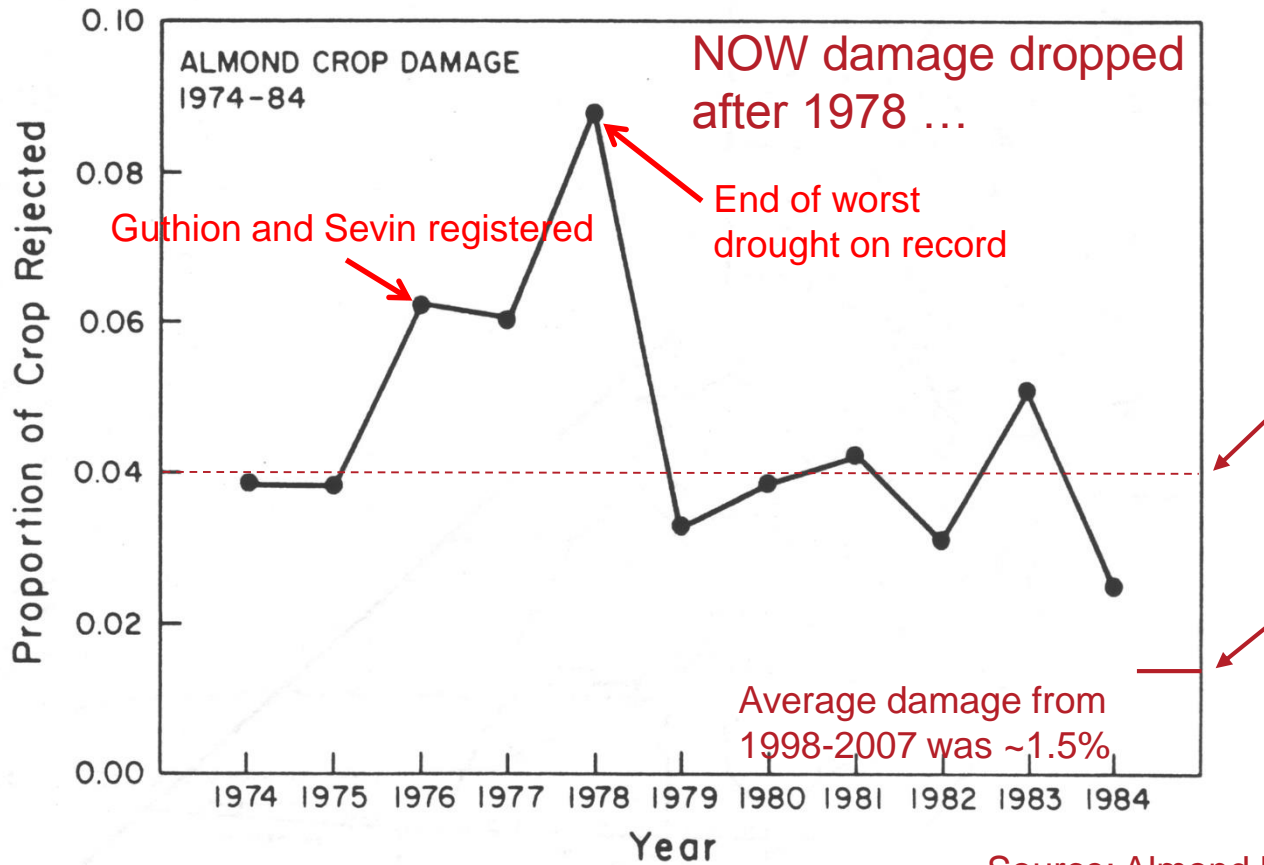


... also older (larger) trees and more contiguous acres

