Codling Moth Control Using Reduced Risk Pesticides

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Single Tree Efficacy Research

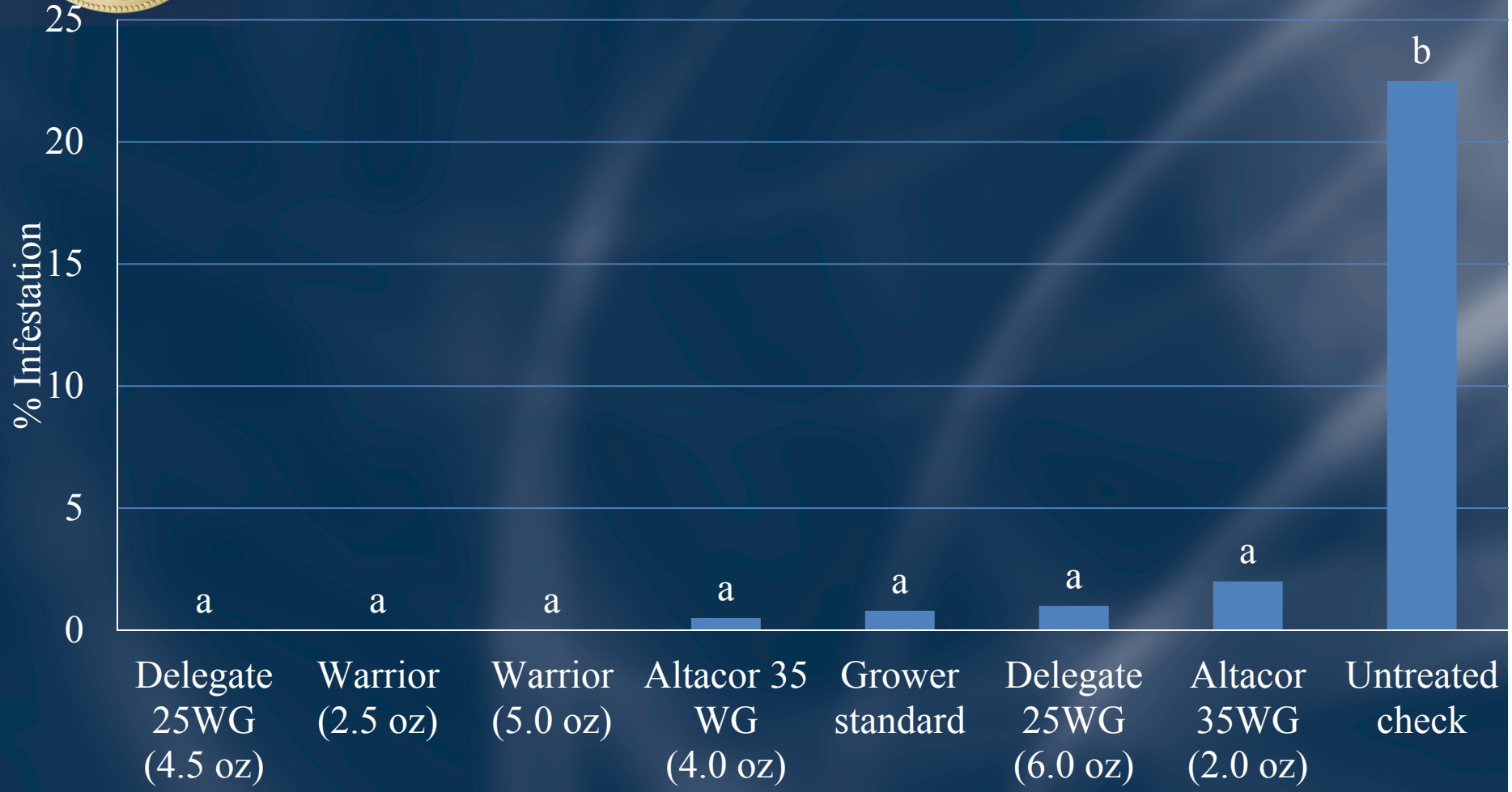
CM Trials 2005 to 2009

- All treatments replicated 4 times
- Applied using hand-held orchard sprayer at 250 psi & 250 gal/ac
- Inspected 400-500 nuts per treatment

Preliminary Research

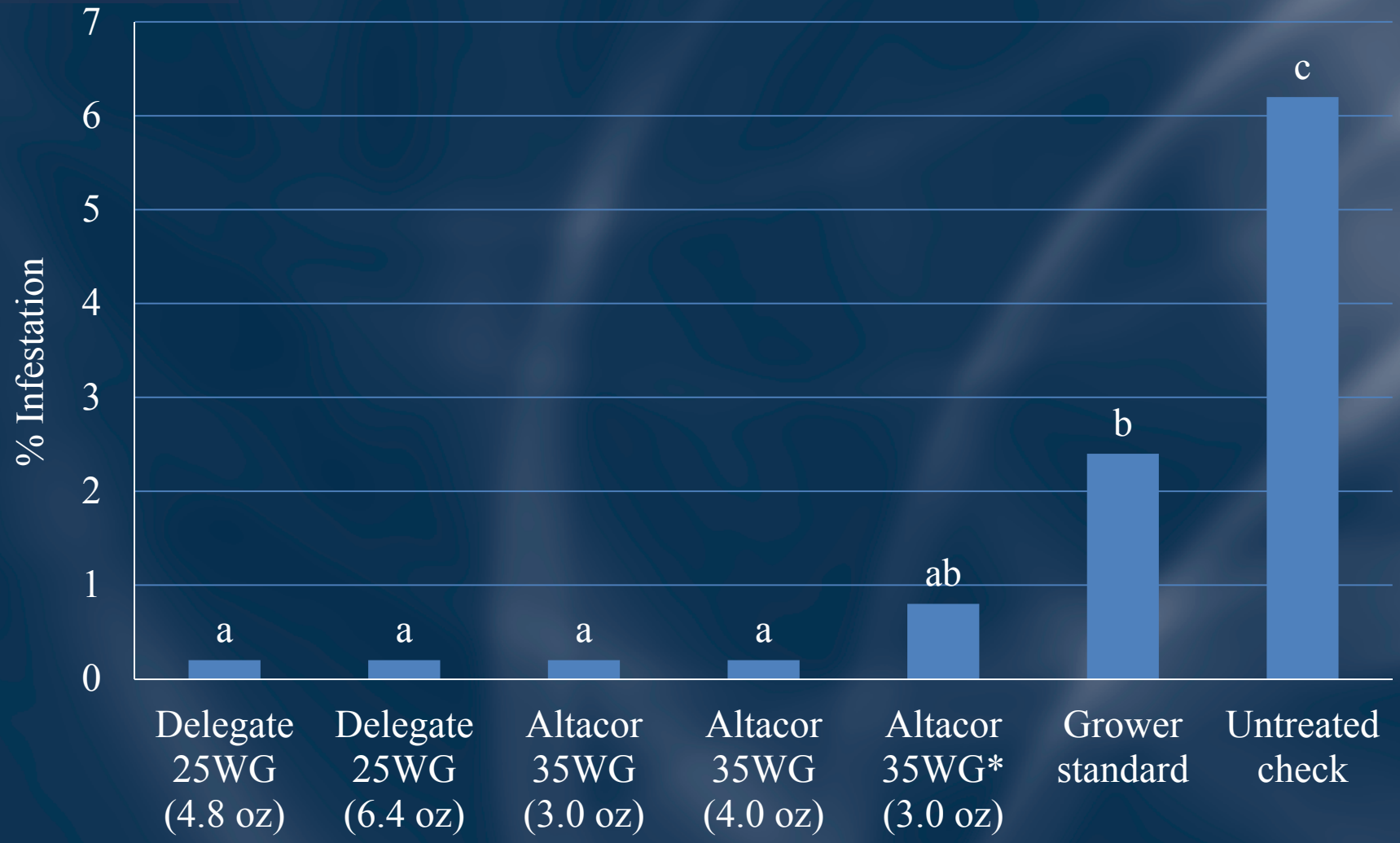
Year	Timing	Grower Standard
2005	May 2 May 31 July 12 August 4	Lorsban (2x) and Penncap (2x) alternating
2007	April 27 July 12	Lorsban (2x)
2009	April 28 May 19 June 23 July 8	Lorsban (2x) and Penncap (2x) alternating

