



## A REVIEW OF MATING DISRUPTION OPTIONS AND INCENTIVES FOR CALIFORNIA ALMOND GROWERS

Moderator: Drew Wolter (ABC)

Speakers: Jeannine Lowrimore (Pacific Biocontrol), Danielle Kirkpatrick (Trécé, Inc.), Abigail Welch (Semios), Emily Symmes (Suterra), Karen Lowell (Natural Resources Conservation Service)



## **Speaker Lineup**

**1) Jeannine Lowrimore-**  
**Pacific Biocontrol Corporation**

**2) Danielle Kirkpatrick-**  
**Trécé Inc.**

**3) Abigail Welch**  
**Semios**

**4) Emily Symmes-**  
**Suterra**

**5) Karen Lowell-**  
**NRCS-USDA**






# ISOMATE<sup>®</sup> -MIST NOW

*Jeannine Lowrimore*

*Technical Field Representative  
Northern California*





# Pacific Biocontrol ISOMATE<sup>®</sup>

Providing superior  
mating disruption products  
for 35 years!

Invest heavily into  
pheromone research  
and insect behavior

Dedicated to customer  
and product support



# ISOMATE<sup>®</sup> - MIST NOW

- Target crops: Almonds, pistachios
- Label Rate: 1Mist/acre
- Deploy ~April 1st
- Programed to emit during peak NOW activity
- Temperature Sensor
- 225+ day product
- Not for organic use





*Mist unit arrives in two parts:  
emitter & can  
Hook is provided*



*Insert can to activate  
Watch for test spray  
Ready to hang!*



## **Consistent & Reliable**

*Emitter design has been in the field for 8+ years*

*New unit every season*

*Quality checked 3X before hitting the warehouse*

*Product and Field  
Support*

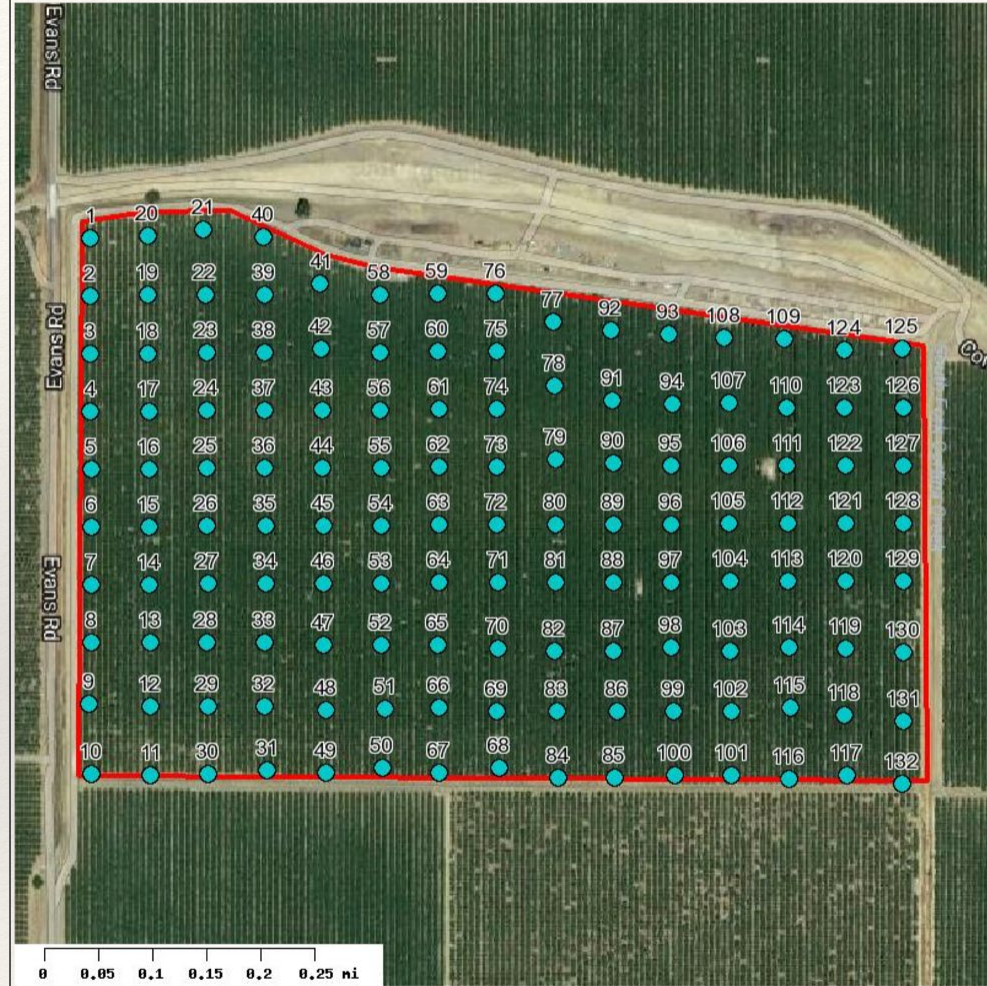
***In season field checks to monitor performance***

# Mapping of Orchards

- Placement map customized to the orchard
- Goal is to create a consistent plume
- Take into account: wind, topography, surrounding area
- Utilize google earth, tree spacing for easy layout & instructions

Location: ISOMATE  
Grower: Jeannine Lowrimore  
Farm:   
Field:

Area: 138.13 acres  
Date Entered: 2018-06-21  
Number of Samples: 132





# DEPLOYMENT...*EASY AND QUICK!*

Don't be intimidated!

Training provided

Follow map & mark trees

Middle to upper 1/3 of canopy

Face downwind and not into scaffolds

Allow can to empty late Fall

Replace with new unit following spring for reduced labor



# 2019-2021 REPLICATED TRIAL DATA

*Goal: To evaluate NOW population decline over 3 years of ISOMATE Mist NOW MD*

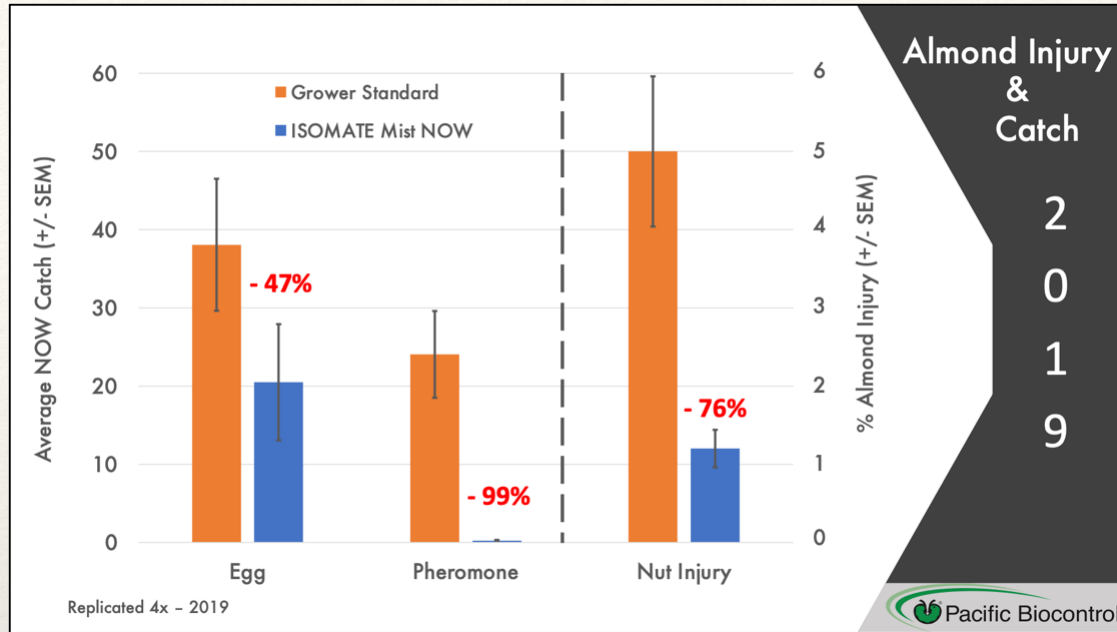
- *Replicated trial, Chico, CA*
- *4- 40A Grower Standard blocks*
- *4- 40A ISOMATE NOW blocks*
- *Each block had 4 pheromone, Peterson and egg traps*
- *Harvest crack-out & injury evaluation*



