



The most devastating disease of citrus worldwide, Citrus Greening (Huanglongbing, HLB)

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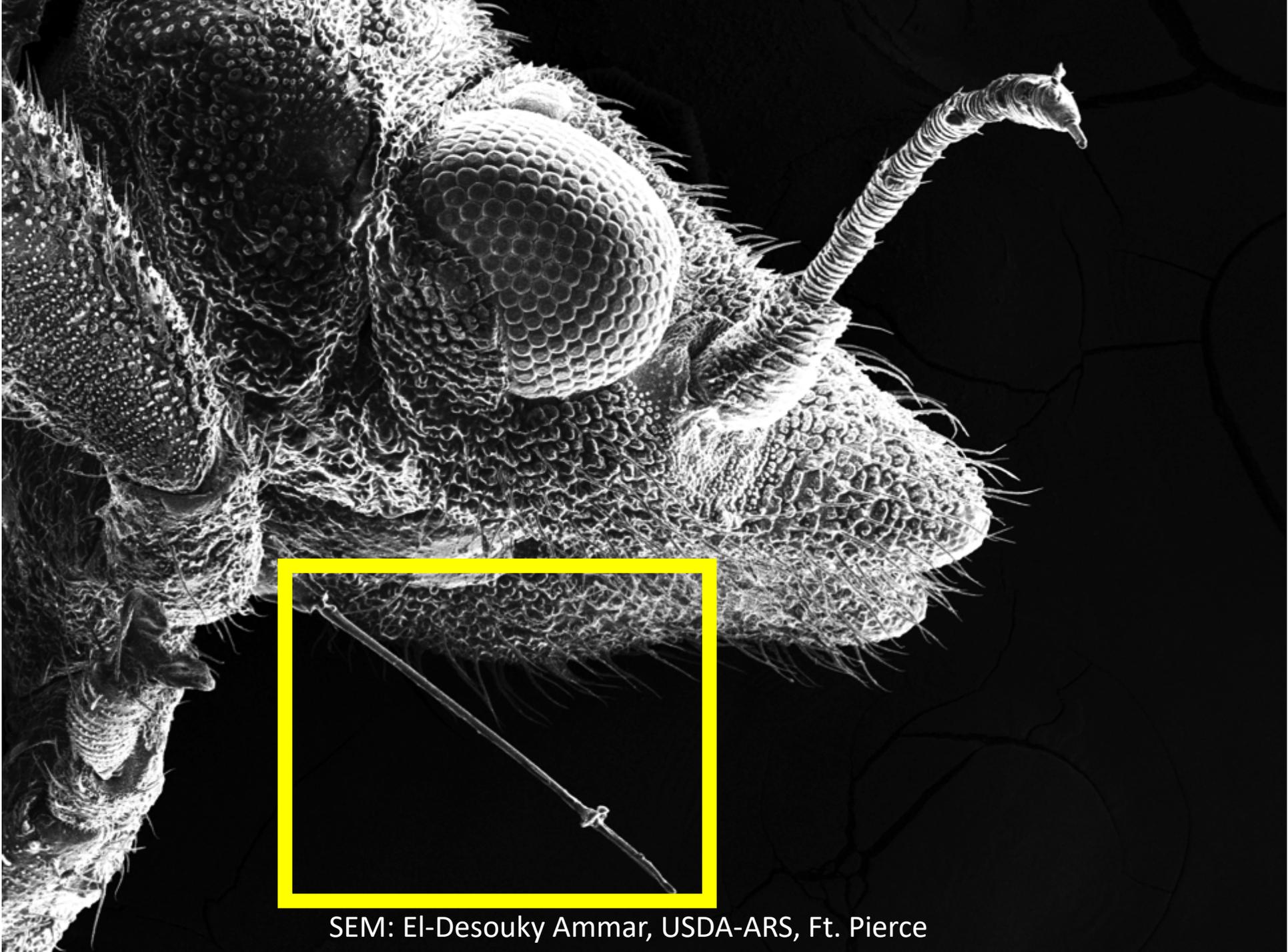
Department of Entomology