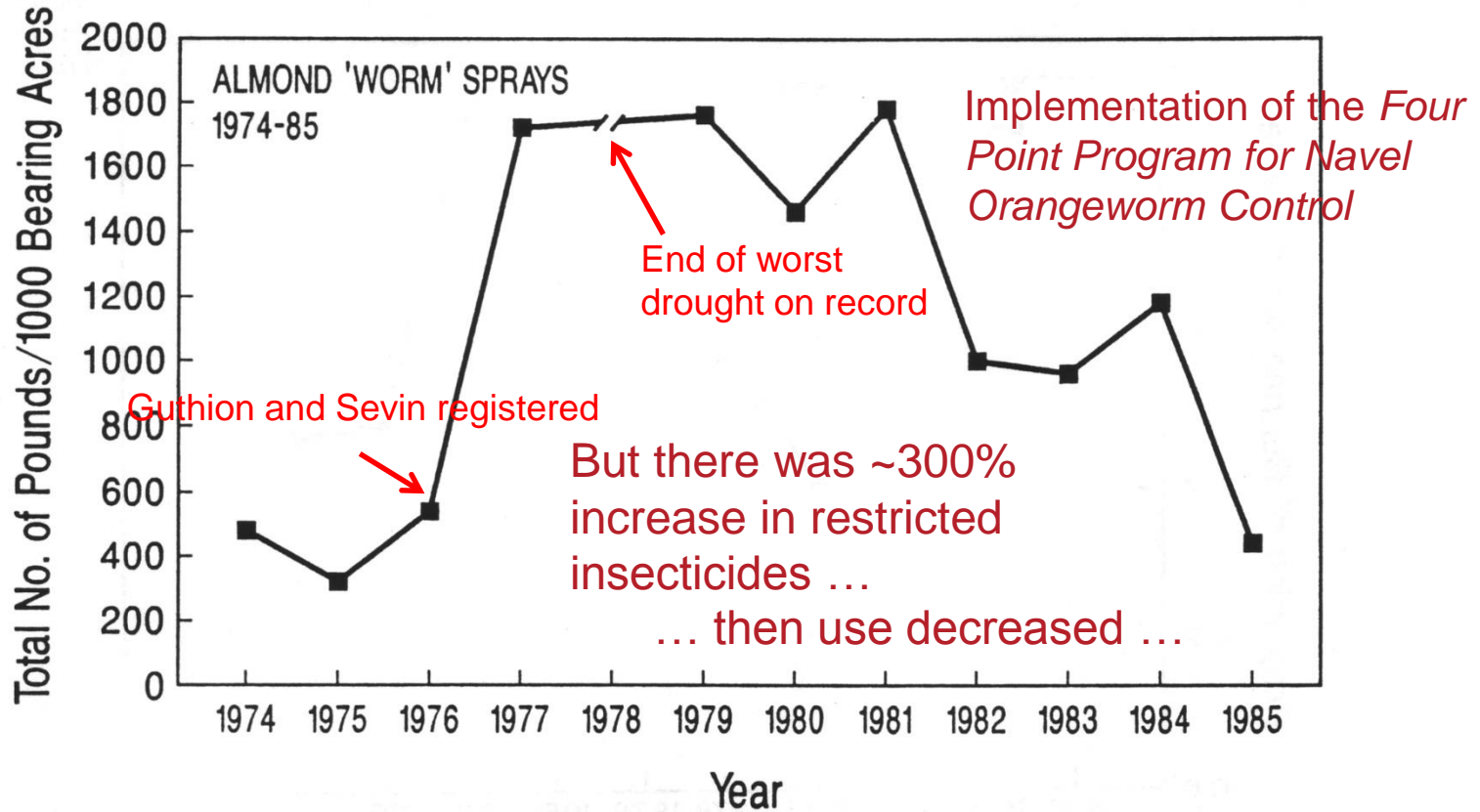


Some Sacramento Valley growers had harvested loads that reached 30% NOW damage ...

