

CODLING MOTH: "Area-Wide" Mating Disruption Using Puffers

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Growers and PCAs



"Been there, done that"

✓ Sprayables



✓ Wax emulsion



✓ Puffers



✓ Hand applied



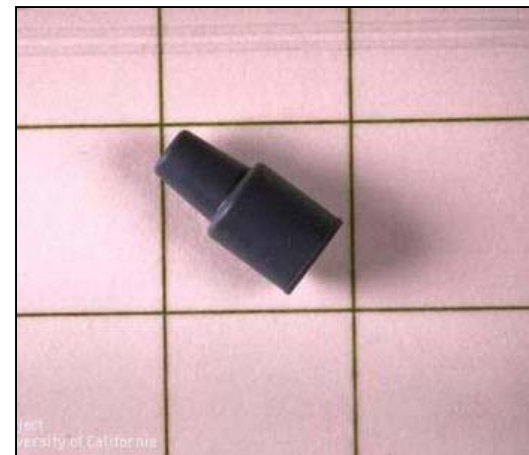
✓ Flakes, tubes





UC Statewide IPM Project
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CMDA "Combo" Lure



Regents of California

STATUS OF PUFFERS IN WALNUTS

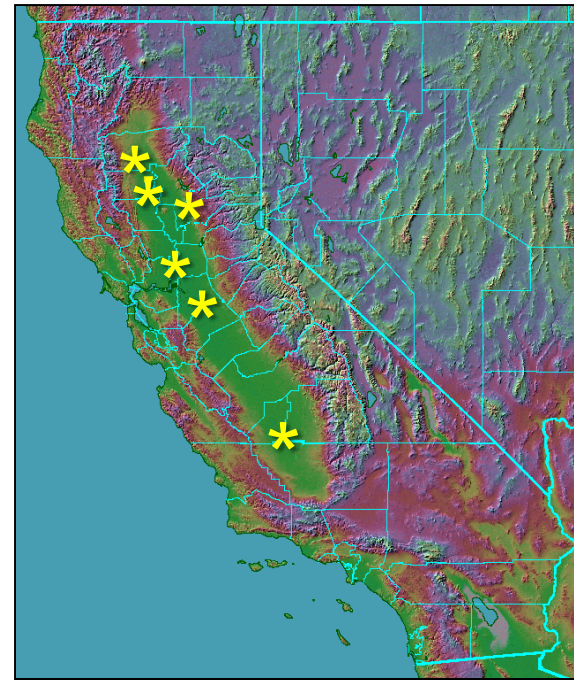
- Few to no mechanical failures (<1%)
- Large areas (40 acre min.) appear to lower populations better
- Supplemental sprays important
- Population suppression achievable in 2-3 years
- Monitor: Use COMBO traps (hung high)
- Stull need actionable treatment thresholds
 - *Traps*
 - *Mid-season damage??*
- Orchard edges may need extra efforts
- Can lose “incidental control” of other pests, esp. **WHF**
- “Good Neighbor” approach: Inform neighbors about puffer use

CM Puffer Transition Strategy

- **Year 1** - Puffers + supplemental sprays to reduce population and control damage
- **Year 2** – Continued population reduction; reduce/eliminate sprays or use softer materials according to “Combo” trap catches and in-season damage
- **Year 3-5** – With above, need for CM sprays eliminated over time

CM Pheromone puffer implementation sites

- **San Joaquin County**
 - *5th year: 600 acres (22 blocks)*
 - *2nd year: 540 acres (10 blocks)*
- **Glenn County**
 - *5th year*
 - *180 acres (3 blocks)*
- **Butte County**
 - *3rd year*
 - *205 acres (2 blocks)*
- **Yolo County**
 - *2nd year*
 - *180 acres (4 blocks)*
- **Tehama County**
 - *2nd year*
 - *2 blocks: 120, 160 acres*
- **Kings County**
 - *2nd year*
 - *160 acres (2 blocks)*



- **Advise cooperators on CM management**
- **Population monitoring**
 - *1x traps low*
 - *Combo traps high*
- **In-season damage counts**
 - *End 1st and 2nd generation*
 - *600 nuts / block*
- **Harvest damage**
 - *500 nuts / block*

San Joaquin County Puffer Trial

Locke Ranch

600 acres

N-Tretheway Rd

Lockeford

12

N-Jack-Tone Rd

E-Jack-Tone Rd

88

Milford Dr

Locke Rd

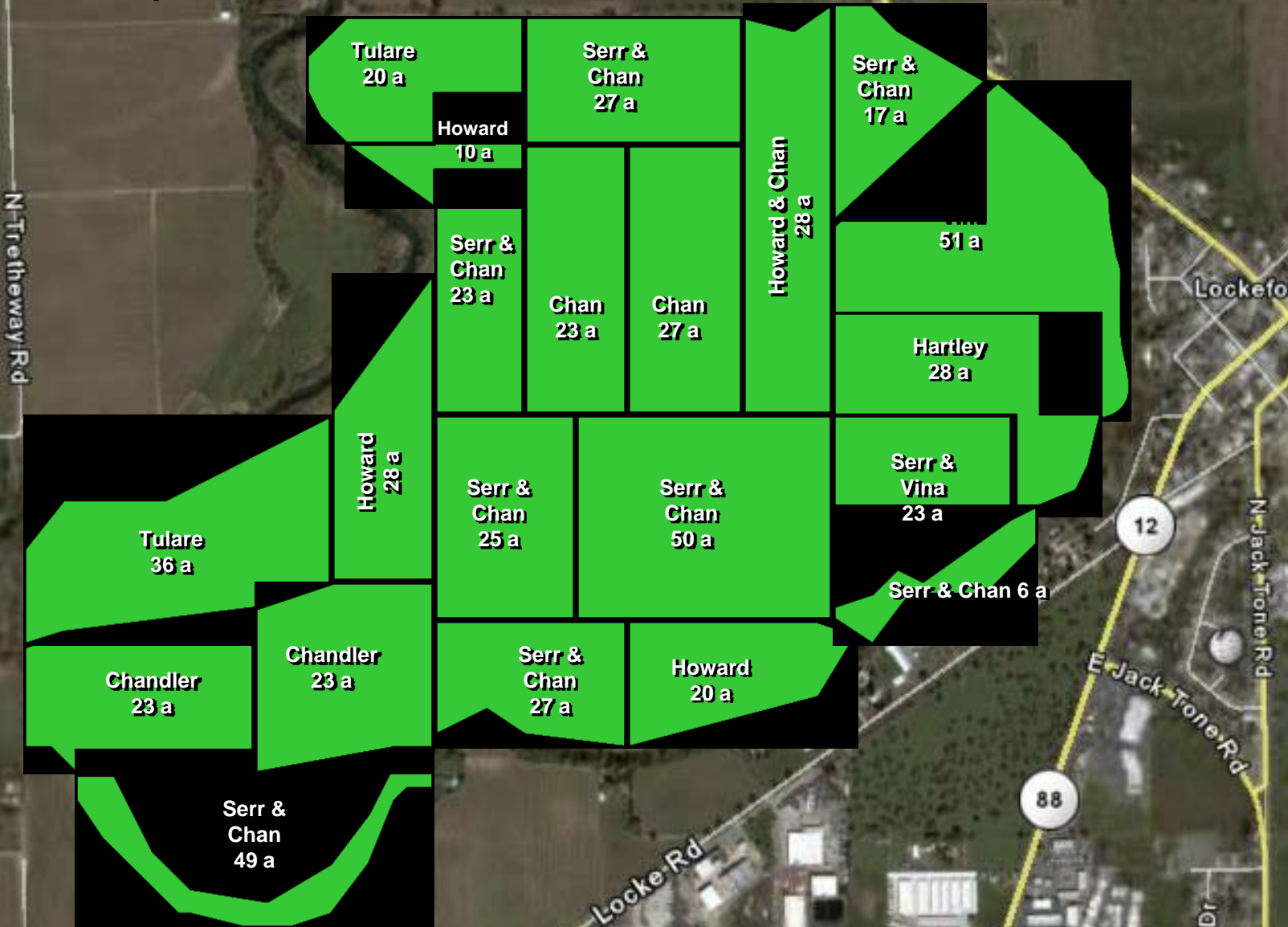
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San Joaquin County Puffer Trial