CM Efficacy 2005



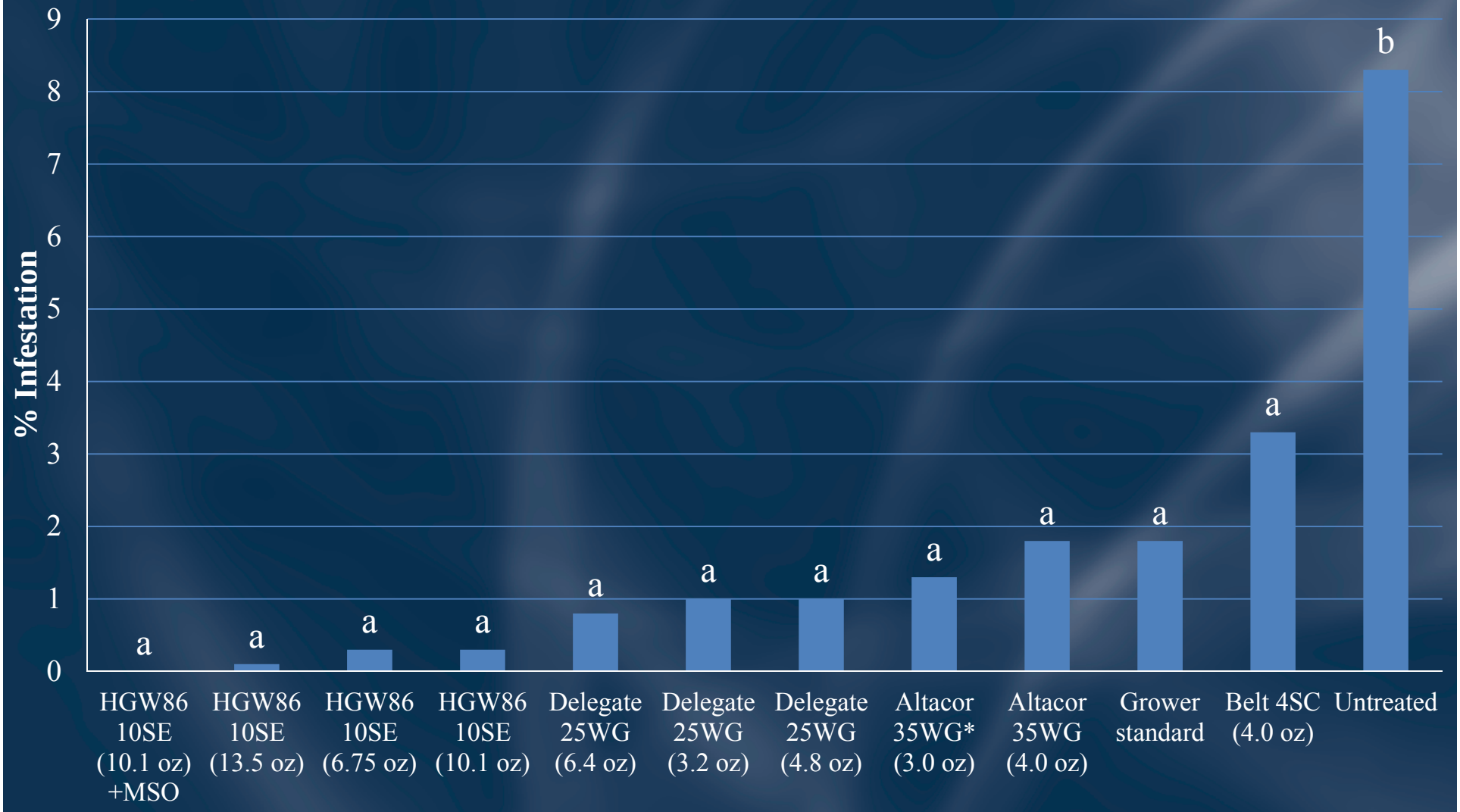
Treatments applied 4 times throughout the season

CM Efficacy 2007



Treatments applied 2 times throughout the season

CM Efficacy 2009



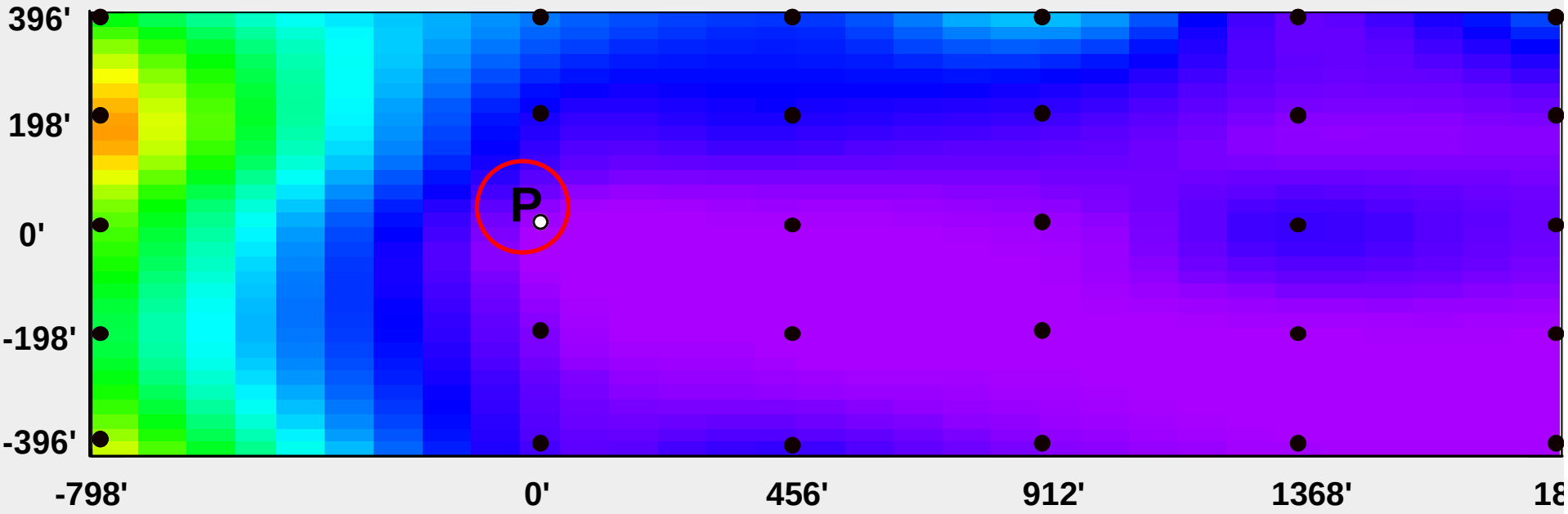
Conclusions

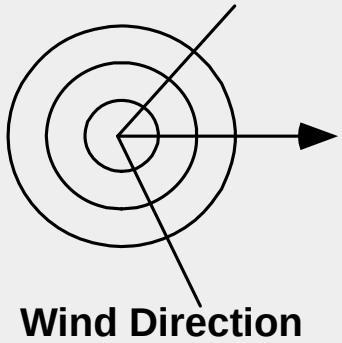
- Delegate, Altacor, HGW86, Belt and Warrior all provided excellent control of CM
- We can now apply Delegate for one CM generation and Altacor, Belt, HGW86, Voliam or other effective insecticides for the next generation

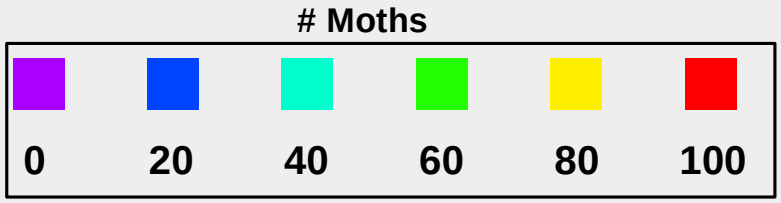
PMD History

- Early experiments - 1988 to 1992
- Puffers - 1995 to 1998
- Alternate emitters - 2000 to present
- Demonstrations - 2005 to present

Colombini Walnut Orchard
Single Puffer "on" Period, 12-hour Cycle
5-Day Cummulative Trap Catch Totals





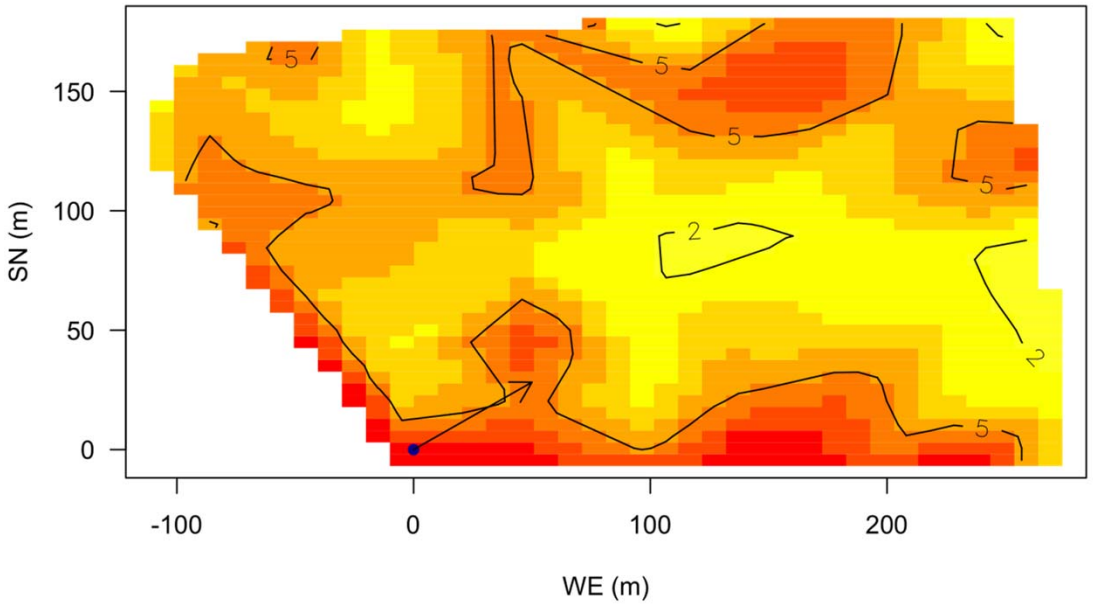


Trap Location

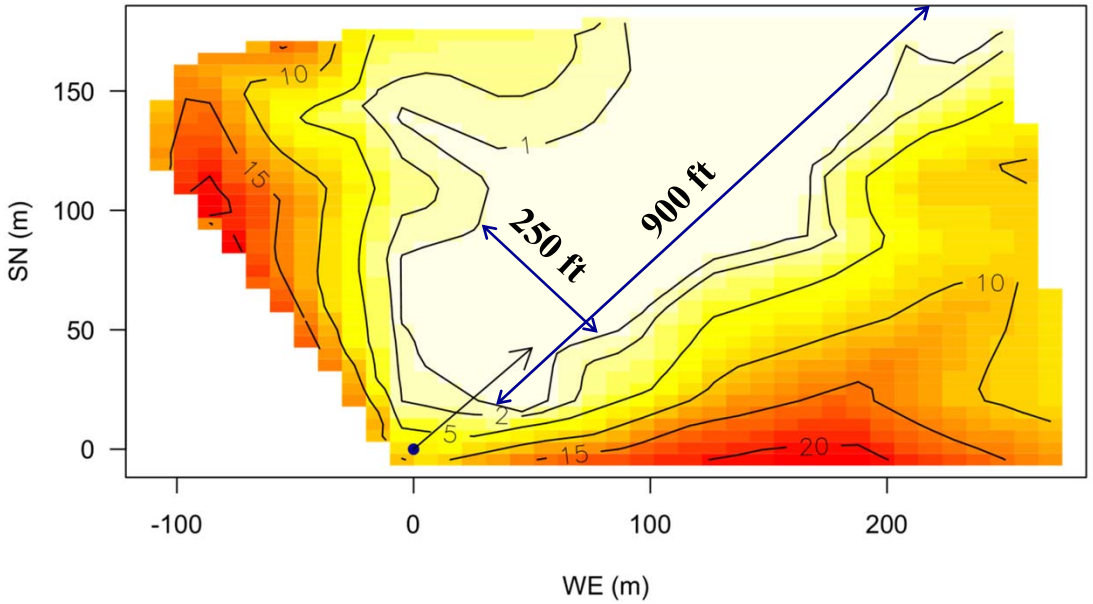
P Puffer Location

Souza 3a-on/5day

No puffer



With puffer



Captures/night (pheromone)

