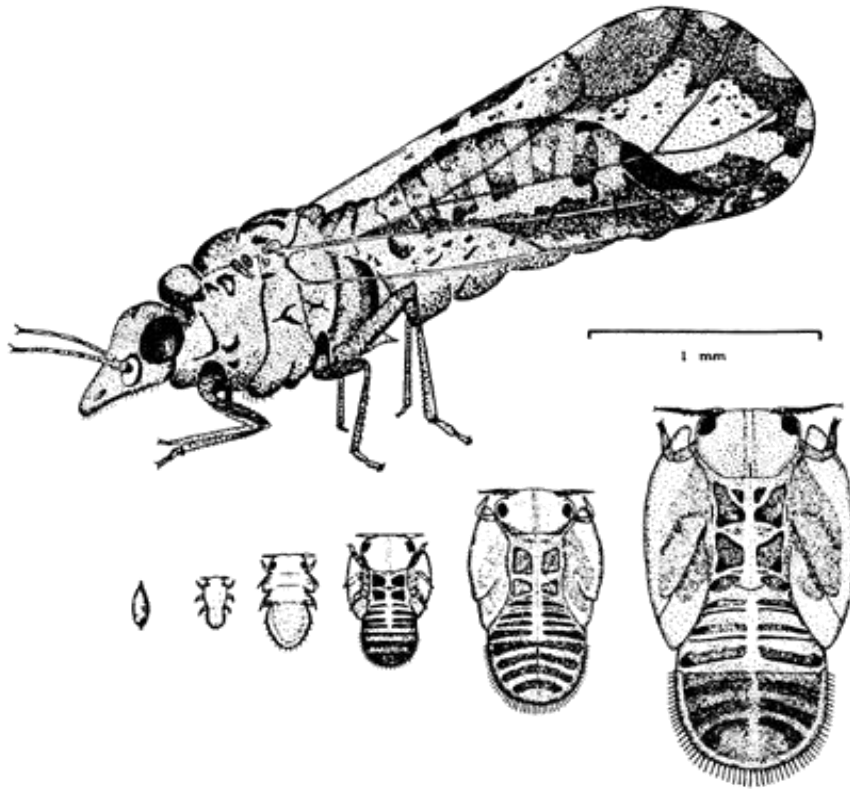


Asian citrus psyllid and the citrus disease huanglongbing



Matt Daugherty, Department of Entomology, UC Riverside
matt@ucr.edu

The psyllid is a small, tan and brown insect about the size of an aphid



- egg stage
- 5 relatively immobile juvenile stages (nymphs)
- winged adults

The lifecycle is strongly tied to periods of new growth in the plant

Adults feed on young or mature leaves, allowing them to persist year-round.



feeding adults tip their rear end up in a characteristic 45° angle

Females lay groups of tiny yellow-orange eggs

Only on the tips of new leaf tissue



new leaves = "flush"

Nymphs are very small, flat-bodied, yellow-brown in color

Can only survive on new leaf tissue



Produce white, waxy tubules as they feed

Tubules are often easier to see than the insect bodies

Psyllids use all types of citrus and some related plants in Rutaceae

- *Citrus* (limes, lemons, oranges, grapefruit, mandarins...)
- *Fortunella* (kumquats)
- *Severinia buxifolia* (Chinese box orange)
- *Murraya paniculata* (orange jessamine)
- *Bergera koenigii* (Indian curry leaf)
- *Citropsis* (cherry orange)
- *Triphasia trifolia* (limeberry)
- *Clausena indica* (wampei)
- *Microcitrus papuana* (desert-lime)
- Others.....

Calamondin



Why worry about ACP?

Psyllids inject a salivary toxin as they feed that can damage developing shoots

Twisted, notched leaves may also be apparent



Severe damage just from feeding is unusual

Why worry about ACP?

