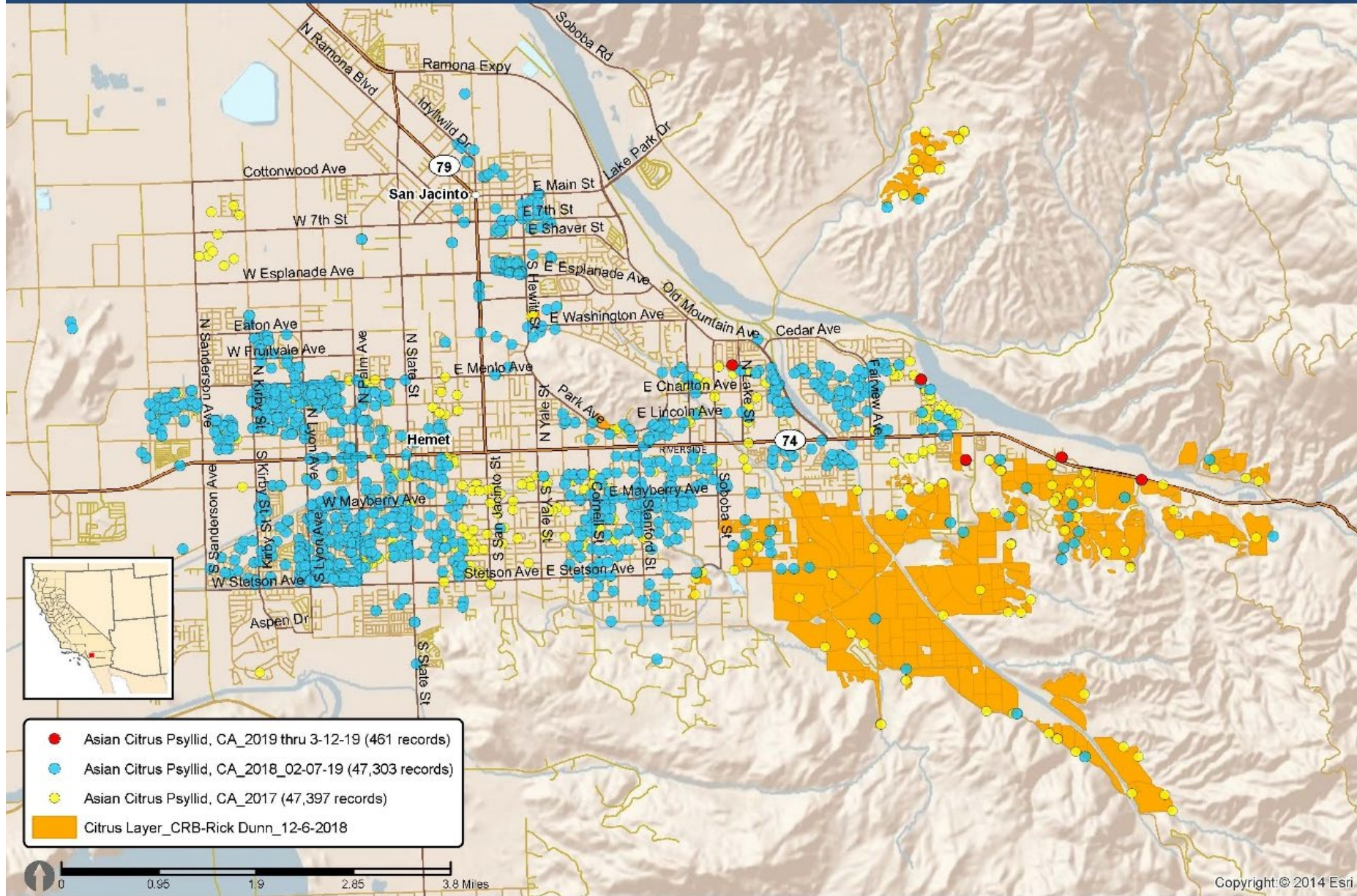


## *Area-Wide Control of ACP in the Residential-Commercial Citrus Buffer in Hemet, California.*

*G. Simmons, R. Stouthamer, I. Wright, E. Bejarano, R. Henderson I. Davidson & A. Washburn.*

- Cooperative project (HLB/MAC), University of California, CRB, Hemet Citrus Pest Control District, USDA, CDFA
- *CLas* vector ACP largely untreated in residential areas with the highest risk close to commercial groves
- CDFA has a control program to release *Tamarixia* in urban landscapes for establishment and to help reduce ACP in high risk areas: HLB quarantines, near commercial citrus & along border and high risk pathways
- CDFA operates urban-buffer pesticide treatment program around commercial citrus



Copyright: © 2014 Esri

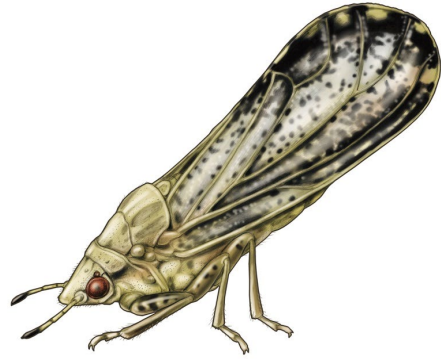
# Keep HLB out of citrus, area-wide IPM in urban-commercial citrus buffer zones

- Evaluate impact on ACP populations from:
  - Augmentative releases of natural enemies
  - Area-wide ant control & impact on ACP populations
  - Urban pesticide buffer treatments
- Determine if these methods can be integrated into the current CDFA HLB quarantine ACP control zones and buffer treatment areas.
- Develop *Diomus pumillo* rearing methods
- Evaluate potential for releases of two commercially produced predator species

## **Demonstration Project:**

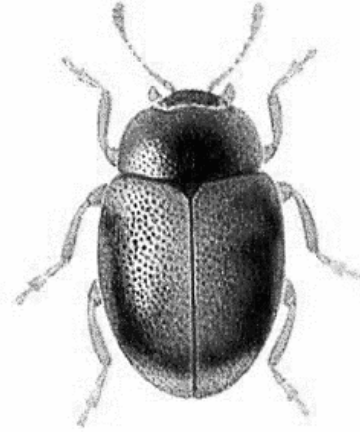
- Area-wide evaluation of inoculative releases of natural enemies, ant control and buffer pesticide treatments, vs no treatment areas next to 3,050 citrus acres in Hemet.
- Two evaluation zones: *inside and outside of ¼ mile* CDFA pesticide buffer application area
- Extensive monitoring with adult ACP counts from traps, tree tap samples, shoot samples for nymphs, ants and predators

## Asian Citrus Psyllid (ACP)



*(Diaphorina citri)*

## Natural Enemies



*Rhyzobius sp.*



*Tamarixia radiata*

## Invasive Enabler



Argentine ant  
*(Linepithema humile)*



*Chrysoperla comanche*



*Diomus sp.*

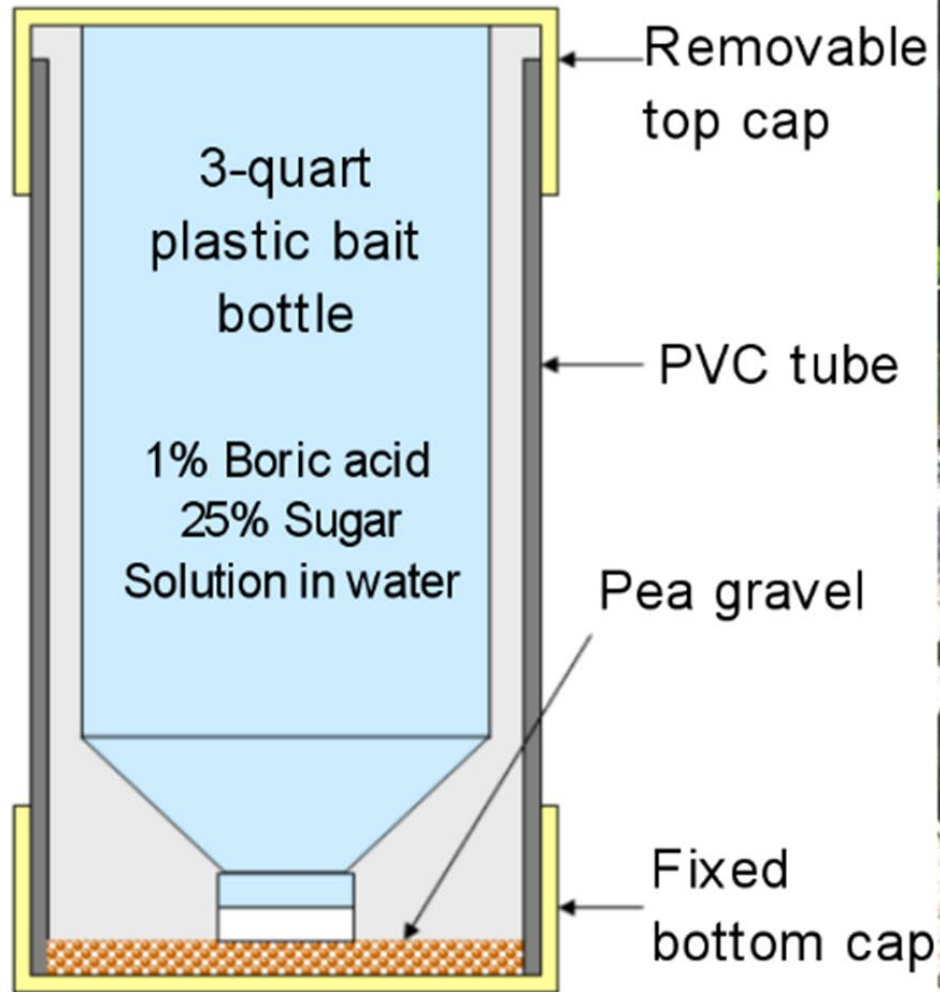
# Why area-wide ant control?

- Sugar feeding ants known to interfere with biocontrol of many hemipteran plant pests [https://biocontrol.ucr.edu/asian\\_citrus\\_psyllid.html#ten](https://biocontrol.ucr.edu/asian_citrus_psyllid.html#ten)
- With Argentine ant removal, biocontrol of ACP increased by 80-99% (Kistner et al. 2016, Schall and Hoddle 2019)
- *Tamarixia* and native natural enemies are widely established across S. Calif. Ant control may be more effective than continuing to release natural enemies



(Photos: Mike Lewis, Center of Invasive Species Research, UC Riverside).

Ant bait treatment: boric acid-sugar, 1/10 trees  $\Rightarrow$  1/5 trees, adding boric acid in hydrogel to some properties this spring



# Outreach developed with Riverside County, Hemet Pest Control District, CDFA & NST.

## Help Save Hemet's Citrus Trees



In cooperation with the University of California and the United States Department of Agriculture, the Hemet Citrus Pest Control District is developing a tool box of options to control a dangerous insect called the Asian citrus psyllid (ACP) – and we need your help.

ACP spreads a devastating citrus disease called Huanglongbing, or HLB. HLB kills all citrus trees it infects, and while it hasn't been found in Hemet yet, the disease is spreading in Los Angeles, Orange and western parts of Riverside counties. The Hemet Citrus Pest Control District and local citrus growers are making an area-wide effort to control the ACP and evaluating various methods of pest control in residential citrus trees.

You can help by:

- Allowing crews from the California Department of Food and Agriculture to inspect and treat your citrus trees. This is the most effective method for lowering ACP populations.
- Notifying the pest control district of your interest in having beneficial insects released on your property. Beneficial insects provide a natural way to control citrus pests – like ACP – as well as other garden pests, through a tactic known as biological control. These small, beneficial insects only feed on other insects and are not a nuisance to people or pets.
  - If interested, our project crew will need to have access to your property during weekdays to monitor for pests on your citrus trees, release beneficial insects, set up an ant control station and hang one yellow panel trap used to catch insects on your citrus trees. On average, one or two project people will be on your property once a week throughout the year.
  - Email [hemetarewideacpproject@gmail.com](mailto:hemetarewideacpproject@gmail.com) if you are interested in having beneficial insects and control for ants on your property.

