US Congressional Briefing
Citrus Huanglongbing (HLB)

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Acknowledgements

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MaryLou Polek, Citrus Research Board

Elizabeth Grafton-Cardwell, UC Riverside

My Background

- Born and raised in the island of Crete in southern Greece
- 1992-1998: BS & MSc, Agricultural Univ. of Athens, Greece
- 2000-2004: PhD, University of California, Riverside
- 2005-Present: UC Riverside
  Dept. of Plant Pathology & Microbiology
  Plant Pathologist & Extension Specialist
  Director, Citrus Clonal Protection Program (CCPP)
- 2007-Present: Secretary of the International Organization of Citrus Virologists (IOCV)

- 2009-Present: Founding member and Chairman of the Citrus Clean Plant Network of the National Clean Plant Network (NCPN)

- 2015: National Plant Diagnostic Network (NPDN) - STAR-D Board

G. Vidalakis - Research & Extension

- Developed a diverse research & extension program with emphasis on citrus diseases that transmit during tree propagation, such as HLB
- Working directly with the citrus industry, growers and nurseries, as well as citrus enthusiasts, at a state and national level
- Over 50 technical, semi-technical, and extension publications

G. Vidalakis - Research & Extension - Funding

- University of California
- California Citrus Research Board (CRB)
- California Citrus Nursery Board
- California Department of Food and Agriculture
- US Department of Agriculture
  1. National Clean Plant Network
  2. HLB Multi-Agency Coordination (MAC)
  3. NIFA/SCRI/Citrus Disease Research & Extension

     Invited to submit full proposals for three collaborative HLB projects: Citrus Phytobiome, Bacteria culturing, & Bacterial secreted proteins

Citrus Phytobiome ?

The Escaped Tree Phenomenon HLB +

California - Plant Pathology 101

1. Exclusion

2. Eradication

3. Management

Citrus Clonal Protection Program-Short History

1937: Psorosis Free Program

- Directors: Dr. Fawcett & Wallace

1957: Citrus Variety Improvement Program

- Directors: Dr. Calavan & Reuther

1977: Rename to Citrus Clonal Protection Program

- Director: Dr. Gumpf

2005: Citrus Clonal Protection Program

- Director: Dr. Vidalakis

2009: National Clean Plant Network (NCPN)

- Citrus Clean Plant Network Administration at CCPP with Dr. Vidalakis as Chair

CCPP-Collaboration, Collaboration, Collaboration

- Citrus Research Board
- California Citrus Nurserymen Board
- University of California
- California Department of Food & Agriculture
- United States Department of Agriculture
- National Clean Plant Network

G. Vidalakis - Research & Extension - Description

Citrus Clonal Protection Program-CCPP Purpose:

- To provide a safe mechanism of introduction of citrus germplasm into California
- To maintain primary sources of disease tested & true to type citrus trees

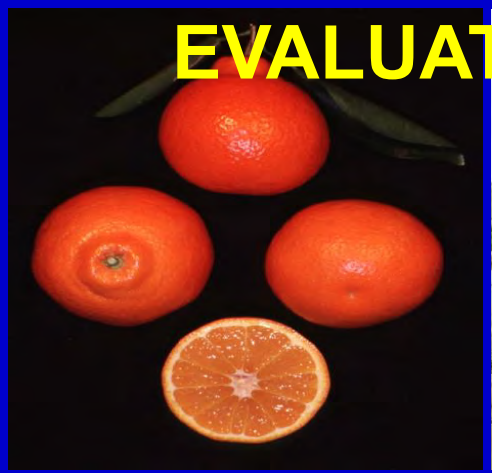
CCPP Introduction-Quarantine Diagnostics & Therapy

Maintenance & Distribution
U.C. Lindcove Research & Extension Center

~350 COMMERCIALY IMPORTANT VARIETIES
DISEASE RETESTING & TRUENESS-TO-TYPE EVALUATION

80,000 ft² PROTECTED FOUNDATION BLOCK

~2000 TREES FOUNDATION & EVALUATION BLOCK



G. Vidalakis - Research & Extension – Impact
Citrus Varieties Distribution

Five years period:

- **581 orders**
- **149,095 buds**
- **290 different varieties**
- **614 registered budwood users**
- **~40 commercial citrus nurseries in California**