ACP is a vector of the bacteria associated with huanglongbing (HLB)

- “yellow shoot disease”
- citrus greening disease

Infective psyllids can spread the pathogen when it moves

The bacterium blocks nutrient transport, causing yellowing and other symptoms of stress

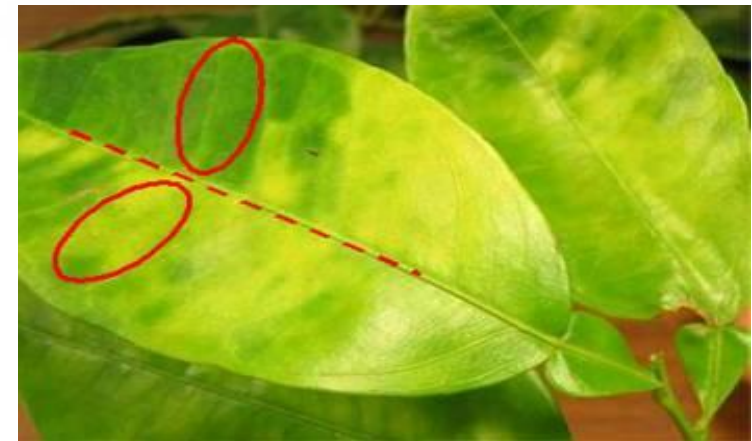


Candidatus Liberibacter asiaticus

Earliest signs of disease are foliar symptoms



Superficially can look like nutrient deficiencies



Asymmetric, blotchy yellow discoloration

Leaf veins may also be noticeably thickened



HLB disease affects fruit development, color, and flavor

Fruit from diseased trees is smaller, lopsided, with uneven segments and aborted seeds

The lower half of fruit may stay green

Flavor tends to be sour, bitter, or otherwise “off-flavored”



Later symptoms characterized by overall lack of vigor

Excessive leaf and fruit drop

- particularly if facing other stressors

Thinning, poor regrowth of canopy

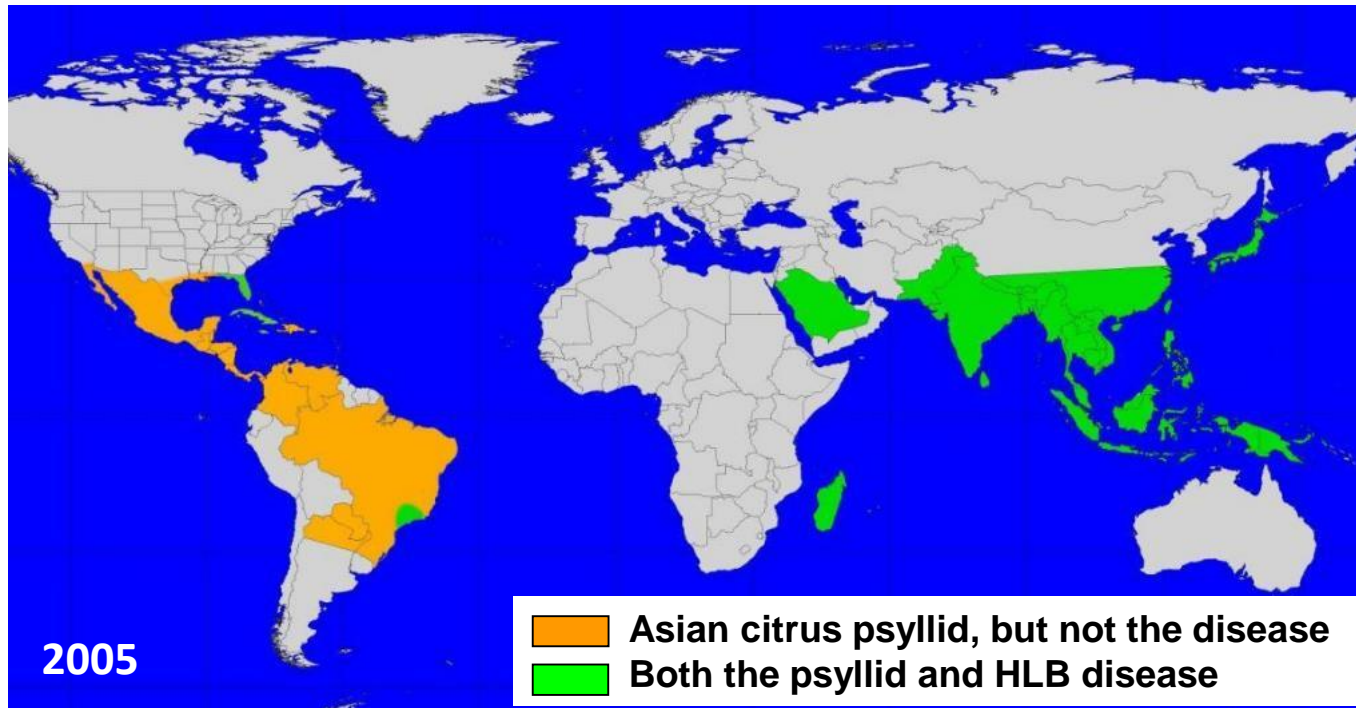
There is no cure for the disease



ACP and HLB origins?