## Replicated Trial Results

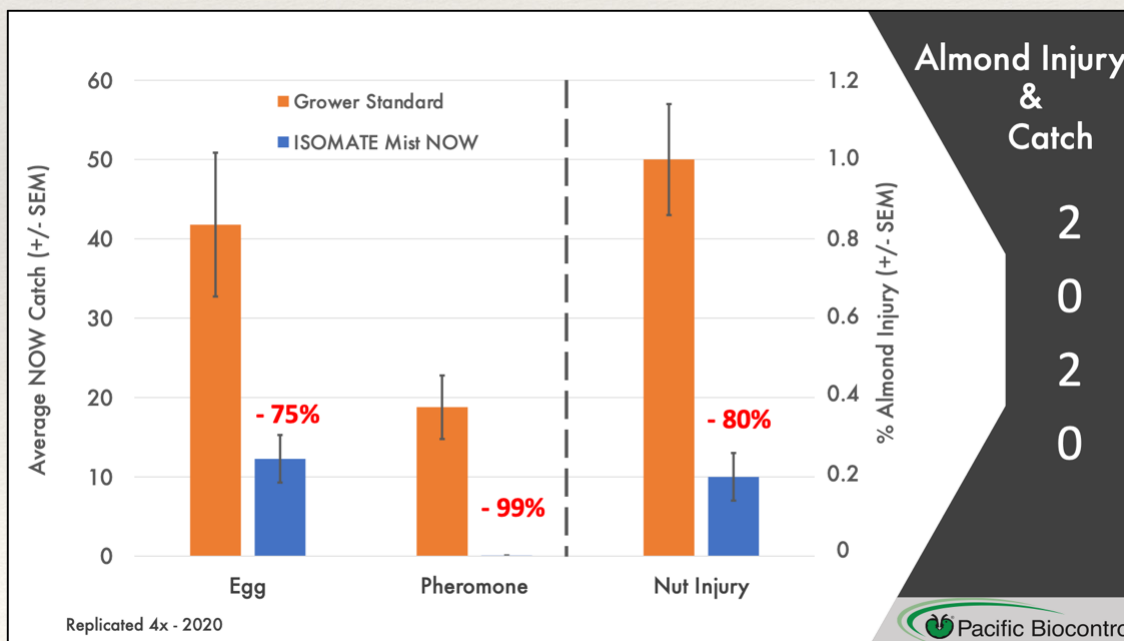
### 2019 Summary

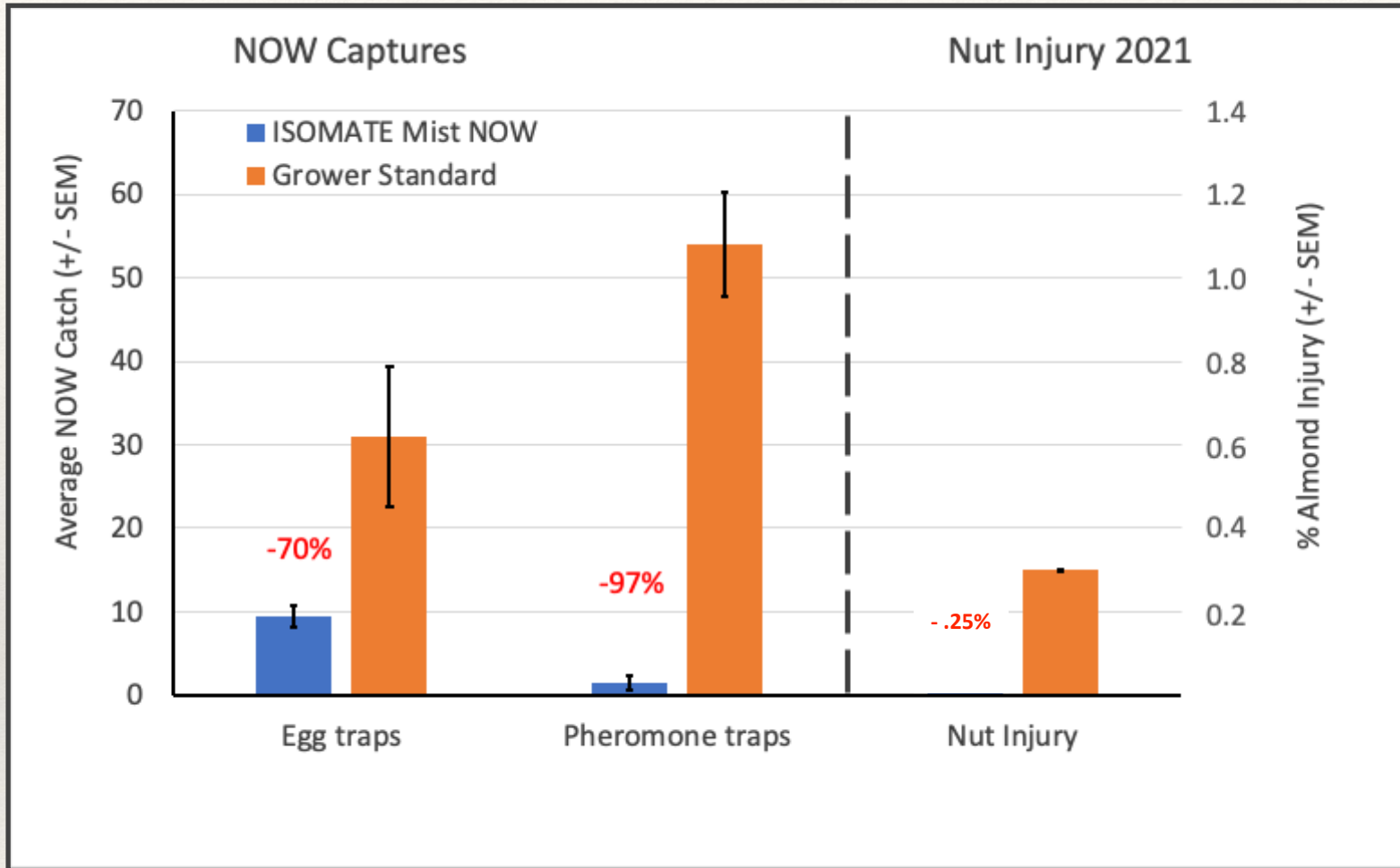
- Wet spring
- Minimal sanitation
- Pyrethroid May spray
- Two hull split sprays



### 2020 Summary

- Drier spring
- Strong sanitation
- No May spray
- Two hull split sprays





## 2021 Summary

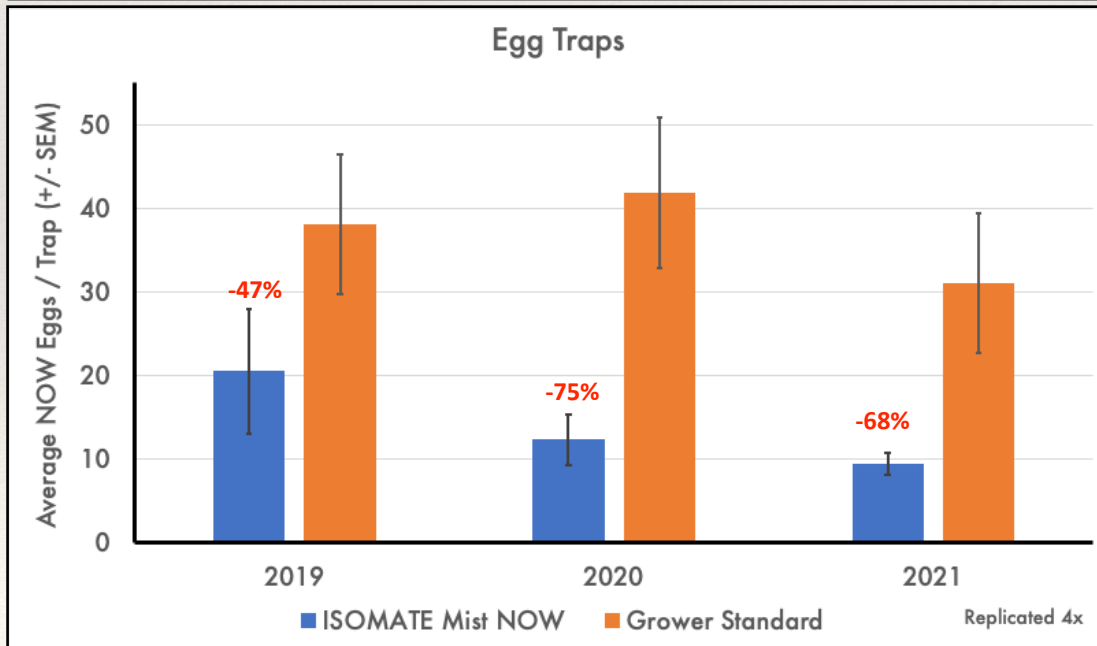
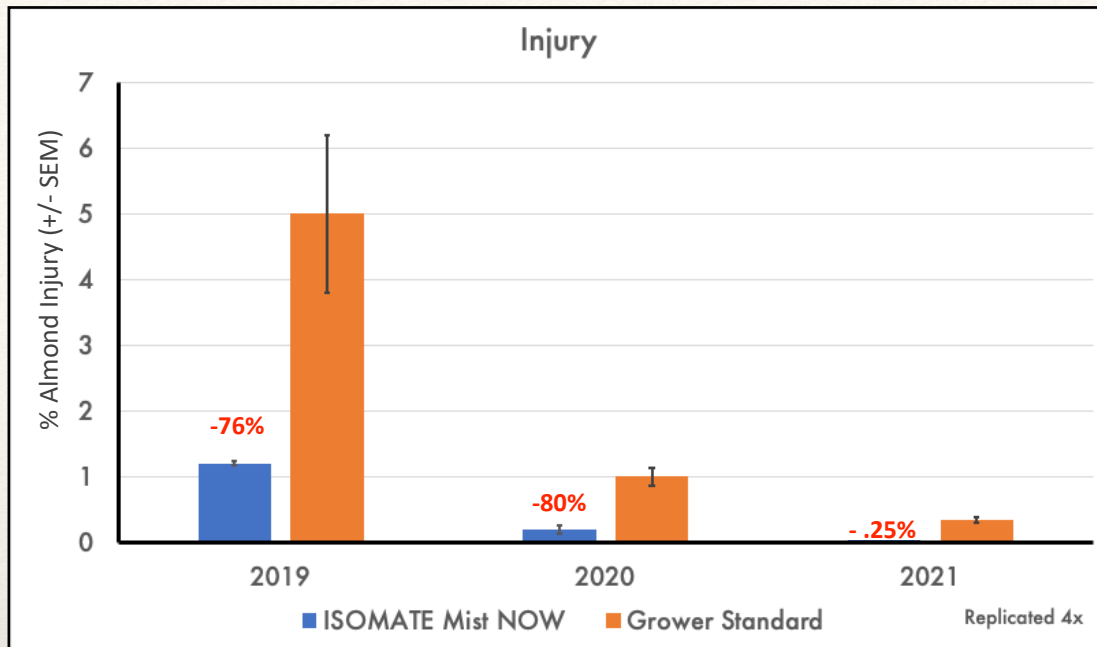
- Dry spring
- Moderate sanitation
- Strong early flight
- May spray only in the GS block
- Two hull split sprays in all blocks



# 2019 to 2021

## Injury Summary

- Nut injury continued to be reduced over all 3 years



## Population Summary

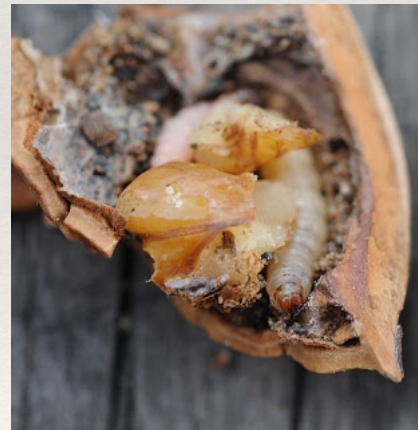
- Egg catch was significantly reduced in ISOMATE blocks compared to the non-disrupted Grower Standard each year
- Continued reduction in egg laying and nut injury suggests NOW populations are being driven to low levels with ISOMATE Mist NOW

# 2020 **NOW** Infested Mummy Survey



## ISOMATE<sup>®</sup> -MIST NOW

*Reduced NOW infested mummies by 75% compared to the non-disrupted Grower Standard*





***Thank you from your California team!***



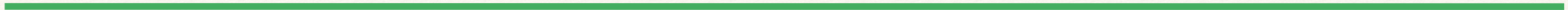
*Jeannine Lowrimore  
Northern CA  
209-603-9244*

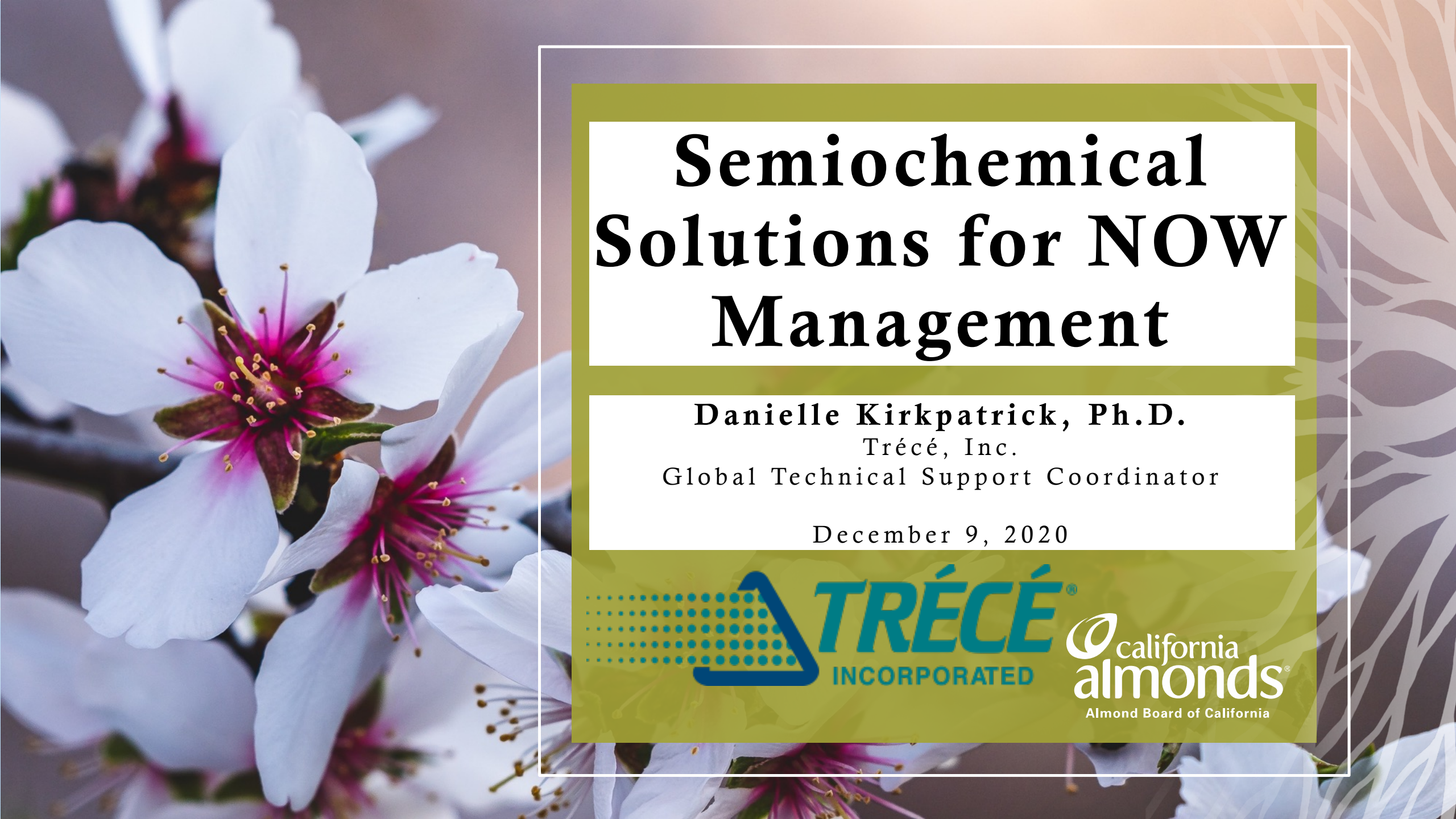


*Joe Devencenzi  
Central CA  
209-642-0136*



*Christeen Abbott-Hearn  
Central CA  
559-334-7664*





# Semiochemical Solutions for NOW Management

**Danielle Kirkpatrick, Ph.D.**  
Trécé, Inc.  
Global Technical Support Coordinator

December 9, 2020





# Product Lines

## PHEROCON®



Monitoring

# Product Lines

## PHEROCON®



Monitoring

## CIDETRAK®

**NEW**

### CIDETRAK® NOW MESO™

MATING DISRUPTION PRODUCT FOR NAVEL ORANGEWORM

Navel Orangeworm, *Xylocopa auraria*

- Up to 80% or more potential reduction in damage vs. current insecticide programs
- Season-long control through post-harvest
- Easy application with ready-to-use carrier pack
- No moving parts, no batteries, no gummy deposits
- Removal not required

