IPM Updates for Walnuts: Navel Orangeworm & Codling Moth

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NOW Management – Points to Remember

- **Consider all varieties important for NOW IPM activities**
  - **Earlier-than-typical, and spread out husk split and maturation led to many later varieties experiencing higher damage in 2016**

- **High NOW damage at harvest = possibility of large overwintering populations**

NOW Management – Key Elements

- **Sanitation**
- **Minimize damage caused by other sources**
  - **CM, blight, sunburn, hail**
  - **Sound nuts most vulnerable to NOW damage after husk split**
- **Timely harvest**
- **Insecticide treatments**

NOW Management – Sanitation

- **Key to NOW management**
  - **Reduce overwintering populations**
  - **Reduce early generation oviposition/development sites**

- **Increasing destruction = greater reduction in emerging NOW**
  - **Shredded vs. bare berm = 100% & 97% reduction**
  - **Double-disked vs. bare berm = 95% & 68% reduction**
  - **Left in weeds vs. bare berm = 85% & 24% reduction**

Sibbett & Van Steenwyk 1992

NOW Management – Sanitation

- **Remove & destroy mummies by early March**
  - **Orchard – trees, floor**
  - **Bins, hulling, drying equipment, buildings**
  - **Maintaining ground cover during winter may aid in decomposing trash nuts**
    - **Do not rely solely on this, especially in dry years**

- **Wet weather helps <u>IF NUTS ARE ON THE GROUND</u>**
  - **BUT less natural mortality expected in walnuts compared to almonds (thicker shell)**

NOW Management – Reduce In-Season Damage

- **NOW is “secondary” pest – intact nuts not vulnerable until husk split**
  - **Good codling moth, blight, sunburn management to reduce earlier season access & development sites**

NOW Management – Harvest Timing

- **The longer nuts stay in the orchard after husk split = more time vulnerable to NOW**
- **Time harvest to avoid late generation NOW flights**
- **Consider possibility of increased damage in 2nd shake**
- **Ethephon to advance husk split**
  - **Especially in high NOW population years & prolonged dry falls**
  - **Based on in-orchard monitoring, potential for immigration**

NOW Management – Insecticides

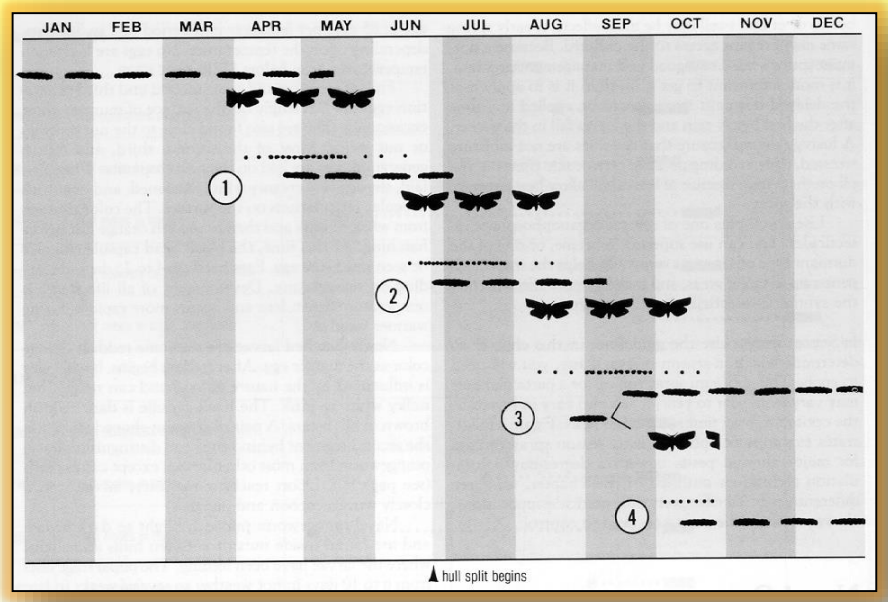
- **Best current guideline - focus protection husk split through harvest**

NOW Monitoring/Treatment Decisions

- **Monitoring options**
  - Egg traps
  - Pheromone traps
  - Kairomone traps
  - Crop phenology and egg detection
- **Historical pressure/damage**
- **Immigration potential (risk assessment)**
- **Treatment thresholds?**