149,095 buds x 200 nursery trees= 29,819,000 Trees

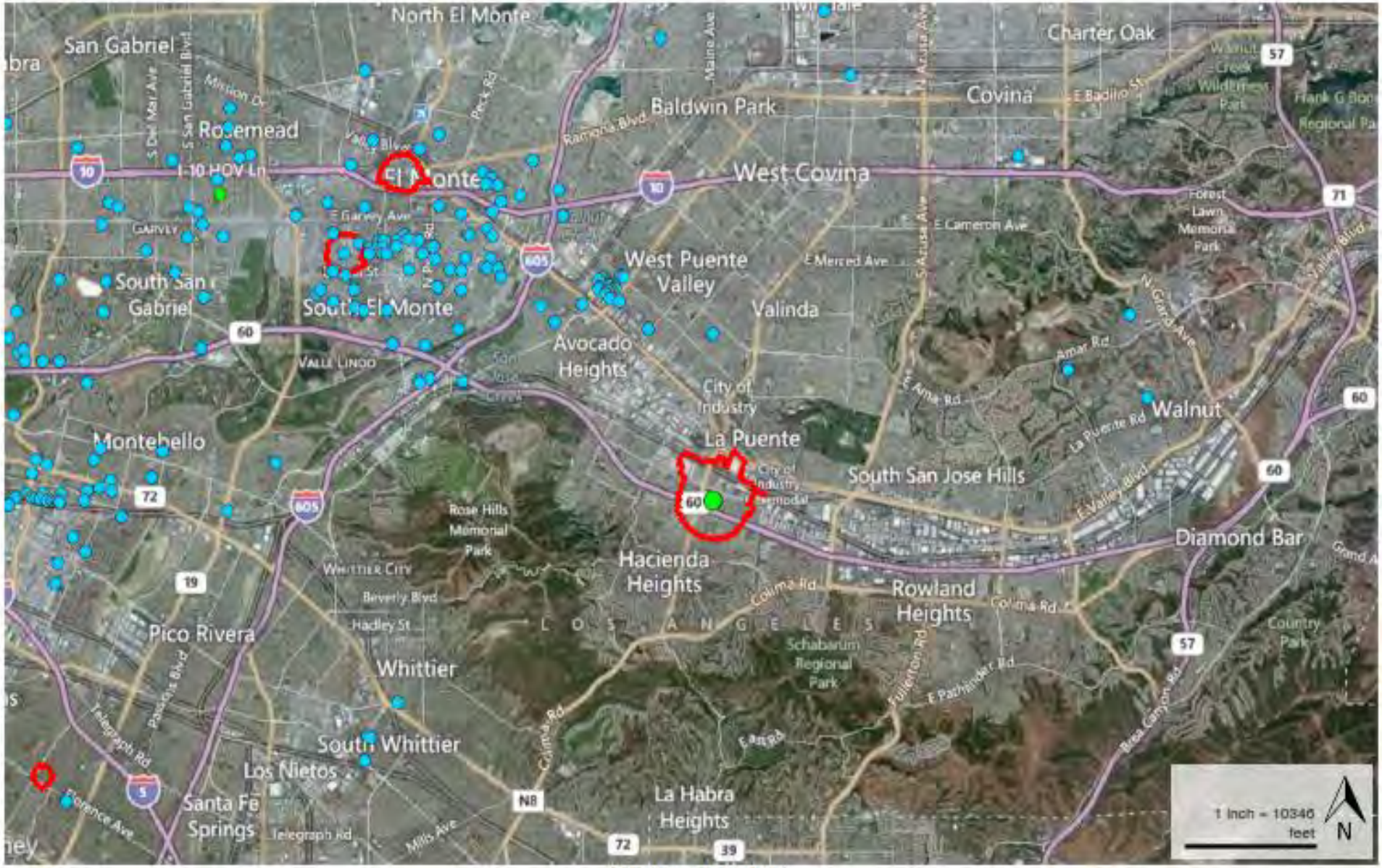
Wall Street Journal: The Big War Over a Small Fruit, *August 14, 2014*

2012, 1st HLB Tree
Hacienda Heights, Los Angeles, California

A lemon tree with 19 grafts of unknown origin that could not be traced back to a California citrus nursery or a CCPP source plant