### BESIDES HELPING TO PROTECT HEMET'S CITRUS TREES, THE BENEFITS WILL INCLUDE:

**1) Control of ants on your property. Some areas will be provided with a white plastic pipe ant control station which will help control Argentine ants (or kitchen ants) that are often a nuisance in gardens and homes. These ants actually protect several pests, like ACP, from beneficial insects. One station will be secured to one citrus tree at about 5 feet above the ground out of reach of kids or pets.**

**2) A chance to observe science at work in your own garden and to learn about the natural history of pests and the beneficial species that eat them.**

**For more information:  
Irene Washburn Davidson  
Washburn & Sons, Inc. PCO# 30116  
807 Center Street  
Riverside, CA 92507  
Office(951)683-2392  
Fax(951)683-8424**

## AYUDA A SALVAR LOS CÍTRICOS DE HEMET



En cooperación con la Universidad de California y el Departamento de Agricultura de los Estados Unidos, el Distrito de Control de Plagas de Cítricos de Hemet está desarrollando opciones para controlar un insecto peligroso llamado el psílido asiático de los cítricos (ACP) y necesitamos su ayuda.

ACP propaga una enfermedad cítrica devastadora llamada Huanglongbing, o HLB. HLB mata todos los árboles cítricos que infecta, y aunque todavía no se ha encontrado en Hemet, la enfermedad se está extendiendo en Los Ángeles, Orange y partes de los condados de Riverside. El Distrito de Control de Plagas de Cítricos de Hemet y los cultivadores locales de cítricos están haciendo un esfuerzo en toda el área para controlar el ACP y están evaluando varios métodos de control de plagas en cítricos residenciales.

Usted puede ayudar:

- Permitir que las cuadrillas del Departamento de Alimentos y Agricultura de California inspeccionen y traten sus cítricos. Este es el método más efectivo para reducir las poblaciones de ACP.
- Notificar al distrito de control de plagas de su interés en que se liberen insectos beneficiosos en su propiedad. Los insectos beneficiosos proporcionan una forma natural de controlar las plagas de los cítricos, como ACP, así como otras plagas de jardín, a través de una táctica conocida como control biológico. Estos pequeños insectos beneficiosos solo se alimentan de otros insectos y no son una molestia para las personas o las mascotas.
  - Si está interesado, nuestro equipo del proyecto deberá tener acceso a su propiedad durante los días de semana para monitorear las plagas en sus árboles de cítricos, liberar insectos beneficiosos, establecer una estación de control de hormigas y colgar una trampa de panel amarilla utilizada para atrapar insectos en sus árboles de cítricos. En promedio, una o dos personas del proyecto estarán en su propiedad una vez por semana durante todo el año.
  - Envíe un correo electrónico a [hemetarewideacpproject@gmail.com](mailto:hemetarewideacpproject@gmail.com) si está interesado en tener insectos beneficiosos y controlar las hormigas en su propiedad.

### ADEMÁS DE AYUDAR A PROTEGER LOS CÍTRICOS DE HEMET, LOS BENEFICIOSOS INCLUIRÁN:

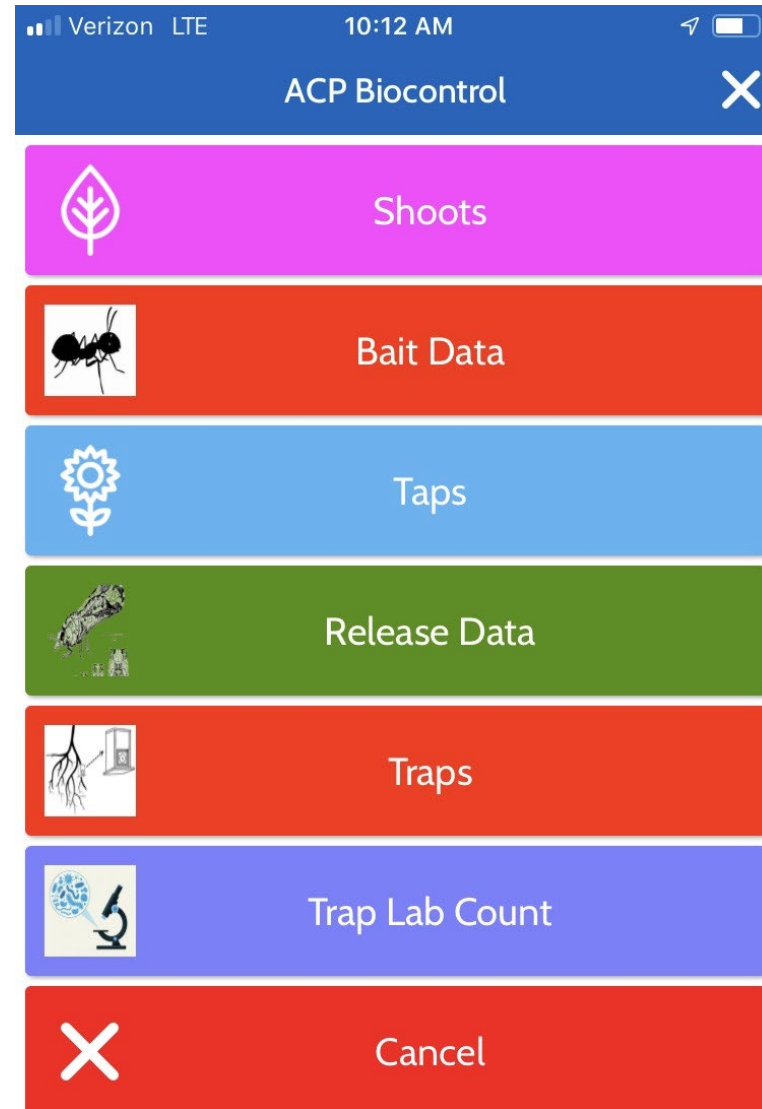
**1) Control de hormigas en su propiedad. Algunas áreas contarán con una estación de control de hormigas de tubo de plástico blanco que ayudará a controlar las hormigas argentinas (hormigas de la cocina) que a menudo son una molestia en jardines y hogares. Estas hormigas en realidad protegen varias plagas, como ACP, de los insectos beneficiosos. Una estación se asegurará a un árbol de cítricos a unos 5 pies del suelo fuera del alcance de los niños o las mascotas.**

**2) Una oportunidad de observar la ciencia en el trabajo en su propio jardín y aprender sobre la historia natural de las plagas y las especies beneficiosas que las comen.**

**Para más información:  
Irene Washburn Davidson  
Washburn & Sons, Inc. PCO# 30116  
807 Center St. Riverside, CA. 92507  
Office(951)683-2392  
Fax(951)683-8424**

# Pilot to test APP- based tech to gather data for ACP biocontrol (AG-Data Management Company)

- Collect and enter data with GIS location
- Save time with data entry, increase accuracy scan trees with QR Codes
- Output maps and CSV Data files
- Manage remotely
- Manage sampling quality





# Data collection and activities

- July-August, contacted ~300 homes with citrus, enrolled ~166 homes
- Releases of 20 of each predator and 25 *Tamarixia*/tree/property/2 wk.
- Placement of ant bait stations @ 1/10 trees, Jan 2020 @ 1/5 trees
- Monthly yellow sticky traps @ 1/10 trees to monitor ACP, predators, *Tamarixia*
- Monthly “tap samples” @ 1 tree/5 trees to count ACP, predators, ants
- Monthly shoot samples collected to count ACP nymphs & eggs, assess parasitism @ ~ 2 shoots/tree
- Monthly flush status determination @ 1/10 trees

# Area-wide ACP control demonstration in urban buffer next to commercial citrus

## “2 x 3 factorial experiment”

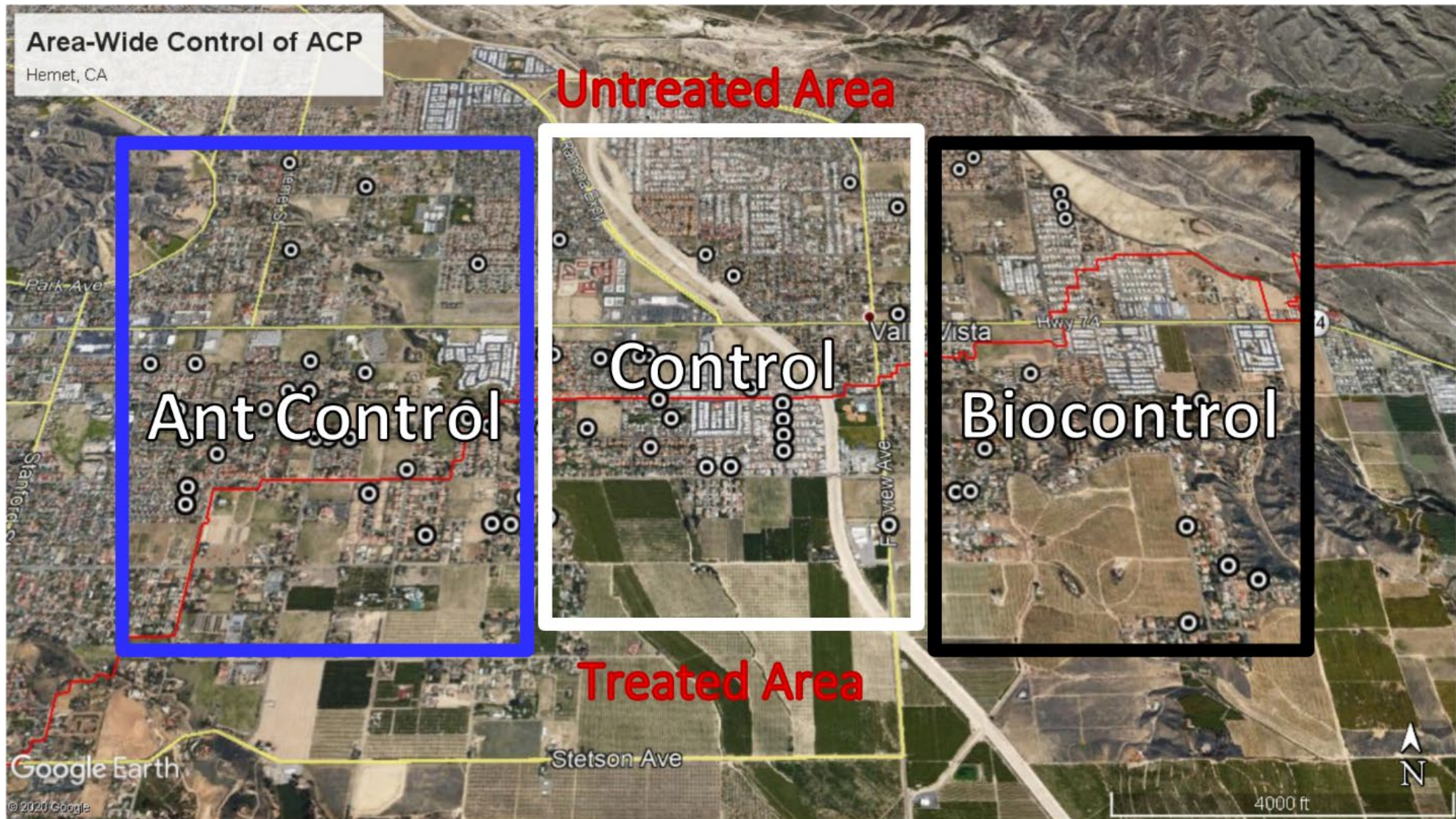
Treatment	Pesticide buffer	No Pesticide outside buffer
All BC	X	X
Ant Control	X	X
No Treatment	X	X
Yr. 2 All BC plus AC ?	?	?