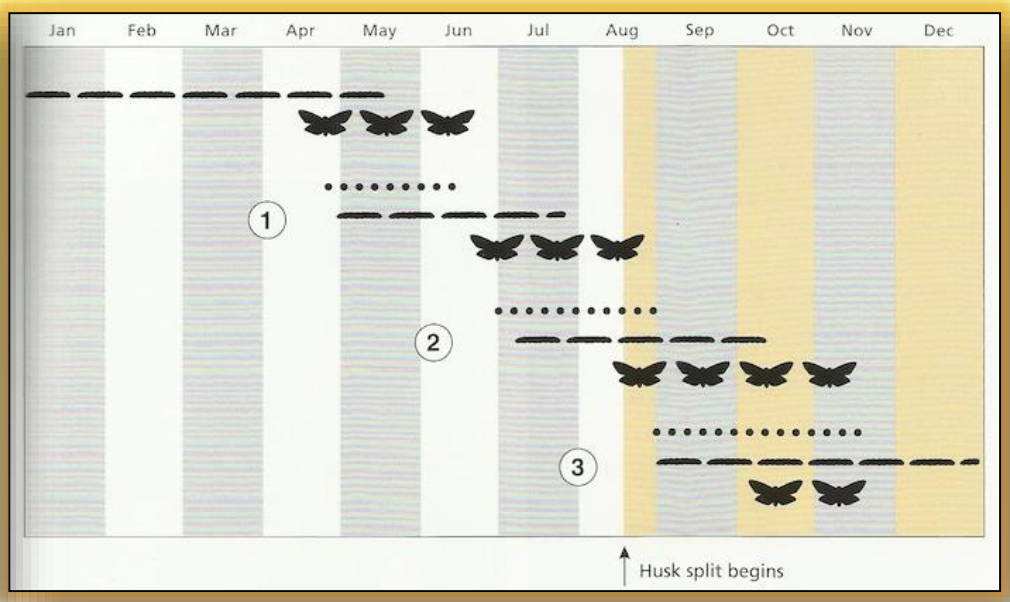
NOW Seasonal Cycle

Almonds



Based on development IN ALMONDS

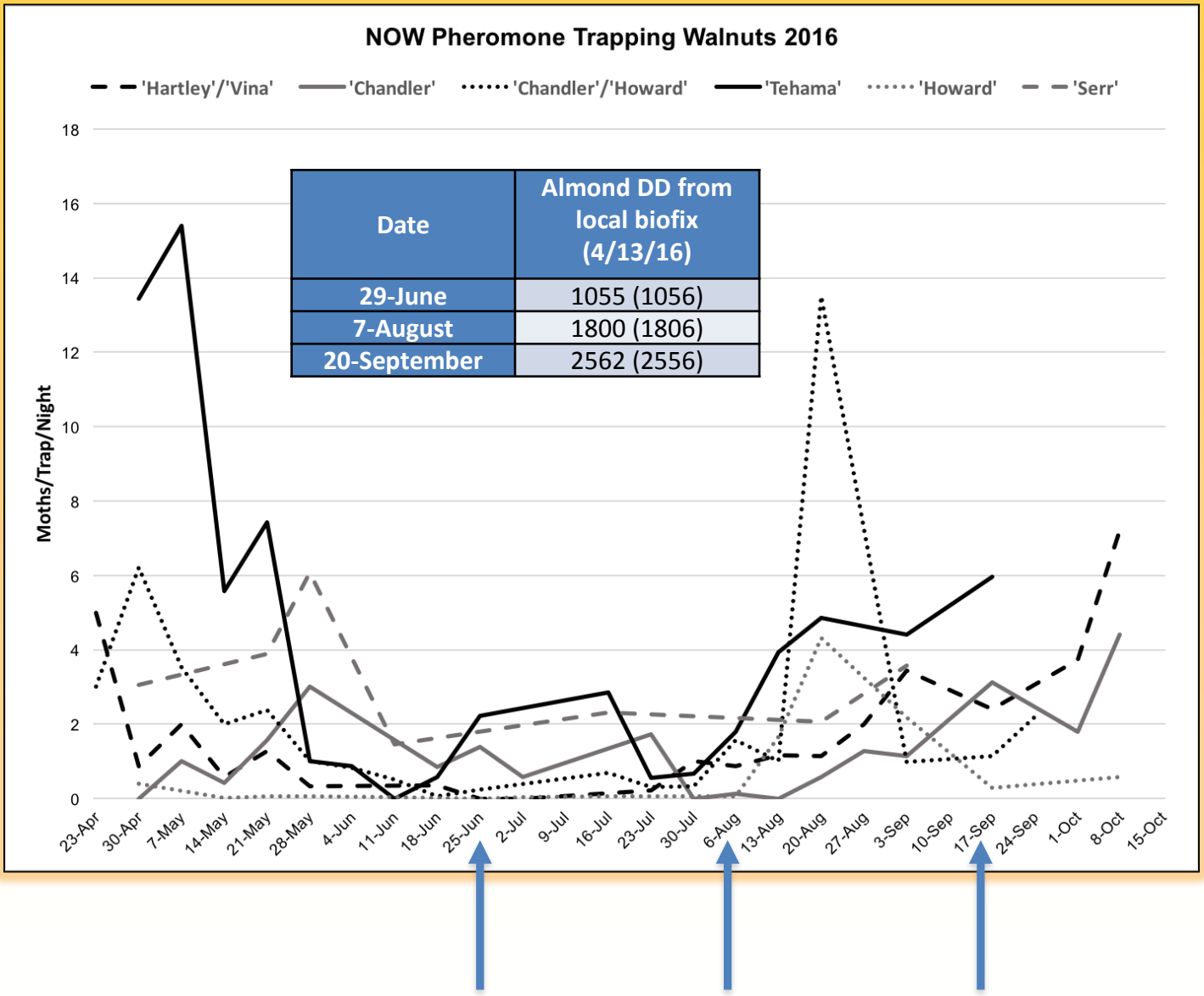
Walnuts



Based on development IN WALNUTS

BUT…resident versus immigrant populations???

NOW Monitoring Pheromone Traps 2016



Date	Almond DD from local biofix (4/13/16)
29-June	1055 (1056)
7-August	1800 (1806)
20-September	2562 (2556)

Synthetic Lures vs. Females
Almonds & Pistachios
Kern County, CA (2015)