Locke Ranch
600 acres



N-Tretheway Rd

12

88

Locke Rd

E-Jack-Tone Rd

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Milford Dr



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San Joaquin County Puffer Trial

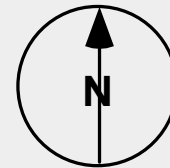
Locke Ranch

600 acres

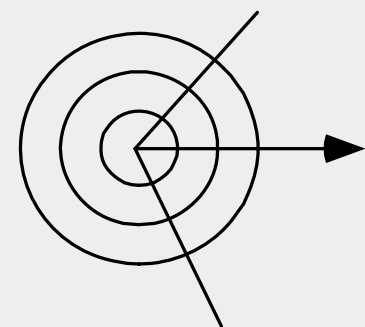
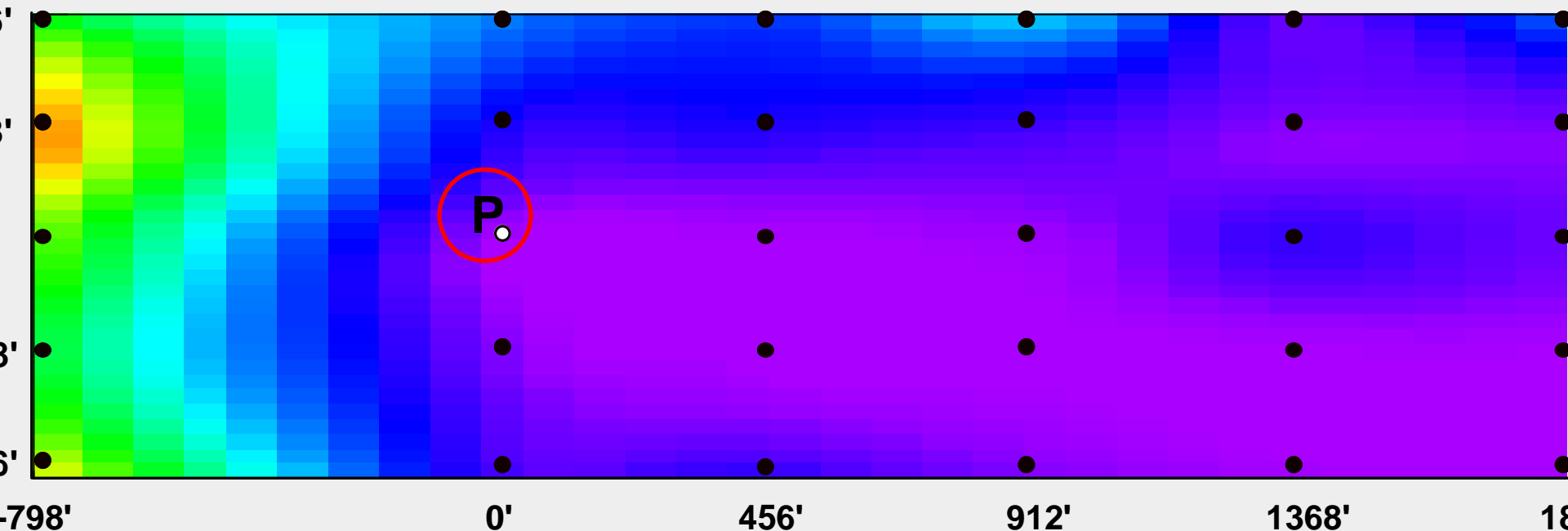
Puffers added in 2006-2008