166 homes enrolled, final count ~ 60 properties per treatment

Applications Tempo<sup>®</sup> SC Ultra (beta-cyfluthrin) 2x/yr winter-spring & fall and Merit<sup>®</sup> 2F (imidacloprid) 1x/spring, last treatments in January 2019

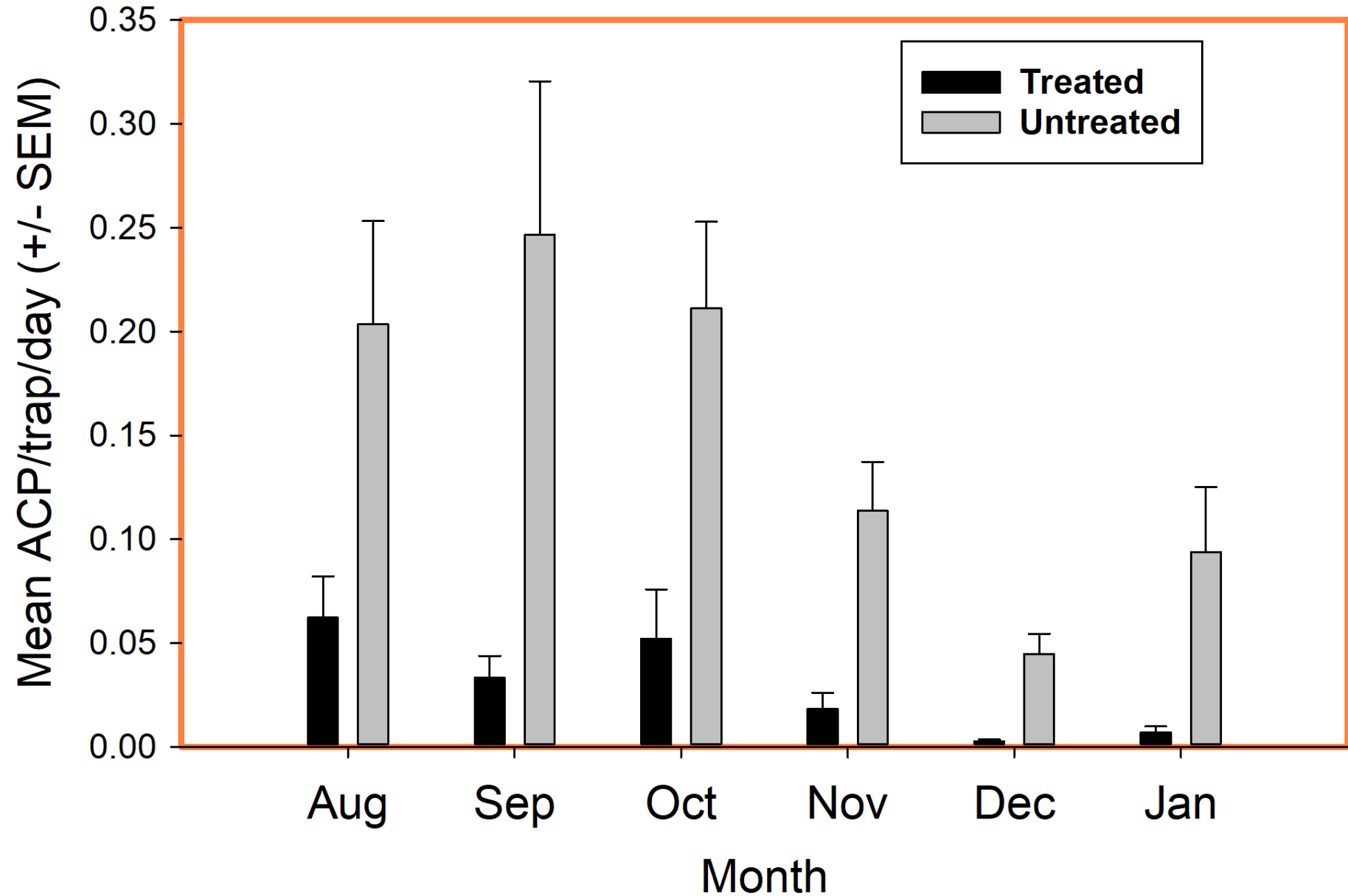
## Number of residences enrolled in trial with % citrus hosts

Properties	N	% Total with Citrus	Pesticide Zone	
			IN	OUT
Total properties	1107	N/A	535	571
Properties with Citrus	560	100%	269	292
Agreed to participate	166	30%	92	74
Not participating	394	70%	95	97
<b>Citrus hosts</b>				
Total hosts	1555	N/A	997	558
# Hosts on participating properties	712	46%	514	208

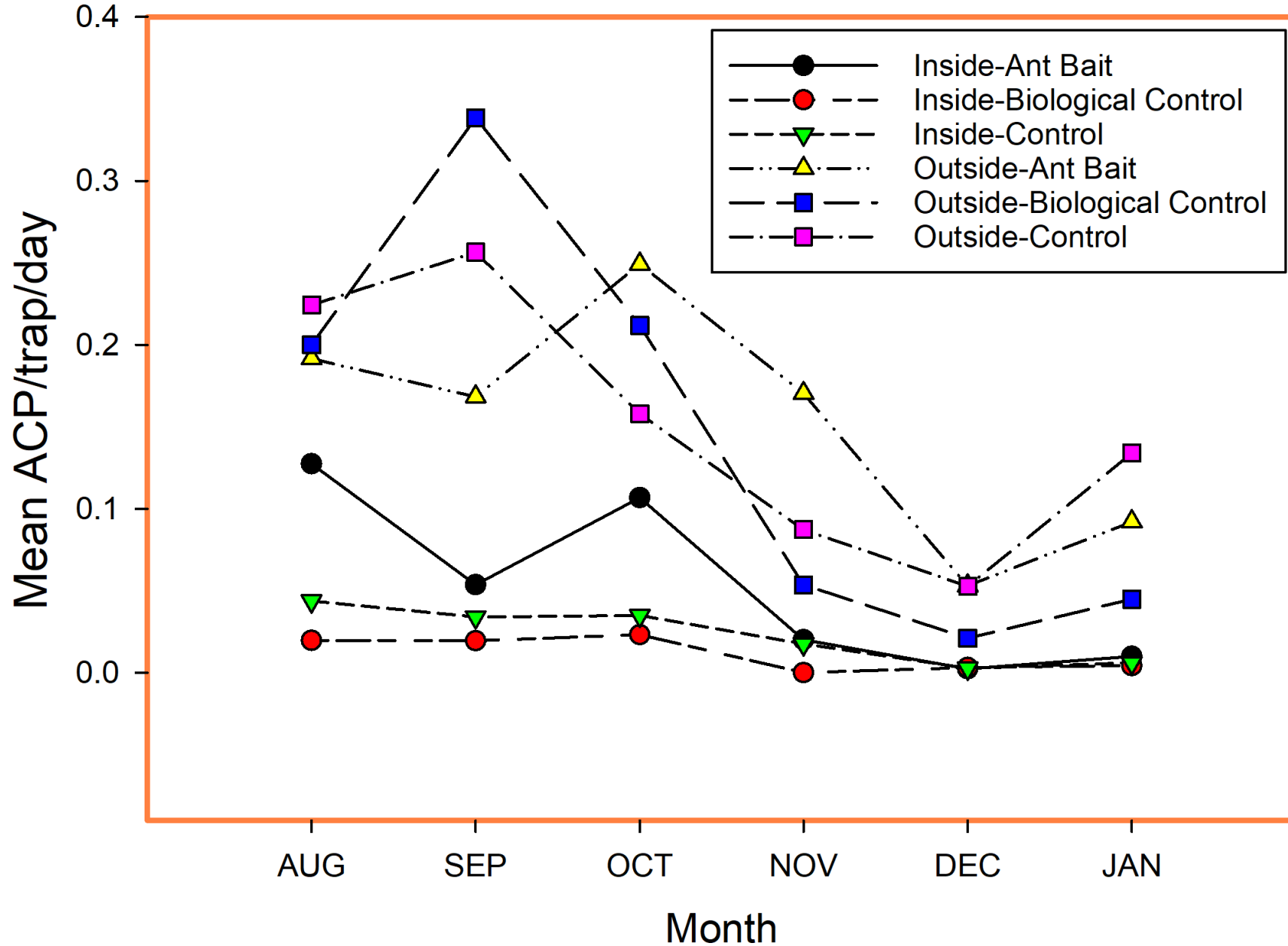


Demonstration trial design, red line is CDFA buffer treatment line dividing project areas into area-wide pesticide treatment and untreated areas

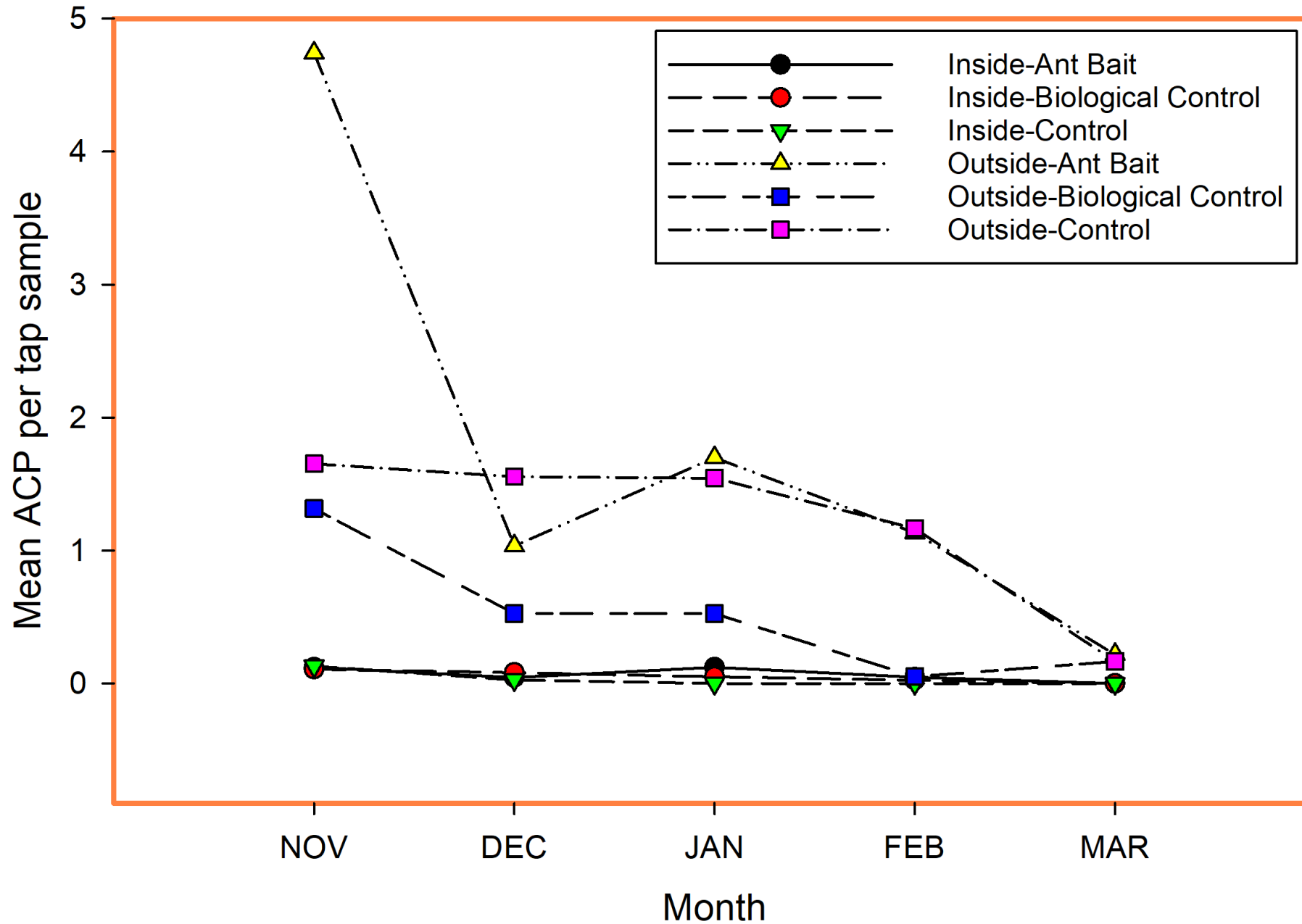
# ACP sticky trap captures-Treated vs Untreated zones



Yellow sticky trap captures-All treatments and zones



# ACP tap samples - All treatments and zones



# Preliminary Conclusions

- Program in operation since September 2019, ~ 18 months to go.
- Striking difference in ACP populations between inner & outer buffer pesticide treatment areas
- Differences very likely due to the effectiveness of Hemet Citrus Pest Control district area-wide control program in commercial citrus and the buffer treatment program by CDFR and the District
- Too soon to see an effect of biocontrol releases and area-wide ant control but there is a trend of reduced ACP in biocontrol treatment areas.
- Large scale demonstrations are challenging to replicate, and standard methods to infer significance are not applicable. However, the large scale of the treatment area and large sample sizes can allow inference of meaningful impacts from the treatments.
- Plans to compare this buffer area with other buffer treatment and biocontrol released areas in S. California to allow more robust assessment of the impacts of the area-wide treatments