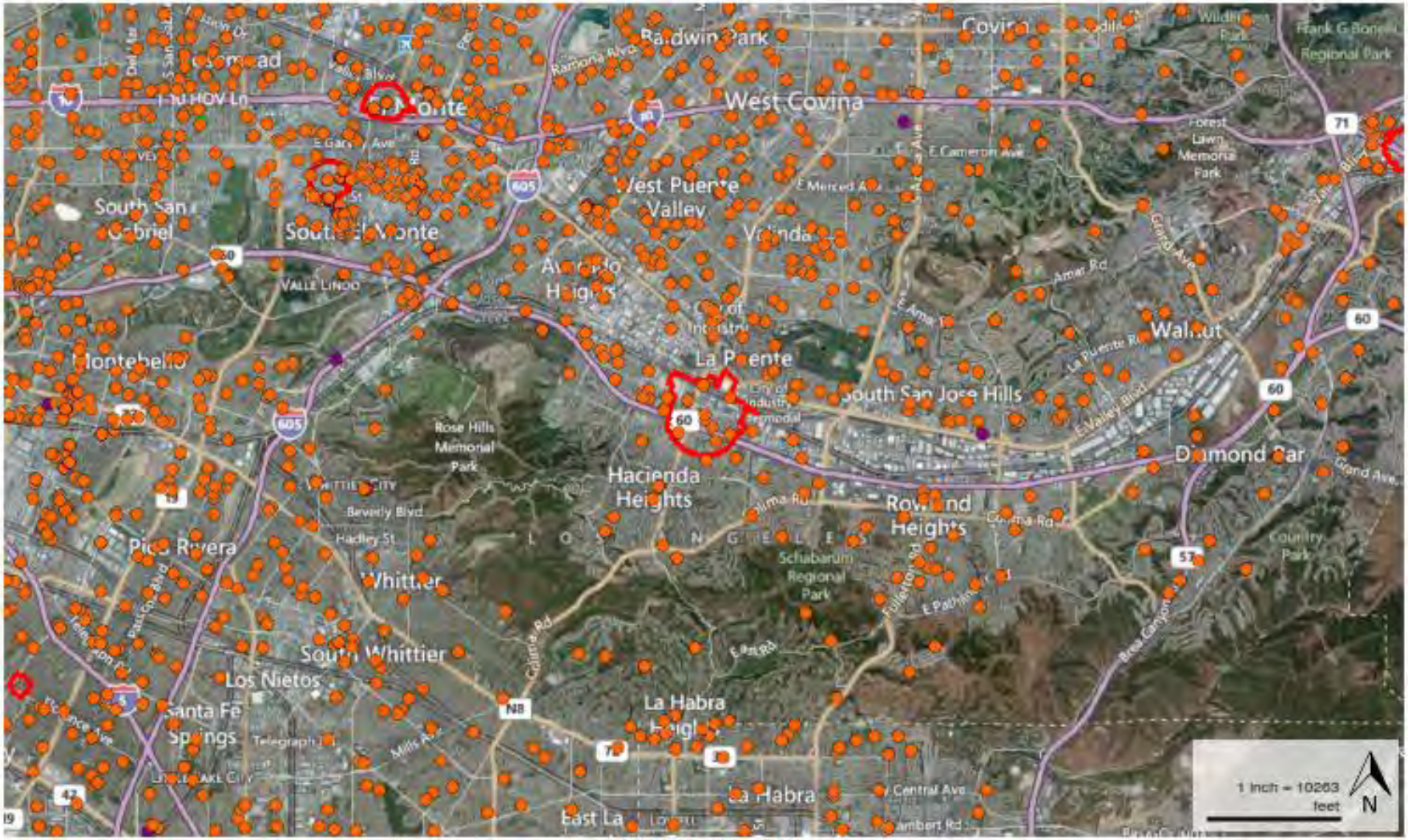
CDFA

2010 ACP Detections Near Hacienda Heights, Los Angeles



ACP Detections 2010

2011 ACP Detections Near Hacienda Heights, Los Angeles



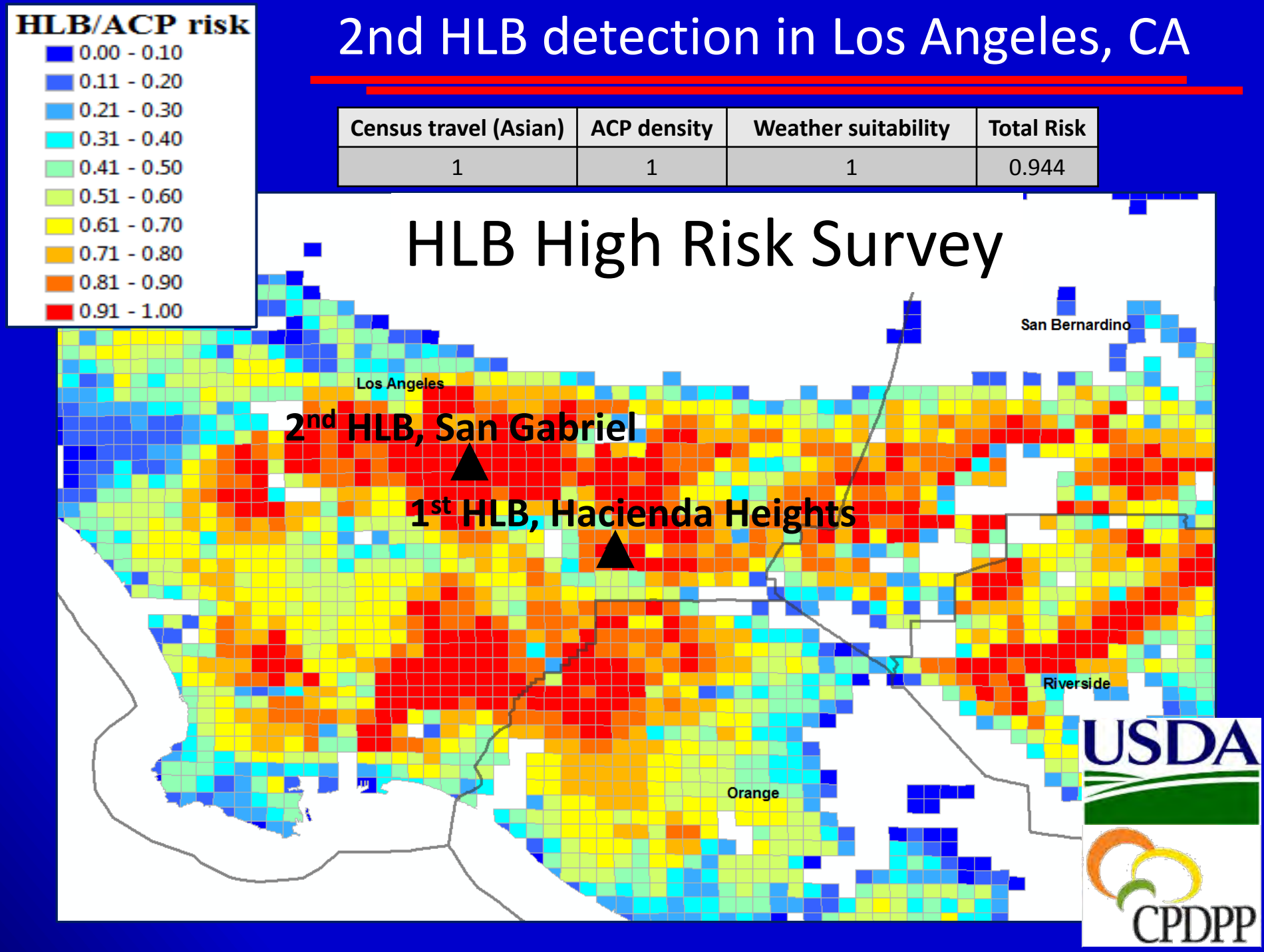
ACP Detections 2011

2012 ACP Detections Near Hacienda Heights, Los Angeles

ACP Detections 2012

2nd HLB detection in Los Angeles, CA

Census travel (Asian)	ACP density	Weather suitability	Total Risk
1	1	1	0.944



Early Detection

Huanglongbing (HLB)
The Pandemic of our Times

- **2002-2012: Florida lost almost half of the citrus acreage. From ~800.000 to ~500.000 acres: HLB and Citrus Canker (USDA, National Agricultural Statistics Service, 2012)**

April 19, 2007

December 16, 2008

Southern Gardens-Florida

Fruit Drop

Victor Williams & Mike Irey

UNITED STATES SUGAR CORPORATION

SOUTHERN GARDENS CITRUS

Healthy

HLB

Fruit Drop

Healthy

HLB

Unusable Fruit – Taste & Quality

	Fruto de Ramo Normal	Fruto de Ramo Doente	Diferença (%)
Altura (cm)	7,95 a	6,54 b	- 18
Diâmetro (cm)	7,72 a	6,20 b	- 20
Peso (g)	246 a	136 b	- 45
Brix %	9,15 a	7,31 b	- 20
Acidez	0,95 b	1,44 a	+52
Ratio	9,67 a	5,15 b	- 47
% suco	47,5 a	43,8 b	- 8
I.T. (kg ss/cx)	1,77 a	1,31 b	- 26