**CIDETRAK®  
NOW MESO™**

MATING DISRUPTION PRODUCT  
FOR NAVEL ORANGEWORM IN  
ALMONDS, PISTACHOS & WALNUTS

**APPROVED  
ORGANIC**

Contact your local supplier and order now!  
Visit our website: [www.trece.com](http://www.trece.com) or call: 1-866-785-1313.

Made in the USA

Control

# PHEROCON<sup>®</sup> Traps for Moth Capture



# PHEROCON® NOW



## Male Attractant System: PHEROCON® NOW L<sup>2</sup>



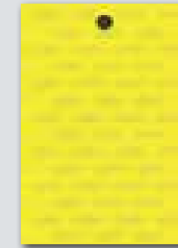
- Male NOW Attractant High/Low-Release Pheromone Lures

## Female Attractant System: PHEROCON® IV NOW



- Female NOW – Oviposition – Attractant, Concentrated, Stabilized lures

## **NEW!** Predator Detection System: PHEROCON® P<sup>2</sup>



- Detect mite predators, such as the Six-spotted thrips and Stethorus beetles
- Based on the Great Lakes IPM trap
- Used in recent university trials
- May be used as a treatment threshold indicator
- Contains easy hanger

Note: Apply miticides based on UC-IPM Guidelines

## **NEW!** Multi-Gender Attractant System: PHEROCON® PPO™ Lure

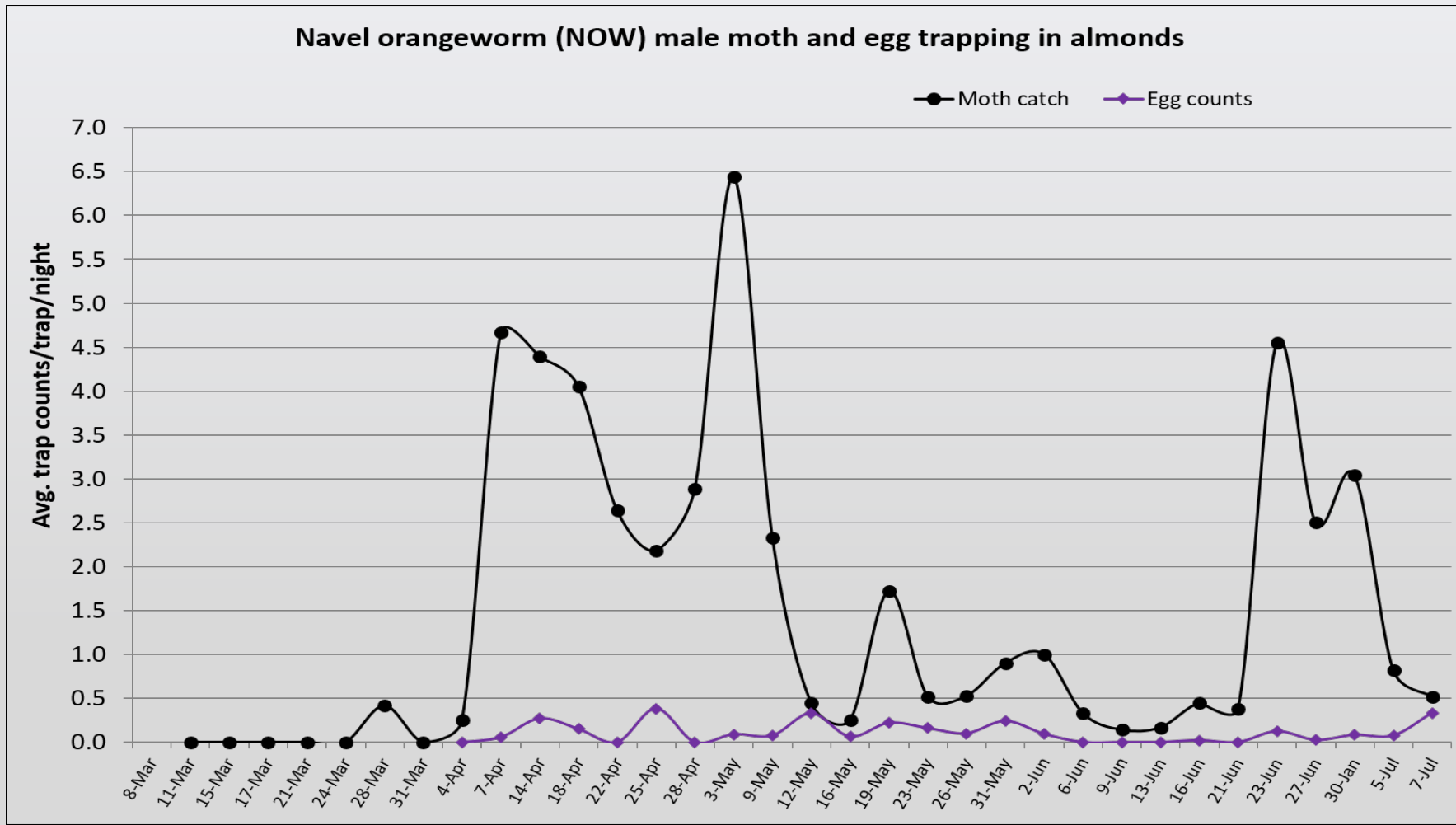


- Male/Female NOW Attractant, High-Release PPO Microporous Gel Kairomone Lure

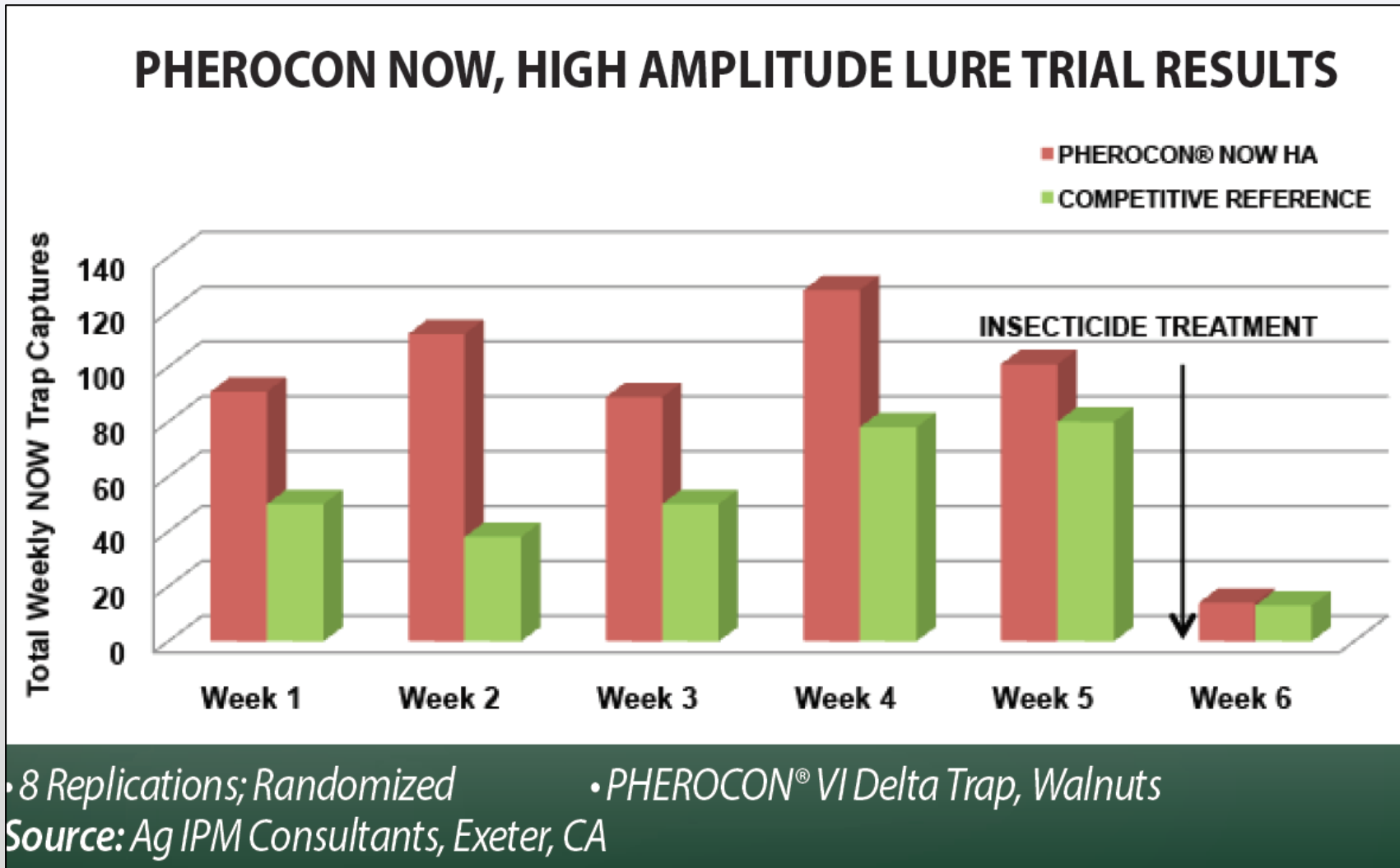
More information below

# NOW PHEROMONE TRAPS

- Placed in the orchard in mid-March
- Pheromone lures used to monitor flights of male NOW