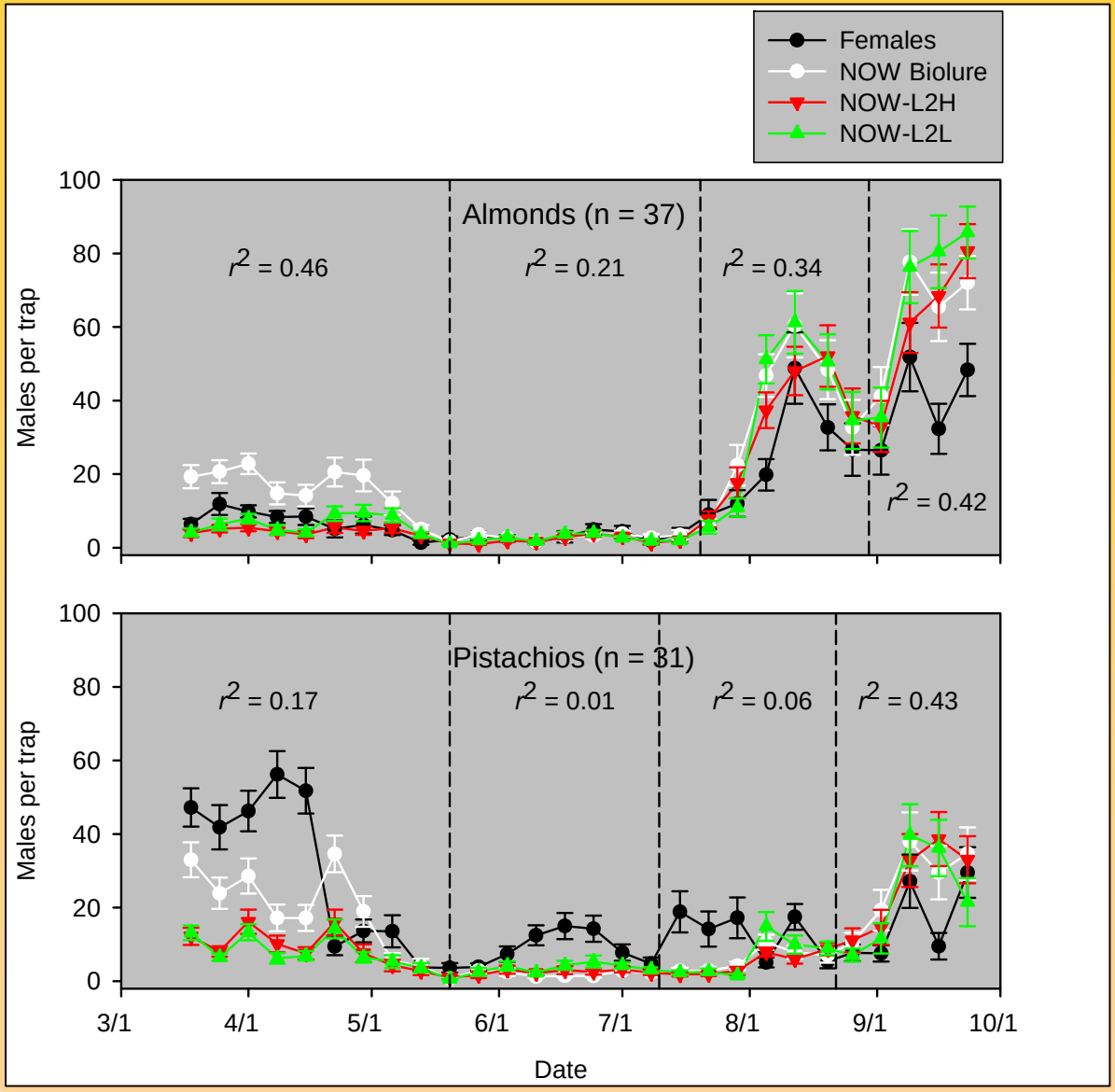
Four traps/set

Females (wing)

- **Trece L2L (delta)**
- **Trece L2H (delta)**
- **Suterra Biolure (delta)**

Almond n = 37

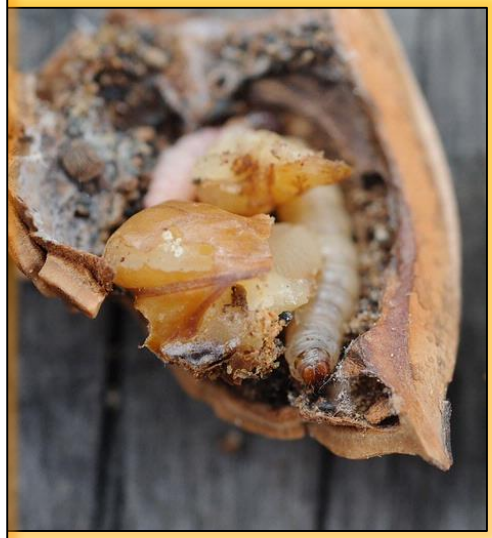
Pistachio n = 31



Commercial lures more similar to female-baited traps in almonds than in pistachios

Lures vs. Females: Almonds & Pistachios
Kern County, CA (2015)

Synthetic Lures vs. Females
Walnuts (2016)



Sacramento Valley

Northern San Joaquin Valley

Southern San Joaquin Valley

Synthetic Lures vs. Females
Walnuts (2016)

Five traps/set

Females (wing)

- **Trece L2L (delta)**
- **Trece L2H (delta)**
- **Suterra Biolure (delta)**
- **AlphaScents AMYTRA (delta)**

Walnut n = 21

Regional Cumulative Trap Catches Walnuts (2016)

Treatment	Southern San Joaquin Valley	Northern San Joaquin Valley	Sacramento Valley
Females	283 ± 94a	201 ± 45	74 ± 27a
NBL	132 ± 25b	216 ± 46	186 ± 48b
L2L	184 ± 22ab	196 ± 43	277 ± 59c
L2H	168 ± 31ab	166 ± 22	315 ± 57c
AMYTRA	235 ± 54ab	256 ± 54	359 ± 32c
$F_{4,24}$	2.87	2.00	31.16
P	0.0448	0.1262	<0.0001