# Data Analysis and Tactical Operations Center (DATOC)

## *Residential Activities Analysis Delimitation Zone follow-up*

*Joint Science & Operations Subcommittee Meeting  
May 6, 2020*

Holly Deniston-Sheets

# Analysis of Residential Control Measures

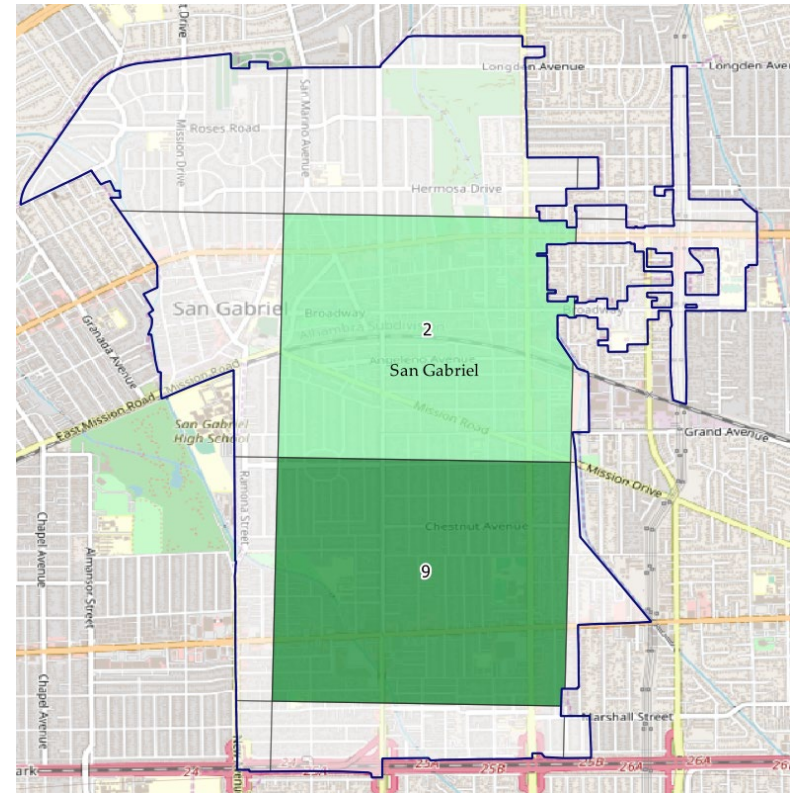
## Agent-Based Model

### Model includes:

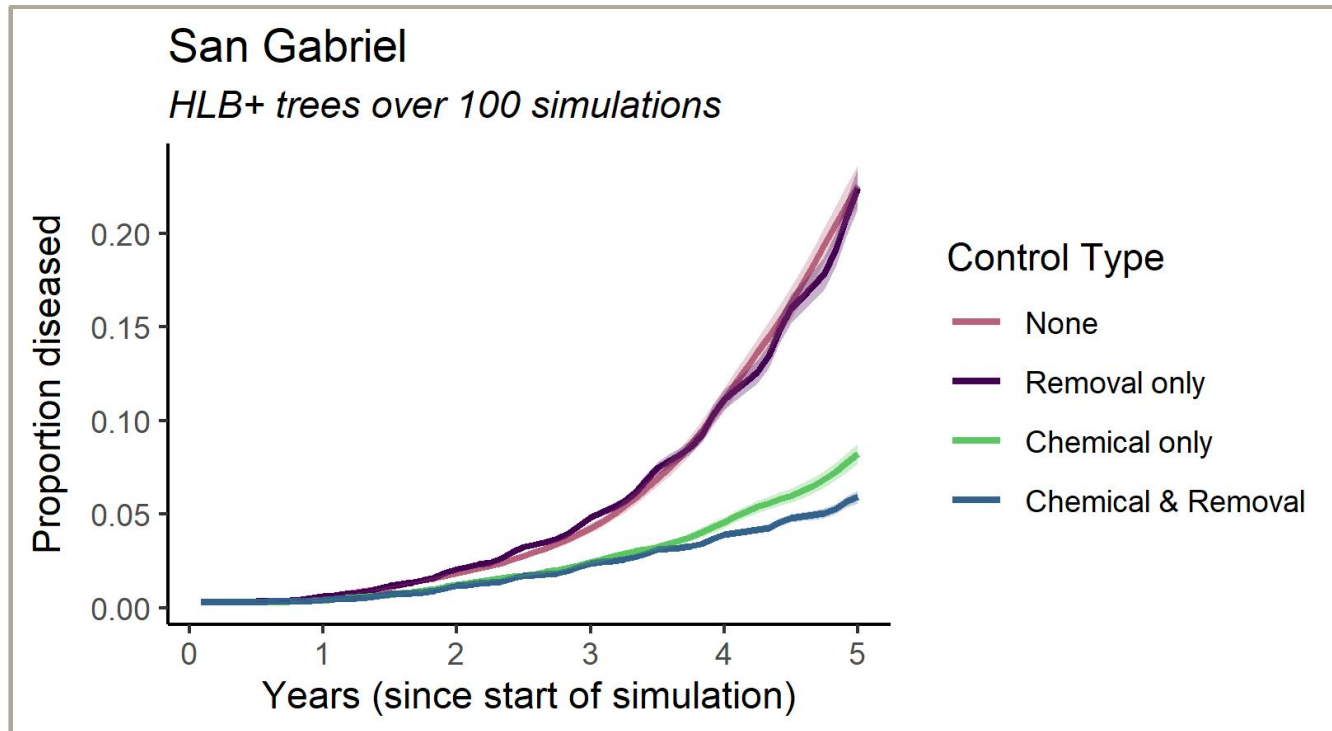
- Weather (NOAA)
- ACP biology (lifespan, reproductive rate, dispersal distance, etc)
- Flush pattern
- Many additional parameters

### Starting conditions: end of 2015

- Citrus tree numbers & variety/property
- HLB+ trees
- ACP probability (interpolated from historical data)

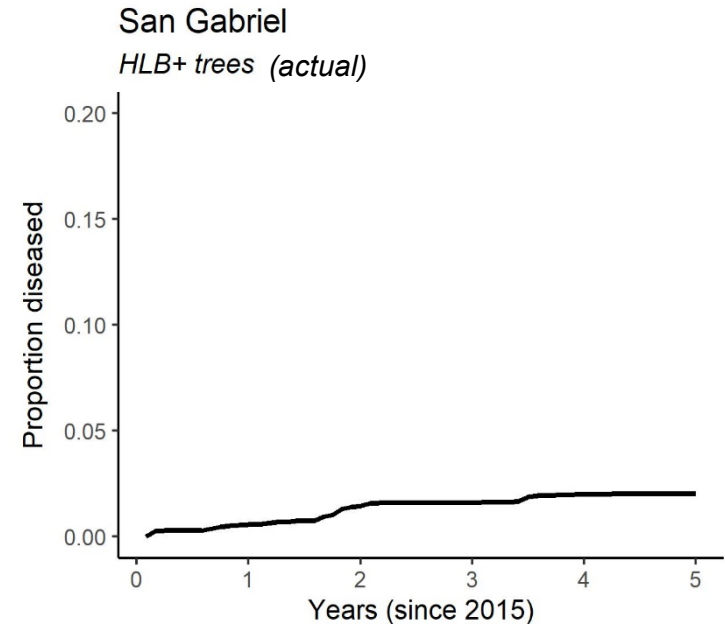
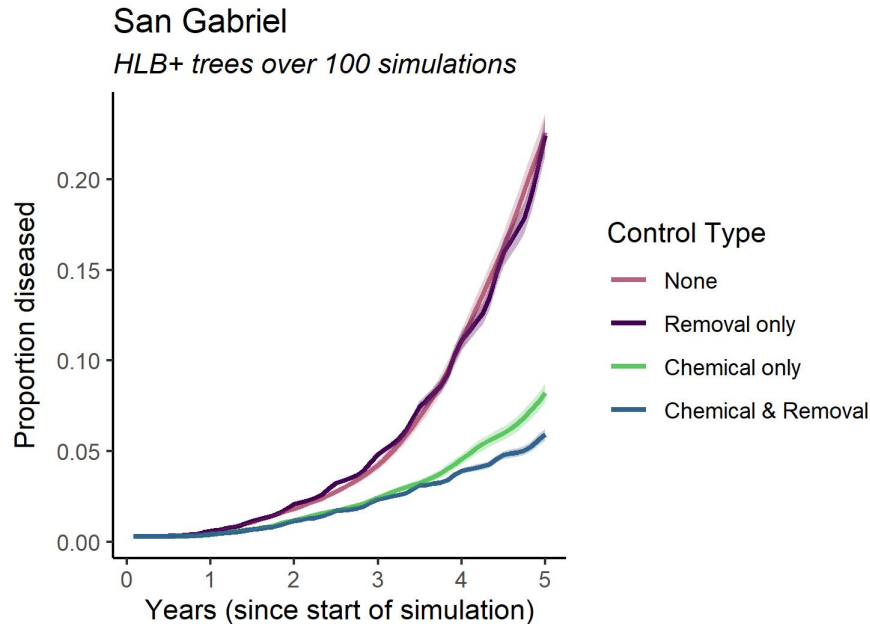


# Residential Control Measures - Results



- Tree removal alone is unlikely to significantly limit disease spread compared to implementing no control
- Vector suppression via repeated insecticide applications is a vital aspect of disease control
- Vector suppression + tree removal interact synergistically over time

# Residential Control Measures - Results



- Tree removal alone is unlikely to significantly limit disease spread compared to implementing no control
- Vector suppression via repeated insecticide applications is a vital aspect of disease control
- Vector suppression + tree removal interact synergistically over time

# Residential Control Measures - Results

Control Type	Trees diseased after 5 years (%)
Chemical & Removal	5.9%
Chemical only	8.2%
Removal only	22.4%
None	22.6%

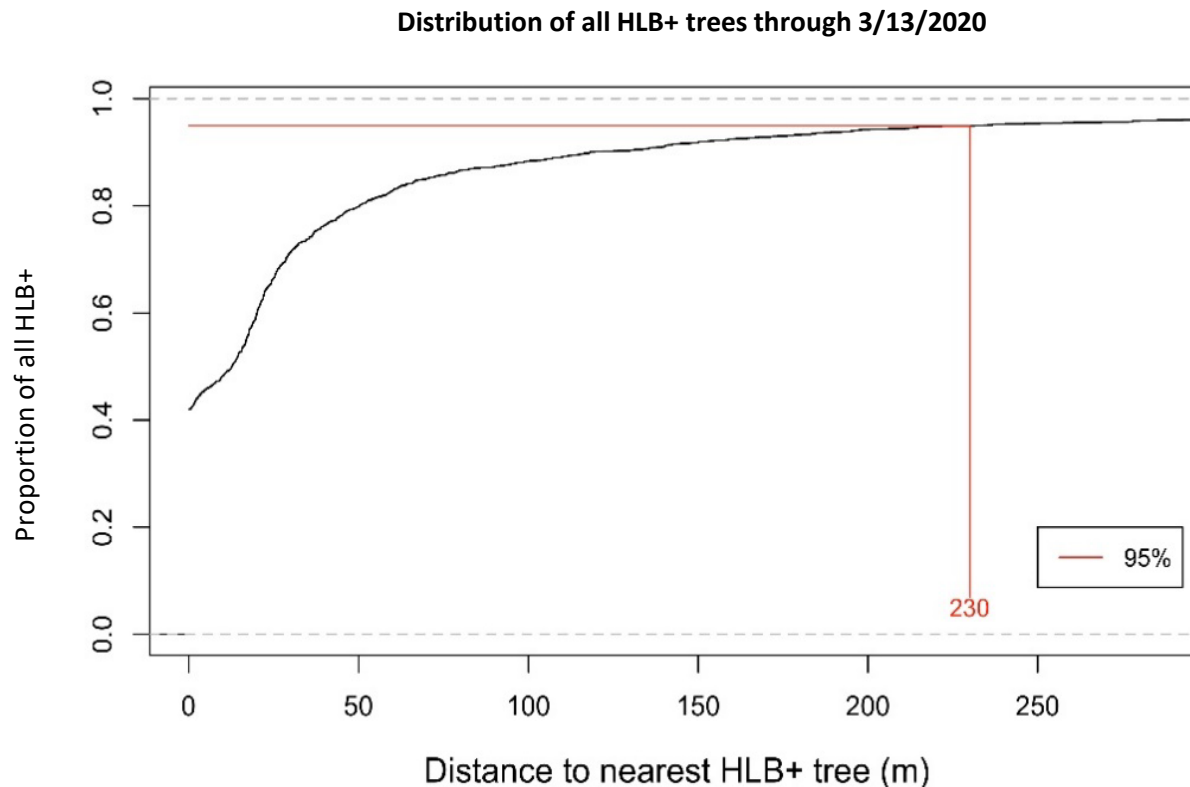
Type of control measure	% Reduction compared to no control
Chemical & Removal	16.6%
Chemical only	14.3%
Removal only	0.2%