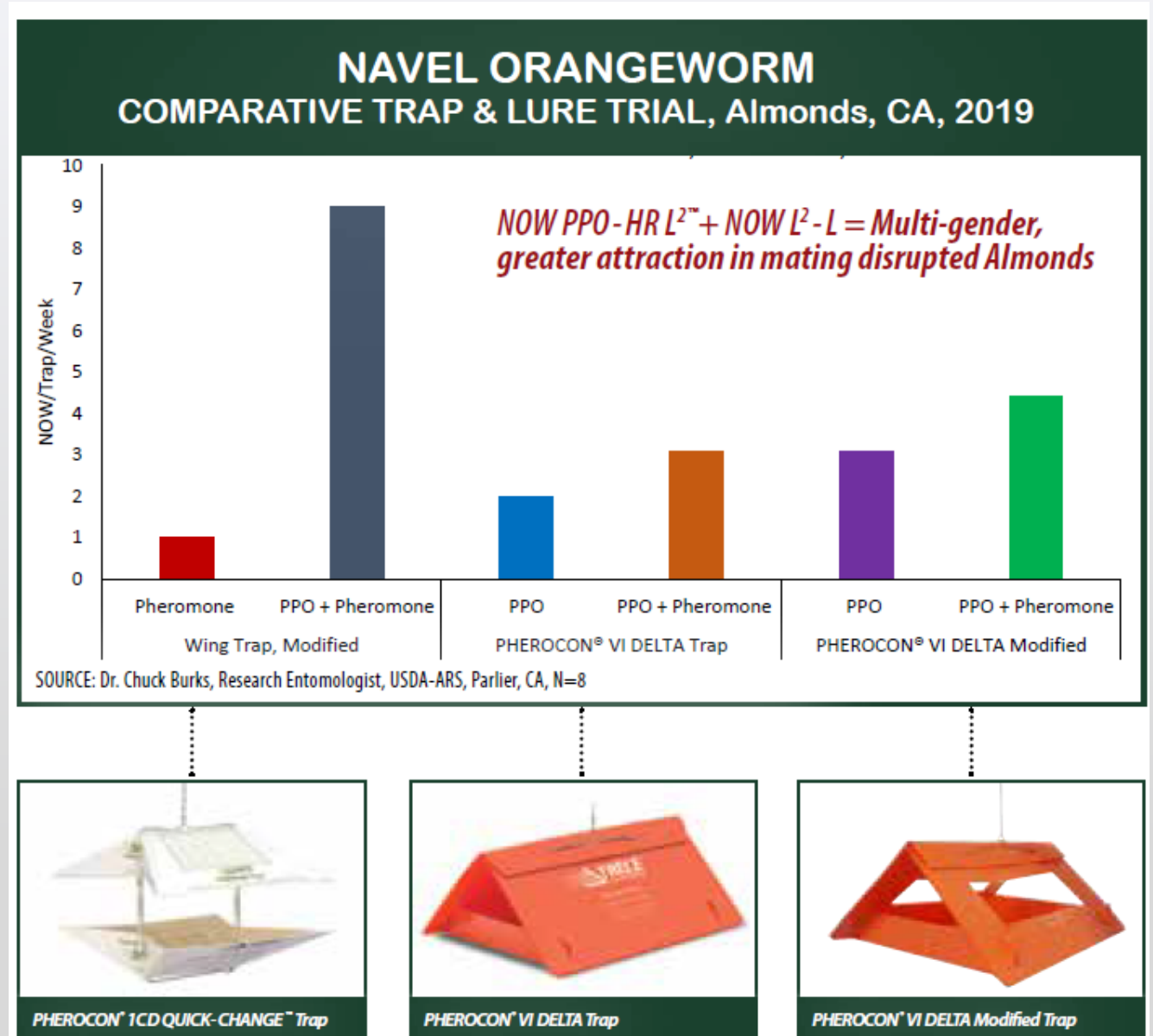
# PHEROCON<sup>®</sup> NOW



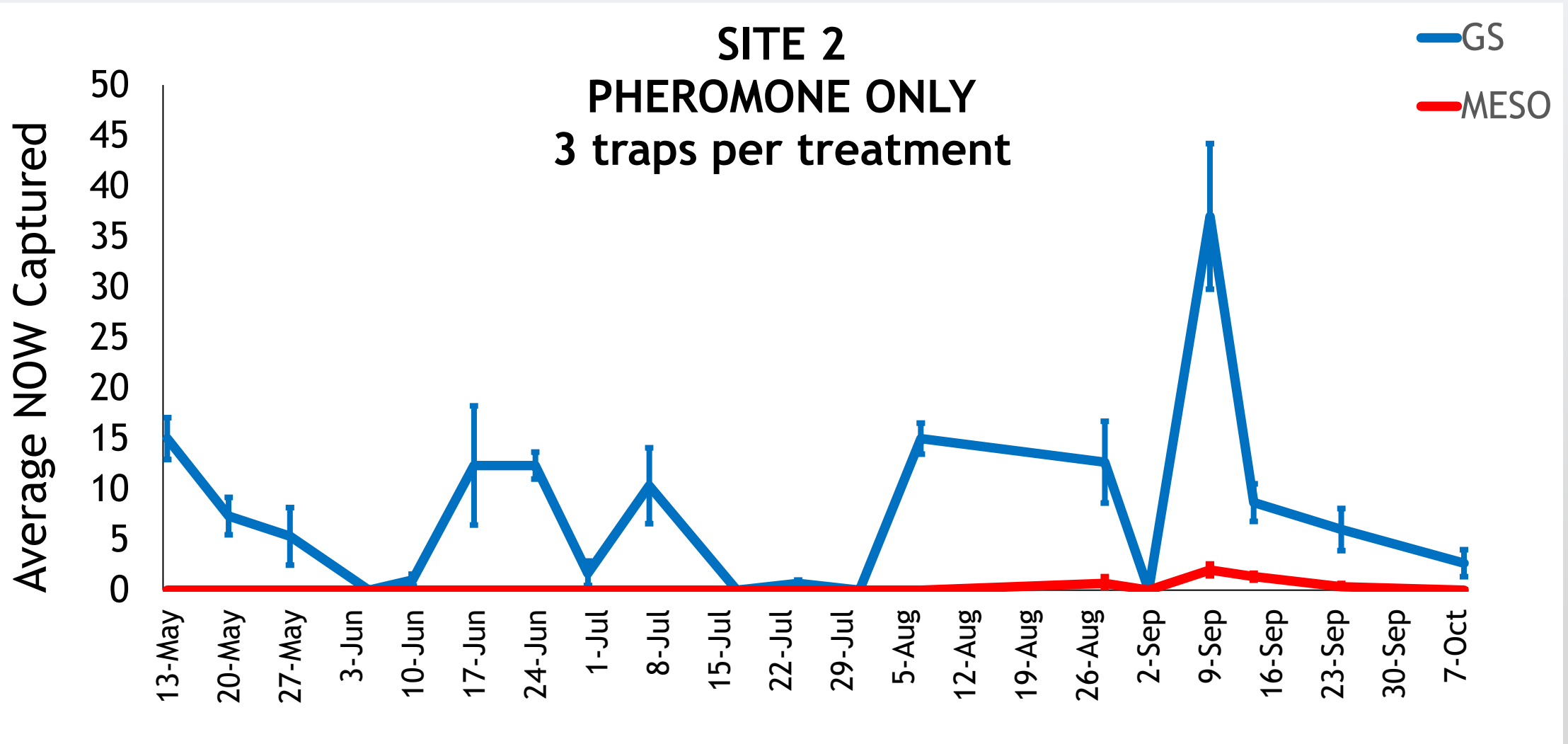
Trécé NOW lures **capture high** male numbers

# PHEROCON® NOW

- Multi-gender attractant – captures both males and females
- Used in combination with the pheromone lure in a trap – higher captures than PPO lure alone
- Can be used in conventional or mating disrupted orchards