Insect Vektored Pathogen

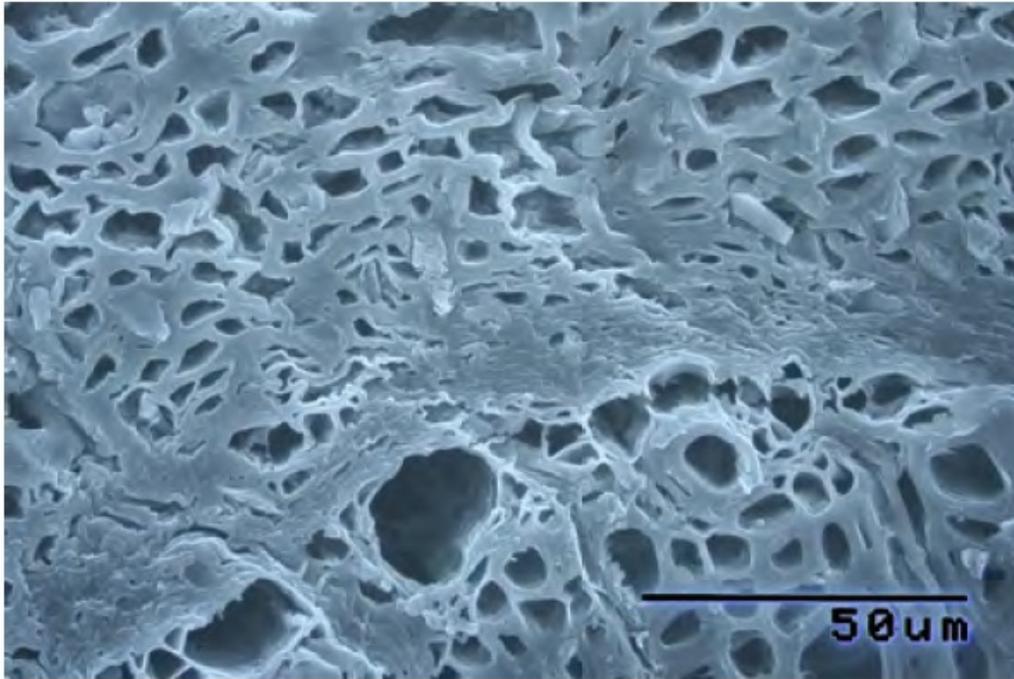


Asian citrus psyllid (ACP),
Diaphorina citri





SEM: El-Desouky Ammar, USDA-ARS, Ft. Pierce



‘Candidatus Liberibacter’ (CLas)

Phloem-limited bacteria

Disrupts normal transfer of nutrients

Fig. 9. Cross-section scanning electron micrograph of an HLB-affected petiole at an advanced stage. In this figure, metaphloem tissue has entirely collapsed forming a solid mass of cell wall. The external protophloem and inner part of the cortex are being crushed by the expanding xylem elements.

Etxeberria and Narciso, 2012

Disease Dynamics



What does HLB do to citrus trees?



There is no known cure for HLB.

How does HLB spread?



How is HLB detected?

- Molecular detection assays
- Dependent on contact with material with pathogen
- Can have a delay in detection (9 months to 2 years)
- Early detection is a critical issue



Mitigation strategies

- **1. Vector control**

- **Insecticide**

- Eradicative (San Joaquin California)
- Area wide management
- Spraying timed with tree phenology