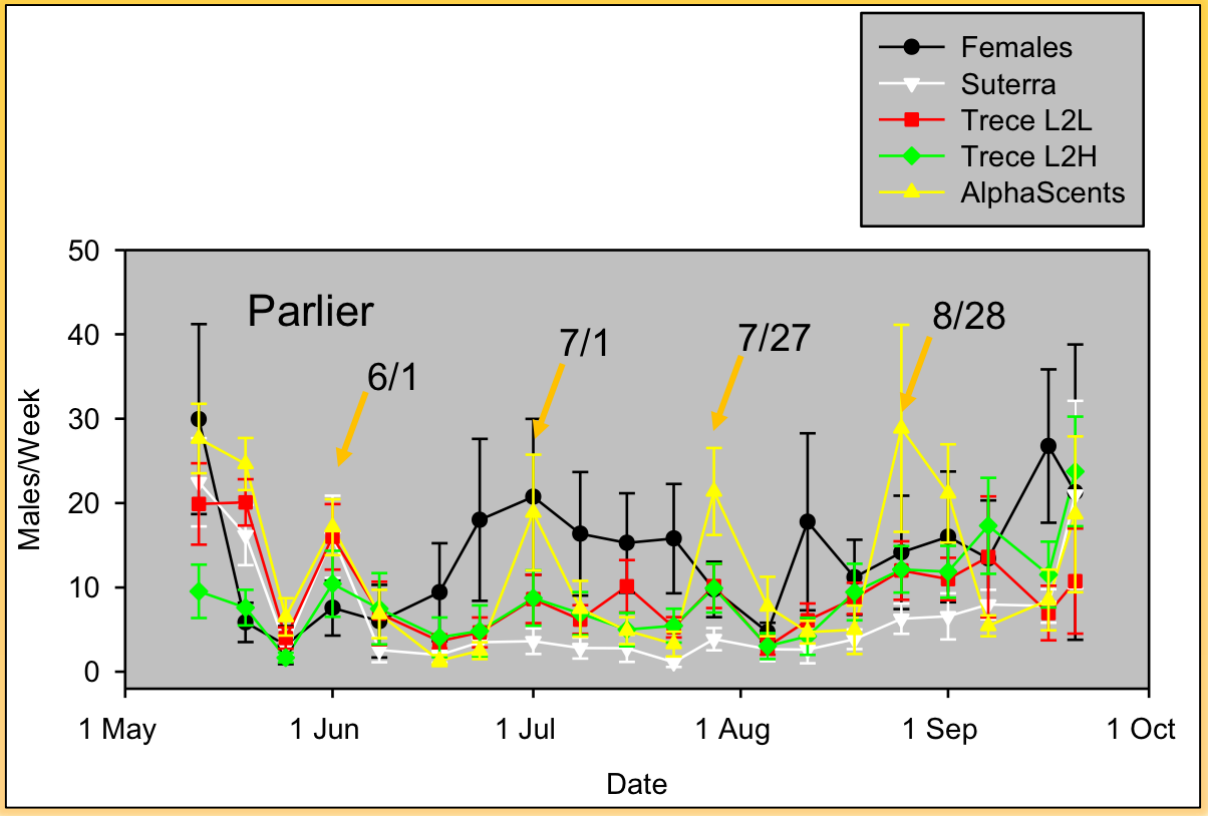
Regional variability in performance

Effect of Synthetic Lure Age on Trap Catch Walnuts (2016)

Lure	n	Spearman ρ	*P*
AlphaScents AMYTRA	386	-0.14	<0.001