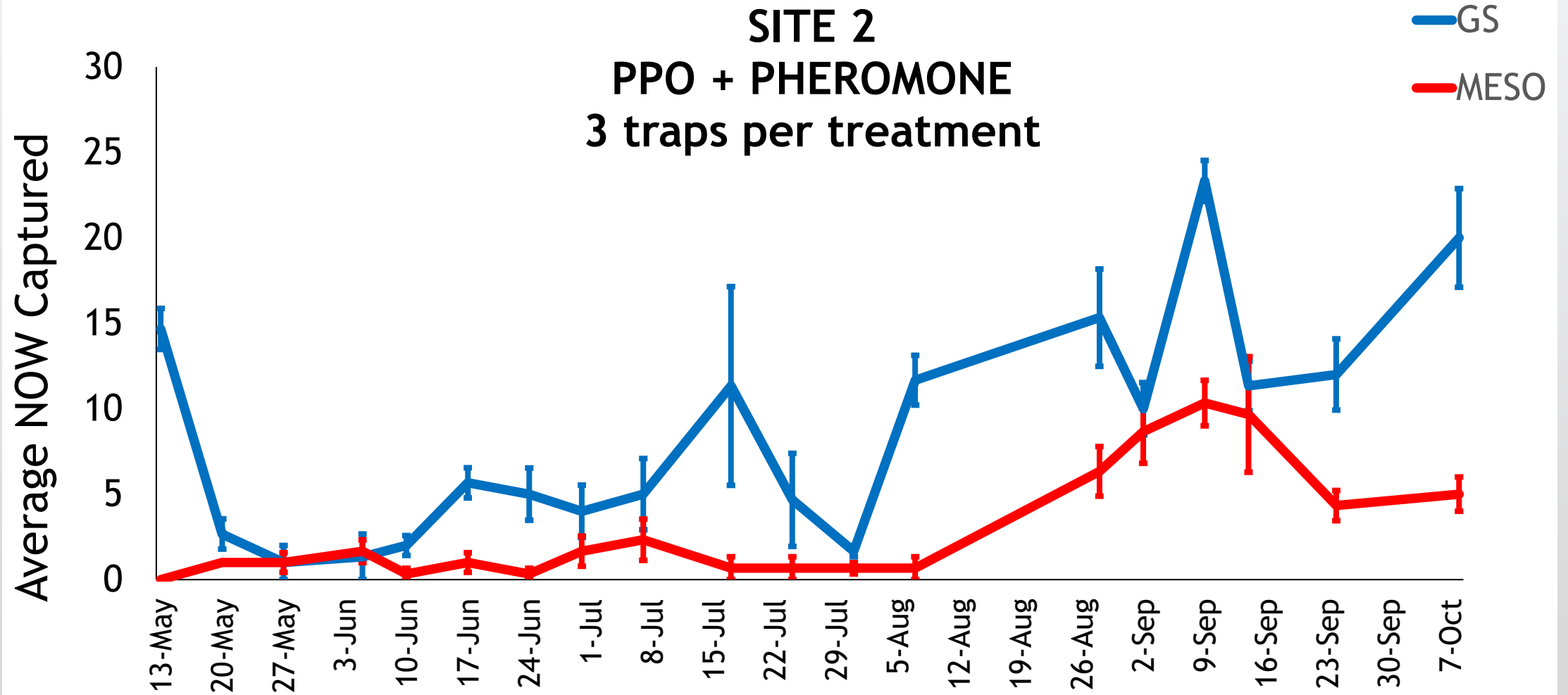


# 2020 ALMOND MATING DISRUPTION TRIAL





# 2020 ALMOND MATING DISRUPTION TRIAL



# NOW Monitoring

Non-mating disruption

**Pheromone lures**  
NOW L2

Separate  
traps by at  
least 5 trees

Mating disruption

**Pheromone lures**  
NOW L2

**Multi-gender lure**  
NOW PPO-HR L2  
+  
NOW L2

# CIDETRAK® PVC FORMULATION MATRIX

ULTIMATE DUAL PROTECTION  
TECHNOLOGY

Resin

Plasticizer

Stabilizer

Lubricant

UV Protection

Antioxidant





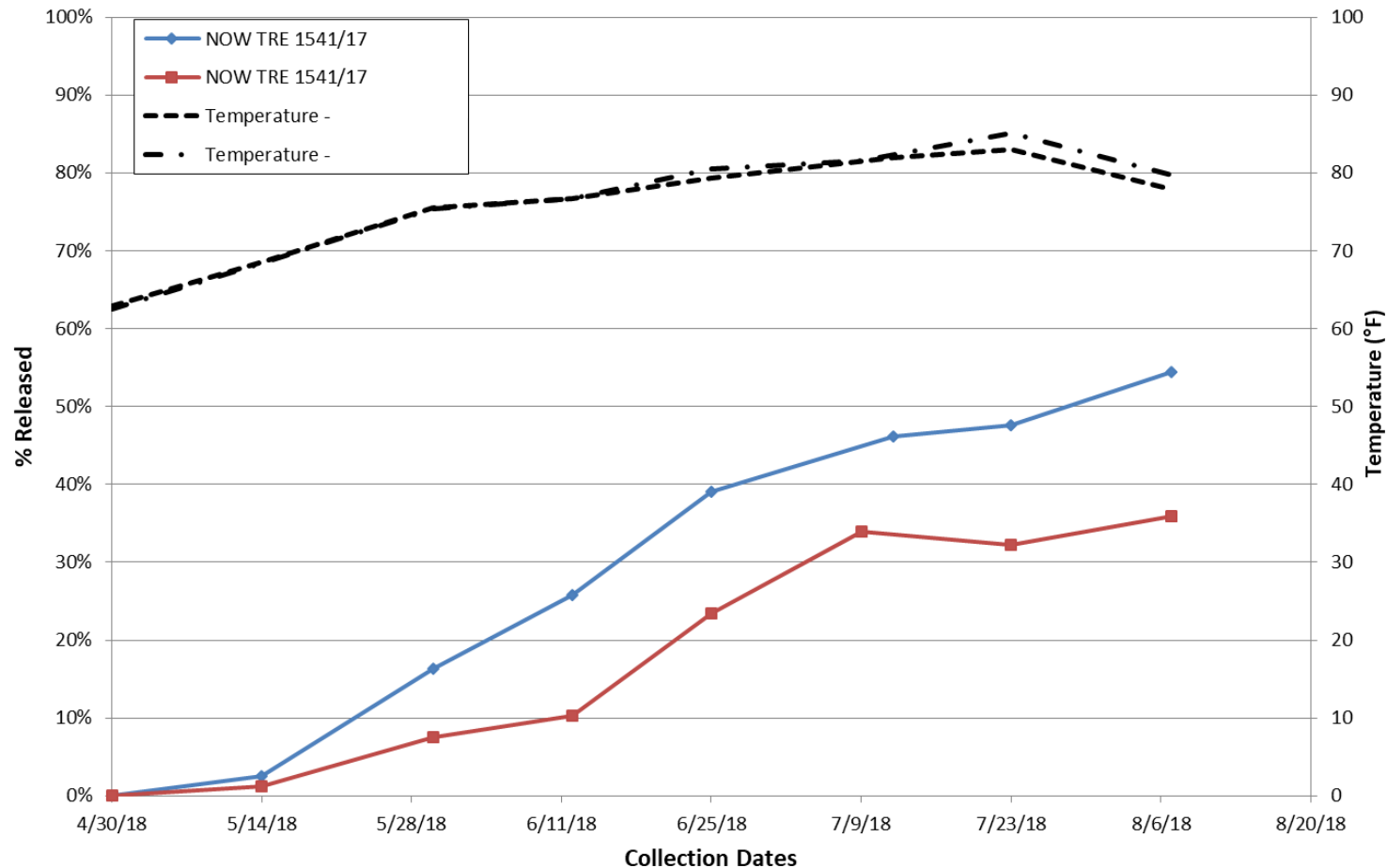
# CIDETRAK<sup>®</sup> NOW MESO

## Aging Study

David Haviland MESO-A NOW TRE 1541 Field Study 2018

Location:

Duration: 5/14/18 - 8/7/18



Long lasting  
dispensers  
through post-  
harvest

Season-long+  
control of NOW



# CIDETRAK® NOW MESO



**NEW**

## CIDETRAK® NOW MESO™

MATING DISRUPTION PRODUCT FOR NAVEL ORANGEWORM



Navel Orangeworm, *Amyelois transitella*

## CIDETRAK® NOW MESO

MATING DISRUPTION PRODUCT  
FOR NAVEL ORANGEWORM IN  
ALMONDS, PISTACHIOS & WALNUTS

- Up to 80% or more potential reduction in damage vs. current insecticide programs
- Season-long control through post-harvest
- Easy application with ready-to-use carrier pack
- No moving parts, no batteries, no gummy deposits
- Removal not required



Contact your local supplier and order now!  
Visit our website: [www.trece.com](http://www.trece.com) or call: 1-866-785-1313.



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Shipping Address: 7560 Hwy 28 W. • Adas, Oklahoma 74330  
Phone: (918) 785-3061 • Fax: (918) 785-3063  
PHEROKIN® and CIDETRAK® are registered trademarks of TRÉCÉ Incorporated, Adas, OK USA  
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# CIDETRAK® NOW MESO



  
 PO Box 42560, Olympia, WA 98504-2560 Ph (360) 902-1805  
 In accordance with Chapter 15.86 RCW and Chapter 16-160 WAC

Washington State  
 Department of Agriculture  
**MATERIAL REGISTRATION  
 CERTIFICATE**  
 is issued to:

Trécé, Inc.  
 PO Box 129  
 Adair, OK 74330  
 United States

The products listed below have been verified to comply with the USDA National Organic Standards (7 CFR Part 205):

#	Product Name	Sub-Type	Type	Annotation
2765	PHEROCON GSB Lure	Pheromone	DPC	Preventative practices must be implemented prior to use.
2932	PHEROCON CMDA Combo Lure	Pheromone	DPC	Preventative practices must be implemented prior to use.
2999	CIDETRAK CMDA + LR Dual MESO	Pheromone	DPC	Preventative practices must be implemented prior to use.
3000	CIDETRAK NOW MESO	Pheromone	DPC	Preventative practices must be implemented prior to use.

**Types:** CPA - Crop Production Aid, DPC - Disease and Pest Control, FSA - Fertilizer and Soil Amendment, LPA - Livestock Production Aid, PH - Processing and Handling

WSDA Registered Company #: 438  
 Issue Date: 09/18/2019  
 Registration valid through 10/31/2020

*Brenda Book*  
 Brenda Book  
 Organic Program Manager  
 DEPARTMENT OF AGRICULTURE  
 AGR 2291 (R/3/16)



# CIDETRAK<sup>®</sup> NOW MESO



Easy to install **PASSIVE DISPENSERS**

# CIDETRAK® NOW MESO

## Application Rate

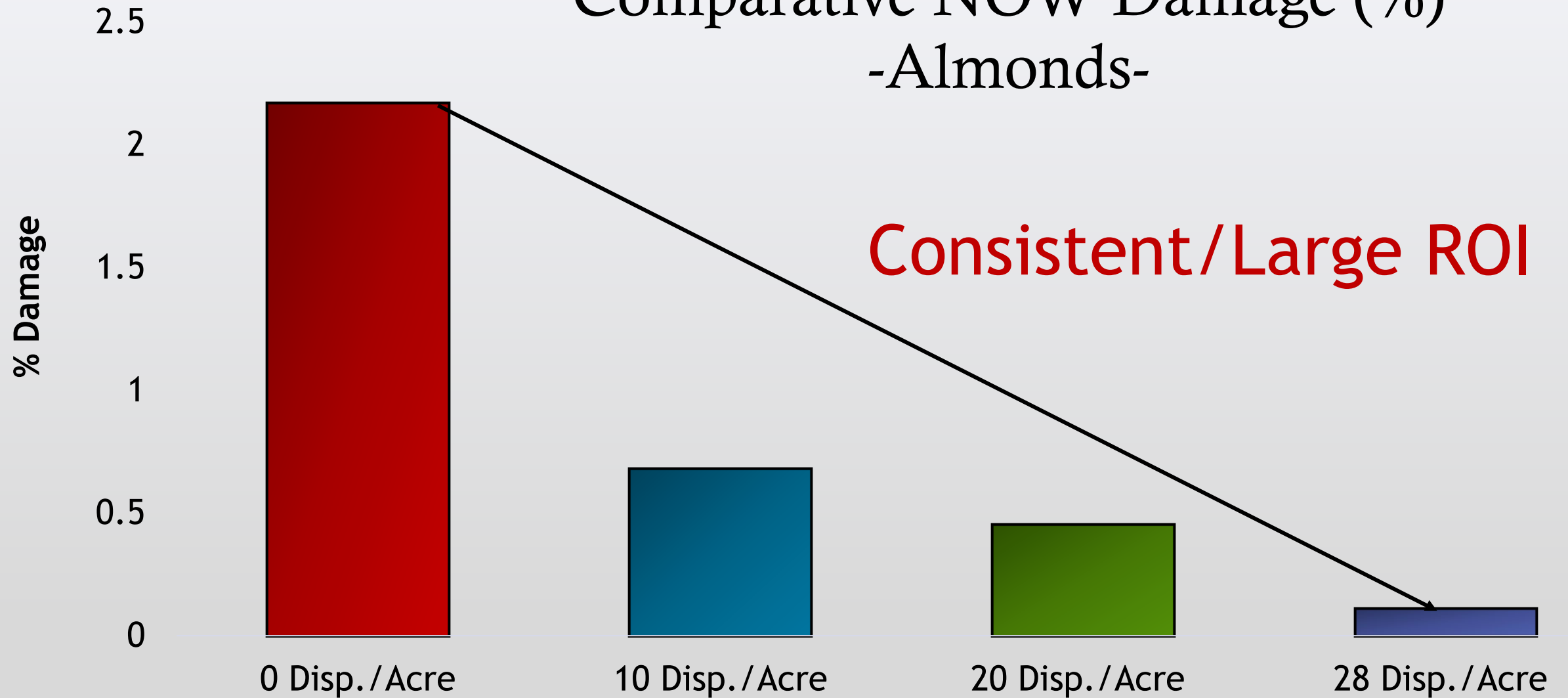
- Low Population Abundance
  - 15 Dispensers/Acre
- Moderate Population Abundance
  - 20 Dispenser/Acre
- High Population Abundance
  - 28 Dispensers/Acre
- Rate of Application 4 to 5 Acres/Hour