Source: Almond Board of California



Source: Almond Board of California



Source: CDFA Pesticide Use Reports

Four-point program for managing navel orangeworm and other insects in almonds. 1983. Almond Board of California

- Winter sanitation
- Dormant spray for peach twig borer control
- Hullsplit spray
- Timely harvest

These are ***still*** the most important management practices for key insects (navel orangeworm and peach twig borer) and mites in the northern San Joaquin and Sacramento Valleys, *with some updates, of course...*

Winter sanitation – a northern perspective

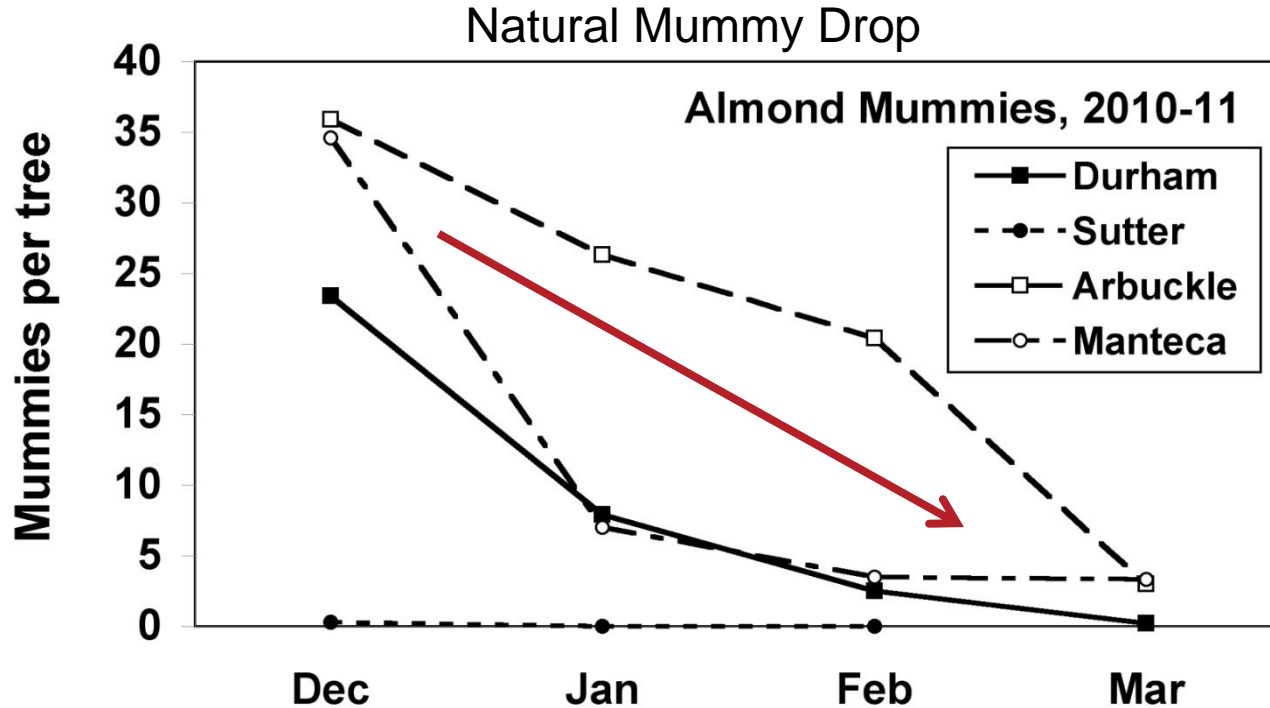
Winter rains

- *Storms reduce mummy load naturally*
- *Wet conditions assist in mechanical mummy removal*
- *Wetness increases microbial biocontrol of larvae*
- *Beware of drought years!*