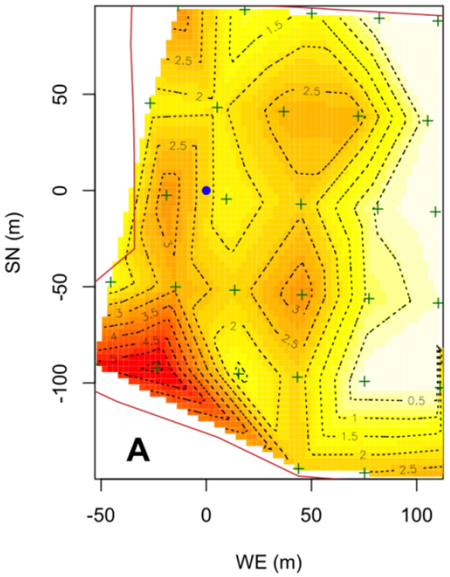
- Captures in absence of puffer were reasonably uniform across the orchard (despite some hot-spots)

- In presence of the puffer a gradient of captures, perpendicular to the wind direction, was very apparent. Captures were totally suppressed up to 900 ft downwind.

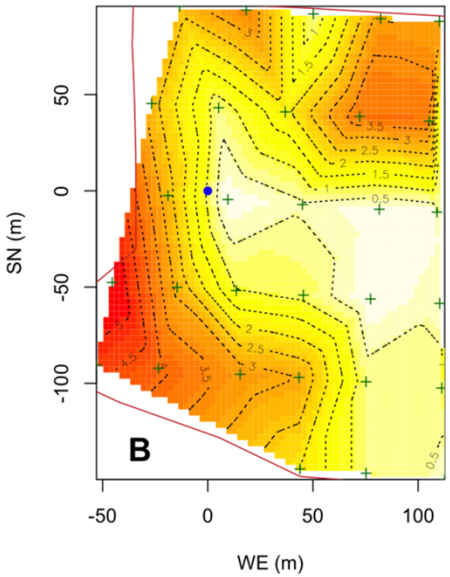
- Smaller values without puffer due to timing of the control (late in season)

Rate Effects on Plume Size and Shape on Wild CM Males

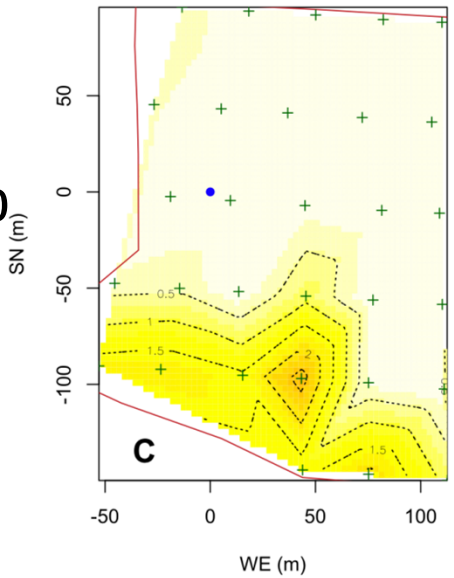
1%



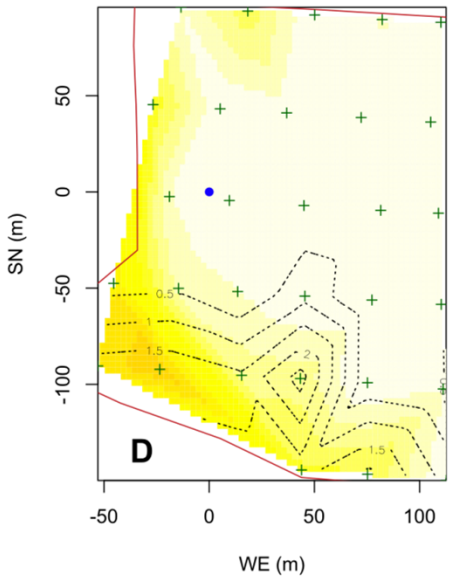
10%



50%



100%



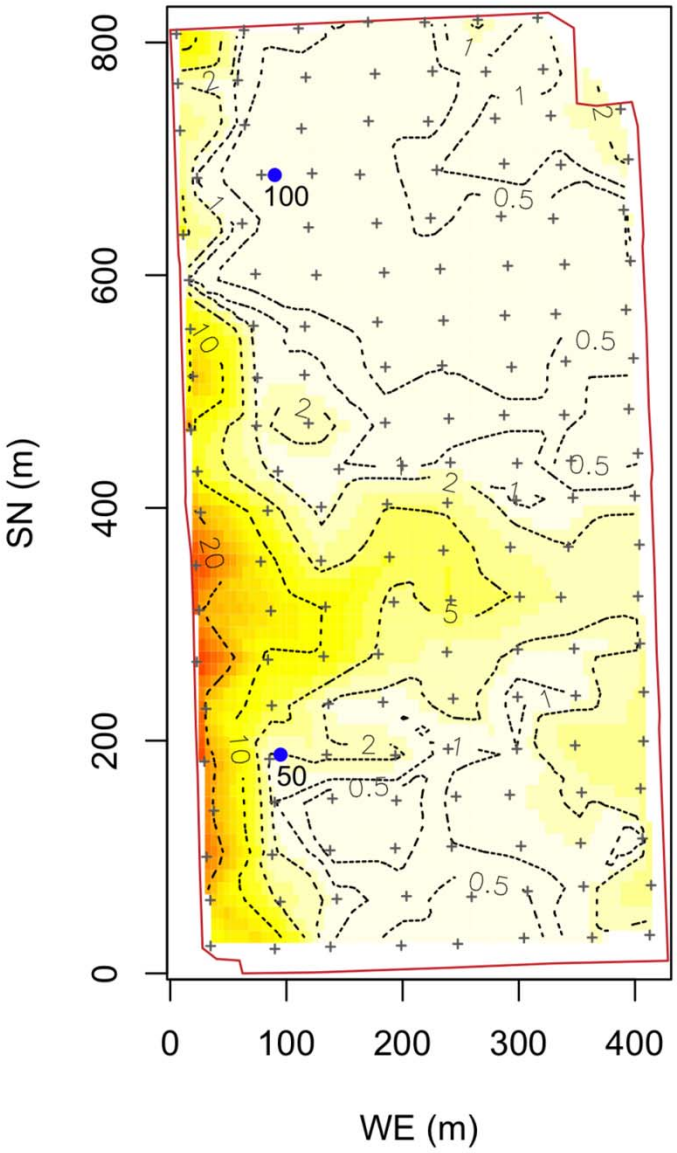
No clear plume observed with 1% ai per puff

Smaller, more narrow plume with 10% ai per puff

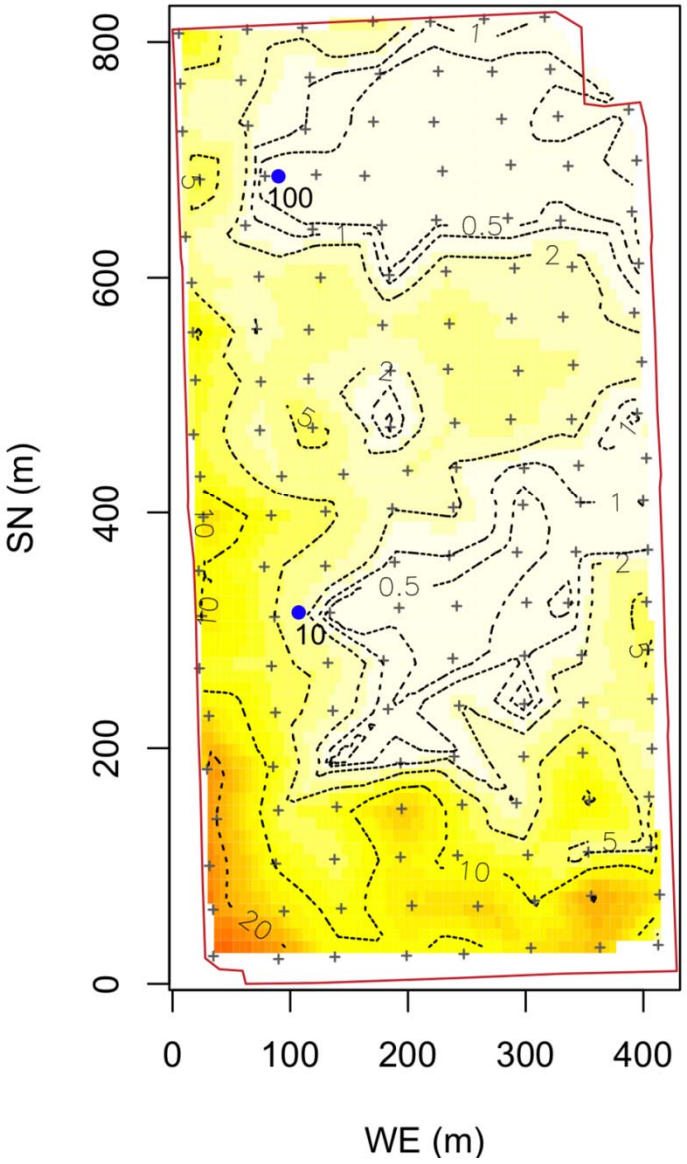
50% and 100% rates with roughly similar plume size and shapes