Downwind pheromone movement from puffer

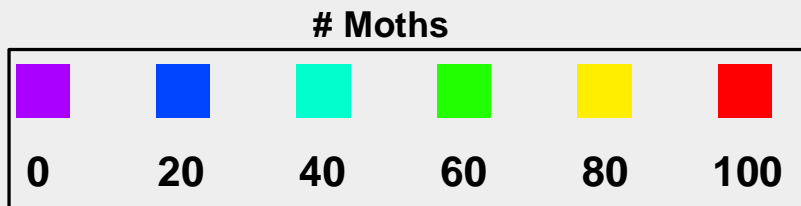


1000 Sterile Marked Codling Moths Released at Each Black Dot



Wind Direction

feet



- Trap Location
- P** Puffer Location

'08 & '09: **0% CM** all blocks except at edges of some blocks

Locke Ranch Puffer Trial
 San Joaquin County
 T4N R7E

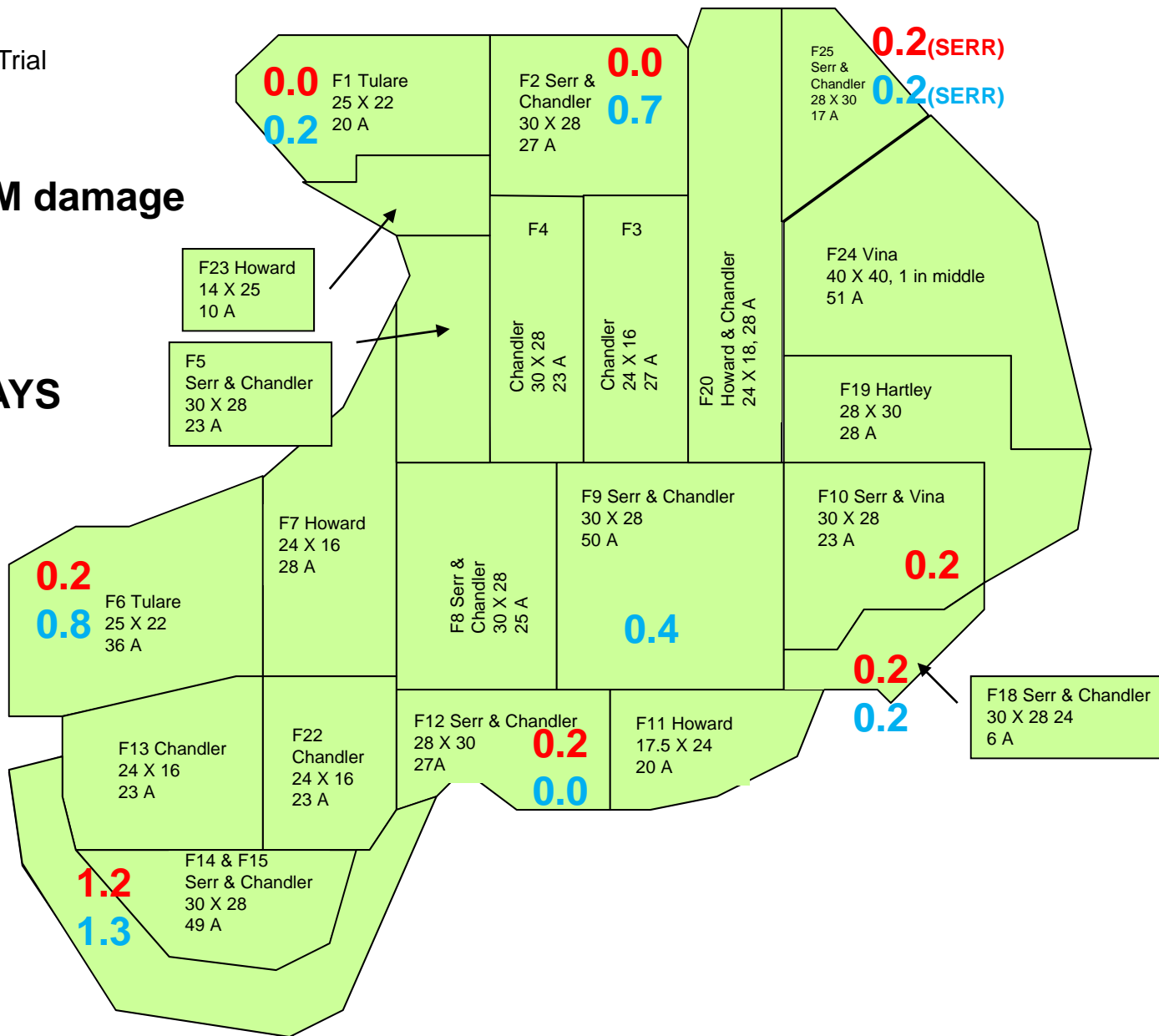
Harvest % CM damage

2008

2009