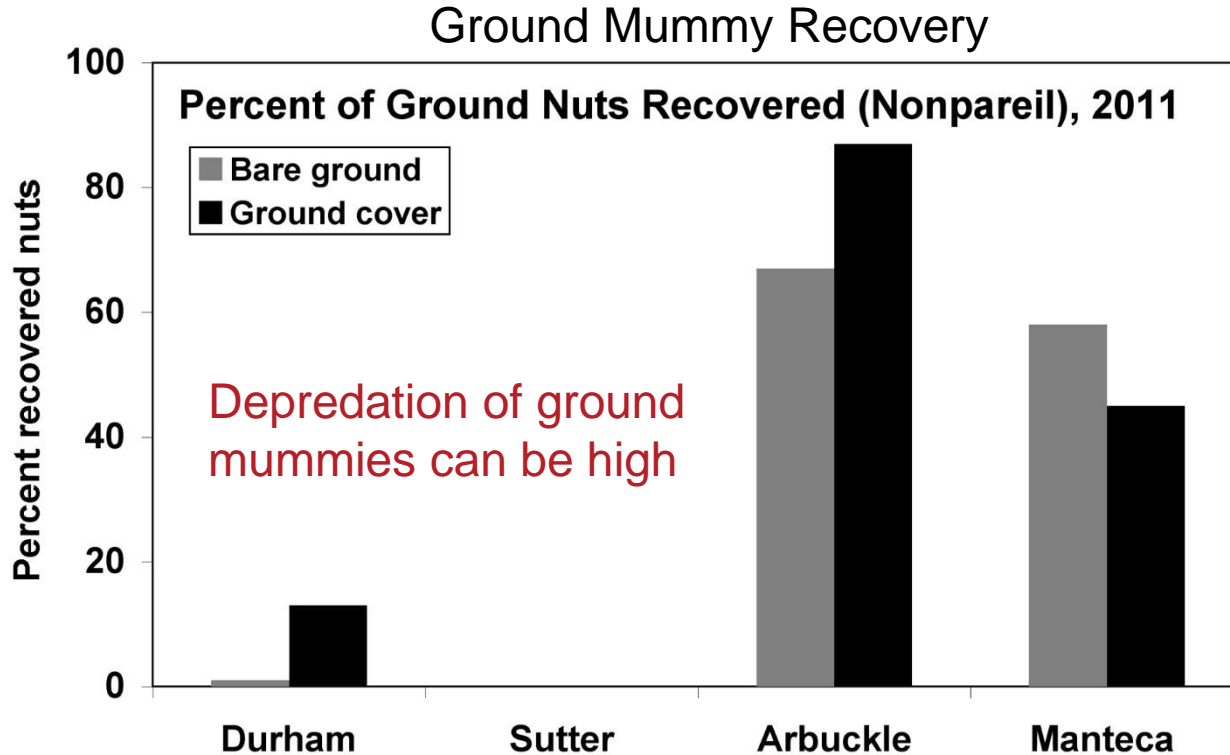
Bird and rodent activity

- *Further reduces mummy load*
- *Destroys mummies on the ground*

Winter sanitation – a northern perspective



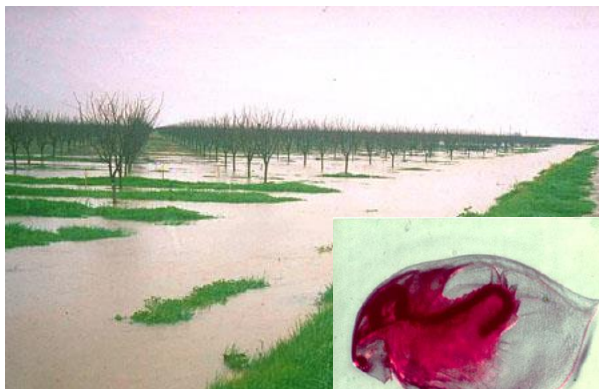
Winter sanitation – a northern perspective



Dormant spray for peach twig borer control

Still the best treatment timing for PTB, but concerns for ...

- *Raptors (research didn't support this)*
- *Storm water runoff*
- *Pollinators (depends on circumstances, product used, and timing)*



Dormant spray for peach twig borer control

Alternatives ...