Paired Rate Contrasts

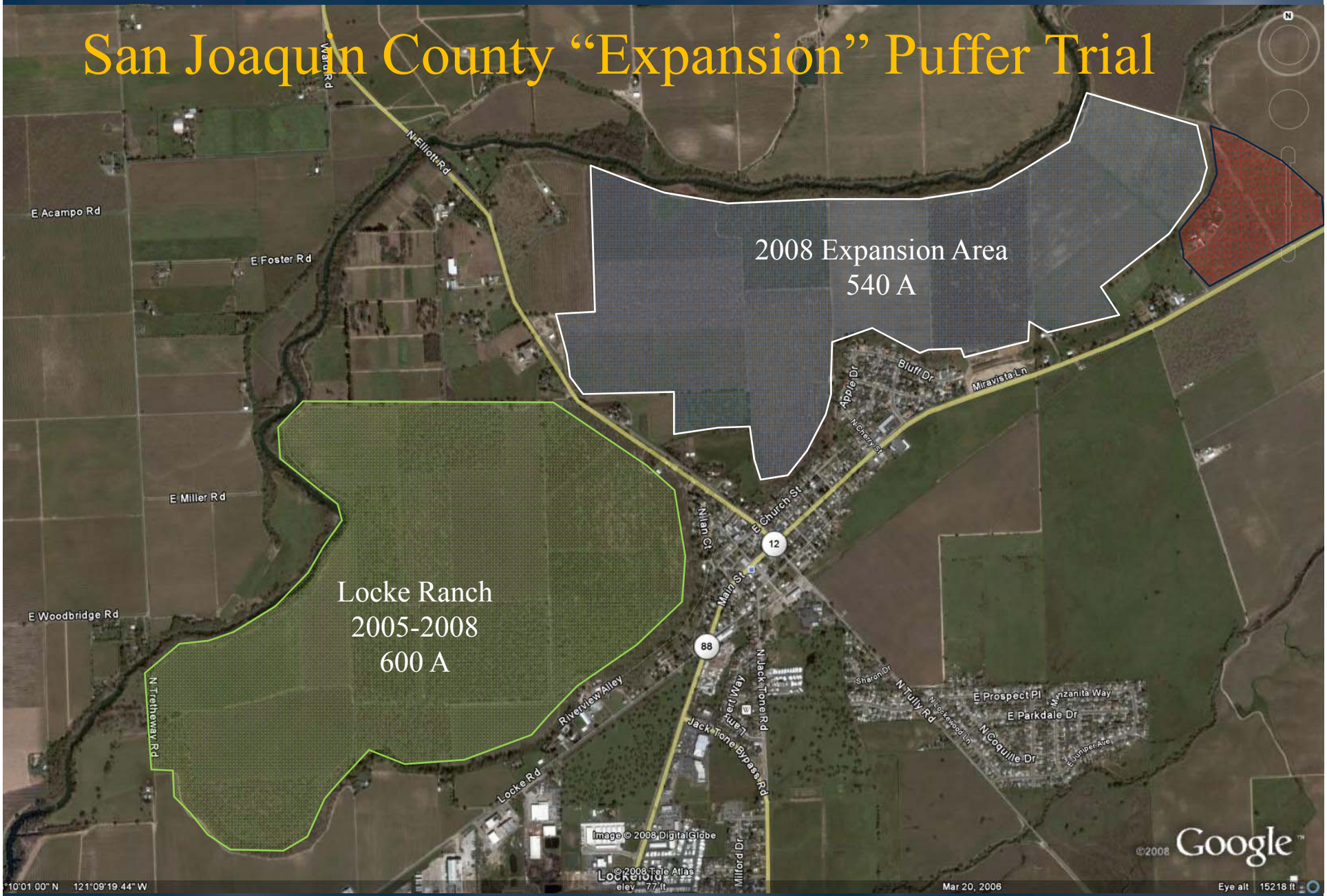
50 vs 100%



10 vs 100%



San Joaquin County "Expansion" Puffer Trial

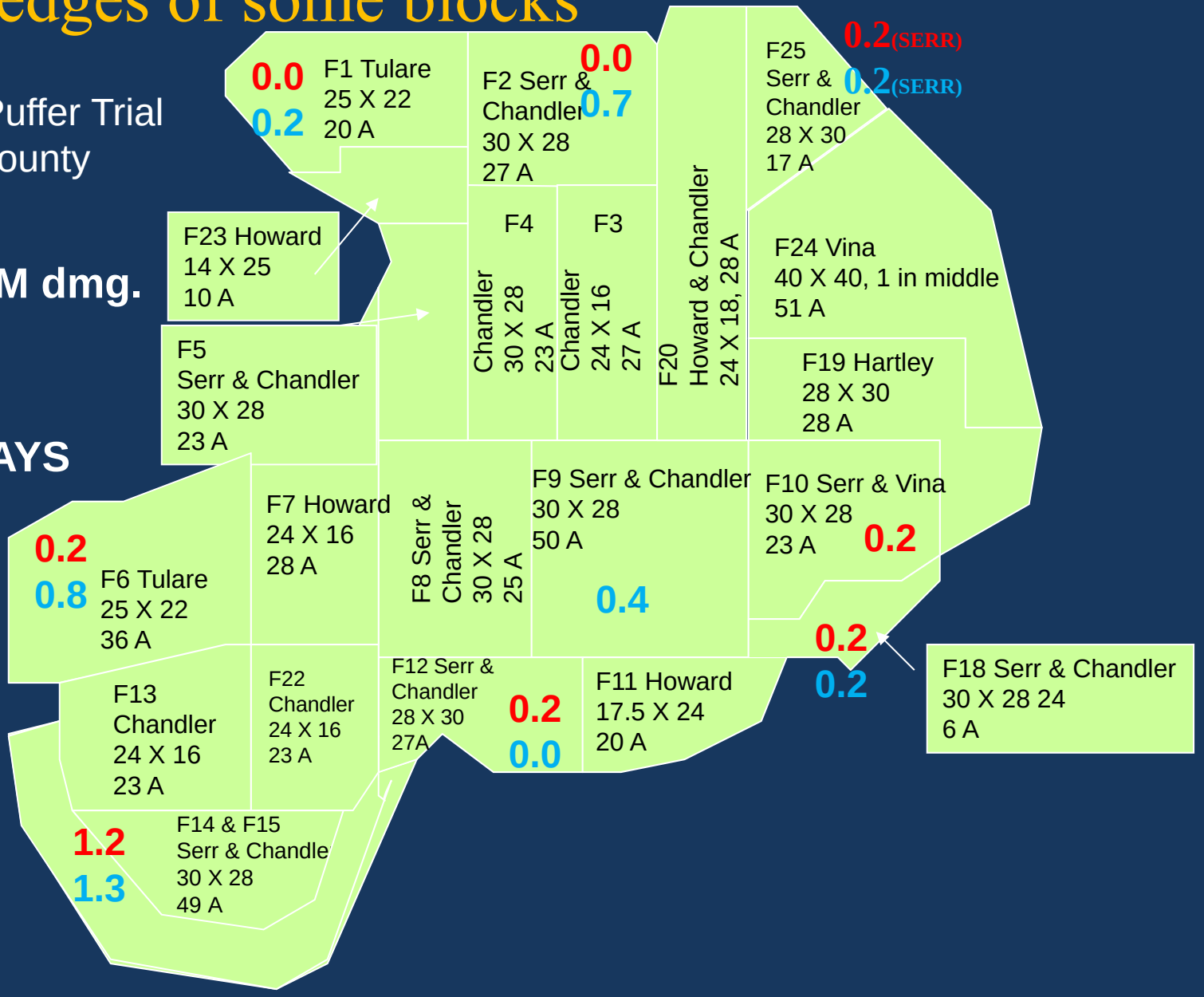


‘08 & ‘09: **0% CM** all blocks <u>except</u> at edges of some blocks

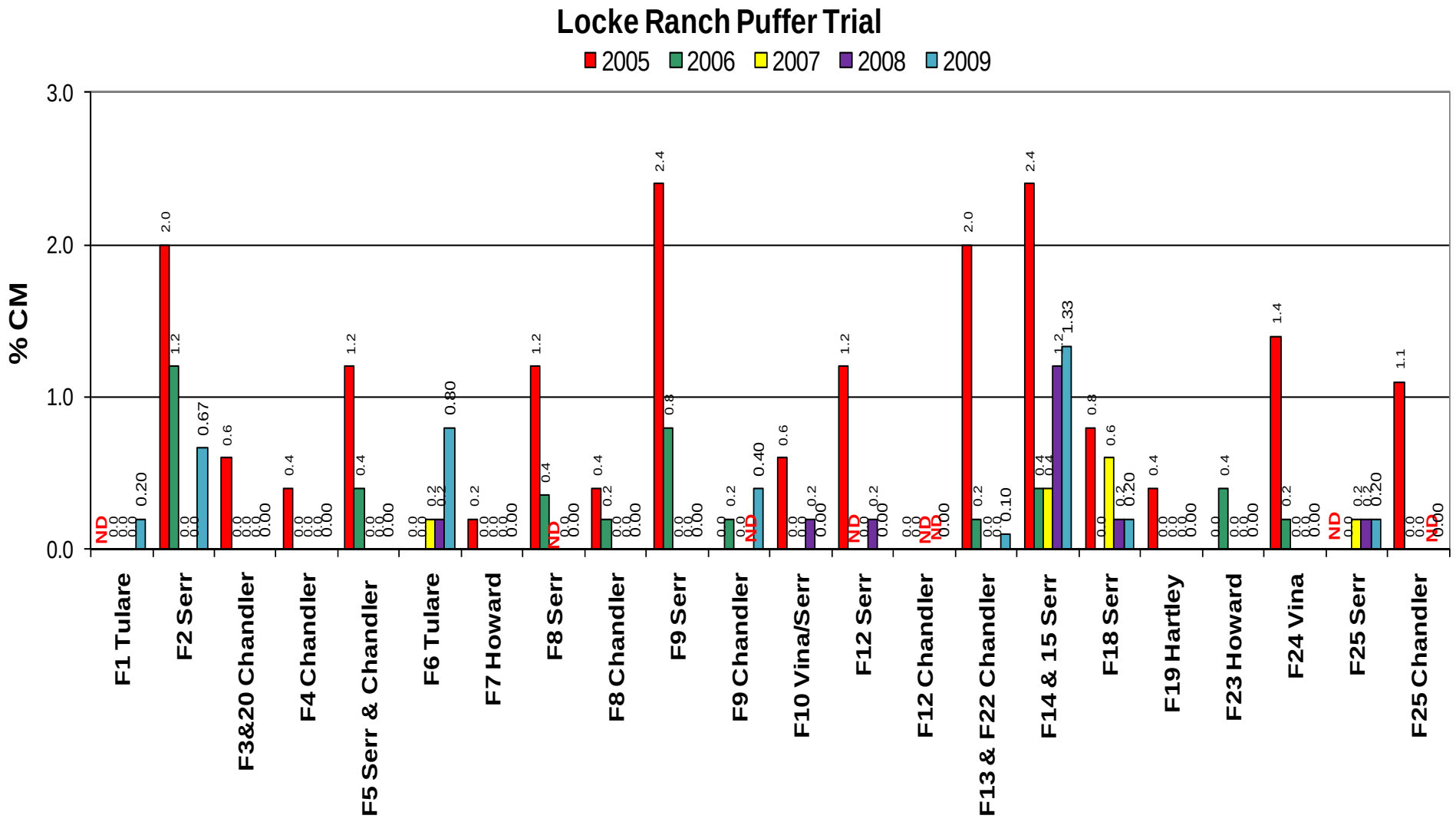
Locke Ranch Puffer Trial
San Joaquin County
T4N R7E