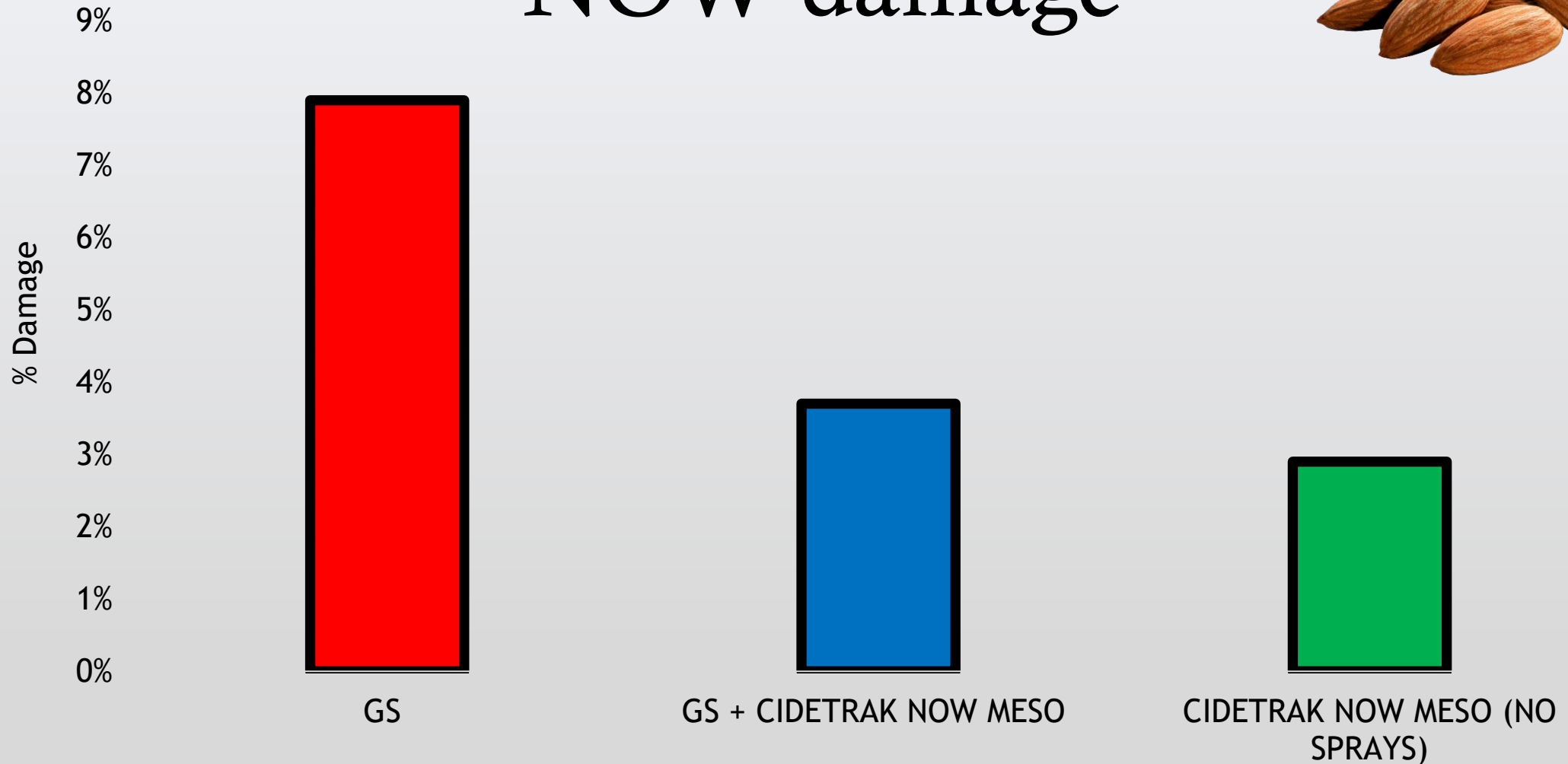
# CIDETRAK® NOW MESO

## Comparative NOW Damage (%)

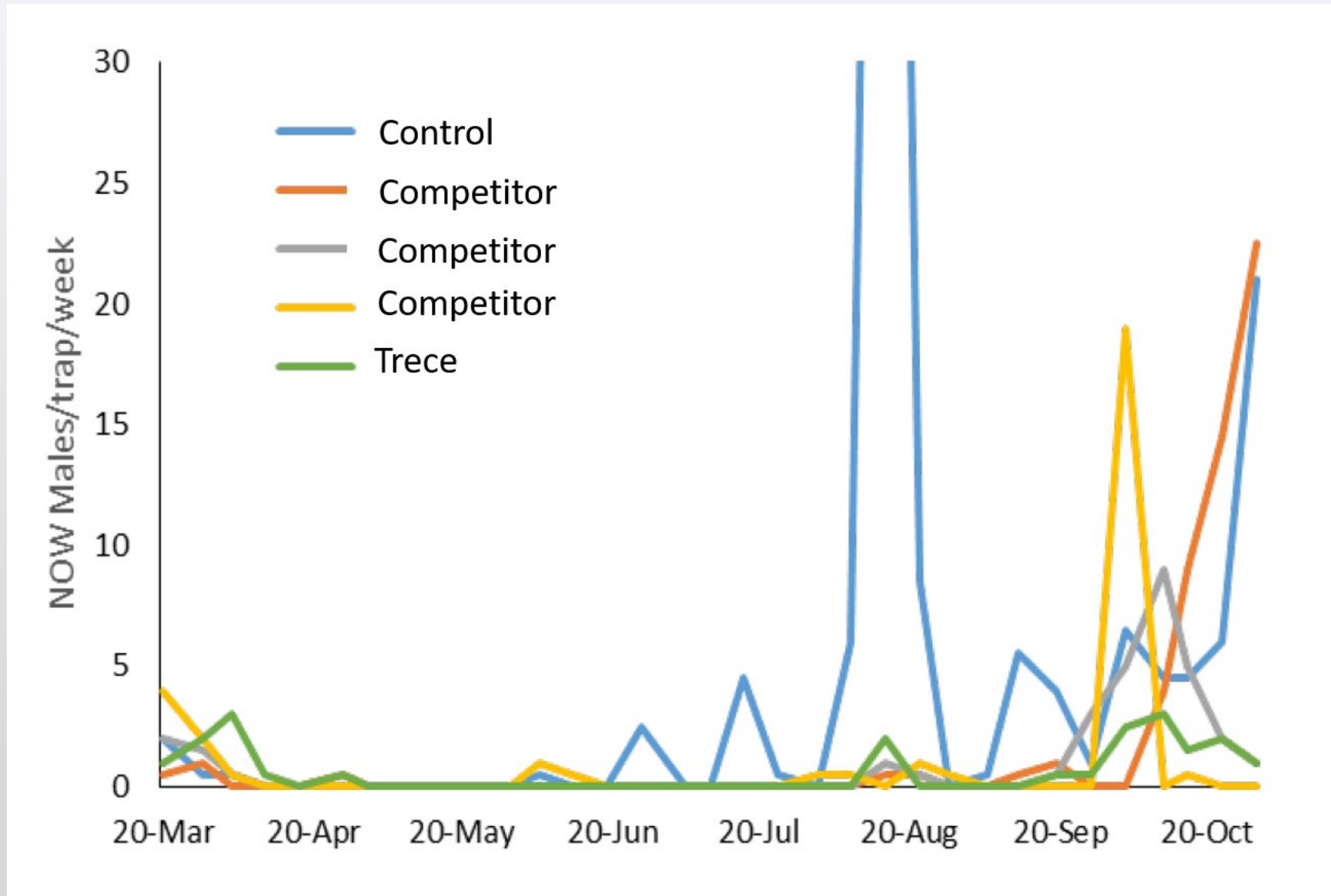
-Almonds-



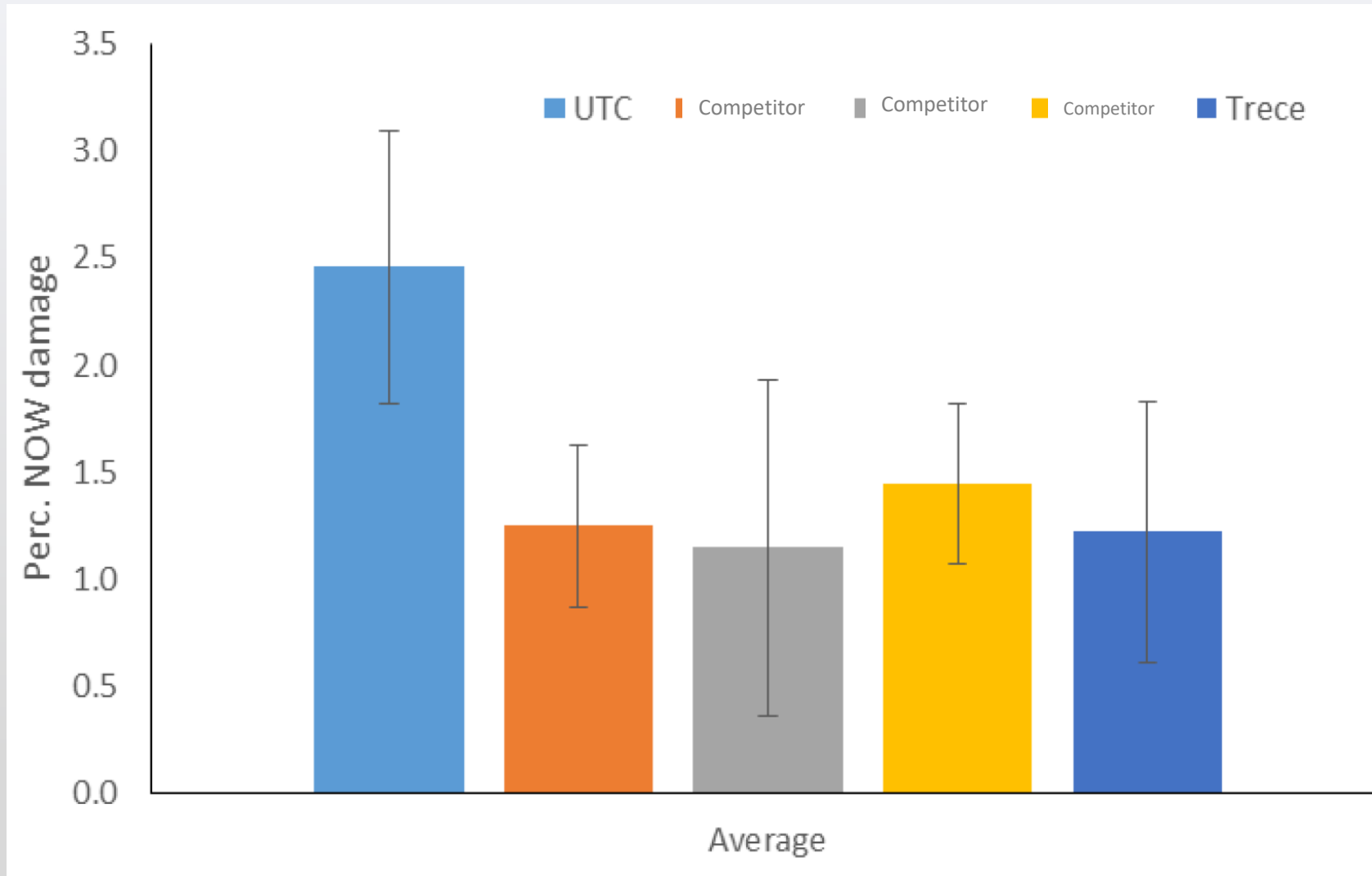
# CIDETRAK<sup>®</sup> NOW MESO NOW damage



# Full Season Trap Shutdown



# Full Season Damage Reduction



# CIDETRAK®

## User Friendly Packaging

20  
Dispensers  
per acre



# CIDETRAK<sup>®</sup>

## User Friendly Packaging



# CIDETRAK<sup>®</sup>

## User Friendly Application



# CIDETRAK<sup>®</sup>

## User Friendly Application





# CIDETRAK<sup>®</sup> Mating Disruption Benefits

1. 50% - 80% reduction in injury
2. Adoption is rapidly increasing over the last five years
3. Unlikely to develop resistance
4. Worker safety – no PHI or REI – beneficial insects
5. **NO MECHANICAL FAILURE!!!**
6. **Return on Investment (ROI)**



# Thank You

Danielle Kirkpatrick, Ph.D.  
Trécé. Inc.  
Global Technical Support Coordinator  
[dkirkpatrick@trece.com](mailto:dkirkpatrick@trece.com)  
918-824-5223

**Rooted**  
IN SUCCESS :: 2021  
the almond conference



# NOW Label Update

Abby Welch | Entomologist & PCA  
Masters in Entomology, LSU





# NOW - Two Formulations

NOW Extra

Conventional

NOW Eco

Organic certified

FEBRUARY 25, 2019

## Semios Introduces First Aerosol Organic Pheromone for the Control of Navel Orangeworm in Almond, Pistachio, Walnut, and Fig Crops

SHARE   

**Fresno, CA** - [Semios](#) is pleased to add NOW Eco to its Integrated Pest Management (IPM) platform for the 2019 growing season. Certified for organic production by the [California Department of Pesticide Regulation](#), NOW Eco is the first organic pheromone-based aerosol for the mating disruption control of navel orangeworm NOW Eco and is approved for commercial use in California.



# Pheromones for Control of Navel Orangeworm



	NOW Extra	NOW Eco - Certified Organic
Availability	Registered in CA in 2016	Registered in CA in 2018
Active Ingredient	(Z,Z)-11, 13, Hexadecadienal, 1.96% w/w	
Product Type	Liquid aerosol product	
Classification	Straight chain lepidopteran pheromone, biopesticide	
Crop Types	Almonds, pistachios, walnuts, dates, figs, citrus, pome & stone fruit	
REI & PHI	0	



# NOW Extra

FIRST AID	
If inhaled	Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Contact a poison control center or doctor for treatment advice.
If on skin or clothing	Remove contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Contact a poison control center or doctor for treatment advice.
If in eyes	Immediately hold eyes open and rinse slowly and gently with water for 15 - 20 minutes. If wearing contact lenses, rinse eyes for 5 minutes, remove contact lenses and continue rinsing. Contact a poison control center or doctor for treatment advice.
If swallowed	Contact a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Hot Line Number: Have the product container or label with you when contacting a poison control center or doctor, or going for treatment. For emergency information on product, uses, and treatment, etc., call the National Pesticides Information Center at 1-800-858-7378, 6.30am-4.30pm Pacific Time (PT), 7 days a week. During other times, call the poison control center at 1-800-222-1222.

#### PRECAUTIONARY STATEMENTS

##### Hazards to humans and domestic animals

**CAUTION.** Harmful if swallowed, inhaled, or absorbed through skin. Causes moderate eye and skin irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing vapor. Wash thoroughly with soap and water after handling and before eating or drinking. Remove contaminated clothing and wash before reuse.