- *Best management practices to mitigate runoff (floor management, buffer strip, post treatment sprinkling, etc.)*
- *Earlier treatment timing*
- *Use of alternative products (including Bt bloom sprays)*
- *Switch to a spring ('May') spray ...*

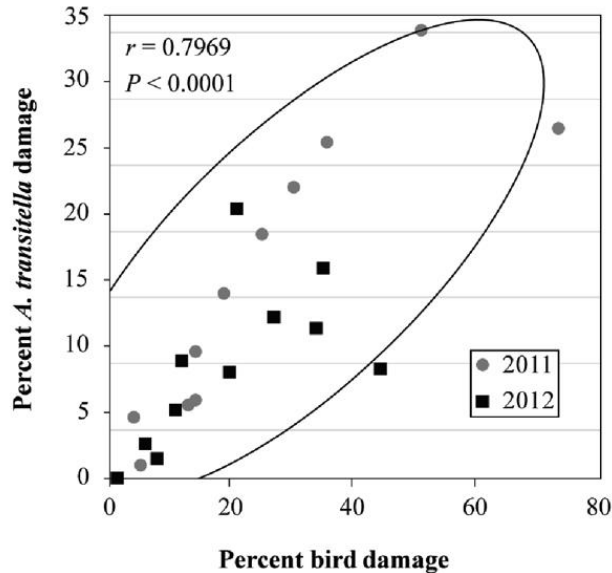
Spring spray for peach twig borer control

Time the spring spray to PTB captures using pheromone trap and degree-days

- *Provides some control of navel orangeworm as well*
- *Altacor and Delegate effective for both PTB and NOW*
- *Intrepid effective for NOW, but less so for PTB*
- *Do not use pyrethroid insecticides due to potential for spider mite outbreaks!*
- *Do not include a miticide in the spring spray unless sampling shows that it is necessary*

Why worry about peach twig borer? It's the damage ...

Any damage, even bird damage or a scratched pellicle will increase navel orangeworm infestation ...



Positive correlation between bird damage and navel orangeworm infestation

Why worry about peach twig borer? It's the damage ...

Percent larval infestation of previously navel orangeworm infested and previously uninfested Nonpareil mummy nuts

Site	Treatment	Year	n=	Dates of NOW exposure	Mean ± SD percent infestation
Ripon	Uninfested	2013	20	April 16-June 5	14.4 ± 12.4
Ripon	Preinfested	2013	9	April 16-June 5	→ 36.7 ± 15.5 ¹
Delta College	Uninfested	2014	14	April 4-May 28	9.9 ± 16.1
Delta College	Preinfested	2014	14	April 4-May 28	→ 54.6 ± 12.6 ²
Ripon	Uninfested	2016	14	May 3-May 31	19.6 ± 12.9
Ripon	Preinfested	2016	14	May 3-May 31	→ 48.5 ± 15.0 ³
Delta College	Uninfested	2016	14	May 3-May 31	9.1 ± 12.7
Delta College	Preinfested	2016	14	May 3-May 31	→ 54.9 ± 12.1 ⁴