Harvest % CM dmg.
2008
2009

NO CM SPRAYS
Either year

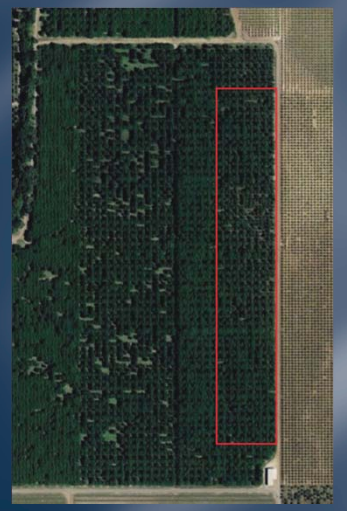


CM damage at harvest



Problematic Edges 2010

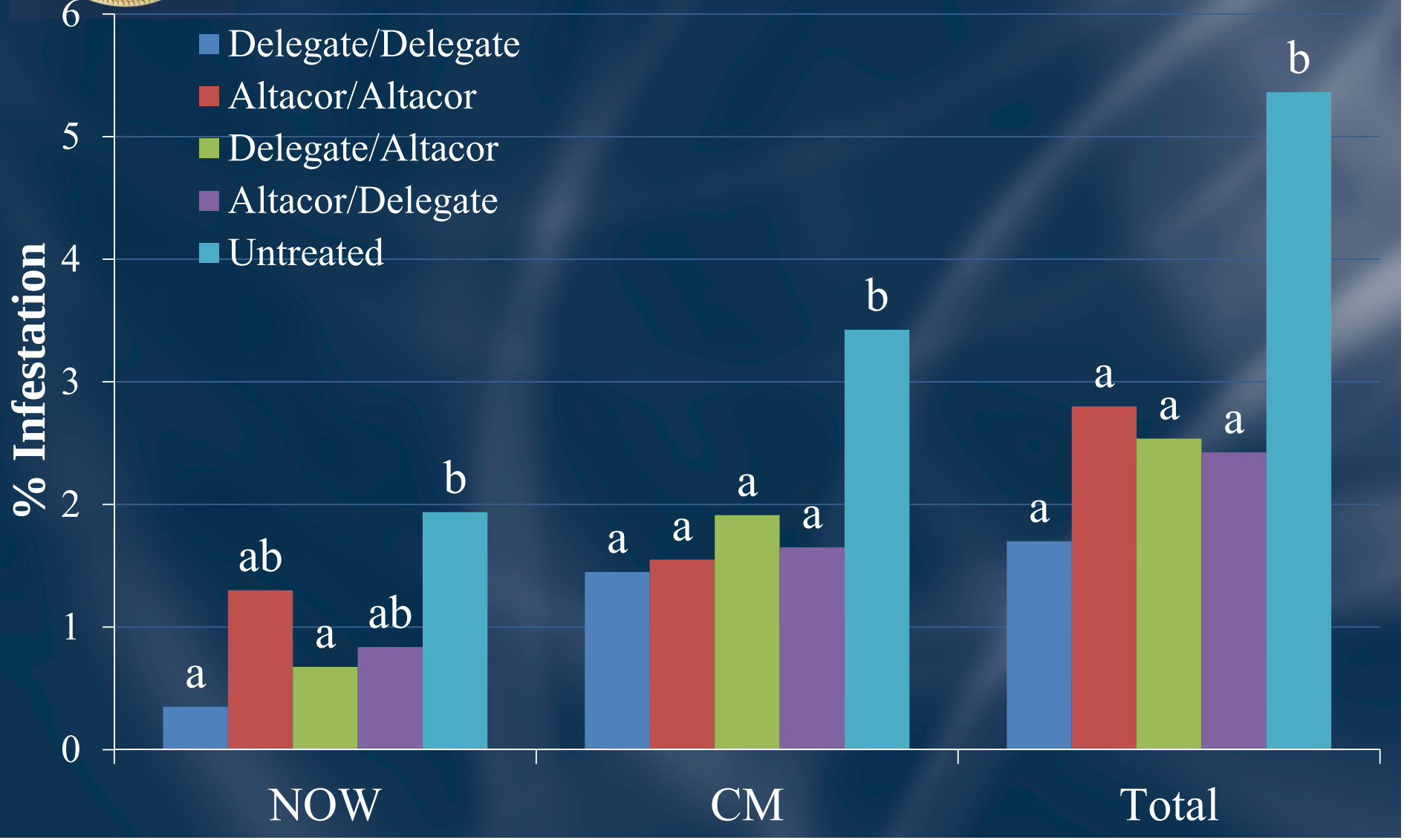
- Orchards under PMD (1 puffer/ac)
- 5 Treatments replicated 3-4 times
  - Within & across orchards
- 1.25 ac plots along edge of orchard



Spray Schedule 2010

Treatment/ Formulation	Rate Form/ac		Timing	
Delegate 25WG	4.8 oz	1B	525DD 1st	4 June
Delegate 25WG	4.8 oz	2A	185DD 2nd	7 July
Altacor 35WDG	3.0 oz	1B	525DD 1st	4 June
Altacor 35WDG	3.0 oz	2A	185DD 2nd	7 July
Delegate 25WG	4.8 oz	1B	525DD 1st	4 June
Altacor 35WDG	3.0 oz	2A	185DD 2nd	7 July
Altacor 35WDG	3.0 oz	1B	525DD 1st	4 June
Delegate 25WG	4.8 oz	2A	185DD 2nd	7 July
Untreated	---			

Infestation at Harvest 2010



Problematic Edges 2010

- All experimental treatments were equally effective in suppressing CM infestation
- No flare of secondary pests

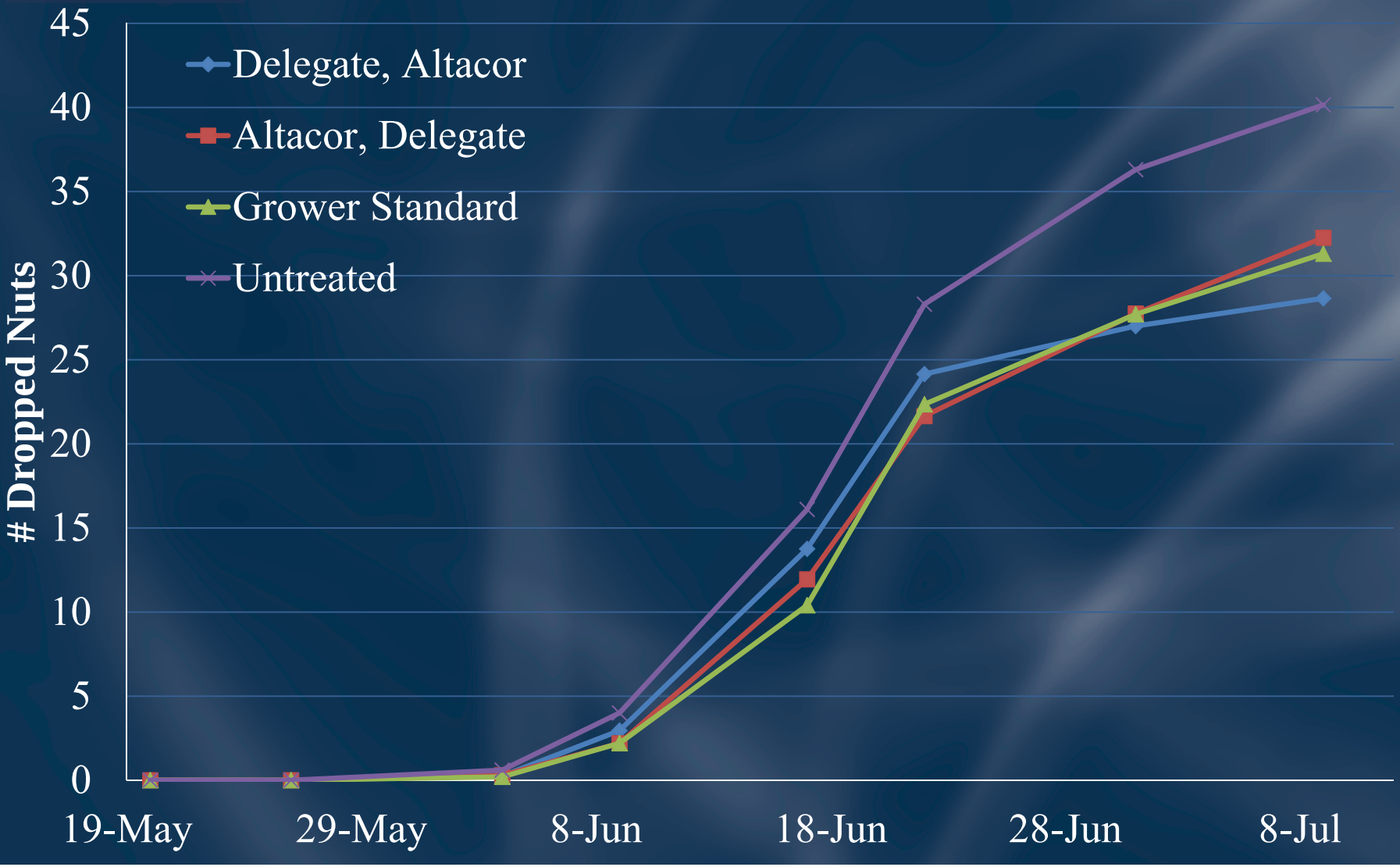
1st Year Pheromone 2010

- Puffers place 1/ac in 2010
- 4 treatments replicated 4 times
- Plots were 1.3 acres 8 trees x 8 trees