Sum = 14.5%

<b>Synergistic effect of chemical &amp; removal</b>	<b>2.1%</b>
---	-------------

# Delimitation Follow-up: Review

- 95% of all HLB+ trees are within 230 m of another HLB+ tree (~760 ft), but randomizing the detection order and analyzing a subset produced an average of 243 m
- Recommendation: Reduce survey radius from 400 m to 300 m



# Delimitation Follow-up: ACP Samples

From 2012 – April 2019				
	Clas+ ACP	% all positives	Clas+ ACP missed*	
			<i>Compared with 400 m</i>	<i>Compared with 300 m</i>
Total	298	100.0%	-	-
800 m from HLB	278	93.3%	-	-
400 m from HLB	266	89.3%	-	-
350 m from HLB	263	88.3%	3 (1.1%)	-
300 m from HLB	262	87.9%	4 (1.5%)	-
270 m from HLB	260	87.2%	6 (2.3%)	2 (0.8%)
250 m from HLB	258	86.6%	8 (3.0%)	4 (1.6%)

*\*Assuming all Clas+ ACP found within 400 m of an HLB+ tree are from delimitation sampling, so likely an overestimate*

# Delimitation Follow-up: Cost

- Total cost is estimated by cost of survey (all properties), treatment, sampling and testing (60% of properties)
- Savings are calculated on activities occurring in the delimitation zone once

	<b>Average savings* compared with zone size:</b>			
<b>Size of Zone</b>	<b>400</b>	<b>350</b>	<b>300</b>	<b>270</b>
<b>350</b>	\$ 11,240	-	-	-
<b>300</b>	\$ 20,980	\$ 9,740	-	-
<b>270</b>	\$ 26,100	\$ 14,870	\$ 5,120	-
<b>250</b>	\$ 29,220	\$ 17,980	\$ 8,240	\$ 3,120

*\*Rounded to the nearest \$10*



Avg. number of properties in Delimitation Area		Avg. properties in zone with hosts (60% total)
400 m	317	190
350 m	242	145
300 m	178	107
270 m	144	87
250 m	124	74

	Per property	Per 400 m delim zone*	Per 350 m delim zone*	Per 300 m delim zone*	Per 270 m delim zone*	Per 250 m delim zone*
Survey	\$ 22.54	\$ 7,140	\$ 5,460	\$ 4,020	\$ 3,250	\$ 2,790
Treat - CDFA staff	\$ 69.58	\$ 13,220	\$ 10,120	\$ 7,440	\$ 6,020	\$ 5,160
Treat - CDFA staff & Tru Green	\$ 184.10	\$ 34,980	\$ 26,780	\$ 19,670	\$ 15,940	\$ 13,660
Testing samples	\$ 88.00	\$ 16,720	\$ 12,800	\$ 9,400	\$ 7,620	\$ 6,530
Sum – CDFA	\$ 180.12	\$ 37,080	\$ 28,390	\$ 20,860	\$ 16,890	\$ 14,480
Sum - Tru Green	\$ 294.64	\$ 58,830	\$ 45,040	\$ 33,090	\$ 26,970	\$ 22,980
<b>Avg Sum</b>	<b>\$ 237</b>	<b>\$ 47,950</b>	<b>\$ 36,720</b>	<b>\$ 26,970</b>	<b>\$ 21,850</b>	<b>\$ 18,730</b>

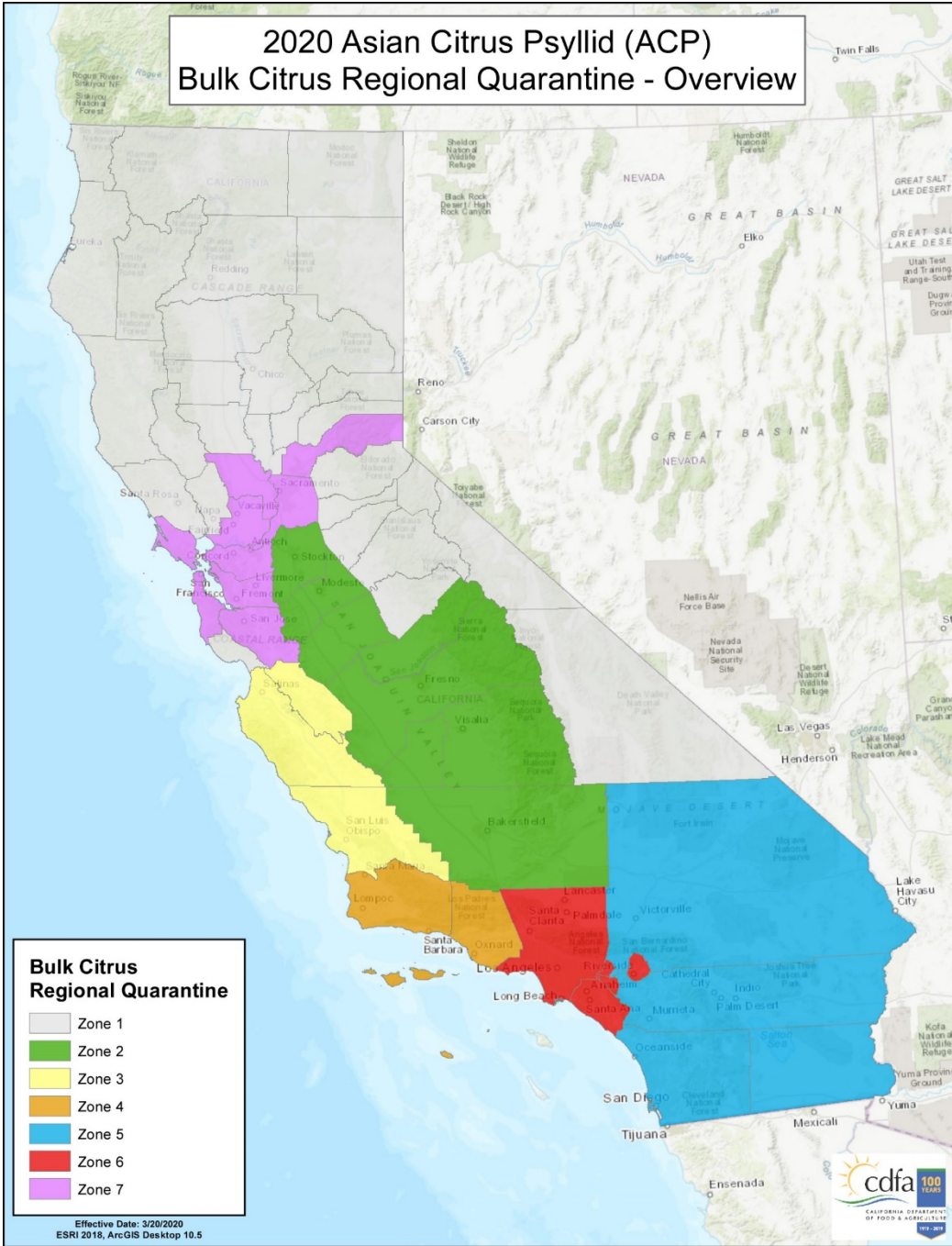
*\*rounded to the nearest \$10*

**Bulk Citrus Movement** between zones requires a mitigation to make sure there are no psyllids riding on the fruit.

- 1. Wash fruit
- 2. Mechanically clean
- 3. Spray the orchard before harvest with pyrethroid or neonicotinoid (no organics)
- 4. Fumigate (2021) ethyl formate (not organic)



**Washing or TWO** mitigations are required for shipping out of zone 6 where HLB has been found



5. **Pre-harvest application of product applied within 14 days prior to harvest.** A list of products and use rates recommended by the University of California, Integrated Pest Management Program (UC IPM), and agreed upon by CDFA are provided below.

<p>It is incumbent upon the user to follow all label directions when using any of the products listed below.                      Reference the California Department of Pesticide Regulation to obtain product and label information: <a href="http://www.cdpr.ca.gov">www.cdpr.ca.gov</a></p> <p>When applying by ground, use 100-200 gallons per acre (gpa) water volume for mature trees.                      Adjust water volume for young trees as necessary. When applying by air, use 5-25 gpa water volume depending upon pesticide used.</p> <p>Products listed below are subject to change.</p>									
Product	EPA No.	Active Ingredient	Treatment Method	Rate per Acre	Rate of Active Ingredient	PHI	REI	Maximum Amount per Crop Season	Minimum Application Volume by Air
Actara	100-938	25% thiamethoxam	foliar	4.0 - 5.5 fl oz	0.063 - 0.086 lb ai thiamethoxam	0 day	12h	11 oz maximum per season	5 gpa
Admire Pro <sup>2,3,4</sup>	264-827	4.6 lb ai/gal imidacloprid	foliar	7 fl oz	0.25 lb ai per acre	0 day	12h	14 oz	25 gpa
Baythroid XL	264-840	1 lb ai/gal beta-cyfluthrin	foliar	3.2 - 6.4 fl oz	0.025 - 0.050 lb ai beta cyfluthrin	0 day	12h	6.4 fl oz of cyfluthrin or beta-cyfluthrin	25 gpa
Danitol 2.4 EC Spray	59639-35	2.4 lb ai/gal fenpropathrin	foliar	16 - 21.3 fl oz	0.3 - 0.4 lb ai fenpropathrin	1 day	24h	21.3 oz	5 gpa
Lannate LV <sup>1</sup>	352-284	methomyl	foliar	1.5 - 3 pints	0.45 - 0.9 lb ai methomyl	1 day	72h	9 pints, 4 appl. per season	15 gpa
Lannate SP*	352-342	methomyl	foliar	0.5 - 1.0 lb	0.45 - 0.9 lb ai methomyl	1 day	72h	3 pints, 4 appl. per season	15 gpa
Leverage 360	264-1104	1 lb ai/gal beta-cyfluthrin + 2 lb ai/gal imidacloprid	foliar	3.2 - 6.4 fl oz	0.025 - 0.50 lb ai beta-cyfluthrin + 0.05 - 0.1 lb ai imidacloprid	0 day	12h	6.4 fl oz of cyfluthrin or beta-cyfluthrin	25 gpa
Mustang	279-3126	17.1% by weight zeta cypermethrin	foliar	4.3 oz	0.05 lb ai zeta cypermethrin	1 day	12h	17.2 fl oz appl. 14 days apart	10 gpa
Tombstone	34704-912	2 lb ai/gal cyfluthrin	foliar	3.2 - 6.4 fl oz	0.10 lb ai cyfluthrin	0 day	12h	6.4 fl oz of cyfluthrin or beta-cyfluthrin	25 gpa
Tombstone Helios	34704-978	2 lb ai/gal cyfluthrin	foliar	3.2 - 6.4 fl oz	0.10 lb ai cyfluthrin	0 day	12h	6.4 fl oz of cyfluthrin or beta-cyfluthrin	25 gpa

<sup>1</sup>Product to be used during citrus bloom.

<sup>2</sup>Do not use if a soil imidacloprid treatment has been applied to the orchard in the same season.

<sup>3</sup>Any 4F formulation of imidacloprid may be used at a rate of 8 oz

<sup>4</sup>Any 4.6F formulation of imidacloprid may be used at a rate of 7 oz

DISCLAIMER – The 14-day treatment interval and all pesticides listed in the above table are solely the recommendations of the University of California. The California Department of Food and Agriculture bears no responsibility for the efficacy of these recommendations.

If you have any questions, please contact Victoria Hornbaker at [Victoria.Hornbaker@cdfa.ca.gov](mailto:Victoria.Hornbaker@cdfa.ca.gov).