##### ENVIRONMENTAL HAZARDS

For terrestrial uses. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposing of equipment wash waters.

##### PHYSICAL AND CHEMICAL HAZARDS

Contents under pressure. Container may explode if heated. Do not expose to temperatures above 50°C (122°F). Do not spray near open flames or sparks. Do not puncture or incinerate.

##### DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling

Do not apply more than 150g of active ingredient per acre per year.

**METHOD OF APPLICATION:** For season-long mating disruption of navel orangeworm on walnuts, pistachios, almonds, dates, figs, citrus, pome and stone fruits. Use only with Semios automated aerosol dispensers. Load aerosol canister in Semios dispenser. Hang dispenser in upper third of tree canopy with nozzle pointing away from foliage and fruit. Evenly place dispensers at an average density of 1-2 dispensers per acre. Use higher density at orchard edge facing prevailing winds. Access Semios web-based user interface to commence operation of networked dispensers as moths begin mating/flight activity and turn off dispensers at the end of the season. Standard application rate is 1 puff every 15 minutes over a maximum 12 hours per day (6PM-6AM).

##### STORAGE AND DISPOSAL

DO NOT contaminate water, food, or feed by storage or disposal of unused dispensers.

**Pesticide Storage:** Store container in a cool, dry place away from heat or open flame.

**Pesticide Disposal:** Wastes resulting from this product may be disposed of on site or at an approved waste disposal facility.

**Container Handling:** Nonrefillable container. Do not reuse or refill this container. Discard empty dispensers in trash or at an approved waste disposal facility

##### WARRANTY AND LIMITATION OF DAMAGES

SemiosBIO Technologies Inc., warrants that this product conforms to the chemical description stated on the label. SemiosBIO Technologies Inc., neither authorizes any agent or representative to make any other warranty or fitness of merchantability, guarantee or representation, express or implied, concerning this material. To the extent consistent with applicable law SemiosBIO Technologies Inc.'s maximum liability for breach of this warranty shall not exceed the purchase price of the product. To the extent consistent with applicable law, buyer and user acknowledge and assume all risks and liabilities resulting from the handling, storage and use of this product which extend beyond the use of the product under normal conditions and in accord with statements made on the label.



## Semios NOW Extra

A PHEROMONE PRODUCT FOR CONTROL OF:  
Navel orangeworm, *Amyelois transitella*

### Aerosol

ACTIVE INGREDIENT		
(Z,Z)-11,13-Hexadecadienal	1.96%	
OTHER INGREDIENTS	98.04%	
Total	100.00%	

EPA Reg. No. 89850-11

EPA Est. No. 46813-CAN-3

EPA Est. No. 58996-MO-1

KEEP OUT OF REACH OF CHILDREN

### CAUTION

See side/back panel for First Aid and Precautionary Statements



FLAMMABLE



EXPLOSIVE

Net contents 10.8 oz. (307 g)

SemiosBIO Technologies Inc.  
101-887 Great Northern Way  
Vancouver, BC V5T 4T5

[www.semios.com](http://www.semios.com)

Batch number: See bottom of can

# NOW Eco

FIRST AID	
If inhaled	Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.
If on skin or clothing	Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Call a poison control center or doctor for treatment advice.
If in eyes	Hold eye open and rinse slowly and gently with water for 15 - 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If swallowed	Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

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#### PRECAUTIONARY STATEMENTS

##### Hazards to humans and domestic animals

**CAUTION.** Harmful if swallowed, inhaled, or absorbed through skin. Causes moderate eye and skin irritation. Avoid contact with skin, eyes, or clothing. Avoid breathing vapor. Wash thoroughly with soap and water after handling and before eating, drinking or chewing gum, using tobacco, or using the toilet. Remove contaminated clothing and wash before reuse.

##### ENVIRONMENTAL HAZARDS

For terrestrial uses. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposing of equipment wash waters.

##### PHYSICAL AND CHEMICAL HAZARDS

Contents under pressure. Container may explode if heated. Do not expose to temperatures above 50°C (122°F). Do not spray near open flames or sparks. Do not puncture or incinerate.

##### DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling

Do not apply more than 150g (5.29 oz.) of active ingredient per acre per year

**METHOD OF APPLICATION:** For season-long mating disruption of navel orangeworm on walnuts, pistachios, almonds, dates, figs, citrus, pome and stone fruits. Use only with Semios automated aerosol dispensers. Load aerosol canister in Semios dispenser. Hang dispenser in upper third of tree canopy with nozzle pointing away from foliage and fruit. Evenly place dispensers at an average density of 1-2 dispensers per acre. Use higher density at orchard edge facing prevailing winds. Access Semios web-based user interface to commence operation of networked dispensers as moths begin mating/flight activity and turn off dispensers at the end of the season. Standard application rate is 1 puff every 15 minutes over a maximum 12 hours per day (6PM-6AM).

##### STORAGE AND DISPOSAL

DO NOT contaminate water, food, or feed by storage or disposal of unused dispensers.

**Pesticide Storage:** Store container in a cool, dry place away from heat or open flame.

**Pesticide Disposal:** Wastes resulting from this product may be disposed of on site or at an approved waste disposal facility.

**Container Handling:** Do Not Puncture or Incinerate! If empty, place in trash or offer for recycling, if available. If partly filled, call your local solid waste agency for disposal instructions.

##### WARRANTY AND LIMITATION OF DAMAGES

SemiosBIO Technologies Inc., warrants that this product conforms to the chemical description stated on the label. SemiosBIO Technologies Inc., neither authorizes any agent or representative to make any other warranty or fitness of merchantability, guarantee or representation, express or implied, concerning this material. To the extent consistent with applicable law SemiosBIO Technologies Inc.'s maximum liability for breach of this warranty shall not exceed the purchase price of the product. To the extent consistent with applicable law Buyer and user acknowledge and assume all risks and liabilities resulting from the handling, storage and use of this product which extend beyond the use of the product under normal conditions and in accord with statements made on the label.



## Semios NOW Eco Aerosol

A PHEROMONE PRODUCT FOR CONTROL OF:  
Navel orangeworm, *Amyelois transitella*

FOR ORGANIC PRODUCTION

ACTIVE INGREDIENT		
(Z,Z)-11,13-Hexadecadienal	1.96%	
OTHER INGREDIENTS	98.04%	
Total	100.00%	

EPA Reg. No. 89850-18

EPA Est. No. 33595-MO-2

EPA Est. No. 33595-MO-4

KEEP OUT OF REACH OF CHILDREN

### CAUTION

See side/back panel for First Aid and Precautionary Statements



FLAMMABLE



EXPLOSIVE

Net contents 10.8 oz. (307 g)

SemiosBIO Technologies Inc.  
101-887 Great Northern Way  
Vancouver, BC V5T 4T5

[www.semios.com](http://www.semios.com)

Batch number: see bottom of can



# The “Smart” Dispenser

- Installed 1 per acre using GPS coordinates
- Reports microclimate data & device status/health every 10 mins
  - Contains humidity, temperature, and pressure sensors (helps inform pheromone application rates)
  - Contains a proximity sensor (tracks pheromone release)
- 0 REI & PHI and can be turned on/off or reprogrammed remotely



Ensures growers get full coverage all season long



# Directions For Use

*Installation included at no cost by Semios but, directions for use are as follows:*

- Load aerosol canister in Semios dispenser. Hang dispenser level with upper third of tree canopy with nozzle pointing away from foliage and fruit.\*
- Evenly place dispensers at an average density of 1 dispenser per acre, up to 2 dispensers per acre, and down to 0.5 dispensers per acre.\*
- Standard dosing levels between 153.5g and 614g of Semios formulation per acre per year.
- Log on to Semios' account to monitor pest activity







# Application

- Semios Variable Rate Mating Disruption :
  - We track pest activity using in-canopy degree days from our weather stations and automated camera traps
  - This data allows us to maximize pheromone release at the height of pest activity and crop vulnerability
- No use of a sprayer is needed! Everything's remotely monitored and variable application rates are automated

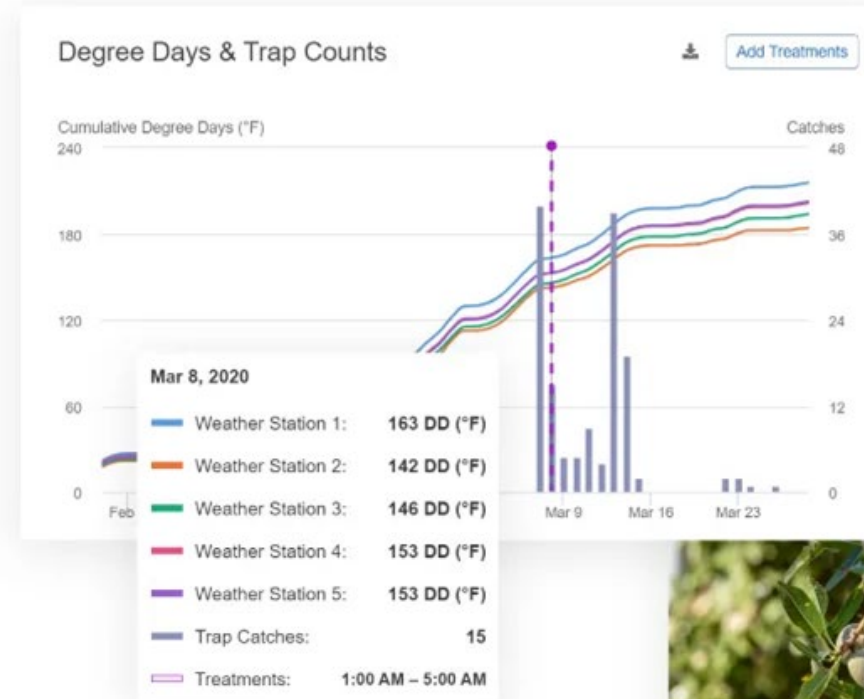


During peak pest activity or crop vulnerability, we release up to **1.7X** more than other solutions available on the market.



# Comprehensive Pest Management Dashboard

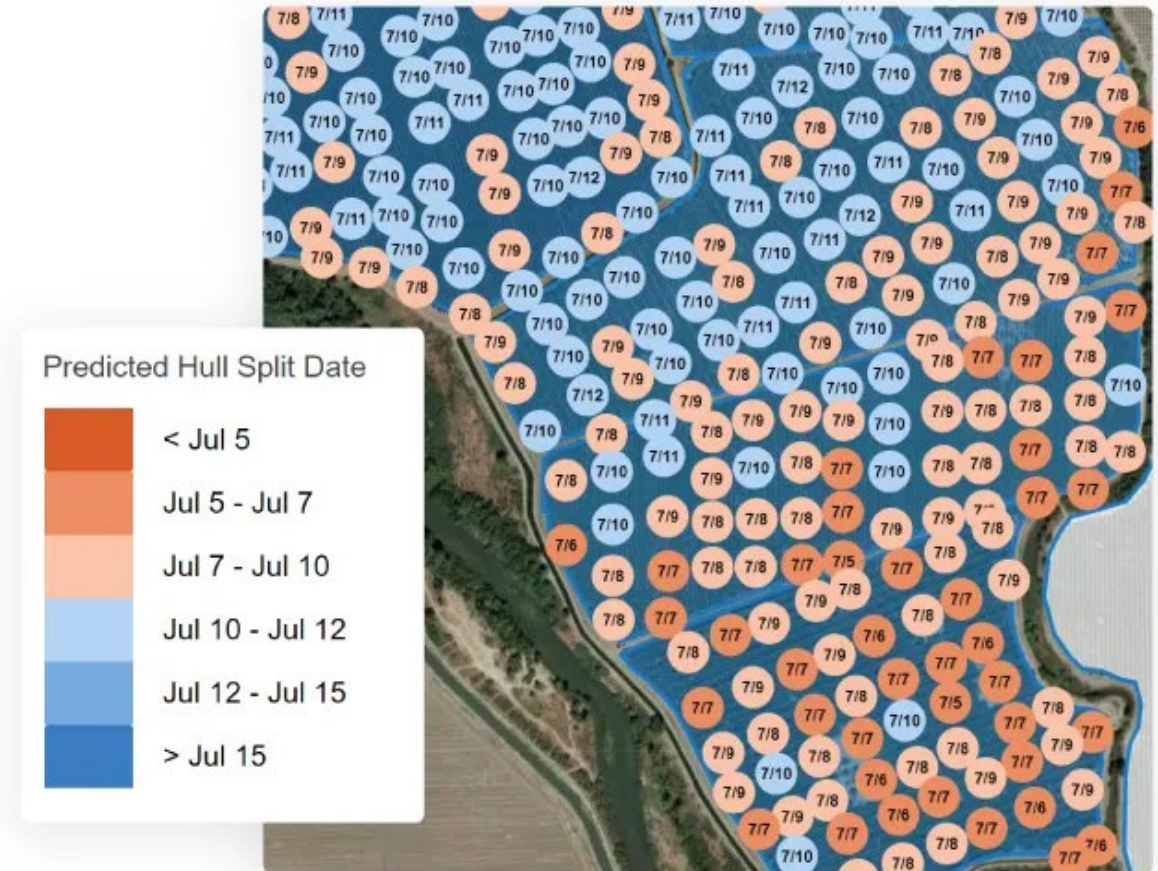
- You can log on to Semios to view trap counts and degree day tracking
- Growers and PCAs can collaborate on pest management decisions using the same data that's driving your pheromone release rate