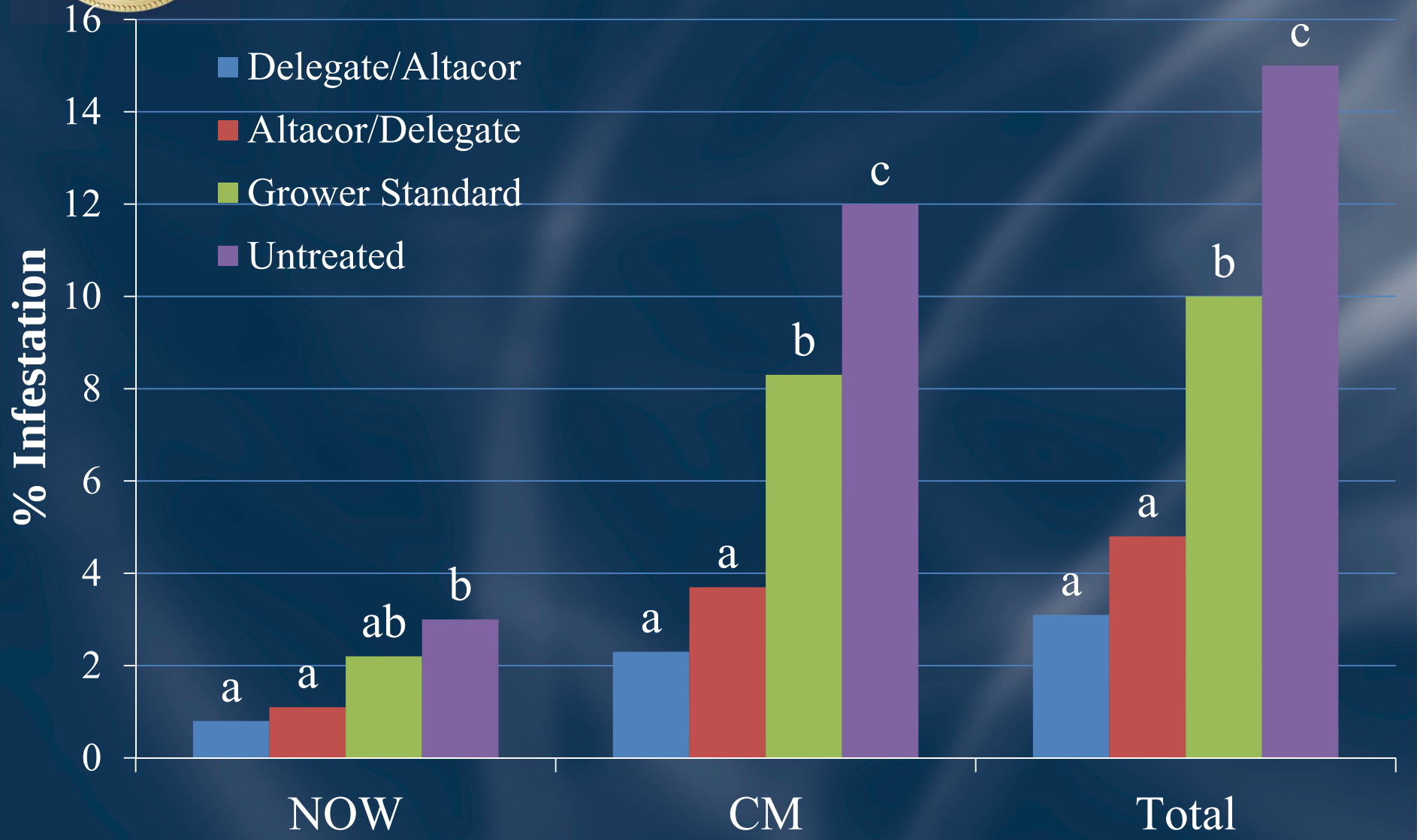
Spray Schedule 2010

Treatment	Rate Form/ac	Timing	Date
Delegate 25WG	4.8 oz	614DD from 1st biofix	8 June
Altacor 35WDG	3.0 oz	185DD, 532DD from 2nd biofix	7 July, 20 July
Altacor 35WDG	3.0 oz	614DD from 1st biofix	8 June
Delegate 25WG	4.8 oz	185DD, 532DD from 2nd biofix	7 July, 20 July
Grower Standard:			
Asana XL	6.0 oz	628DD from 2nd biofix	24 July
Untreated	---		

Cumulative CM Infested Dropped Nuts per Tree – 2010



Infestation at Harvest 2010



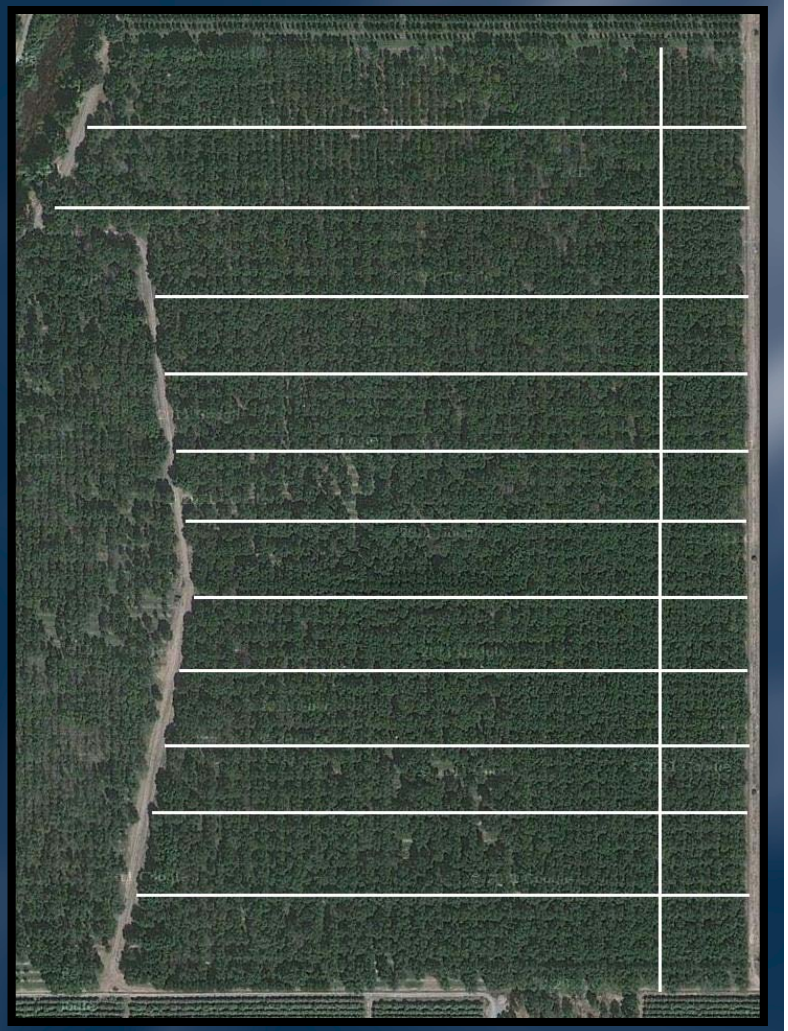
1st Year Pheromone 2010

- Both experimental treatments were equally effective in suppressing CM and total infestation

- The grower standard was less effective compared to the experimental treatments in controlling CM and total infestation, but was still significantly different compared to the untreated check

High Populations 2011

- 4 treatments replicated 3 times
  - split plot design.
- Plots were 8 or 10 trees wide ~25.3 ac/tr
- Plots split into east (10 trees long) and west (remainder)