¹ ANOV statistics, $F=17.2634$, $df=1,28$, $P=<0.0003$

² ANOV statistics, $F=60.2221$, $df=1,27$, $P=<0.0001$

³ ANOV statistics, $F=29.8127$, $df=1,27$, $P=<0.0001$

⁴ ANOV statistics, $F=95.1113$, $df=1,27$, $P=<0.0001$

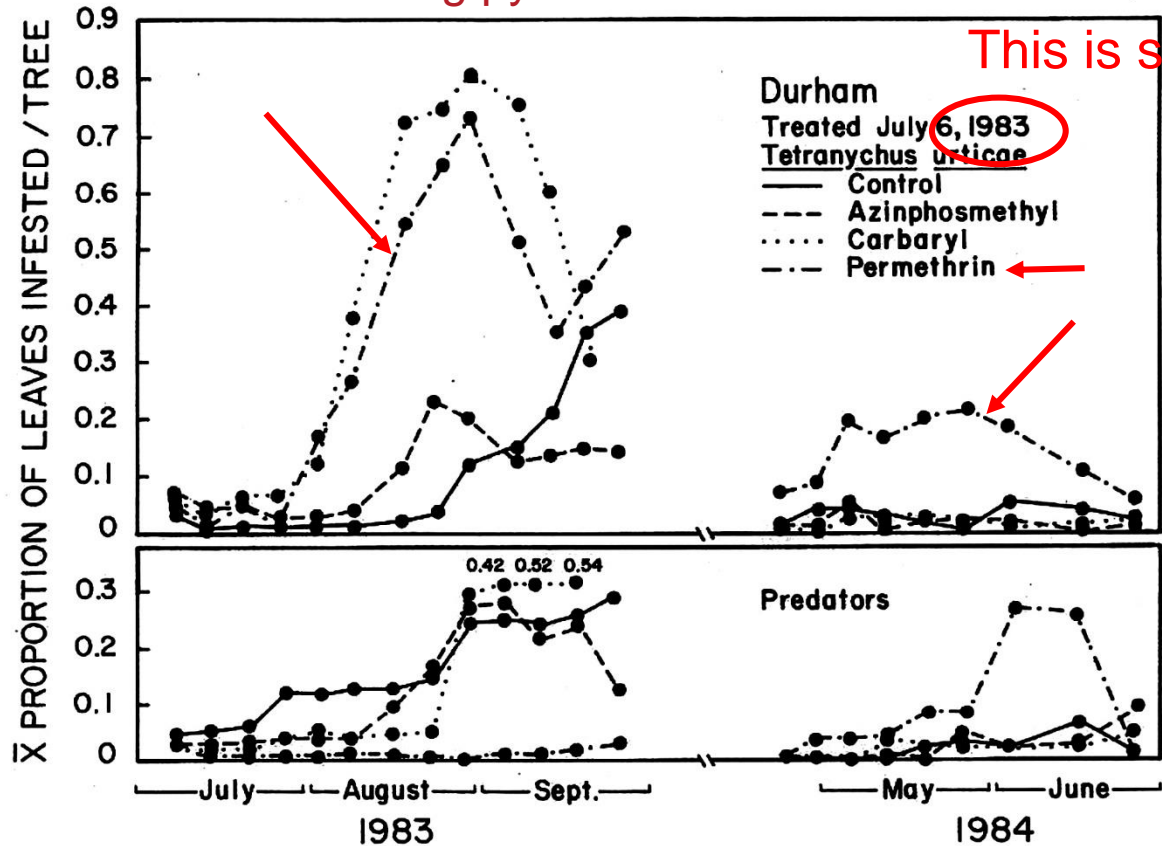
See our lab's poster ...

Hullsplrit spray

Time treatment to beginning of hullsplrit

- *Intrepid, Altacor, and Delegate are all 'effective'*
- *Apply insecticides carefully (insecticide sprays in general are not as effective as potential due to difficulty in achieving good coverage)*
- *Do not use pyrethroid insecticides due to potential for spider mite outbreaks!*