NO CM SPRAYS

Either year

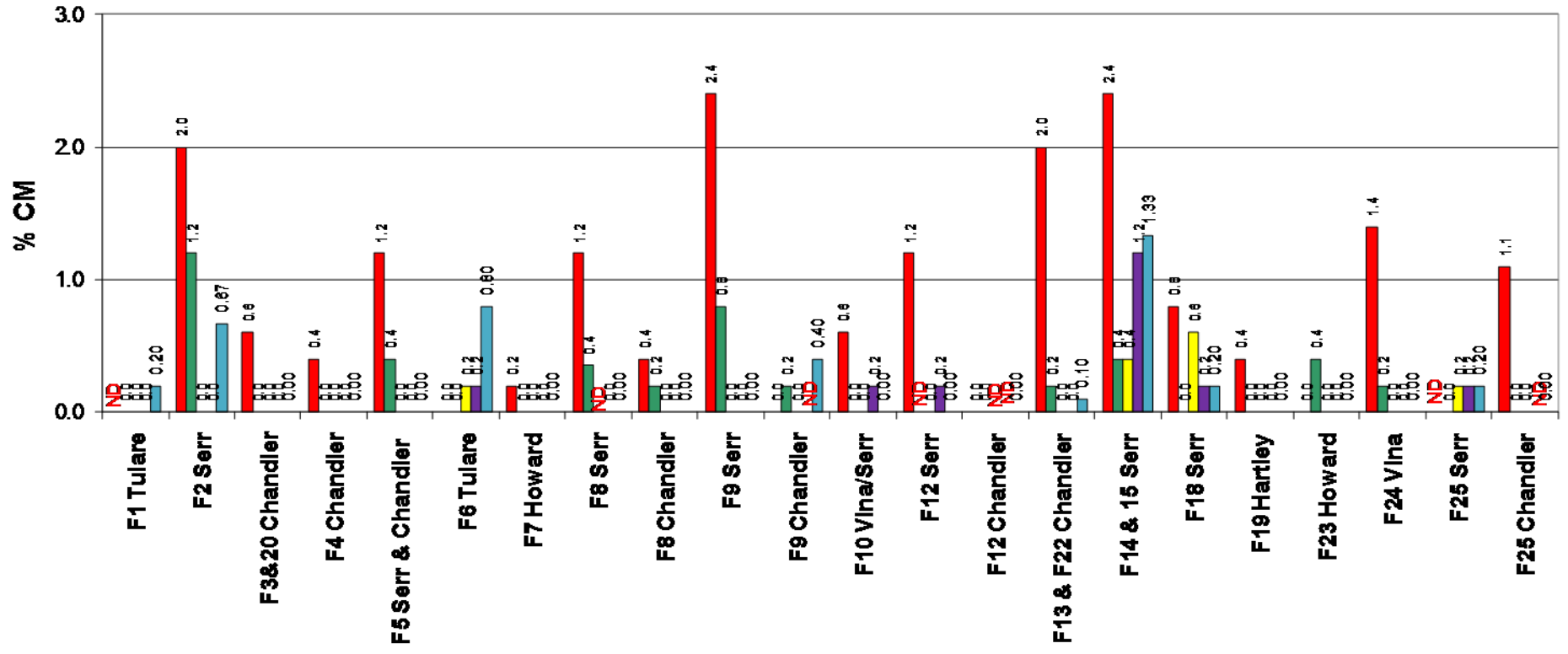


Codling moth damage at harvest



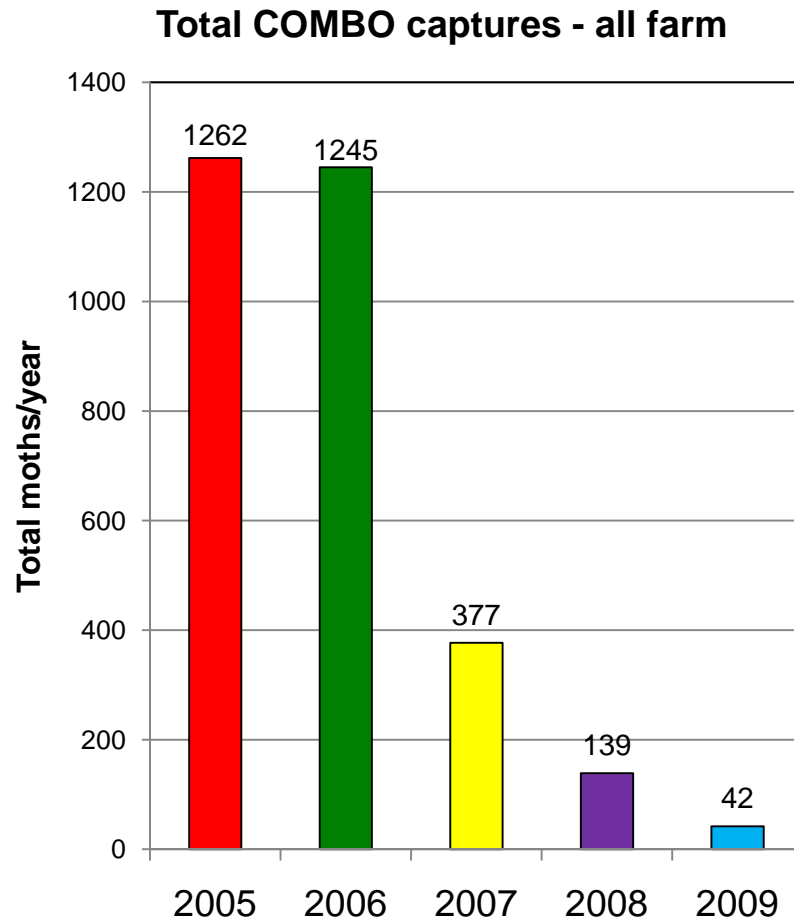
Locke Ranch Puffer Trial

■ 2005 ■ 2006 ■ 2007 ■ 2008 ■ 2009



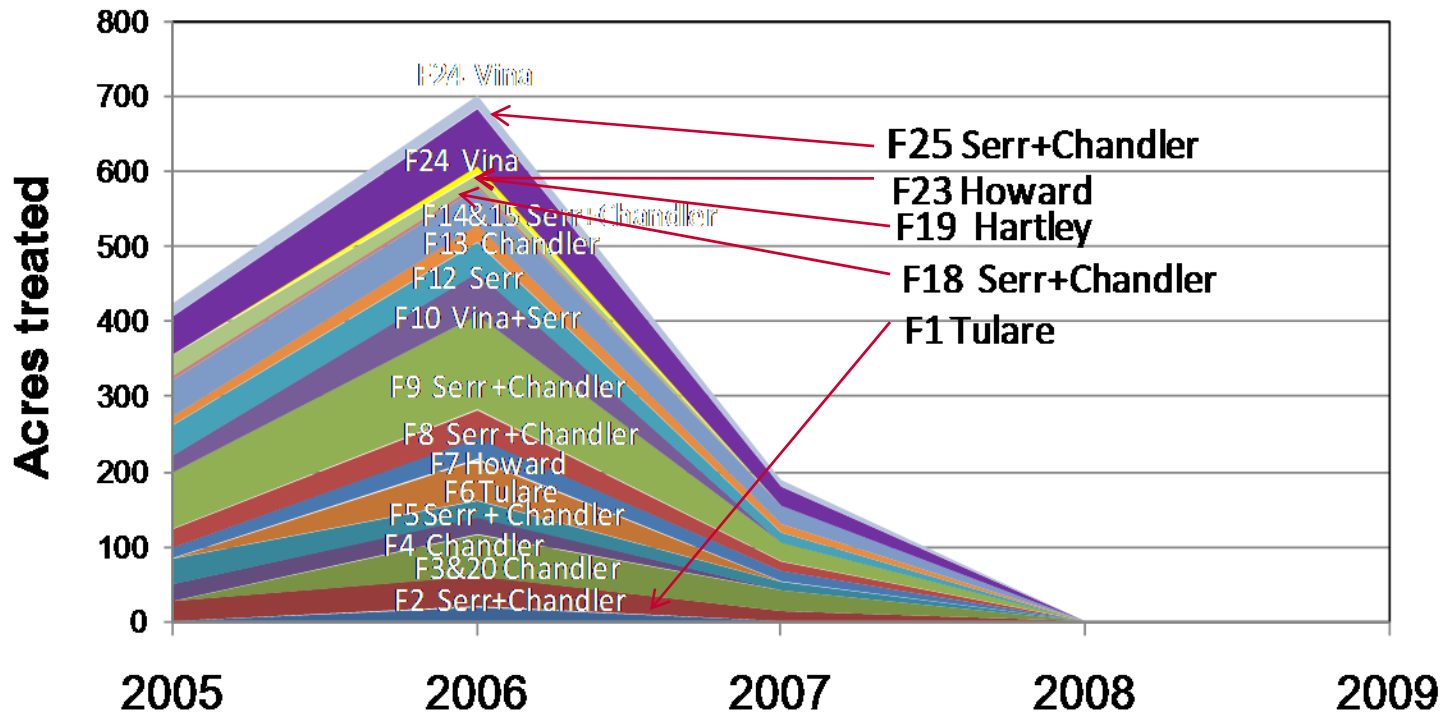
Population decline over time

Locke Ranch, 2005-2009



Need for supplemental sprays declines over time

CM "treated acres" Locke Ranch, Lockeford, Calif.