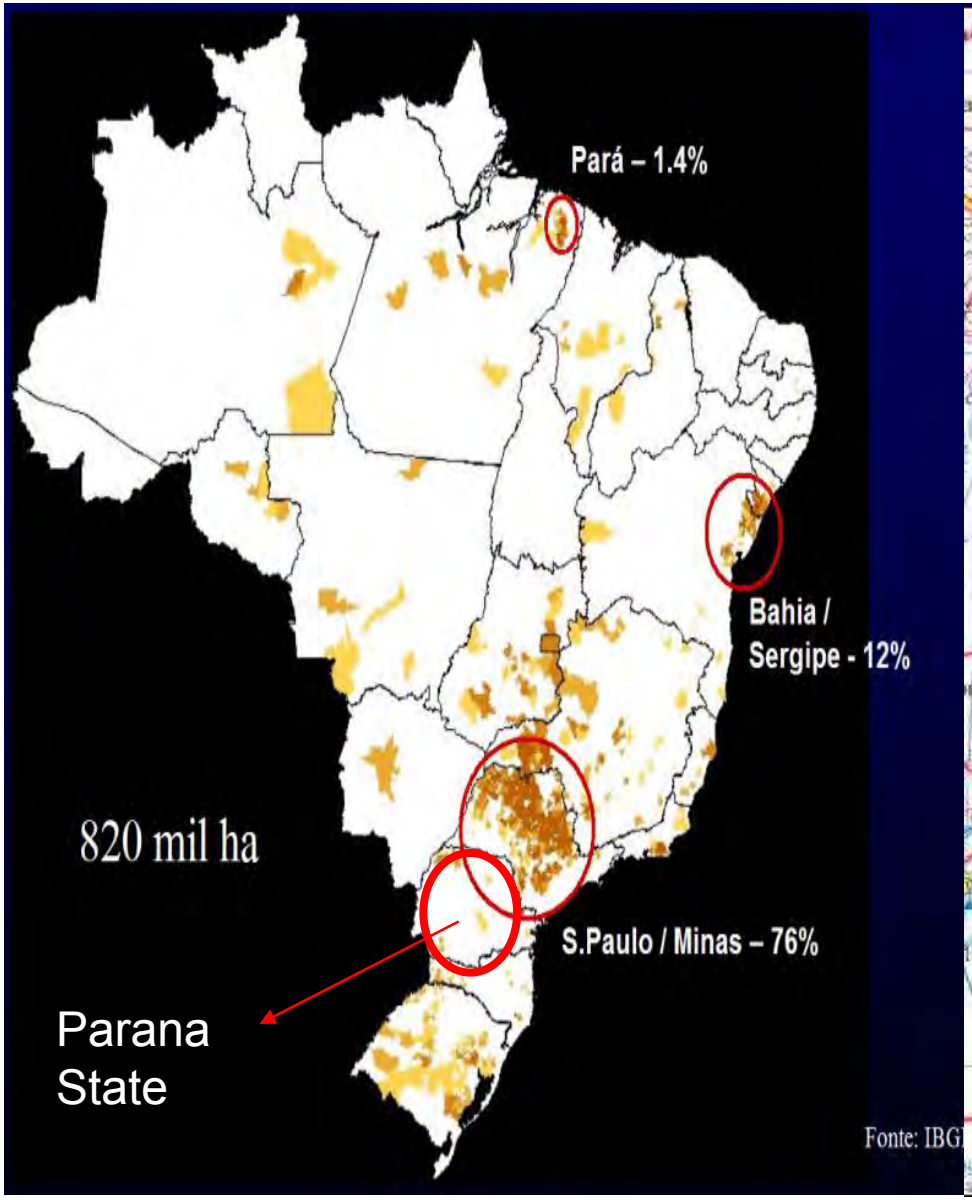
Brazil – Cambuhy Farm – HLB Vector Control

Action	Before HLB Per year	After HLB Per year
Sprays Young plants (0-3 years)	6	18 October to May Every 15 days
Sprays Systemic insecticides Young plants (0-3 years)	1	2
Sprays Mature plants	0	4
Fog	3	0
Insecticide by plane	0	3
Total	10	27