Suterra NOW Biolure (NBL)	391	-0.02	0.678
Trécé NOW L2 low (L2L)	388	-0.01	0.829
Trécé NOW L2 high (L2H)	391	0.04	0.376

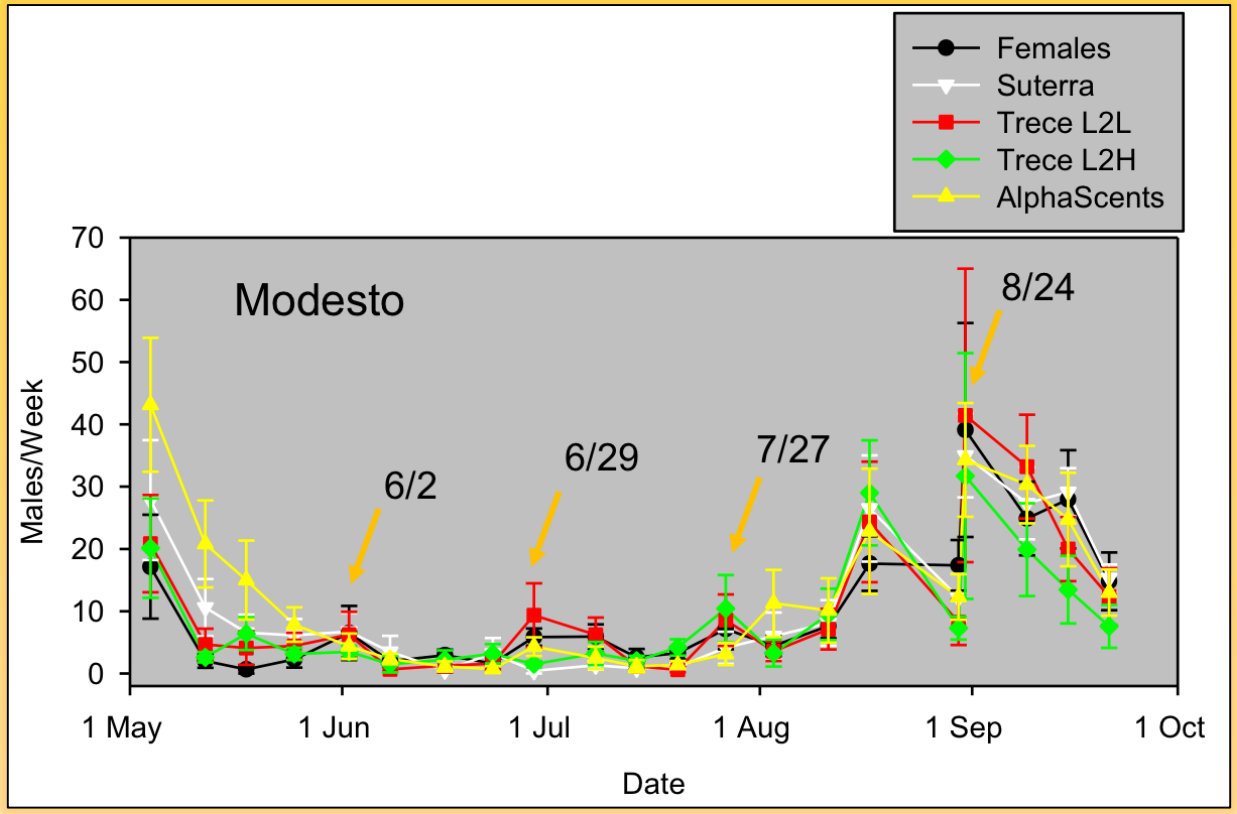
Correlation analysis:

Number of males captured decreased over the monitoring period for AMYTRA only



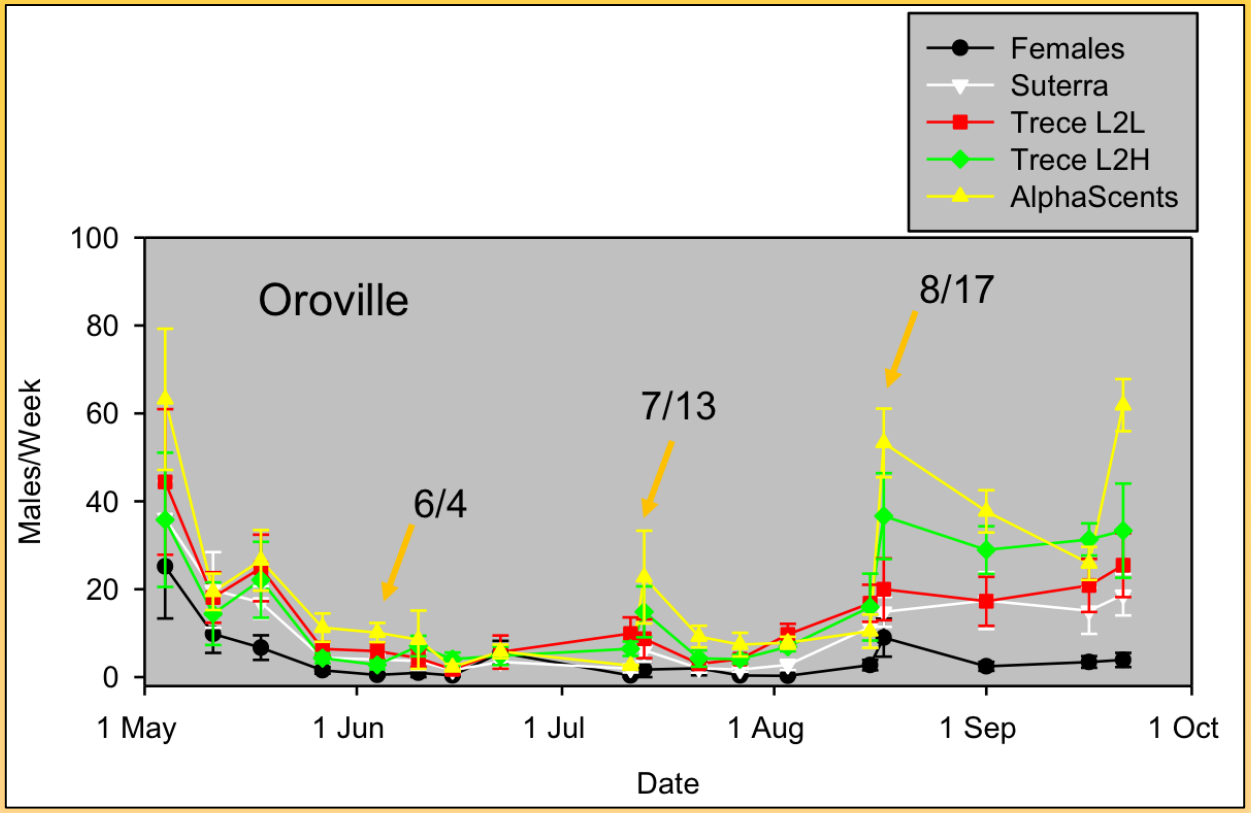
- **Females outperformed lures**
- **Alphascents lures more variable**
- **Suterra performed poorly**