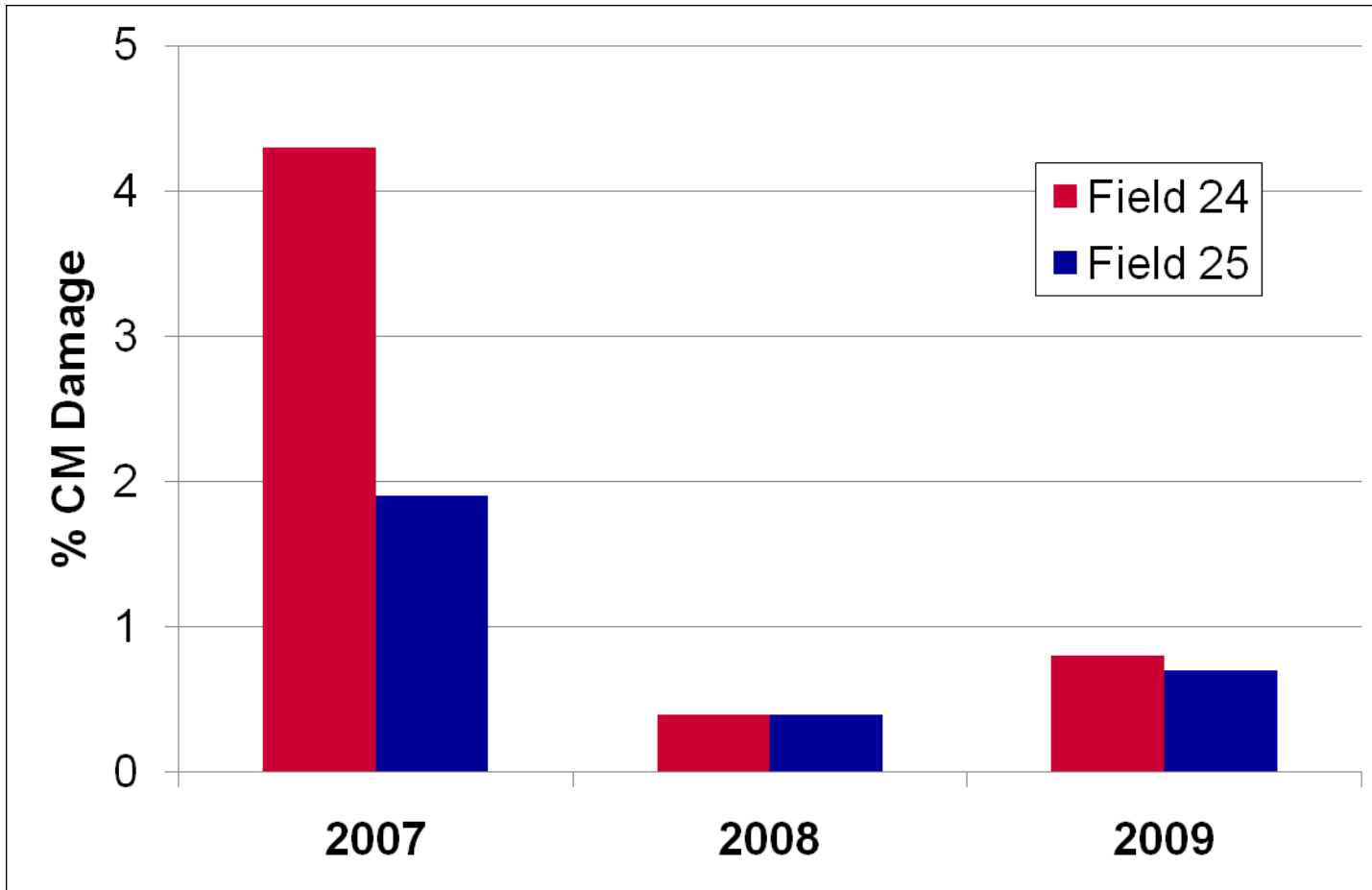


Acres in block X CM treatments/block
CM treatments counted as 1.0
Multi-target as 0.5

Butte 2007-2009

% CM Damage at Harvest

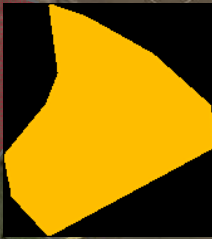
No CM Insecticides for 3 years!



San Joaquin County "Expansion" Puffer Trial

2008 Expansion Area
540 A

Locke Ranch
2005-2008
600 A



38°10'01.00" N 121°09'19.44" W

Image © 2008 DigitalGlobe

© 2008 Tele Atlas
Locke
elev 77 ft

©2008 Google™

Mar 20, 2006

Eye alt 15218 ft



COMBO Trap catches '08 '09
 Harvest % CM '08 / '09
 # Supplemental CM sprays '08 / '09