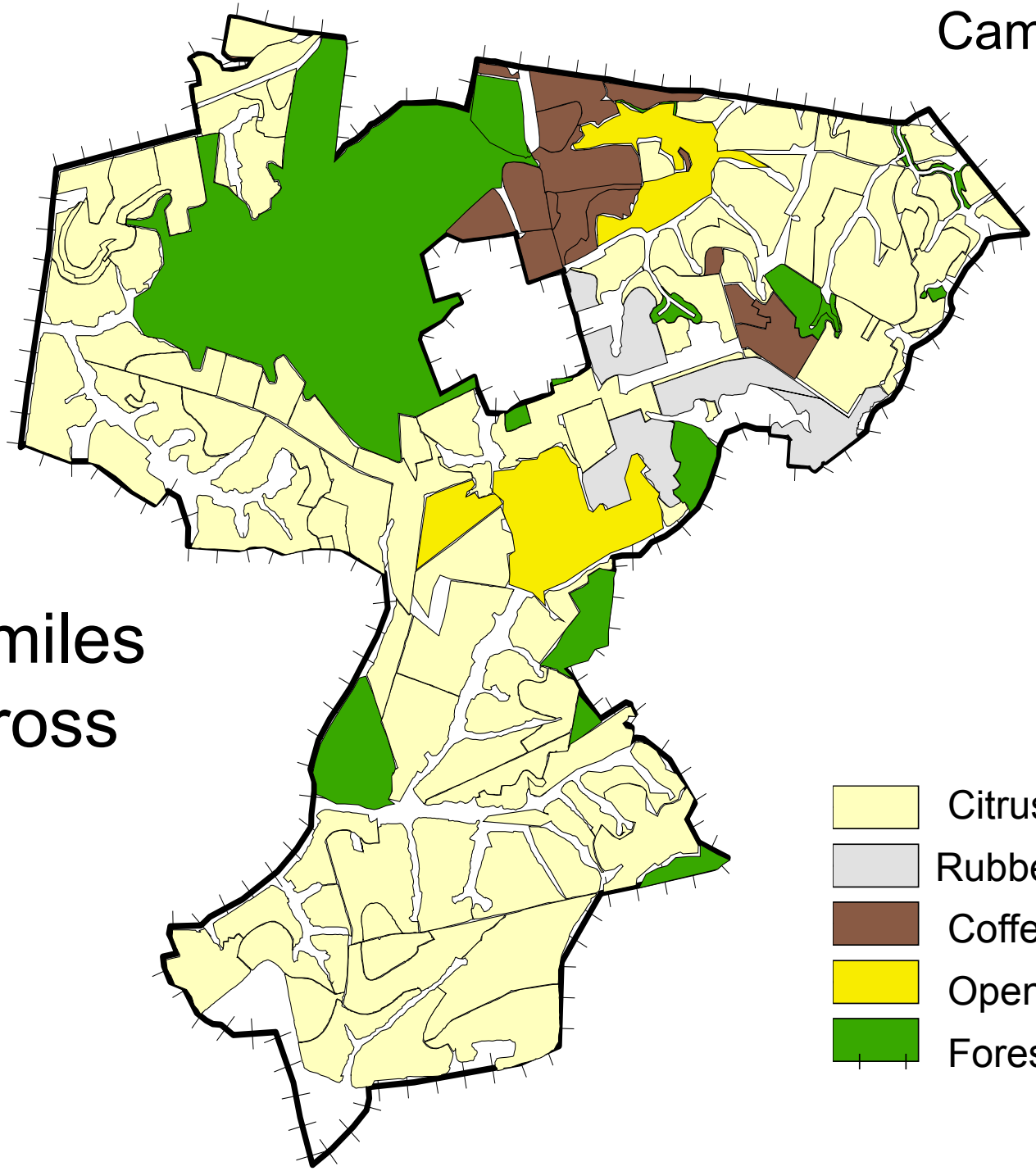
Citrus Production, HLB, and Survey and Method Development Sites

Created By: Yu Takeuchi
USDA APHIS PPQ CPHST/NCSU CIPM
Date: January 10, 2011
Projection: WGS 1984