# Dispenser Placement and Data

- The same dispensers releasing pheromones are providing in-canopy data
- You can view where dispensers are located in your field and micro climate variability that affects pest management decisions
  - Temperature heatmaps, humidity maps, degree days heatmaps, and hull split maps





# Thank You!



## Questions?

**Abigail Welch**

Technical Sales Support Specialist

Entomologist, PCA

Masters in Entomology & LSU Alumni



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E | [awelch@semios.com](mailto:awelch@semios.com)



# Suterra Mating Disruption Solutions for Navel Orangeworm

The Almond Conference  
December 9, 2021

**Emily J. Symmes, PhD** | Senior Manager of  
Technical Field Services

[emily.symmes@suterra.com](mailto:emily.symmes@suterra.com)

**Suterra**<sup>®</sup>

# Pillars of a Successful IPM Program for Navel Orangeworm



## Monitoring & Decision-Support



- Trap-based monitoring
- Crop phenology monitoring
- Visual samples
- Thresholds and degree days
- Harvest damage evaluation

## Mating Disruption



- CheckMate® Puffer® NOW Ace
- CheckMate® Puffer® NOW-O Ace
- CheckMate® NOW-F

## Cultural Practices



- Sanitation
- Timely harvest
- Minimizing damage from other sources

## Biological Control



- Parasitoids
- Predators
- Conservation
- Augmentation

## Insecticide Options



- Diamides (IRAC 28)
- Insect growth regulators (IRAC 18)
- Pyrethroids (IRAC 3A)
- Spinosyns (IRAC 5)
- Microbials

# Mating Disruption Solutions for Navel Orangeworm



Suterra<sup>®</sup>

CheckMate<sup>®</sup>  
Puffer<sup>®</sup> NOW Ace<sup>™</sup>

EPA Number  
73479-19

Application Rate  
1 per acre

CheckMate<sup>®</sup>  
Puffer<sup>®</sup> NOW-O Ace<sup>™</sup>

EPA Number  
73479-21

Application Rate  
1 per acre

CheckMate<sup>®</sup>  
NOW-F

EPA Number  
56336-38

Application Rate  
3 fl. oz per acre

# CheckMate® Puffer® NOW Ace™



- 1 Puffer®/acre
- Season-long (+)
- Consistent and precise release rate
- Temperature sensor pre-programmed for time zone and pest; puffing suppressed below biologically-relevant temperatures
- Deployment and replacement timing flexible
- Zero REI and zero PHI, MRL exempt
- Pesticide Use Report (PUR) required
- Free recycling at grower convenience through Suterra's Clean Orchard Promise™ program ensures sustainability and zero waste in landfills





# CheckMate® Puffer® NOW-O Ace™



- 1 Puffer®/acre
- Season-long
- Consistent and precise release rate
- EPA authorized for use in organic production
- Zero REI and zero PHI, MRL exempt
- Pesticide Use Report (PUR) required
- Flexible refurbishment timing through Suterra's Clean Orchard Promise™ program ensures sustainability and zero waste in landfills



# Puffer® Application Overview

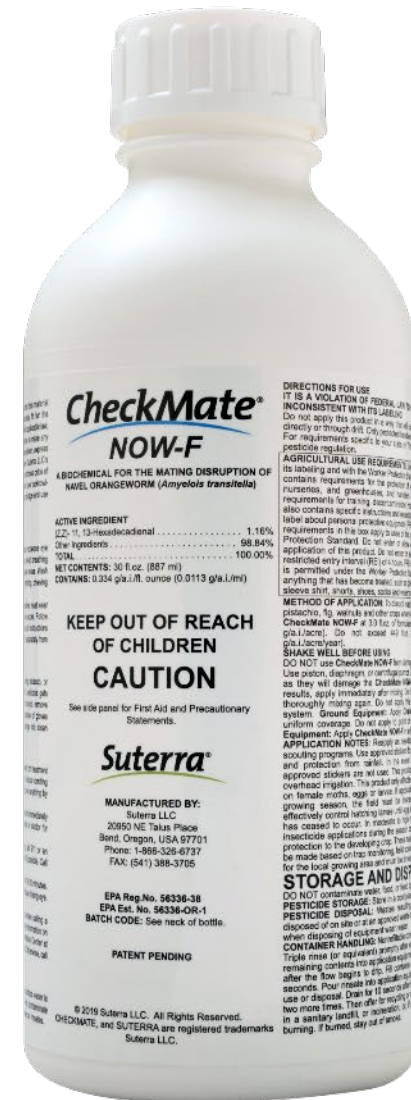
- Hang Puffers® in the top half of the tree canopy and direct emissions away from the trunk, foliage, and nuts in an even grid pattern distributed throughout the orchard
- Hang Puffers® on a sturdy branch or pole to withstand operational and harvest activities
- Mapping and deployment training available



# CheckMate® NOW-F Flowable



- Proprietary microencapsulated formulation
- 3 fl. oz./acre/application
- Up to 30-day field life
- Zero PHI, 4-hour REI, MRL exempt
- Pesticide Use Report (PUR) required
- Flexible and easy to deploy using conventional spray equipment
- Tank mixable with common agrochemicals



# Incorporating Sprayable Pheromone into Your IPM Program

Applied like conventional insecticide spray but with mating disruption MOA



- “Free-ride” as a tank-mix with conventional inputs
  - *Compatible with common agrochemicals*
- Efficient stand-alone applications
  - *Coverage not as critical as other inputs*
  - *Can be applied at lower volumes, faster speeds*

## Benefits of MD in an Overall IPM Program

Highly specific to target pest	Reduces damage	Increases quality	ROI
Flexibility in overall IPM program	Season-long (+ post-harvest)	Organic options	Ecosystem balance
Conventional pesticide limitations	Reduces insecticide inputs	Insecticide resistance mitigation	Pest resistance & resurgence mitigation
Fewer environmental impacts	Reduces pesticide residues	Reduces hazards for workers	Increases food safety

# Mating Disruption: ROI and the “Less Tangibles”

- **ROI and benefits compounded over time**
  - *Sustained use drives populations down*
- **Sustainability goals**
  - *Personal, commodity and marketing boards, regulatory, etc.*
- **Marketing & PR**
  - *Sustainability & organic certifications, branding*
- **Potential financial incentives**
  - *NRCS*

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Meet the  
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Meet the  
California Team

**Suterra**<sup>®</sup>



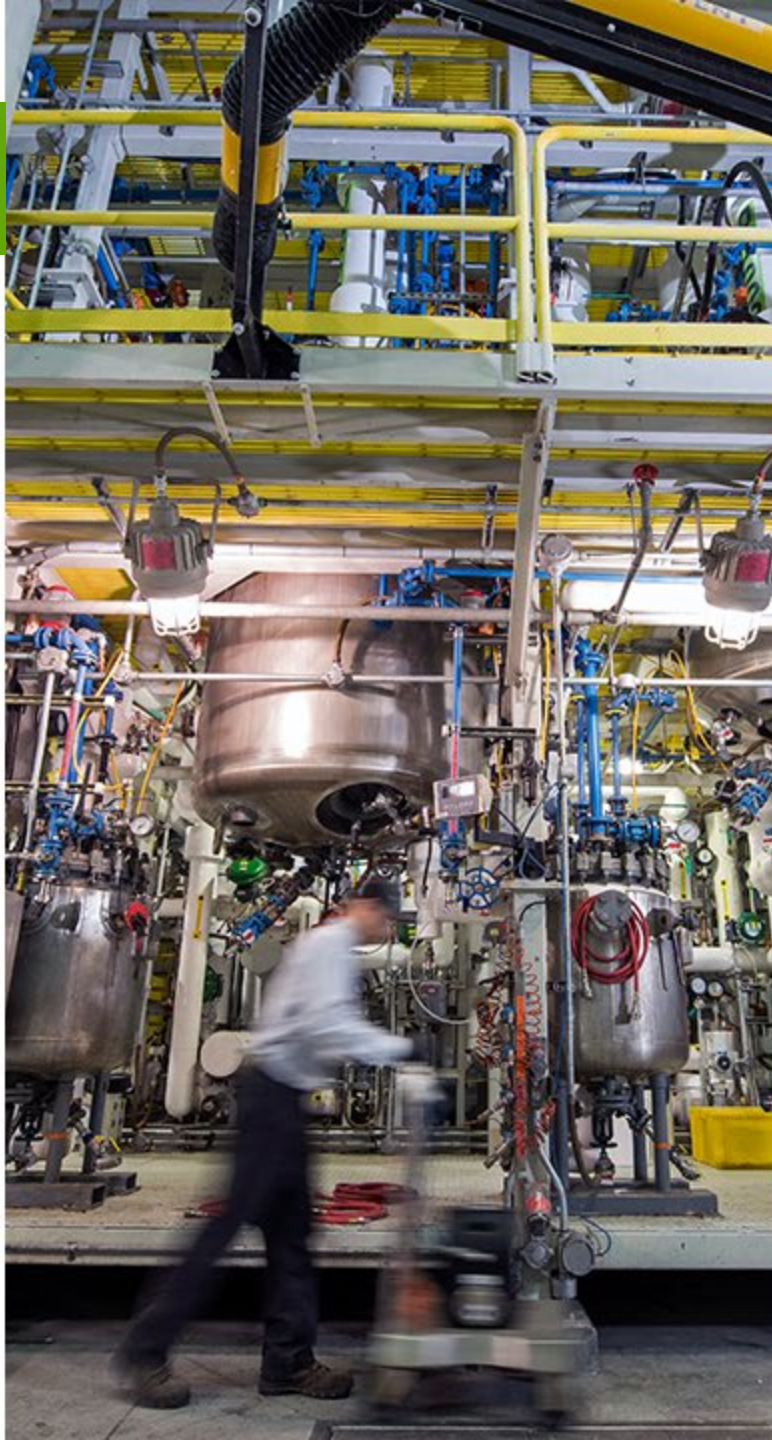
## Unique, World-Class Capabilities

Largest dedicated pheromone facility in the world

Early-stage research in synthesis and formulation

Product design and manufacturing

**Suterra**<sup>®</sup>



*Suterra*<sup>®</sup>

Thank you!

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[www.suterra.com](http://www.suterra.com)  
[CustomerCare@suterra.com](mailto:CustomerCare@suterra.com)





**A REVIEW OF MATING  
DISRUPTION OPTIONS AND  
INCENTIVES FOR CALIFORNIA  
ALMOND GROWERS**

Karen Lowell (Natural Resources  
Conservation Service)





**Thank You**

**Rooted**  
IN SUCCESS :: 2021  
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