No puffers in 2008

Glenn County Puffer Trial

180 acres



1 2 3 4 5 6 7 8 9 10 11

12

21 20 19 18 17 16 15 14 13

Vina 110 ac

22 23 24 25 26 27 28 29

36 35 34 33 32 31 30

Walnut Ln

37 38 39 40 41 42 43

49 48 47 46 45 44

50 51 54 55 56 57 58 59 60

Tehama 37ac

52

53

61

71 70 69 68 67 66 65 64 63 62

Chandler 30ac

81

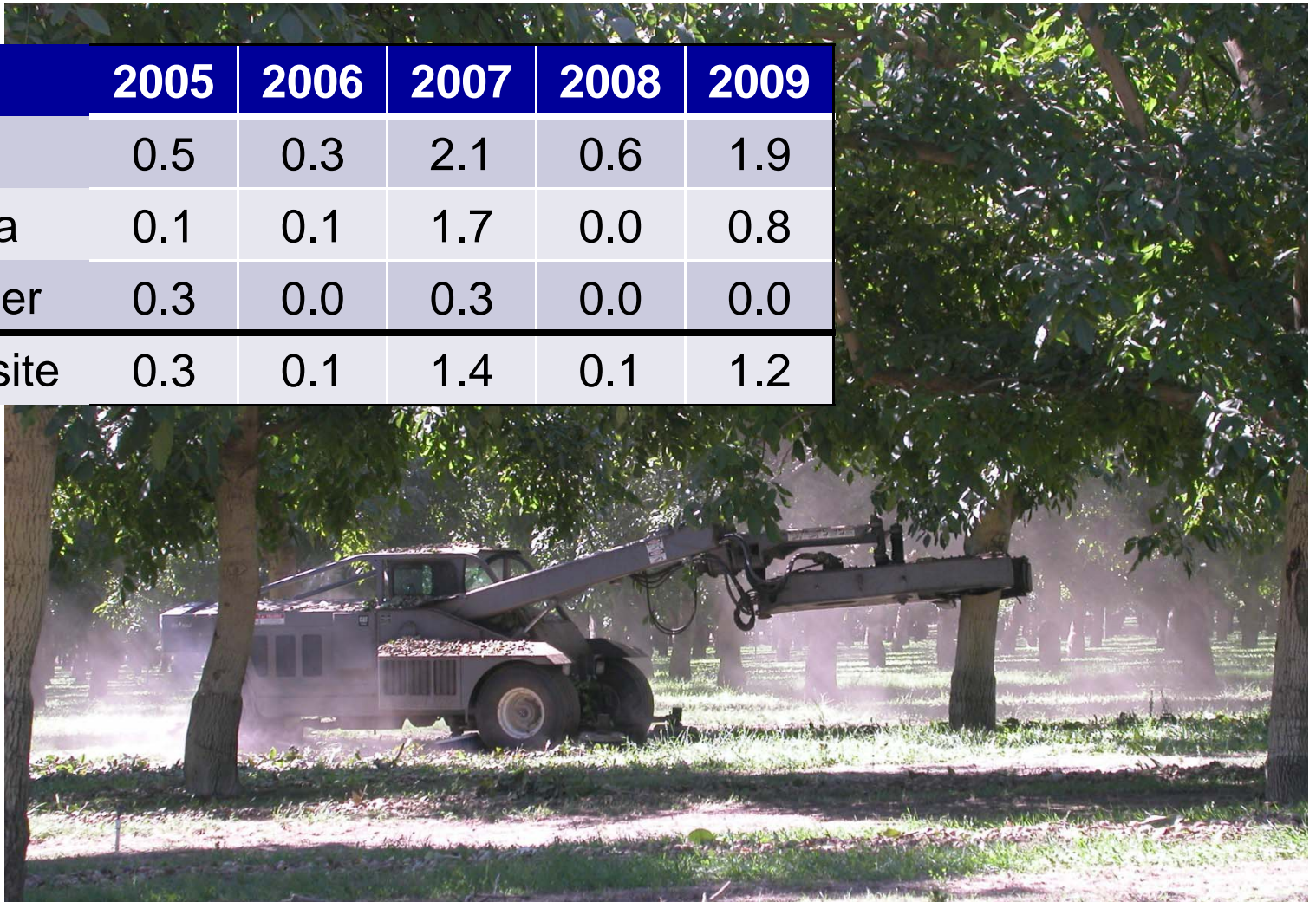
72 73 74 75 76 77 78 79 80

Sacramento River

Glenn puffers 2005-2009

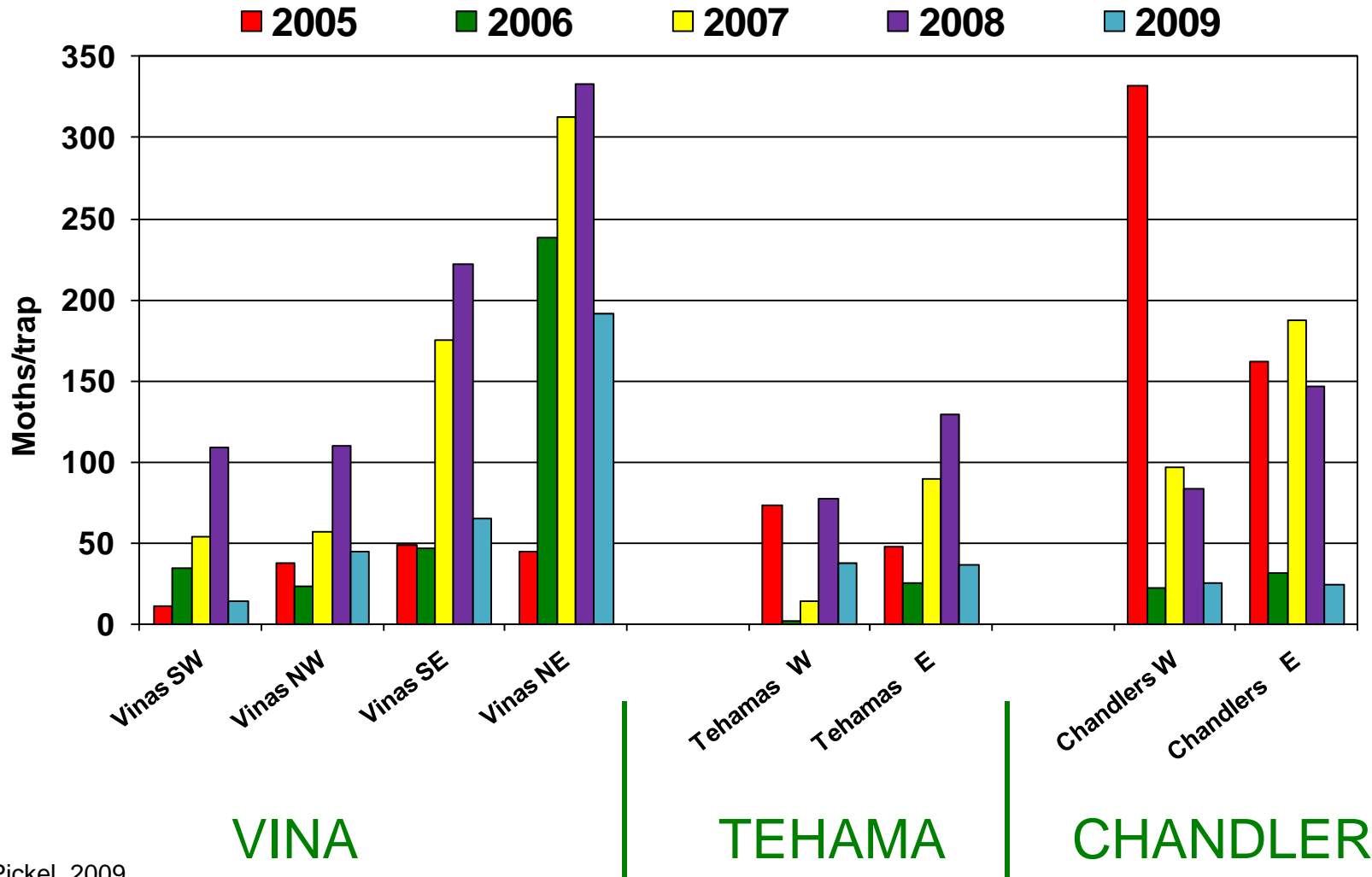
% CM Damage at Harvest

Block	2005	2006	2007	2008	2009
Vina	0.5	0.3	2.1	0.6	1.9
Tehama	0.1	0.1	1.7	0.0	0.8
Chandler	0.3	0.0	0.3	0.0	0.0
Entire site	0.3	0.1	1.4	0.1	1.2

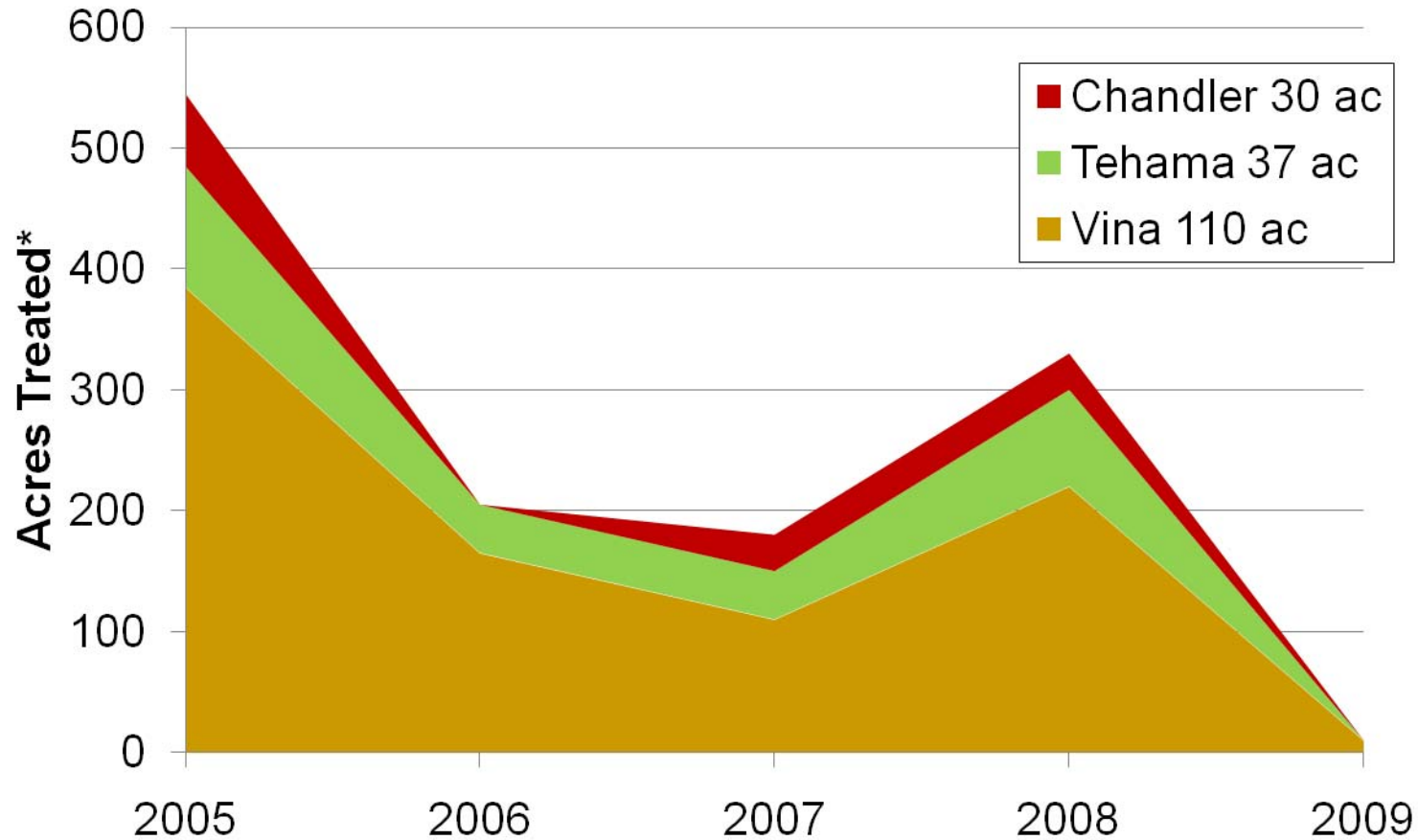




Total Seasonal CM Trap Catches, Combo lure Glenn County Site



Glenn 2005-2009 Codling Moth Insecticide Applications*



*Acres in block X CM treatments per block. Only CM treatments shown.