- **Biological control**

- Difficult with disease vector extremely low tolerance

- **Cultural tactics**

- Netting / screens
- Protective clay



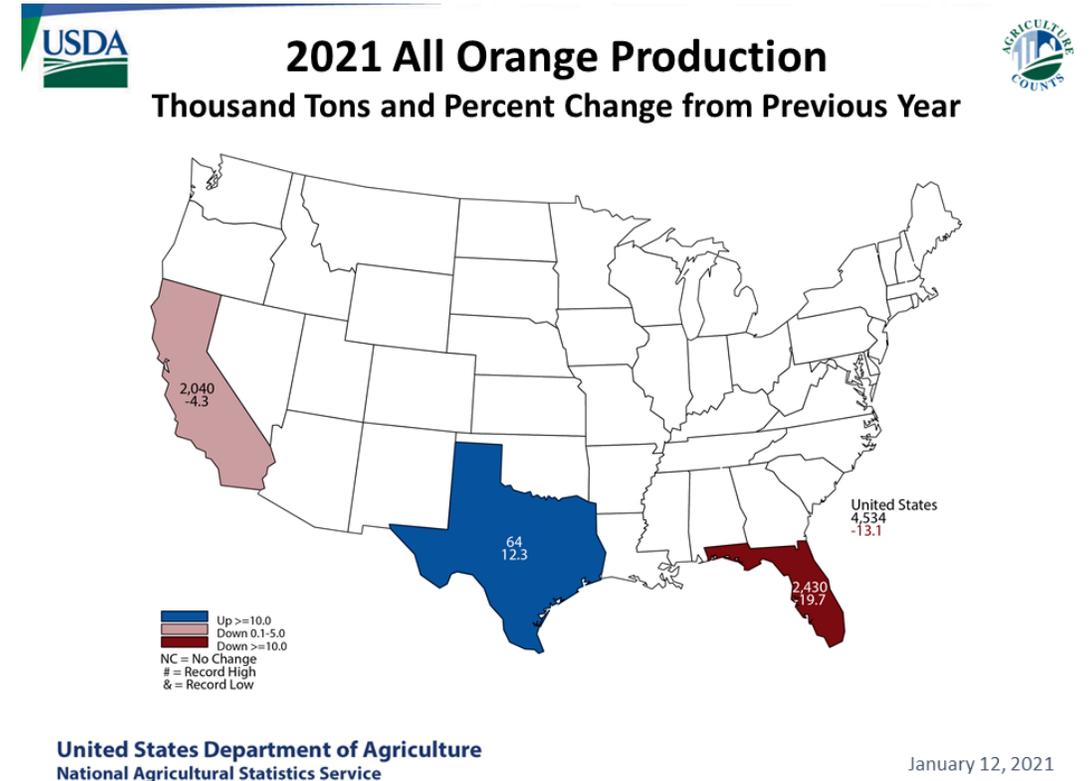
Mitigation Strategies

- **2. Development of new technologies**
 - Peptides to target pathogen
 - Double stranded RNA to target pest
 - Methods to deliver new tech to fully grown trees
 - Development of tolerant and resistant cultivars through use of breeding and genetic engineering



Where are we currently?

- HLB is widespread in:
 - FL (\$800 M, 90/10 juice/fresh)
 - **HLB: 2005**
 - TX (\$100M 60/40 fresh grapefruit/juice)
 - **HLB: 2012**
- HLB is a developing issue in California
 - CA \$4B, fresh fruit
 - **HLB 2012**
 - No known HLB in commercial citrus
- Strategies are different for emerging disease vs. widespread