Lures vs. Females: Walnuts
Southern San Joaquin Valley, CA (2016)



- **Less activity between May and August**
- **All lures performed more similarly**

Lures vs. Females: Walnuts
Northern San Joaquin Valley, CA (2016)



- **Less activity between May and August**
- **Poor female performance**
- **Alphascents performed inconsistently**

Lures vs. Females: Walnuts
Sacramento Valley, CA (2016)

Overall Conclusions

- **Female-lure anomaly:**
  - **Evident in pistachio**
  - **Not evident in almonds**
  - **Walnut more intermediate and variable**
- **Variable performance of commercial lures**
  - **AMYTRA was least suitable**
  - **L2 lures were similar and most consistent**
- **More evidence of mid-summer populations in walnuts in SSJV than NSJV or Sacramento Valley**

NOW in Walnuts – Risk Model Assessment

- **Things to consider:**
  - **Proximity to external sources of infestation**
    - **Native habitats, almond orchards, pistachio orchards**
  - **Previous season's harvest damage**
  - **Orchard sanitation**
  - **Carry-over populations in mummy nuts**
  - **Degree-day accumulation and populations cycles in walnuts and surrounding crops**
  - **Harvest timing**
    - **Harvest timing of external sources**
  - **In-season damage caused by other sources**
    - **Codling moth, sunburn, blight, etc.**
  - **Environmental conditions**
    - **Temperature, precipitation, etc.**

Updates on Codling Moth Mating Disruption

Codling Moth Mating Disruption – Why?

- **Flexibility in spray programs targeting other pests**
  - **Timing for each pest more critical with increasingly selective pesticides**

- **Good early CM control can reduce navel orangeworm damage**

Codling Moth Mating Disruption

A proven technology

- **So what's new?**
  - **Aerosols**
  - **Medium-density meso emitters**
  - **Flowables**

- **Aerosols**
  - **Reduced rates (50% vs. 100%)**
  - **Reduced emission frequency (7h vs. 12h)**
  - **Effective suppression at reduced loads & shorter operating times = more economical options ☺**
  - **Suterra CheckMate® Puffer®**
  - **Pacific Biocontrol Isomate® Mist**

Codling Moth Mating Disruption

- **Medium-density meso emitters**
  - **Pacific Biocontrol Isomate® CM Ring (20/A)**
  - **Trece CideTrak® CMDA (20/A)**
  - **Effective trap catch suppression and multiple mating reduction**
  - **An option for smaller orchards**