Long-Term, Area-wide CM Puffer Sites 2009

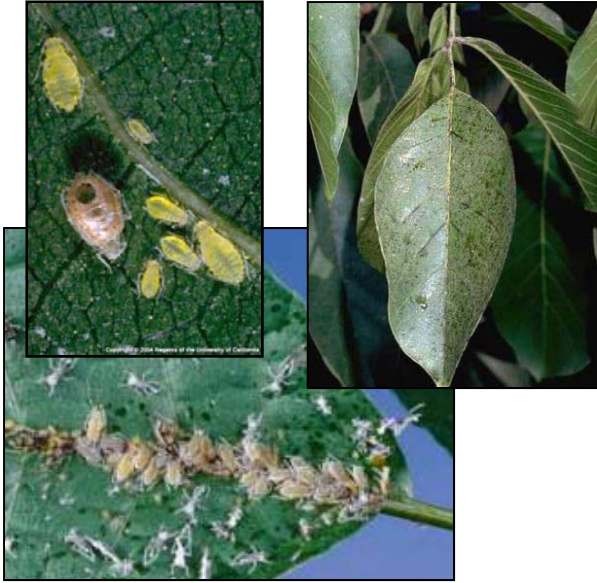
LOCATION	# YEARS	BLOCKS	VARIETIES	% CM	# CM SPRAYS
San Joaquin	5	22	Chandler, Hartley, Howard, Serr, Tulare, Vina	0.2	0
Glenn	5	3	Chandler, Tehama, Vina	1.2	spot treat
Butte	3	2	Vina	0.7	0
Tehama-S	2	2	Ashley, Tehama	0.1	0
Tehama-N	2	2	Vina	0.0	0
SJ expansion	2	10	Chandler, Hartley, Serr, Vina	0.4	spot treat
Yolo2	1	4	Chandler, Hartley, Tehama, Vina	0.5	1

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CODLING MOTH "KEY PEST"

Walnut & Dusky-veined Aphids



Navel Orangeworm



Mites



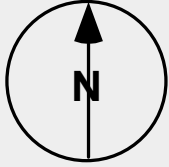
Walnut Husk Fly



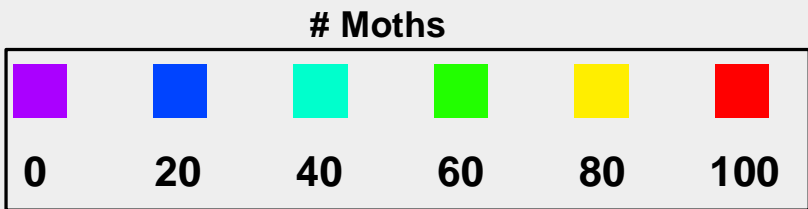
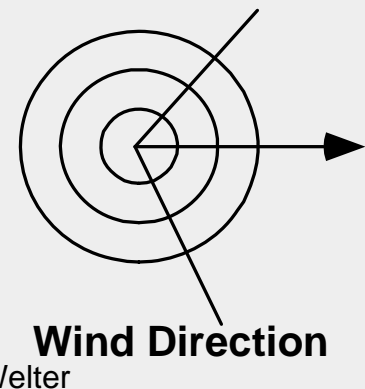
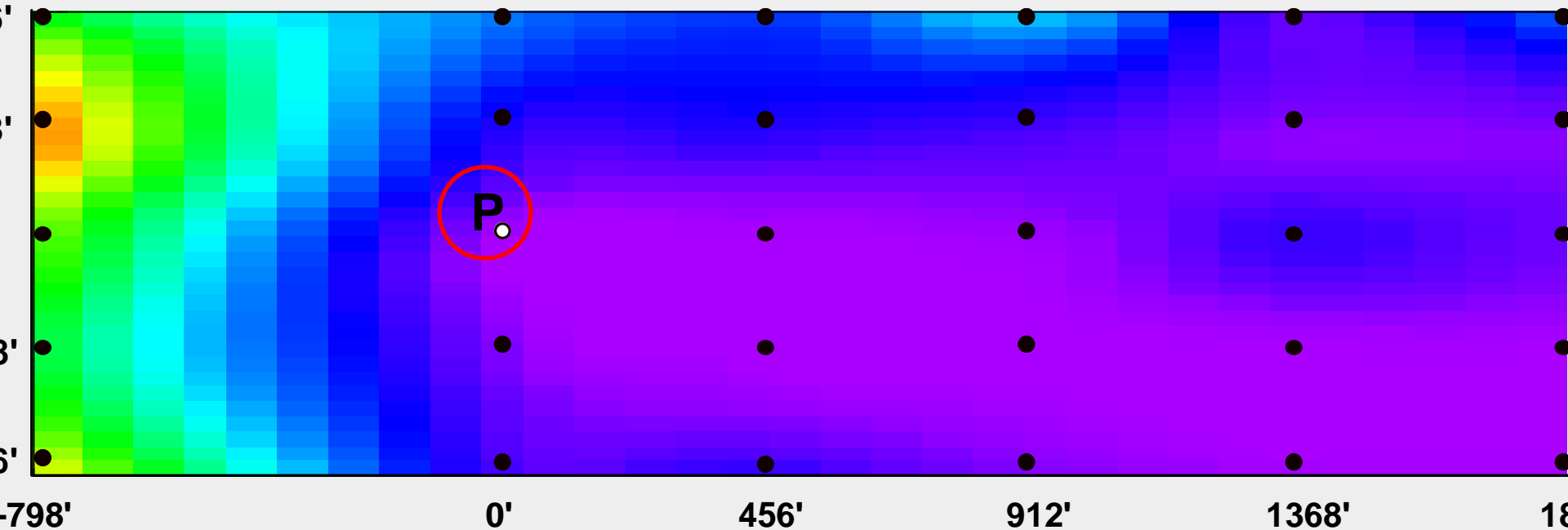
Fall Webworm