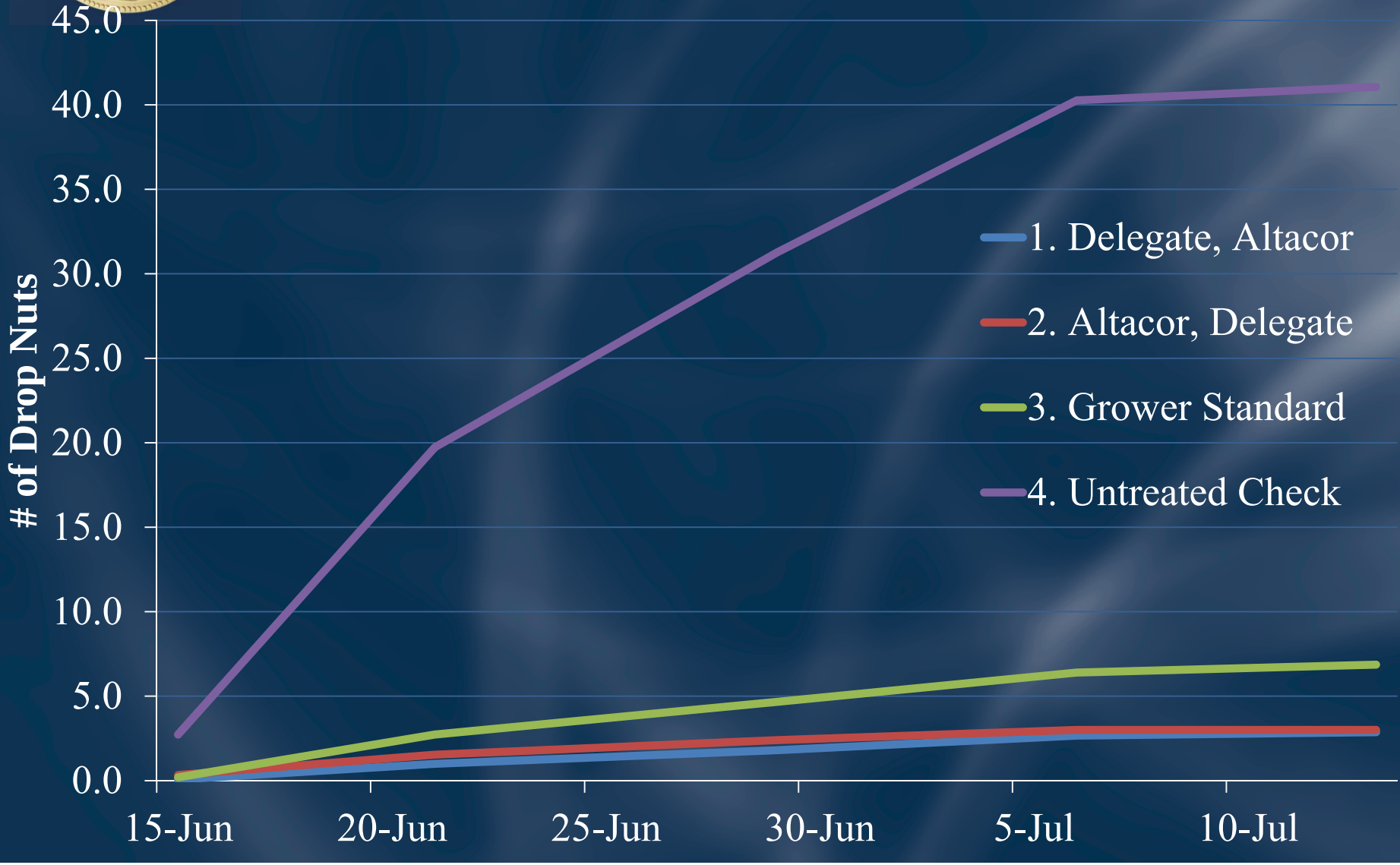
Orchard in 2010

- 2010 Application:
  - Asana at ½ label rate, late in the 2B CM flight
- 2010 Infestation:
  - Dropped nuts >30
  - 10% Grower Std.
  - 15-18% Orchard

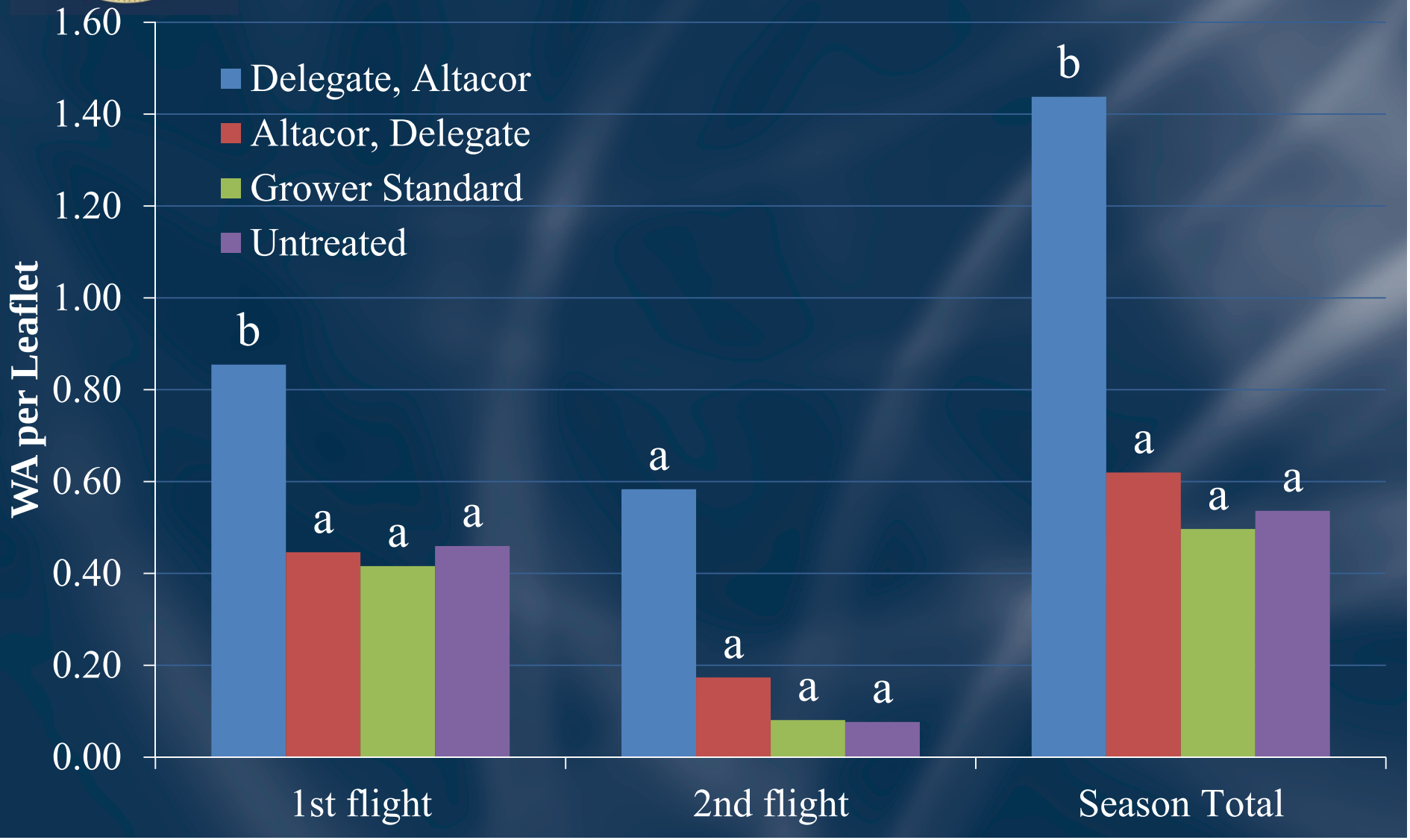
Spray Schedule 2011

Treatments	Rate (Form./ac) Air	Ground	Timing & Date	
1. Delegate 25WG	4.0 oz	3.0 oz	189DD 1st	3 May
Delegate 25WG	---	7.0 oz	719DD 1st	15 June
Altacor 35WDG	2.5 oz	2.0 oz	245DD 2nd	19 July
2. Altacor 35WDG	2.5 oz	2.0 oz	189DD 1st	3 May
Altacor 35WDG	---	4.5 oz	719DD 1st	15 June
Delegate 25WG	4.0 oz	3.0 oz	245DD 2nd	19 July
3. Grower Standard:				
Lambda-Cy EC	3.12 fl oz	2.0 fl oz	249DD 1st	6 May
Bifenture 10DF +	---	10.0 oz	631DD 1st	11 June
Abamectin 0.15EC	---	16.0 fl oz		
Lambda-Cy EC	5.12 fl oz	---	894DD 1st	22 June
Warhawk 4EC	4.0 pt	---	245DD 2nd	19 July
4. Treated Check:				
Warhawk 4EC	4.0 pt	---	245DD 2nd	19 July

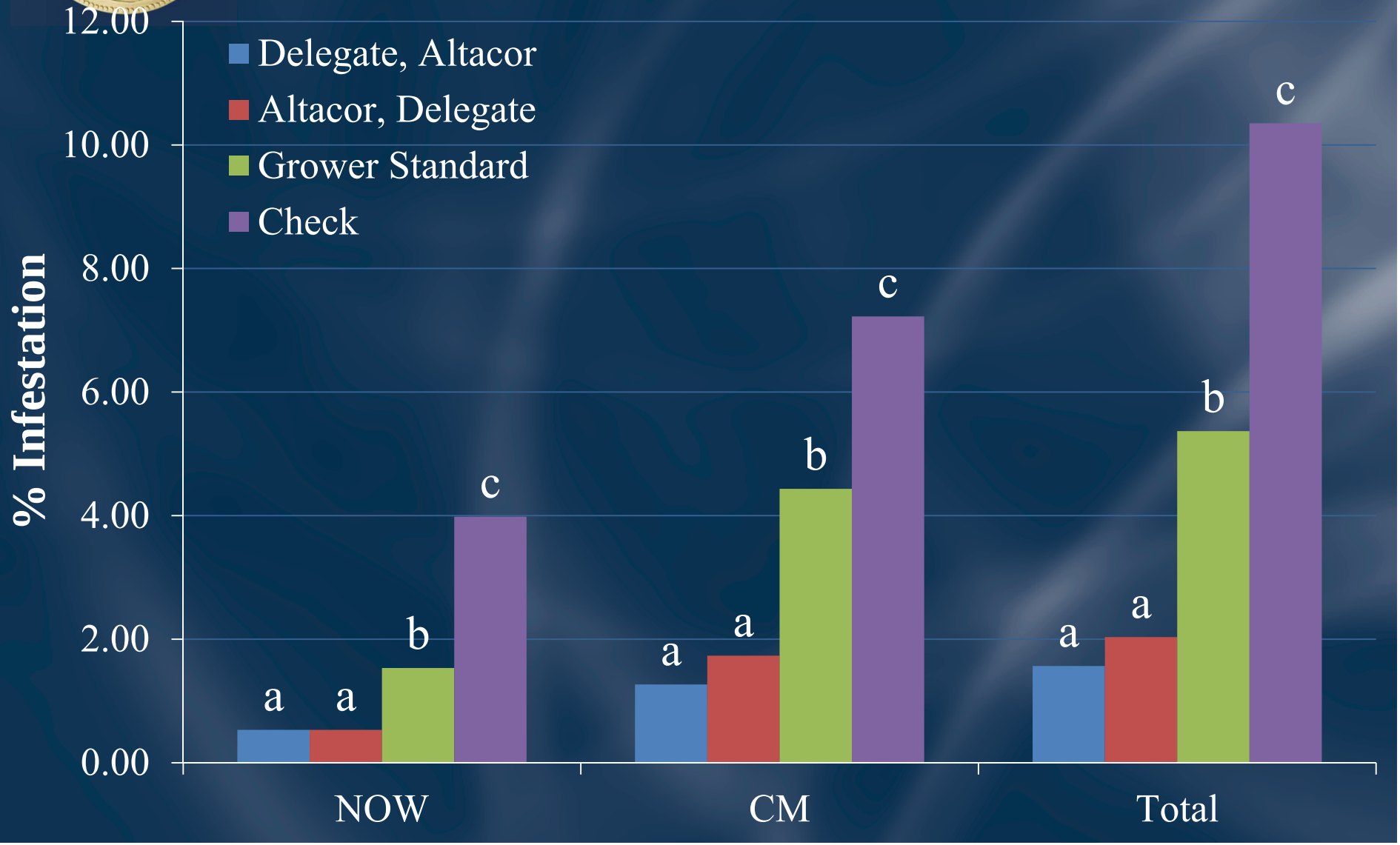
Cumulative CM Infested Dropped nuts per tree - 2011



Walnut Aphids per Leaflet - 2011



Infestation at Harvest 2011



High Populations 2011

- Slight flare up of secondary pests in the Delegate-initiated treatment.