Brazil - Oranges production areas



Cambuhy Farm Map



Training and motivation = is the key of the success in Greening Handling

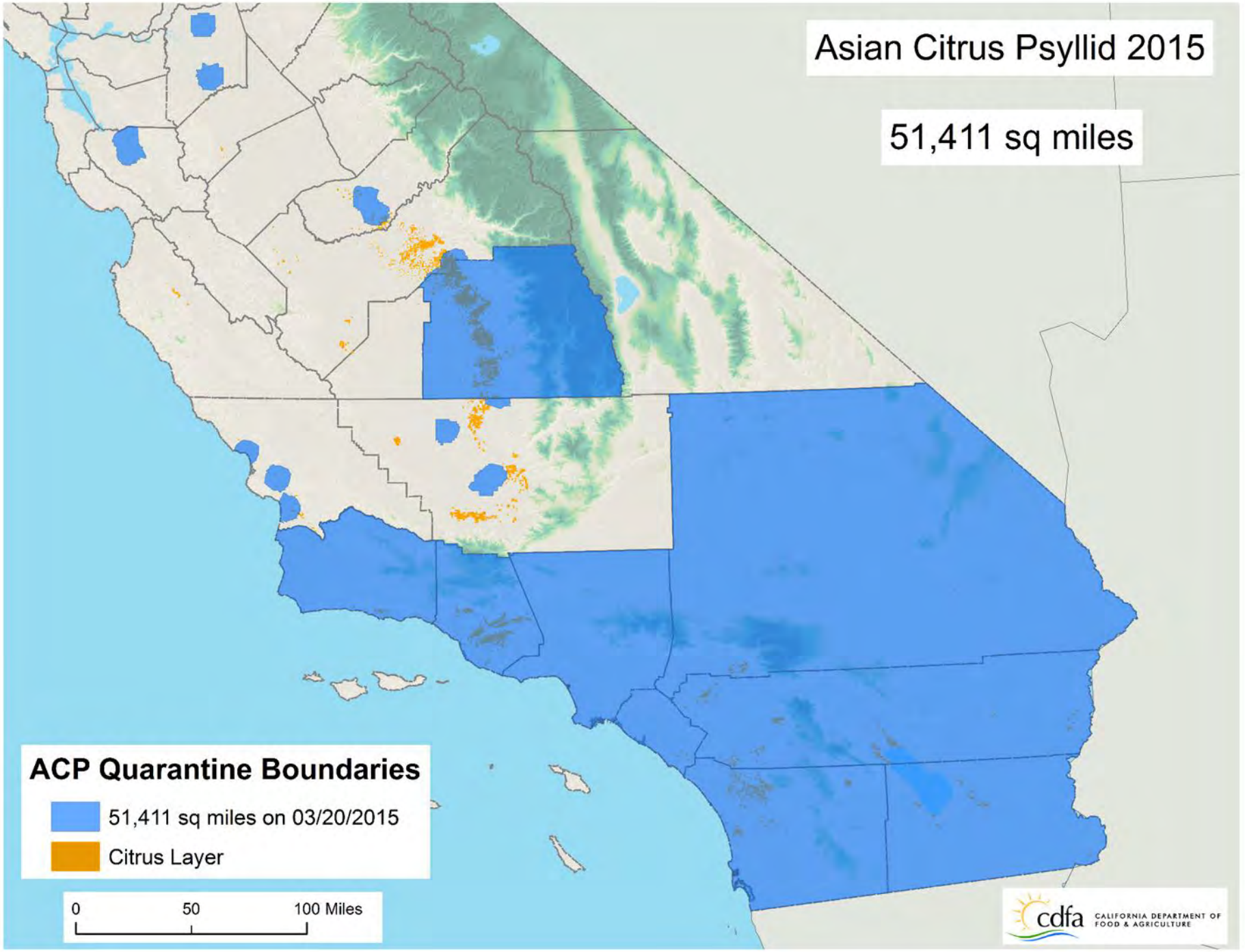
Motivation – a good job ambient

California HLB-ACP Program Cooperators

- Federal
  - USDA
- State
  - California Department of Food & Agriculture
  - Dept. of Pesticide Regulation
  - Office of Health Hazard Assessment
  - University of California - Cooperative Extension
- Local
  - County Agricultural Commissioners
- Industry
  - California Citrus Research Board
  - Growers
- Residents

California HLB-ACP Program Activities

- Detection Trapping
- Visual Survey
- Delimitation Trapping
- Residential & Area wide Treatments
- Outreach
- Quarantine


Asian Citrus Psyllid 2015
51,411 sq miles
ACP Quarantine Boundaries
51,411 sq miles on 03/20/2015
Citrus Layer
0
50
100 Miles
cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Why Areawide Treatments?

- Because coordinated pesticide applications in commercial citrus help obtain better control of Asian citrus psyllid (ACP) while minimizing resistance.
- Citrus Health Management Areas (CHMAs) – In Florida - Grower defined grouping of citrus acreage where grower participants coordinate ACP control efforts and management of pesticide resistance.
- In California, the areawide control concept has already successfully been done for glassy-winged sharpshooter (GWSS).