HLB in the Los Angeles basin

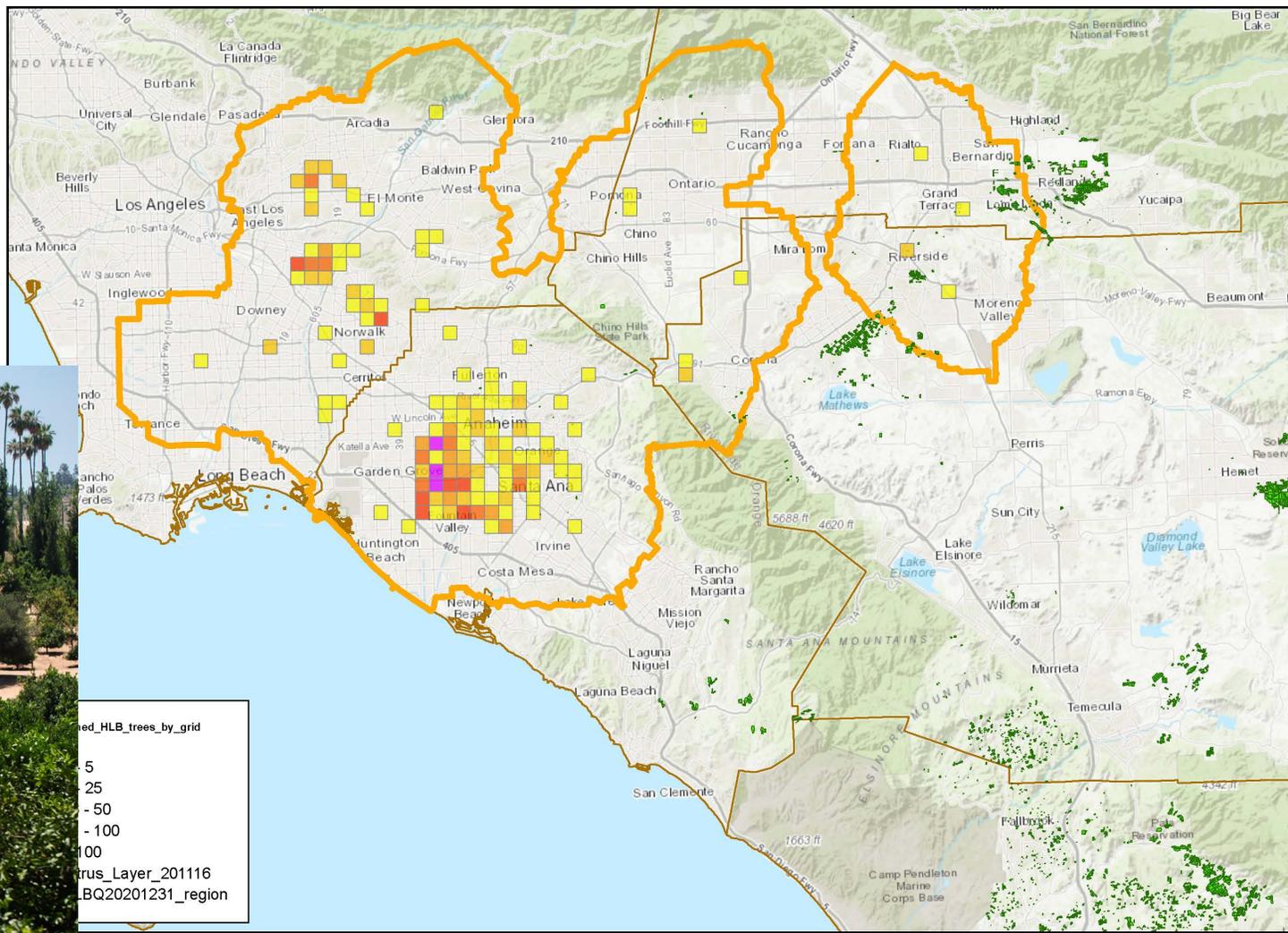


CITRUS PEST & DISEASE
PREVENTION DIVISION
CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

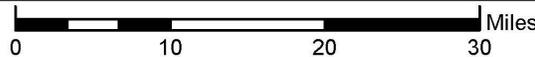
California HLB Detections Infected Trees by Grid - Mapped 1/11/2021



The family's fruit stand on Riverside's Van Buren Boulevard, a major thoroughfare. Open seven days a week, it's a local landmark and a "must do" destination for loyal customers. They sell fresh citrus picked daily and fresh-squeezed orange juice plus Gless Ranch avocados and dates. They also offer dried fruits and nuts, and jams and jellies.



Infected HLB trees by grid
 5
 25
 50
 100
 1000
 Citrus_Layer_201116
 BQ20201231_region



N. Ying (1/11/2021)



Why is it spreading slower in California?