- Judicious use of low-risk pesticides is sufficient to bring high populations of CM to acceptable levels within a single season.

2010 & 2011Conclusions

- Delegate & Altacor can provide adequate control of CM in walnut
- There may be an advantage to using Delegate over Altacor but there is no statistically significant difference
  - In 2010 and 2011, Delegate-initiated treatments have numerically lower infestation across experiments

Alternative emitters 2000 to 2010

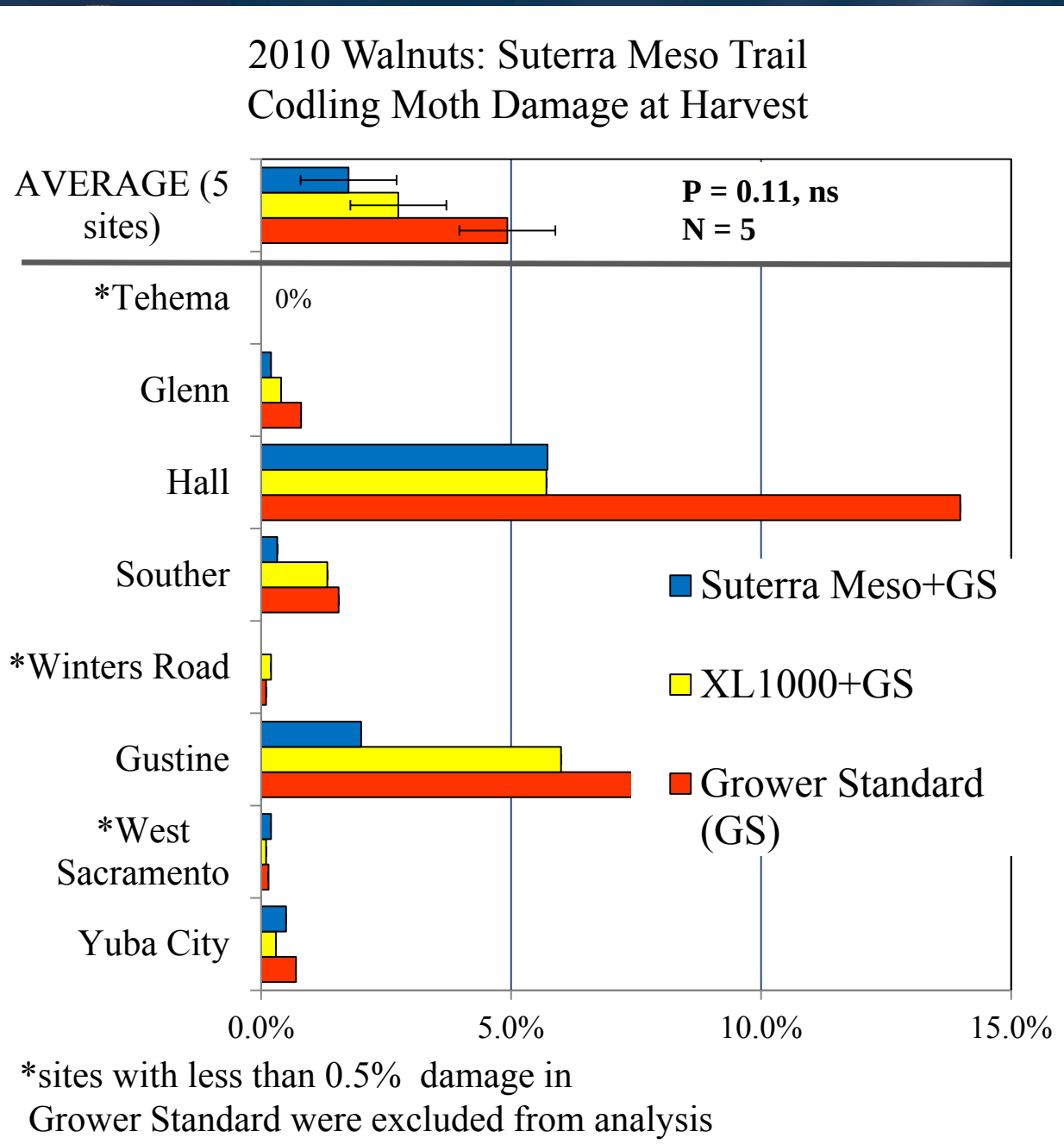
Isomate "Ring" (2008)

* 2009 "ring" is a 5-C TT unit that separates to form a ring of 10 single tubes.
Deployed at 20-40 rings per acre.

G037

CM XL1000
(for comparison)

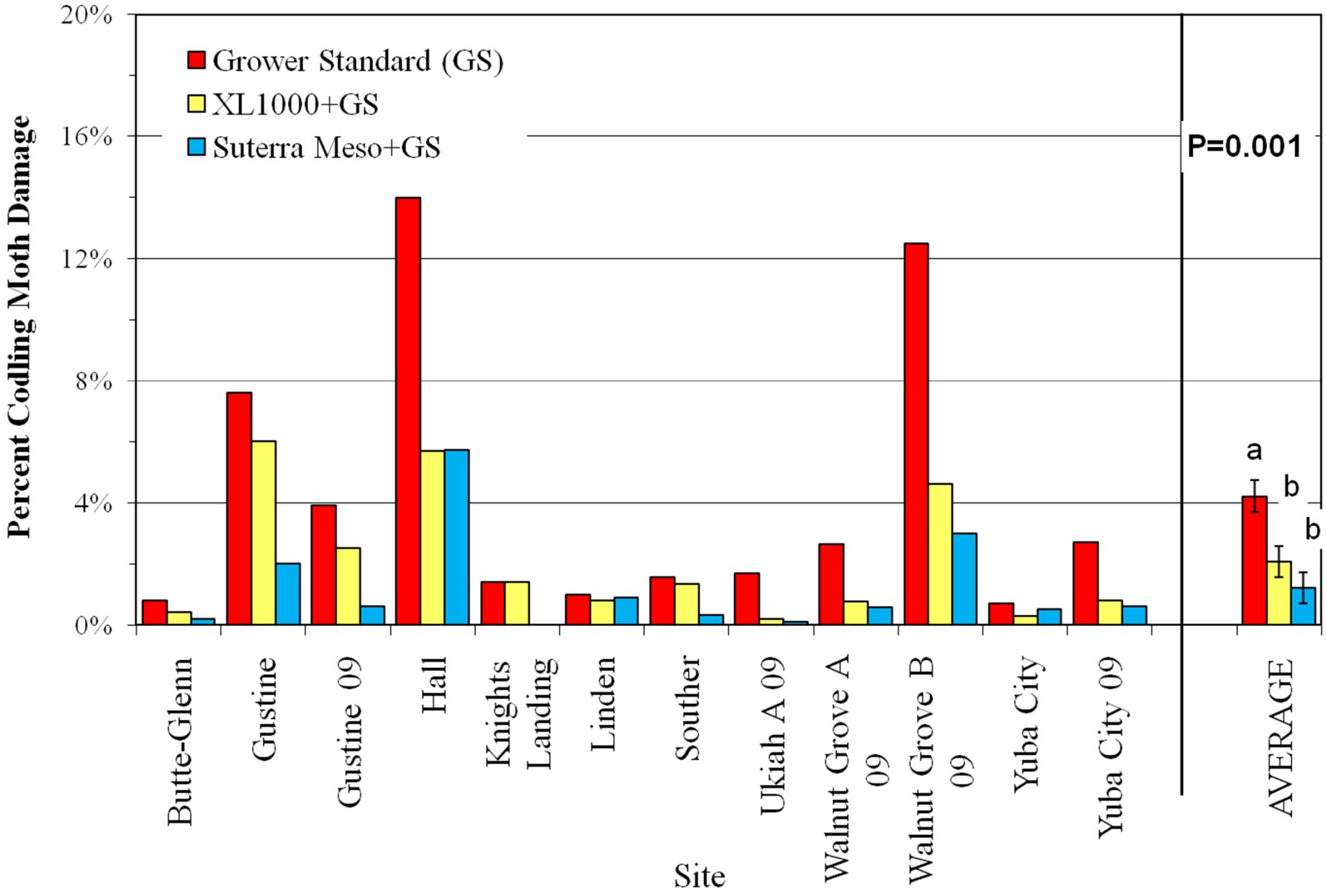
Suterra membrane type dispensers. G037 deployed at 18 units/ac



Same general pattern observed in 2010, but not statistically different

Pressures were quite good in a lot of the orchards

2009-2010 Suterra Meso Trials
Codling Moth Damage at Harvest (Pears & Apples)




QUESTIONS ANYONE?