**Neonicotinoids**  
**Actara**  
**Admire foliar**  
**Pyrethroids**  
**Danitol**  
**Mustang**  
**Tombstone**  
**Combinations**  
**Leverage**  
**Carbamate**  
**Lannate**

Propose to replace Lannate with Sivanto and Fujimite (bee safe)

## Residual toxicity of pesticides for adult ACP

	4+ weeks	2-4 weeks	< 2 weeks
Broad spectrum (potential upsets of scales or mites)	<ul style="list-style-type: none"> <li>• Baythroid, Danitol, Tombstone</li> <li>• Actara</li> <li>• Agri-Flex</li> <li>• Leverage</li> <li>• Admire Pro</li> <li>• PLatinum</li> </ul>	<ul style="list-style-type: none"> <li>• Mustang</li> <li>• Organophosphate</li> <li>• Carbamate</li> <li>• Platinum</li> <li>• Sivanto*</li> </ul>	
Selective – soft on natural enemies		<ul style="list-style-type: none"> <li>• Delegate</li> <li>• Exirel, Verimark</li> <li>• Fujimite*</li> <li>• Movento</li> <li>• Surround</li> <li>• Beleaf</li> </ul>	<ul style="list-style-type: none"> <li>Abamectin</li> <li>Micromite</li> <li>Pyganic</li> <li>Success/Entrust</li> <li>Oil</li> </ul>

UC IPM Guidelines for Citrus

### Why is residual toxicity so important?

- Eggs and nymphs are hard to reach with insecticides
- Adults fly in from untreated areas
- It's a numbers game: high populations nothing works, low populations everything works

\*Bee safe, active on adult ACP



Table 2. Duration and magnitude of reduction of *Diaphorina citri* adults on orange trees treated with foliar sprays of insecticides in Florida.

Product <sup>a</sup>	Active ingredient	Rates tested (oz/acre)	Duration of adult reduction (days) <sup>d</sup>				Magnitude of reduction (%) <sup>d</sup>				Reference <sup>f</sup>			
			Low	High	Low	High	Mean	± SEM	Rank <sup>e</sup>	Low		High	Mean	± SEM
Exirel	cyantraniliprole	1(1)	16	16	60	60	60	0	1	80	80	80	0	[56]
Apta 15 SC	tolfenpyrad	8(8)	11	24	17	68	57	6	2	77	99	90	3	[34, 35, 55]
VoliarFlexi	chlorantraniliprole + thiamethoxam	4(3)	5	7.5	24	67	46	12	3	82	100	90	4	[45, 56, 60]
Sivanto 200 SL	flupyradifurone	18(10)	6.8	14	19	52	37	3	4	47	90	73	3	[37, 38, 56, 61, 62]
Actara 25 WG	thiamethoxam	10(4)	2.8	5.5	24	60	36	4	5	58	100	84	5	[39, 43, 44, 45, 56]
Warrior II	lamda-cyhalothrin	3(0)	1.4	5.8	31	42	35	4	6	88	97	92	3	[39, 40]
Baythroid XL	beta-cyfluthrin	3(0)	3	3	18	51	35	10	7	62	87	79	9	[41, 42, 62]
Supracide 2 E	methidathion	1(0)	32	32	33	33	33	0	8	91	91	91	0	[46]
Danitol 2.4 EC	fenpropathrin	8(5)	16	21.3	7	60	33	6	9	68	100	90	4	[38, 39, 40, 45, 46, 47, 48, 56]
Portal	fenpyroximate	10(7)	24	64	17	58	33	4	10	59	97	76	5	[34, 43, 45, 49, 55, 57, 61]
Dibrom 8 E	naled	2(1)	16	16	24	42	33	9	11	52	91	71	19	[45, 57]
Closer SC	sulfoxaflor	16(15)	2.9	5.7	12	67	32	4	12	17	93	62	7	[38, 56, 59, 60]
Delegate WG	spinetoram	21(19)	4	6	16	52	32	2	13	66	98	89	2	[37, 38, 43, 48, 49, 50, 58, 59, 63]
Agri-Flex	abamectin + thiamethoxam	5(5)	8.5	8.5	17	53	31	6	14	82	100	92	4	[34, 44, 45, 56, 60]
Dimethoate 4 E	dimethoate	1(0)	16	16	31	31	31	0	15	96	96	96	0	[40]
Agri-Mek 0.15 EC	abamectin <sup>b</sup>	4(4)	4.3	20	24	42	31	4	16	32	87	54	13	[39, 43, 56]
Mustang Max 1.5 EC	zeta-cypermethrin <sup>b</sup>	5(0)	4	4.3	18	44	30	5	17	44	97	75	9	[41, 42, 48, 62]
Lorsban 4 E	chlorpyrifos <sup>b</sup>	8(4)	24	80	24	42	29	3	18	79	100	91	4	[40, 48, 52, 57]
Magus	fenazaquin	7(7)	16	36	26	42	28	4	19	58	98	66	11	[46, 57, 61]
Movento 240 SC	spirotetramat	24(22)	5	16	0	58	26	4	20	0	97	60	6	[34, 36, 37, 38, 41, 42, 44, 49, 51, 62]
Stallion	chlorpyrifos + zeta-cypermethrin	1(1)	11.8	11.8	24	24	24	0	21	100	100	100	0	[52]
Sil-Matrix	potassium silicate	1(0)	128	128	24	24	24	0	22	74	74	74	0	[50]
Admire Pro 4.6 SC	imidacloprid <sup>b</sup>	9(5)	1	7	0	67	22	8	23	0	88	60	9	[36, 37, 43, 51, 53, 56]
Micromite 80 WGS	diflubenzuron	10(9)	3.1	6.3	0	48	20	6	24	0	94	46	9	[34, 36, 39, 43, 49, 54]
Grandevo	<i>Chromobacterium subtsugae</i> <sup>b</sup>	11(10)	24	256	0	28	20	2	25	0	97	64	8	[45, 58, 63]
Imidan 70 W	phosmet	7(0)	8	24	0	33	18	6	26	0	100	51	18	[40, 46, 52]
MBI-206 EP	<i>Burkholderia spp</i>	5(5)	192	384	7	28	18	4	27	48	99	69	9	[45, 58, 63]
435 oil	horticultural mineral oil	11(0)	192	640	0	38	18	4	28	0	76	36	10	[34, 36, 37, 43, 44, 49, 50, 52, 54, 58, 63]
Belt 4 SC	flubendiamide	2(2)	5	7.5	17	17	17	0	29	36	52	44	6	[34]

Table 2. Cont.

Duration

Magnitude

Product <sup>a</sup>	Active ingredient	Rates tested	Duration of adult reduction						Magnitude of reduction				Reference <sup>f</sup>	
			(oz/acre)		(days) <sup>d</sup>				(%) <sup>d</sup>					
		N <sup>c</sup>	Low	High	Low	High	Mean	± SEM	Rank <sup>e</sup>	Low	High	Mean	± SEM	
Fulfill 50 WDG	pymetrozine	1(1)	5.5	5.5	17	17	17	0	30	38	38	38	0	[60]
Entrust SC	spinosad	1(1)	3	3	16	16	16	0	31	86	86	86	0	[63]
MSR 2 E	oxydemeton-methyl	3(0)	24	48	0	24	16	6	32	0	59	33	18	[36, 43]
Sevin XLR	carbaryl	2(0)	48	48	14	17	16	2	33	4	74	39	35	[51, 54]
NoFly WP	<i>Isaria fumosoroseus</i>	2(0)	16	32	16	16	16	0	34	48	53	51	3	[63]
Requiem 25 FC	<i>Chenopodium ambrosioides</i>	12(5)	64	192	0	24	13	3	35	0	76	47	9	[43, 47, 49, 50, 54]
M-pede	potassium salts of fatty acids	2(2)	106	393	0	24	12	12	36	0	97	49	49	[34, 45]
Nexter	pyridaben	5(1)	6.6	10.6	0	24	9	5	37	0	100	43	19	[36, 52, 57]
Vydate L	oxamyl	2(0)	32	64	7	7	7	0	38	71	79	75	4	[47]
Assail 30 SG	acetamiprid	1(0)	7	7	0	0	0	0	39	0	0	0	0	[53]
Aza-Direct	azadirachtin	1(0)	8	8	0	0	0	0	40	0	0	0	0	[46]
Envidor 2 SC	spirodiclofen	1(0)	20	20	0	0	0	0	41	0	0	0	0	[36]
NNI-0101	pyrifluquinazon	1(0)	6.4	6.4	0	0	0	0	42	0	0	0	0	[35]

<sup>a</sup>Not all products are permitted for use on orange, so always follow the label for details on proper use.

<sup>b</sup>More than one formulation or product brand tested.

<sup>c</sup>Number of times product was tested (in parenthesis with adjuvants) in a randomized complete block design using at least 20 trees in four replicates each time.

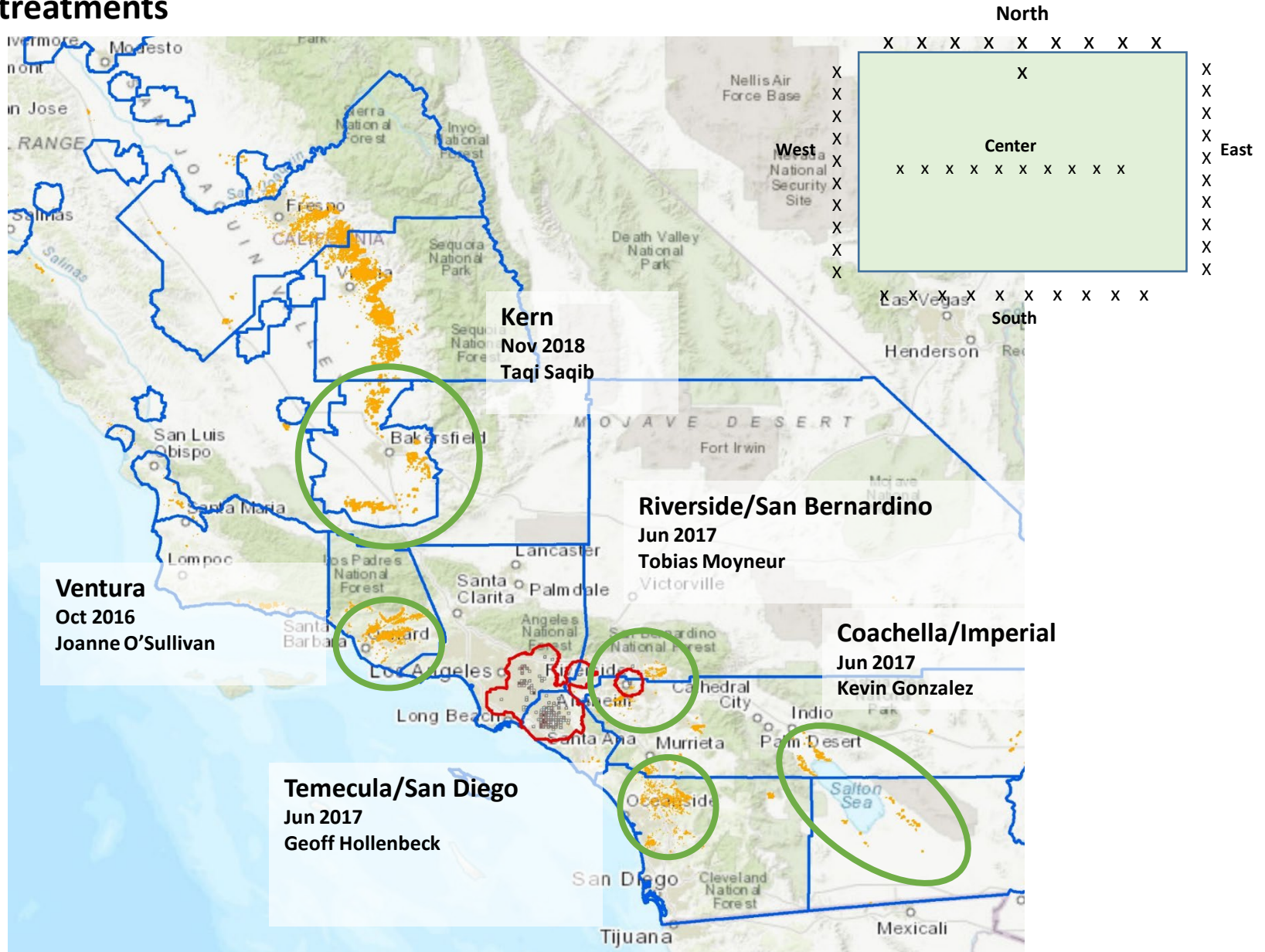
<sup>d</sup>Significantly more reduction compared to untreated control (P<0.05).

<sup>e</sup>Based on mean number of days significantly fewer adults were observed on treated trees compared to untreated trees.

<sup>f</sup>Reference to reports which appeared in non-peer reviewed literature.