- **Five reasons**

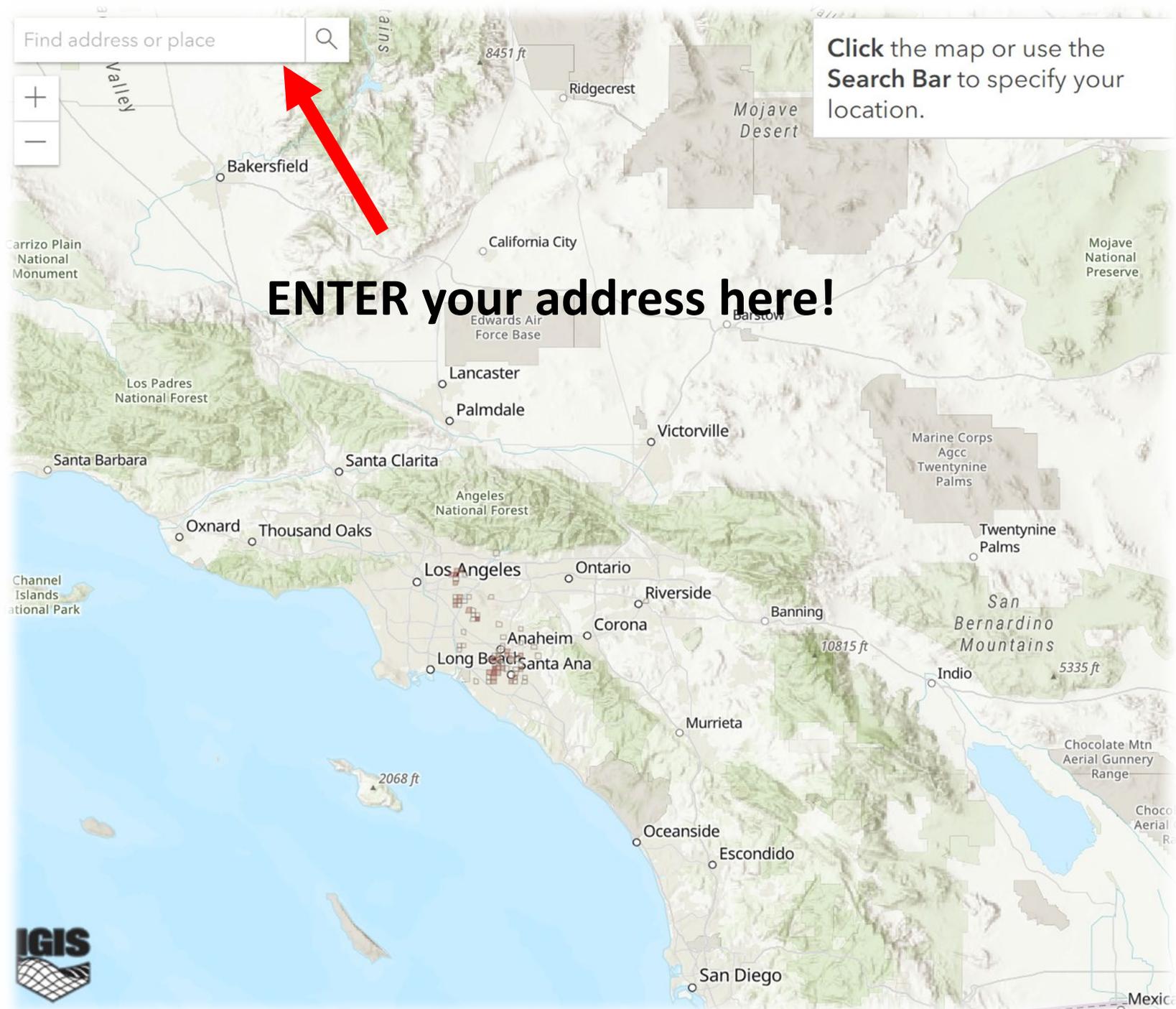
- Major weather differences
- Millions of dollars/year spent by state to monitor, treat and remove infected trees in LA basin
- Area-wide management
- Science-based regulations
- Geography

What is being done in California?