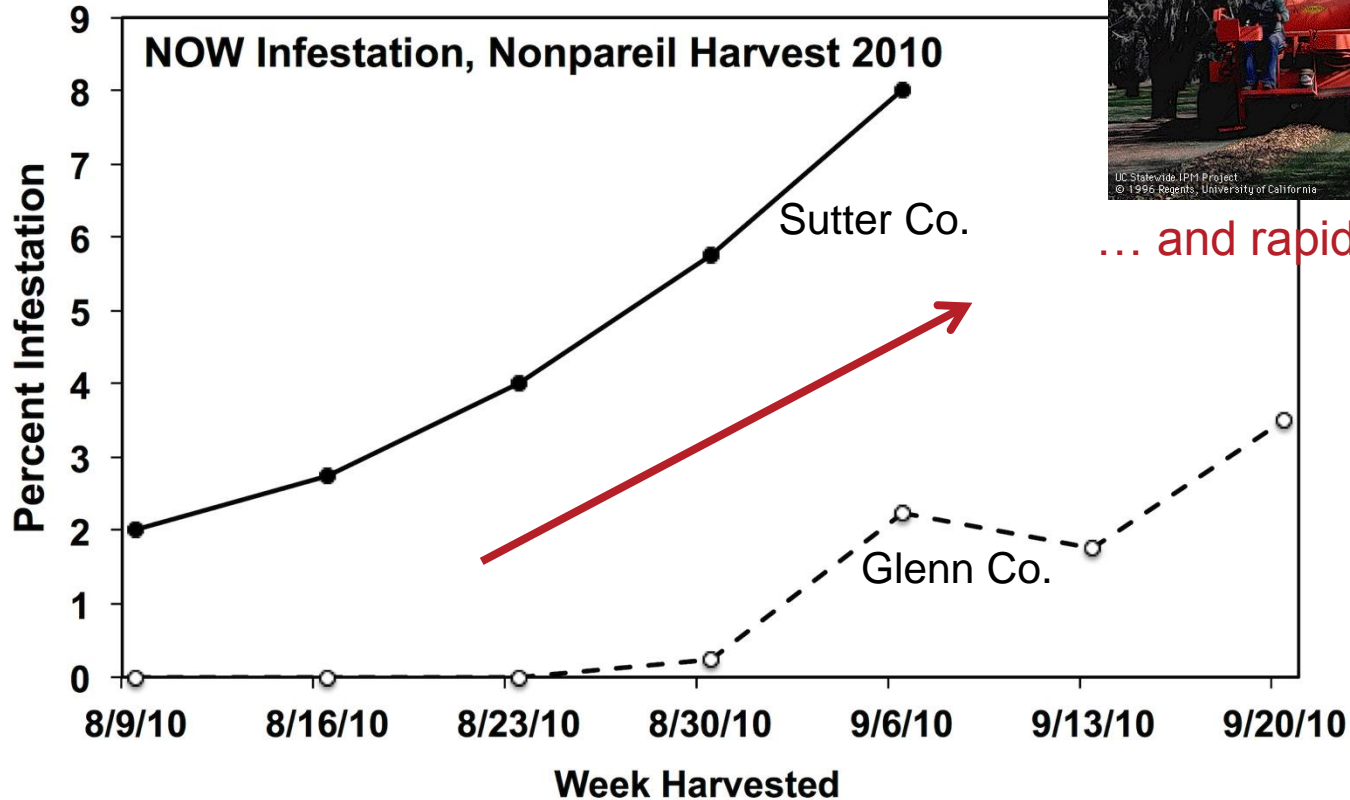
Avoid using pyrethroids for NOW Control



This is still true!

Bentley, W., F.G. Zalom, W.W. Barnett, and J.P. Sanderson. 1987. Population densities of *Tetranychus* spp. (Acari: Tetranychidae) after treatment with insecticides for *Amyelois transitella* (Lepidoptera: Pyralidae). J. Econ. Entomol. 80: 193-200.

Timely harvest



... and rapid nut pick up

So what's current? A View From the North

- Be especially vigilant during drought years
- • Always practice winter sanitation
- • Control peach twig borer during dormancy or spring
 - Time spring spray, if used, to PTB degree-days
- • Hullsplit spray with effective product other than pyrethroid
- • Timely harvest and rapid nut pickup
 - Monitor for mites, and only treat when needed
 - Consider NOW mating disruption when appropriate

Sound familiar?

Thank you!

A close-up photograph of a glass jar filled with almonds. In the foreground, a small white dish contains a dollop of almond butter. The background is a warm, golden-brown color.

Questions?