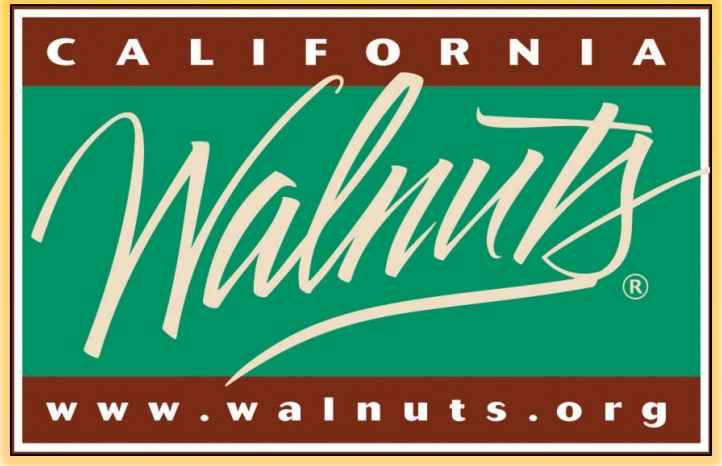
Pacific BioControl

Trece

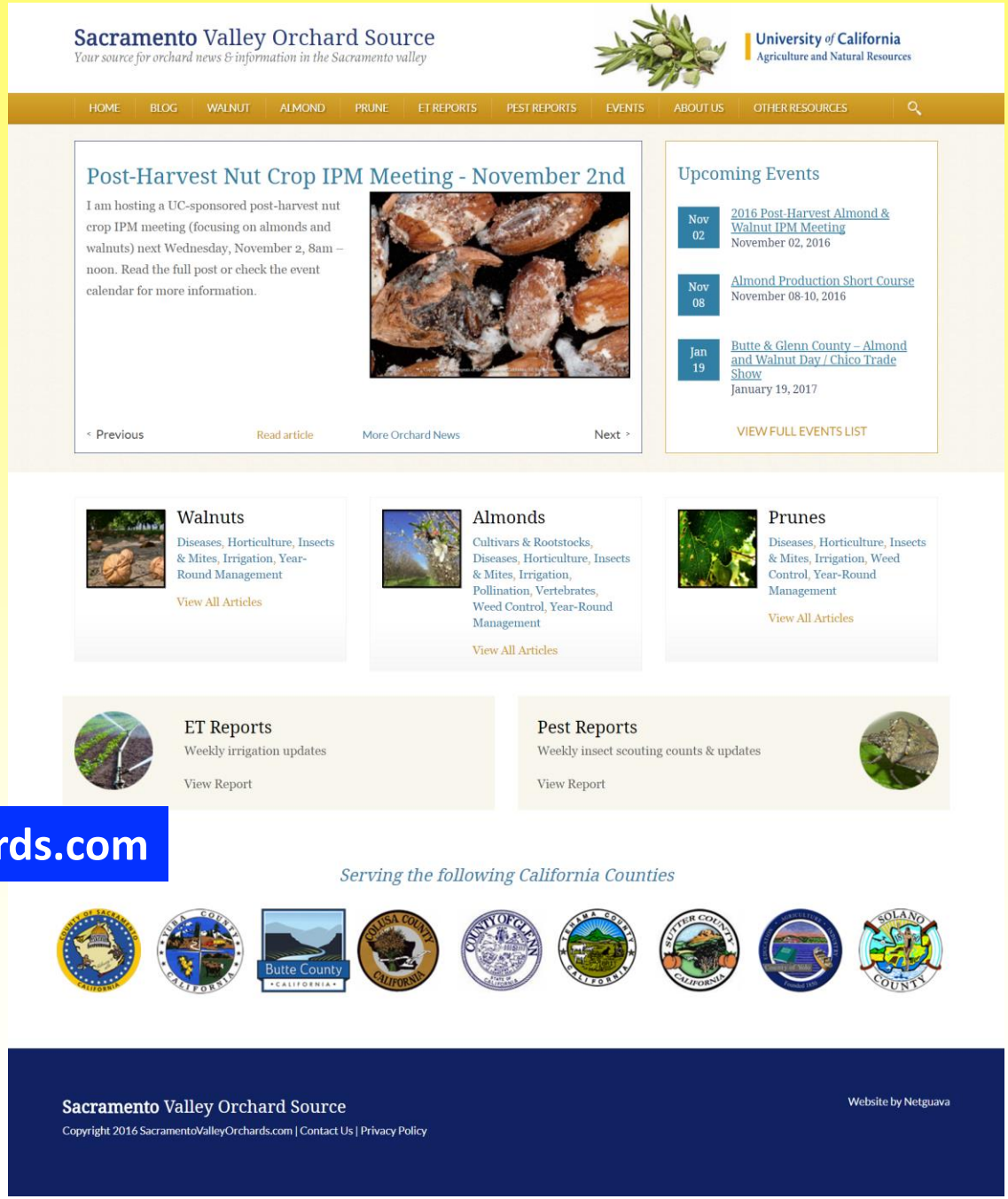
Codling Moth Mating Disruption – Monitoring

- **Pheromone lures**
  - **1X, L2**
  - **Trap shut-down expected if MD working**
- **Combination pheromone-kairomone lures**
  - **Combo (codlemone + pear ester)**
  - **3-way (codlemone + pear ester + acetic acid)**
  - **Allow monitoring within/near MD**
- **Proximity to MD blocks**

Acknowledgements



California
Walnut Board



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New this Year!
Monthly IPM Breakfast Meetings

Meetings will be held the second Tuesday of each month from February through November and will cover a wide range of timely pest management topics. Meeting locations will be rotated throughout the Sacramento Valley.

- Colusa: February and July
- Yuba-Sutter: March and August
- Tehama: April and September
- Glenn: May and October
- Butte: June and November

Meeting locations and more information will be available at sacvalleyorchards.com or by contacting UC IPM Advisor Emily Symmes at (530) 538-7201 or ejsymmes@ucanr.edu

*****Contact me to request topics*****

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