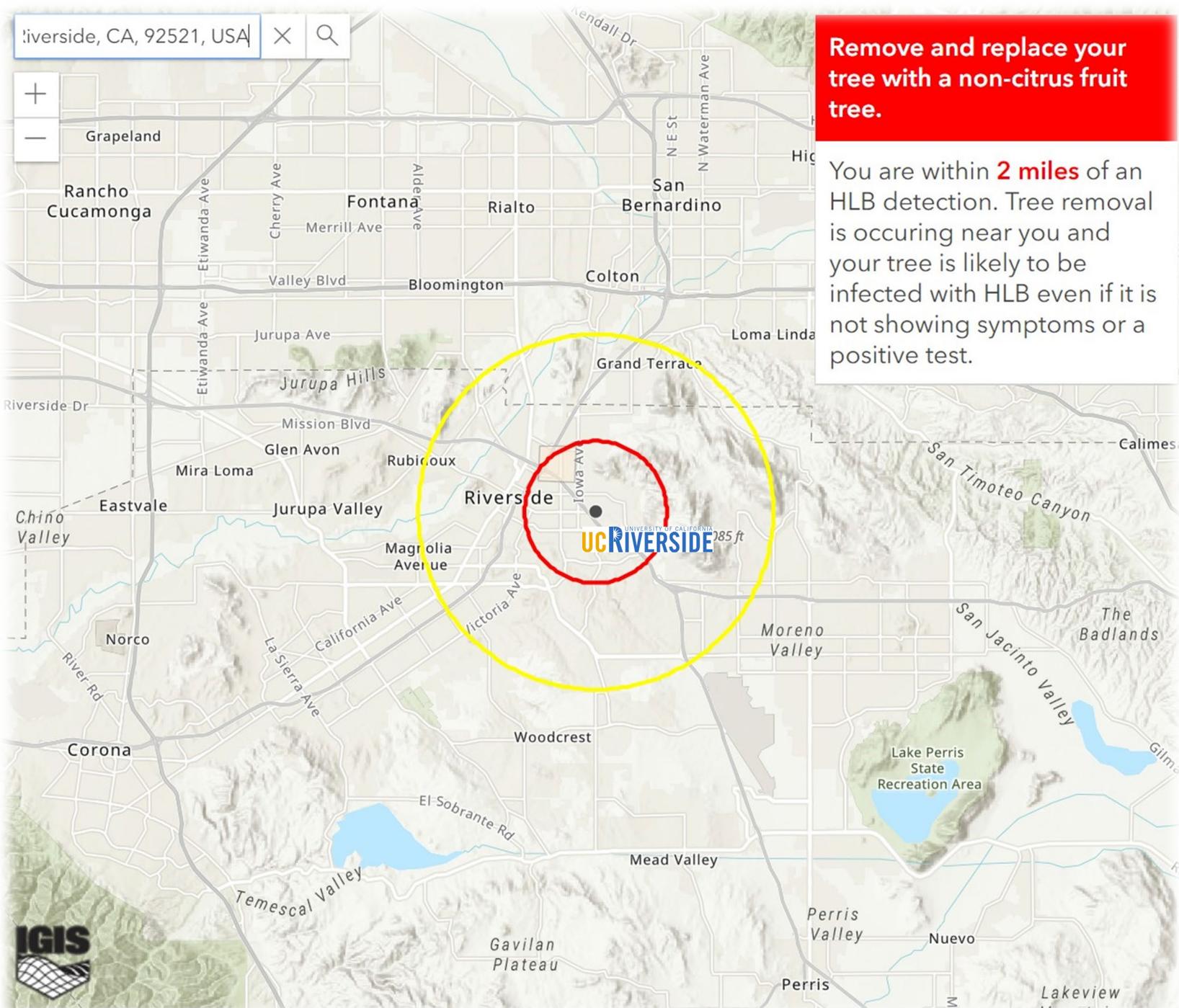
- Extension a.k.a. Outreach or Science Communication
 - Growers/Farmers
 - Public
- California Based Research



<http://ucanr.edu/hlbapp>



Riverside, CA, 92521, USA



Remove and replace your tree with a non-citrus fruit tree.

You are within **2 miles** of an HLB detection. Tree removal is occurring near you and your tree is likely to be infected with HLB even if it is not showing symptoms or a positive test.



Developing tools for organic growers

- ACP populations build in organic fields
 - Low efficacy products
 - Few options for control
 - High risk of insecticide resistance



Pink Kaolin Clay

- **Hypotheses:**
 - Enhances plant growth
 - Repels ACP better than undyed white kaolin
 - Visual cue for ACP disrupted



Essential oil-based repellent bars

- 20% fir oil
- Development:
 - Density
 - What trees are ideal for this tool
 - Repellency over time



Understanding phenology of HLB in ACP

- Sampling project
- 15 sites in three citrus production regions
- Goals:
 - Determine % of **HLB+ ACP in commercial groves**
 - Understand the **phenology** (presence over time) of HLB+ ACP
 - Determine %**number of ACP color morphs** in the field



Understanding the best use of insecticides

- Climate and soil variation through state
- Understanding what insecticides work best and preserve natural enemies
- Understanding efficacy of new products coming to market

Thank you!

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