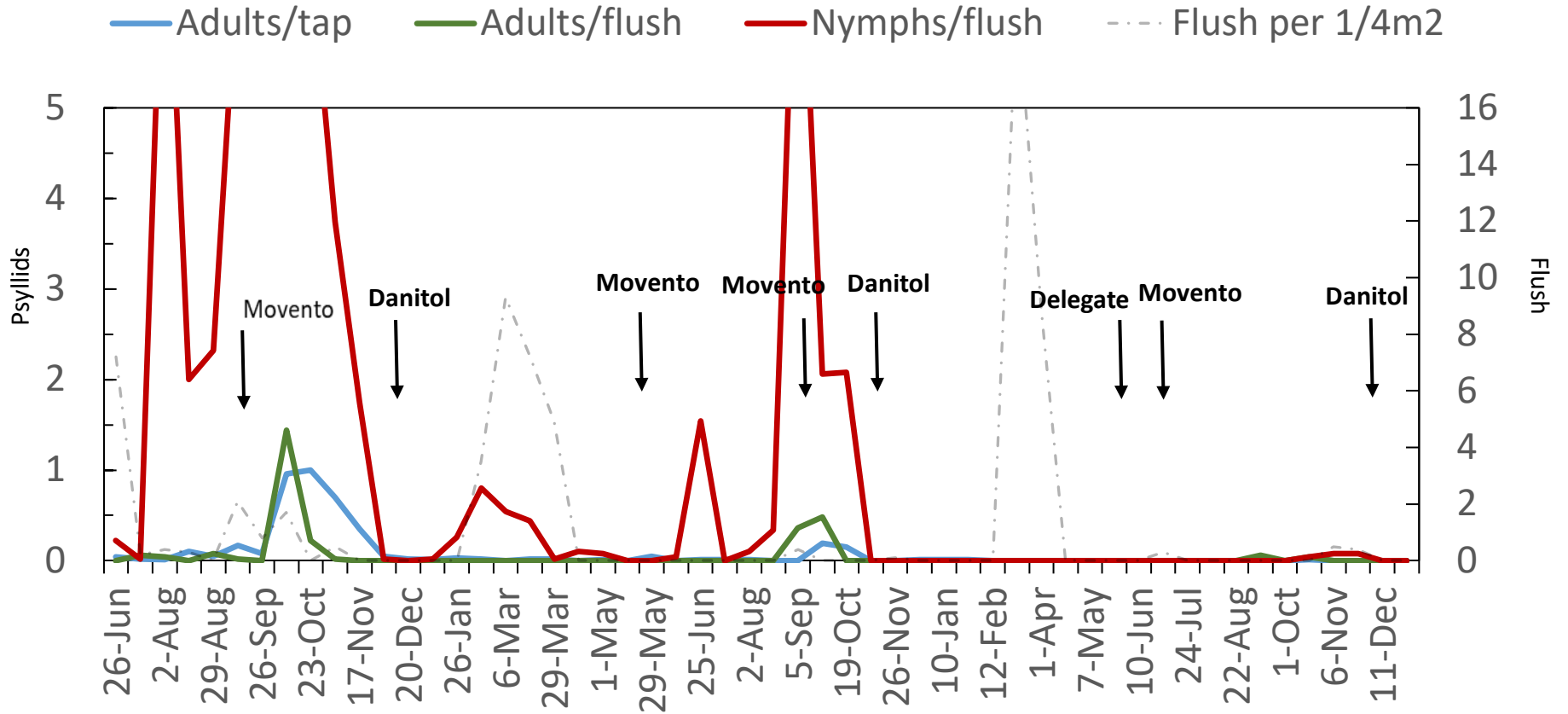
doi:10.1371/journal.pone.0112331.t002

# Federal Grant: 5 Technicians survey 246 commercial orchards to determine the impact of psyllid treatments



Site #15  
SBD-18  
Orange 20 acres  
2017-2018

Danitol is extremely effective in eliminating adults and nymphs for weeks compared to soft insecticides.





Site #48

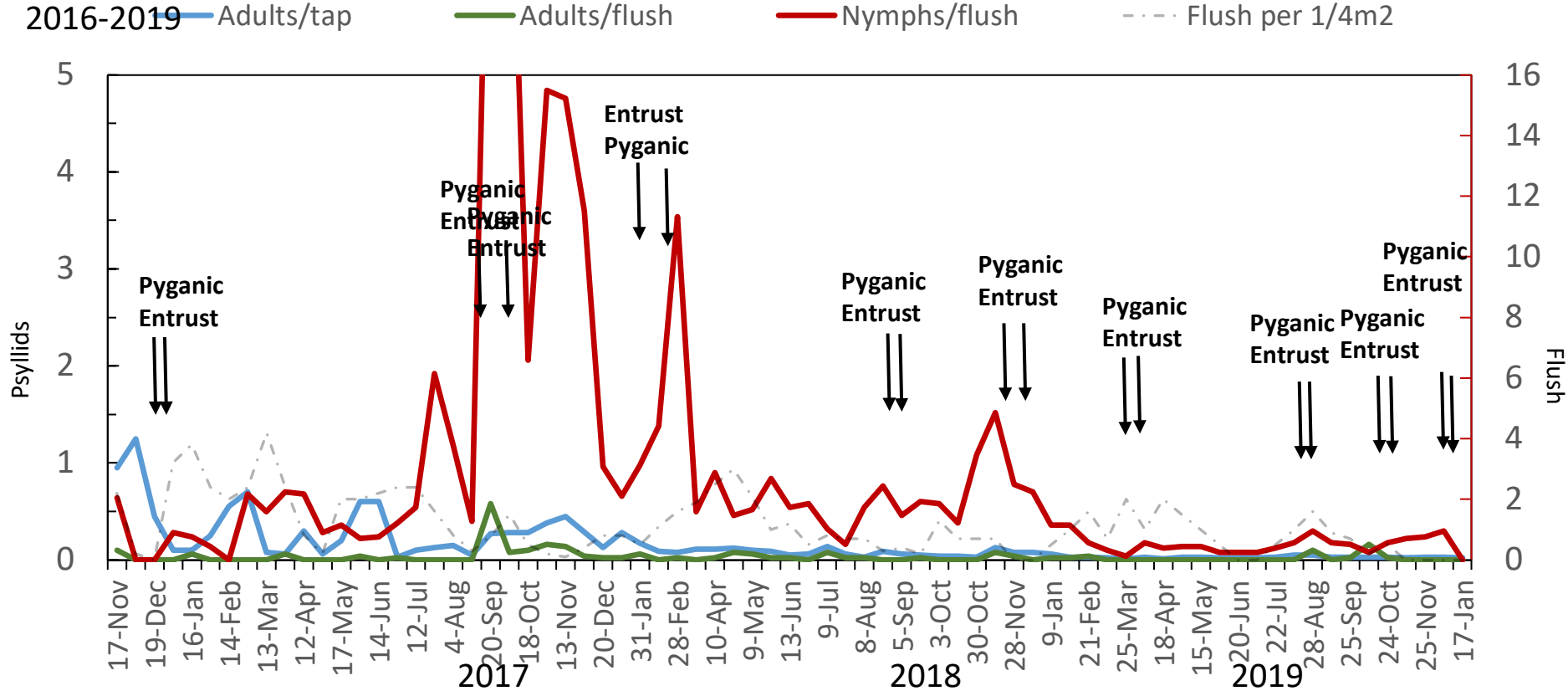
PMA 34

Lemon 50 acres

2016-2019

Organics struggle to reduce nymphs and adults even when two applications are applied fairly close together.

Organic



14-Dec-16 Pyganic 17 oz/acre + 415 Oil .127 gal/acre 50 gpa Air (11 acres treated)  
 23-Dec-16 Entrust 8 oz/acre + 415 Oil .125 gal/acre 50 gpa Air (14 acres treated)  
 10-Aug-17 Pyganic 17 oz/acre + Leaf Life Gavicide .125 gal/acre 50 gpa Air  
 21-Aug-17 Entrust 7 oz/acre + Omni oil .125 gal/acre 462 gpa Grd 1  
 19-Dec-17 Entrust 8 oz/acre + Omni oil 2 pts/acre 50 gpa Air  
 28-Dec-17 Pyganic 17 oz/acre + Omni oil 2 pts/acre 50 gpa Air

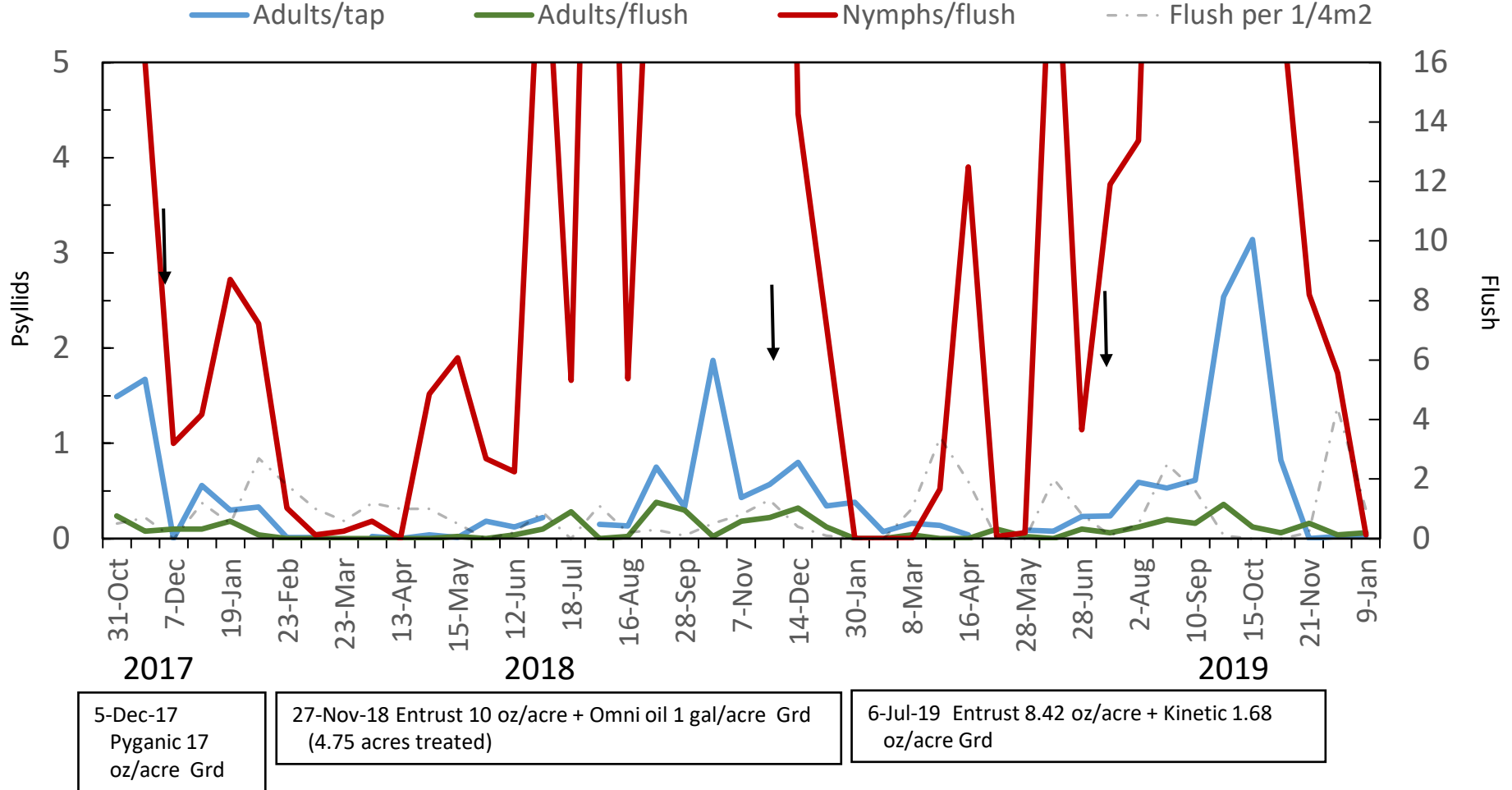
19-Jul-18 Pyganic 17 oz/acre + Omni oil 2 pts/acre Grd  
 27-Jul-18 Entrust 8 oz/acre + Omni oil 2 pts/acre Grd  
 5-Oct-18 Pyganic 17 oz/acre + Omni oil 2 pts/acre Grd  
 16-Oct-18 Entrust 8 oz/acre + Omni oil 2 pts/acre Grd

28-Jan-19 Pyganic 17 oz/acre + Leaf Life Gavicide G 2 pts/acre Air  
 8-Feb-19 Entrust 7.75 oz/acre + Leaf Life Gavicide G 2 pt/acre Air  
 31-Jul-19 Pyganic 15.5 oz/acre + 1.2 gal/acre Air  
**Perimeter**  
 11-Aug-19 Entrust 8 oz/acre + Omni Oil 2 pts/acre Air  
**Perimeter**  
 7-Oct-19 Pyganic 15.5 oz/acre + 2 pt/acre Air  
 17-Oct-19 Entrust 8 oz/acre + 2 pt/acre Air  
 15-Jan-20 Pyganic 15.5 oz/acre + 2 gal/acre Air

Grafton-Cardwell MAC project data

Site #40  
 SBD-13  
 Grapefruit, Lemon, Orange 9.15 Acres  
 2017-2018

Growers that don't treat aggressively still have lots of psyllids.