Downwind pheromone movement from puffer treated orchard

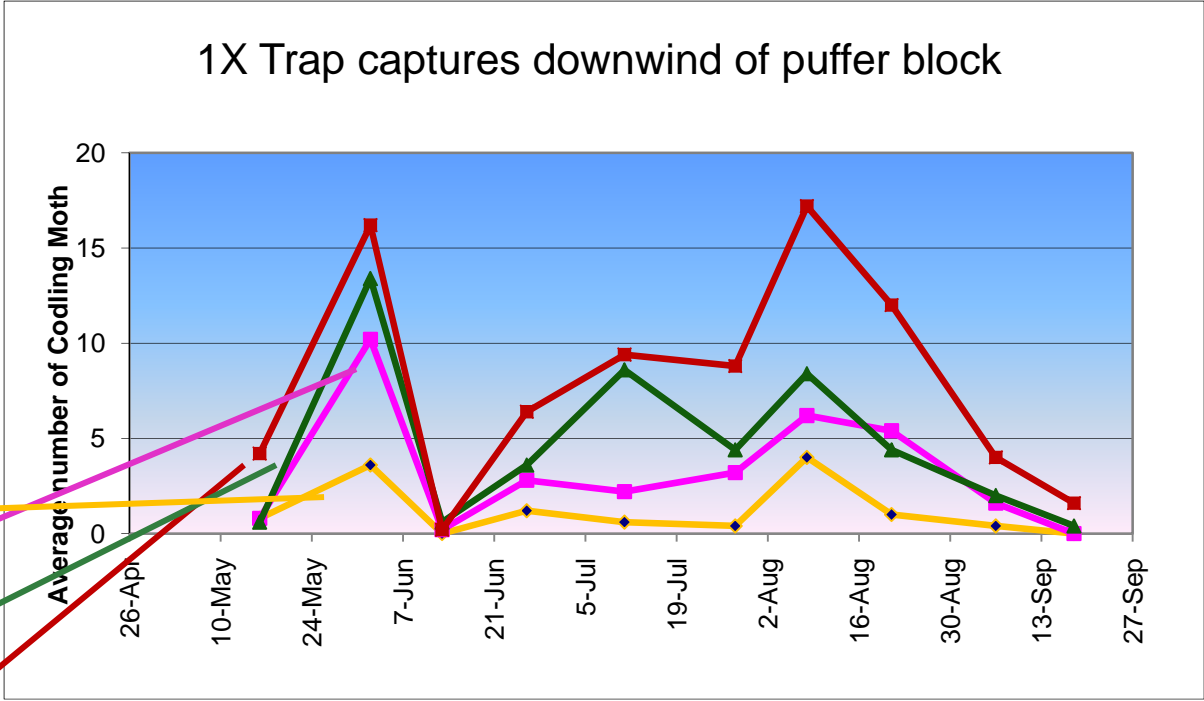


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- Trap Location
- P** Puffer Location

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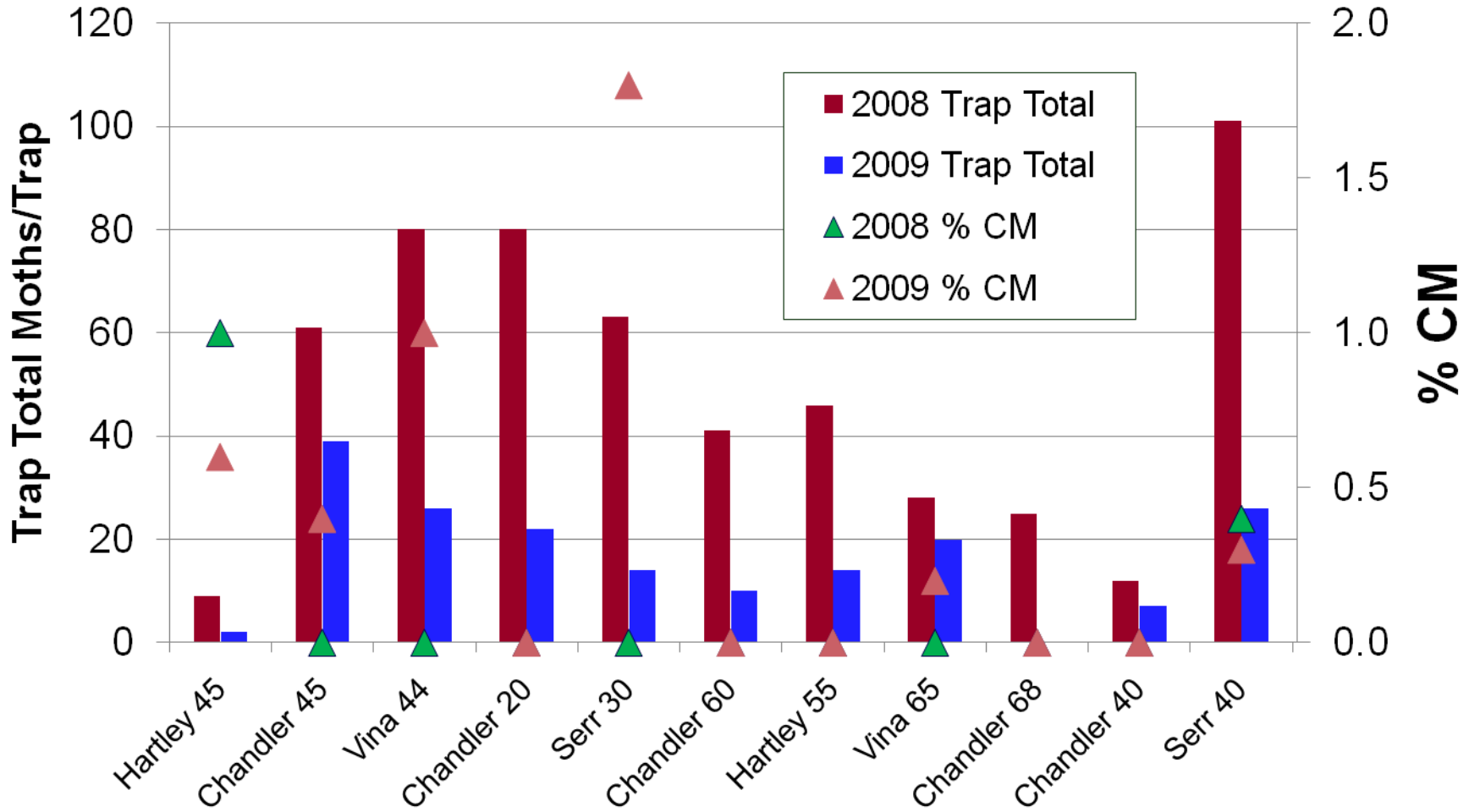
“Medium density” dispensers under test



For:

Puffer edges
Blocks too small
for puffers

SJ 'Expansion' 2008-2009



Damage at Harvest 2009

Codling Moth & Navel Orangeworm

LOCATION	% CM	% NOW	# Nuts Examined
San Joaquin	0.2		11,000
Glenn	1.2	0.4	4,500
Butte	0.7	0.7	7,000
Tehama-S	0.1	0.7	2,000
Tehama-N	0.0	0.1	1,600
SJ expansion	0.4		5,000
Yolo2	0.5	0.1	1,000

Zero (almost) Supplemental CM Insecticide Applications in 2009

LOCATION	ACRES	# CM SPRAYS	Acres Treated
San Joaquin	600	0	
Glenn	180	spot treat	< 20 ac treated
Butte	205	0	
Tehama-S	120	0	
Tehama-N	160	0	
SJ expansion	540	spot treat	44 ac treated
Yolo2	180	1	180 ac

2010 Tehama Grower talk Varieties

Final.ppt