ACP Biocontrol-Pakistan Collections

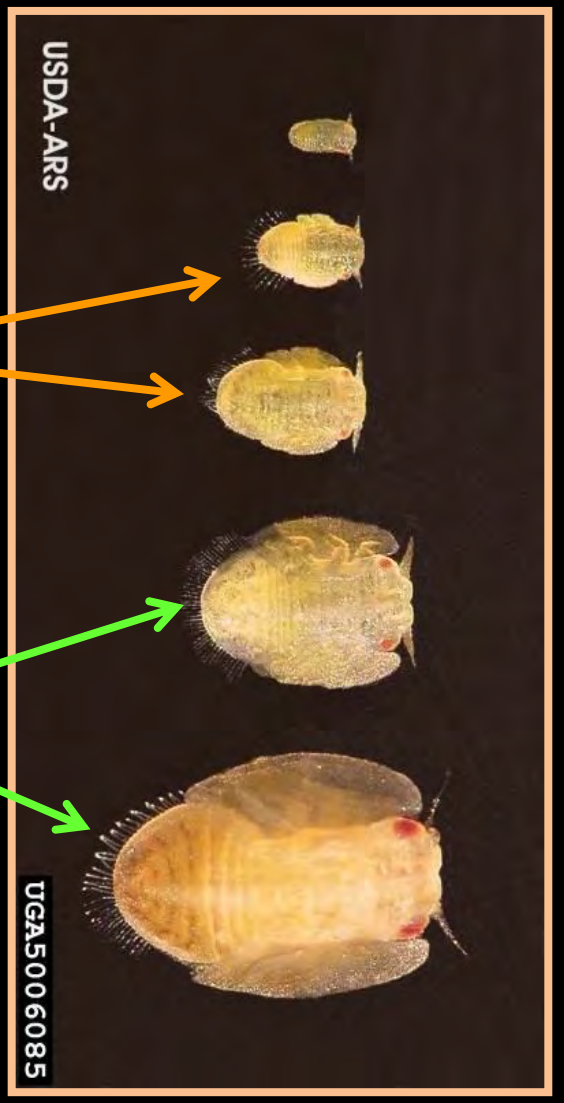
- **September 2010**
  - Reconnaissance completed in Pakistan
  - Demonstrated it was feasible to collect& rear ACP parasitoids
- **March 10 to April 10 2011**
  - Set up long-term replicated phenology studies
  - Collected ~ 200 parasitoids
- **June 4-13 2011**
  - ~400 parasitoids returned to UCR
- **Oct. 23-28 2011**
  - > 1,000 parasitoids returned to UCR
- **June 16-23 2012**
  - > 1,000 parasitoids returned to UCR
- **April 15-22 2013**
  - > 400 parasitoids returned to UCR

ACP Natural Enemies Collected in Pakistan are Returned to the Insectary & Quarantine Facility at UC Riverside for Safety Testing

UNIVERSITY OF CALIFORNIA UC RIVERSIDE | Center for Invasive Species Research

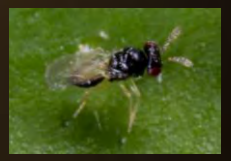
Diaphorencyrtus

Tamarixia



Biocontrol Releases – Through June 1, 2015

Tamarixia – 437,702
Diaphorencyrtus – 60,927



County	Urban Grid Releases			Organic Grove Releases		Total # of Tamarixia Released	Total # of Diaphorencyrtus Released
	Est Total	% Complete	# Visits	# Groves	# Released		
Imperial	80	83	1	1	4,000	**29,467**	**0**
Los Angeles	188	119	1	3	4,500	**99,000**	**8,104**
Orange	70	124	1	0	0	**41,200**	**0**
Riverside	197	124	1	8	10,378	**88,900**	**29,104**
San Bernardino	72	83	1	1	2,000	**31,246**	**5,775**
San Diego	206	117	1	19	29,879	**120,589**	**15,680**
Ventura	69	62	1	1	500	**16,400**	**500**
Santa Barbara	58	36	1	1	1,000	**10,900**	**1,764**
TOTAL	**940**	**3**		**34**	**52,257**	**437,702**	**60,927**

Citrus Huanglongbing (HLB) - My Prediction
I am optimistic that we will make history but…

- HLB was first reported in China in 1919
- In other words we need to cover 100 years worth of research in a very short period of time.
- We have achieved a lot but we need your support to keep moving
- Short term solutions
  - ACP control & HLB eradication
- Medium term
  - Horticultural practices & treatments (heat, tristeza virus vector… 1930s-1960s pandemic, 100 million trees dead)
- Long term
  - Breeding for resistance tolerance (classical and engineering) & Integrated pest management

Thank You

Thank You

http://www.saveourcitrus.org/

http://www.californiacitrusthreat.com/