## **Organic citrus has available for bulk citrus movement:**

Local packing

Wet wash

Mechanical roller/grate system

**Request:** That the CPDPC vote to support the current recommendations with changes from Lannate to Sivanto and Fujimite. A DATOC analysis/white paper is requested at some future date to provide supporting documentation for these decisions.

# Availability of Nursery Stock in the HLB Quarantine

---

CPDPC – OPERATIONS SUBCOMMITTEE MEETING

MAY 6, 2020

# Overview

---

Background

Issues Identification

Proposals and Analysis

Discussion

# Nurseries in the HLB Quarantine

---

When quarantined, nurseries may:

- Build a CDFA-approved structure
  - 2-year hold on plants
  - Inspected every 30 days
  - Testing every 6 months
- Voluntarily destroy nursery stock

\*Currently 7 nurseries with CDFA-approved structure\*

# Issue Identification

---

No mechanism for replenishing nursery stock inventory

- Limited availability of retail nursery stock as HLBQ expands

Large quantity of voluntarily destroyed nursery stock

# Proposal 1: Receive New Plants

---

Must clear 2-year hold

Must sell all original nursery stock

Plants may only be received from an APHIS-approved facility

Nursery must provide 72-hour shipment notification to CDFA

HLB tag must be affixed to each tree upon arrival

Maintain compliance with existing requirements



# Proposal 1: Impact Analysis

---

## IF APPROVED

Increased inventory within HLBQ

Continuity of supply as HLBQ expands

Additional 30-day inspections for staff

## IF NOT APPROVED

No mechanism to replenish inventory

Expansion of HLBQ will limit sale to existing plants

Reduced clientele for production nurseries

# Proposal 1: Discussion

---



# Proposal 2: Plant Outdoor Stock

---

Additional option to holding in a structure or destroying

Demonstrated adequate space on site or on adjacent property

Signed a hold notice for all plant parts except fruit

Sign HLBO grower compliance agreement

# Proposal 2: Impact Analysis

---

## IF APPROVED

Potentially fewer trees destroyed

CDFA staff will conduct inspections to verify status

## IF NOT APPROVED

No change to current practice

# Proposal 2: Discussion

---

Presented by: Keith Okasaki

Email contact: [Keith.Okasaki@cdfa.ca.gov](mailto:Keith.Okasaki@cdfa.ca.gov)

# Statewide GL Coordinator Update for the 5/6/20 Ops/Science Subcommittee Meetings

## Mapping/GIS

The GLs have provided their annual lists of grower/grove operator contacts. Victoria continues to have a working group review the maps and databases to look for gaps and possible duplications. The GLs in the area-wide treatment portion of the State report that they get good cooperation from the CACs on permits and grower locations.

The San Diego and Imperial GL, PCDs and CACs are working with CRB to include those counties in the PMA maps on the citrusinsider.org site.

## AB5

We are still waiting for the final decision on the GL positions how they might be affected by AB5, Gig Worker Law. CDFG legal staff is reviewing the law to see if we, as contractors, meet the exemptions of the law or if a change will be required in the contract or if the positions need to be State employees. The GLs reviewed the law and provided information to help Victoria, David and Legal to find a solution. So, until the final decision, the SD GL will remain unfilled and the Statewide Coordinator contract, which ends June 30, will not be advertised.

## Fresno County Sylvie Robillard

No trap detections for Asian citrus psyllid in 2020. The Citrus Division continues their commodity disease and insect survey in Fresno County and then they will move up to Madera County. Sylvie continues with her normal liaison activities.

## Northern Tulare County – Teri Blaser

As of this date, there are no new finds of ACP on traps or finds of live ACP in Northern Tulare County. There have been no discoveries of abandoned or neglected groves. The County Ag Commissioner has inspectors out doing bee inspections, which may result in finding neglected or abandoned groves. Teri continues to look for any neglected groves and new plantings of citrus. Teri is working on an update to be sent out to growers.

## Southern Tulare County – Jessica Leslie

Currently, there have been no new ACP detections in Southern Tulare County to report. Jessica has been to multiple meetings this month via conference calls. Even with the Stay-at-Home order in place in California Ag workers remain essential and busy. Bloom was declared for citrus in District 1 of Tulare County on March 24<sup>th</sup> and District 2 of Tulare County on March 31<sup>st</sup>. The list of approved materials for the “spray and move” mitigations to move bulk citrus out of your ACP quarantine zone has been updated and now contains 2 new materials while removing 1 material.

Jessica would like to remind everyone to be mindful of the restrictions of materials that can be used during bloom.

#### Kern County – Judy Zaninovich

Judy reports no ACP detections in Kern County so far in 2020. The 2019 ACP detections in Kern were at the lowest level since 2013.

The Kern County Agricultural Commissioner has declared 75% petal-fall on the north side of trees on Saturday, April 18<sup>th</sup> for citrus producing areas south of 7<sup>th</sup> Standard Road. Although ACP detections have been low over the last year, the San Joaquin Valley ACP/HLB Task Force suggests if at all possible, growers should consider using an ACP-effective material in all of their citrus blocks (including non-bearing) sometime within 3-4 weeks of petal-fall declaration. This timing usually requires most orchards to be treated for citrus thrips and other pests and most of the materials used for these pests also suppress ACP. This treatment can greatly assist in keeping un-detected ACP populations from establishing. Judy sent this information out through her email update which goes out to Kern County growers, PCA's, PCO's, and other interested parties.

#### San Luis Obispo County – Cressida Silvers

There are no new ACP finds in the county.

#### Santa Barbara County– Cressida Silvers

Winter AW treatment percentages have been finalized and reported to CDFR and DATOC. They were consistent with previous AWM cycles, with 5 out of 8 PMAs reaching the 90% threshold. Percentages for the remaining three PMAs were 80, 72, and 26. That last percentage would have been 68 but a large grower treated too late to be included.

#### Ventura County Sandra Zwaal & Cressida Silvers

Winter Area-wide treatment windows ended, and final percentages were submitted to CDFR and DATOC. Weather and low lemon prices delayed, and in some cases prevented, treatments. Overall percentage acreage treated for the county was 72%. PURs continue to come in although they are too late to be included in final winter percentages. Sandra and Cressida continue to update the grower file with data from CRB, CAC, PURs, Agrian, irrigated lands database. The Area-wide treatment schedule for Fall is pending.

Cressida continues to work on updating the grower file.

#### San Bernardino County – Sandra Zwaal

The 2020/2021 ACP areawide treatment schedule has been posted and distributed to the San Bernardino citrus growers and affiliates with growers currently treating for Spring. Sandra has requested that NST distribute mailers with the [www.citrusthreat.org](http://www.citrusthreat.org) website to all residences in the HLB quarantine and she has provided NST with a list of all addresses in the Redlands and Loma Linda area. The mailers have been finalized by NST, approved by Victoria, and are scheduled to be mailed at the end of April.

Sandra continues to ground truth the area for new groves, abandoned/neglected groves, removed groves, and update the GL grower list with new contact information.

## Riverside County – Alan Washburn

### *Coachella – Riverside County Citrus Pest Control District No. 2*

The District's Winter ACP Area-Wide Treatment finished on Sat. Feb. 1<sup>st</sup> and the District has been diligently processing the growers' ACP reimbursements. Unfortunately, the District is still waiting for some of the Pesticide Use Reports to be submitted so that an accurate percentage can be given for each zone.

Regarding ACP, most growers are treating for thrips during this time of year, which also helps control psyllids. These sprays are not coordinated though.

The District is still conducting their intensive red scale eradication sprays on about 6% of the total acreage. This is taking up the bulk of the District's time. These sprays will continue through mid-June.

Lastly the District will continue our intensive tree removal program of citrus trees that are near commercial groves and are difficult and costly to treat. To date the District has removed 3,412 citrus trees at 48 different locations. A couple of locations are tentatively scheduled to have trees removed next week.

Current maps show a couple of spots with low numbers.

### *Riverside County Pest Control District No. 3 – Hemet*

In Hemet, we are getting more and more compliance with area-wide treatments. Six properties were in non-compliance with the required treatments. Two of those decided to participate in the upcoming spring treatment, and three agreed to let our biological control team come on their property. Our bio-control team is collecting monthly data, using ant bait, and releasing multiple beneficial insects.

The recent trap data shows Hemet having two locations with a couple of ACP.

## Imperial County – Curtis Pate

Curtis met with the Imperial PCD and they discussed inventorying the residential citrus within 1 mile and possibly 2 miles of their commercial groves to encourage treatment or removal of these trees. All zones reported over 90% treatments for the winter area-wide applications, although some growers were late in their treatments, which would have boosted the numbers even higher.

They too are discussing beneficial insect releases near their groves. They also want to encourage research to improve the tools that are available to organic growers for both area-wide applications and for bulk fruit movement to other regions. This reflected organic fruit moving to Imperial from SD, because two organic fruit packers closed a month ago.

## San Diego County – Vacant

Thanks to Enrico Ferro, the PCD and Jason Schwartz and Jasmin Lopez, SD CAC staff for helping to keep the information flowing to SD growers. They shared the new Bulk Citrus



Movement changes, so that growers were able to adjust to Spray and Harvest as required as of 4/13/20.

Also, they have been working with CRB staff to include the Area-wide treatment maps on the citrusinsider.org site.

### Neglected/Abandoned Groves

No changes reported by the CACs. The GLs continue to work with the growers and CAC staff to address any suspected abandoned groves.

County	BOS Sup (Y/N)	Co Coun Sup (Y/N)	#Groves Report'd	#Groves Confmd N/A	Total Acs (100 trees/ac) Confmd	#owners contactd	#1st Letrs	#2nd Letrs	#3rd Letrs	#Heard	Hears won	#Hears lost	Groves Remvd	Total Acres Remvd	#Groves Rem'd	Acres Rem'd	#Groves Pndg	Total Acres Pndg				
Fresno																						
Kern	Y	Y	3	1	60.36	1												1	60.36			
Madera																						
SLO	Y	Y																				
Tulare	Y	Y	88	88	1148	88	44				1	1	0	66	908	9	79	13	161			
<b>Subtotal</b>			<b>91</b>	<b>89</b>	<b>1208.36</b>	<b>89</b>	<b>44</b>				<b>1</b>	<b>1</b>	<b>0</b>	<b>66</b>	<b>908</b>	<b>9</b>	<b>79</b>	<b>14</b>	<b>221.36</b>			
Imperial	Y	Y	1	1	6	1								1	6							
LA																						
OC																						
Coachella			48	48	34.12	48								48	34.12							Coachella is a PCD in Riverside
Riverside	Y	Y	92		264.81	43	43	43	11				22					35				
San Brdo																						
SD	Y	Y	108	61	1693	61	39	28	24				37	774		71	919					
Sta Barb																						
Ventura	Y	Y																				
<b>Subtotal</b>			<b>108</b>	<b>110</b>	<b>1997.93</b>	<b>153</b>	<b>82</b>	<b>71</b>	<b>35</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>108</b>	<b>814.1</b>	<b>0</b>	<b>71</b>	<b>954</b>	<b>0</b>				
<b>Total</b>			<b>340</b>	<b>199</b>	<b>3206.29</b>	<b>242</b>	<b>126</b>	<b>71</b>	<b>35</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>174</b>	<b>1722</b>	<b>9</b>	<b>150</b>	<b>968</b>	<b>221.36</b>				