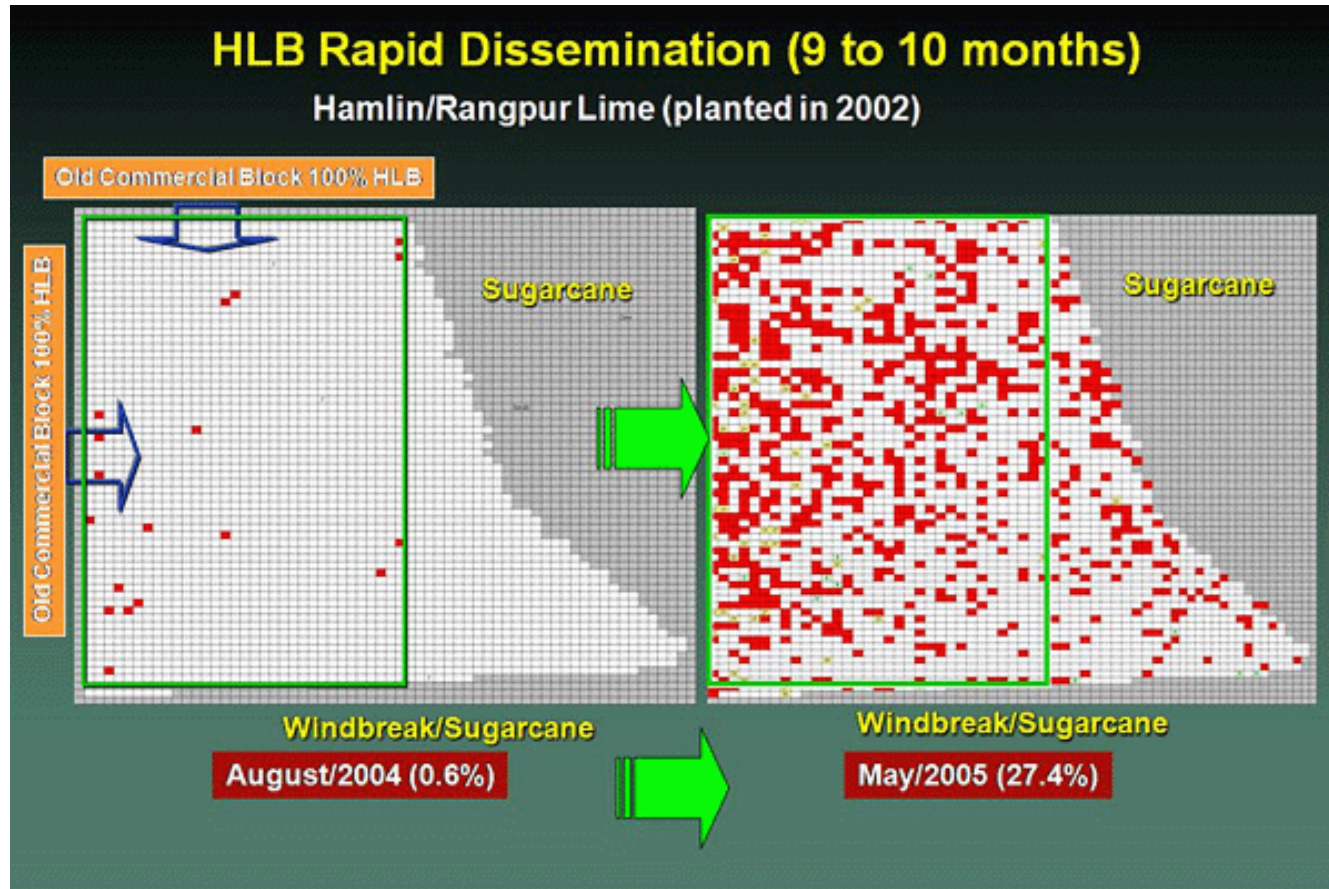
Most likely from Indian subcontinent or SE Asia

- also present in Middle East and East Africa



Invaded the Americas within last 20 years: Brazil, Caribbean, Mexico, Florida, TX, CA

HLB can spread quickly



From less than 1% to more than 25% within a year

HLB epidemiology makes it difficult to manage

Disease symptoms manifest after > 6 months

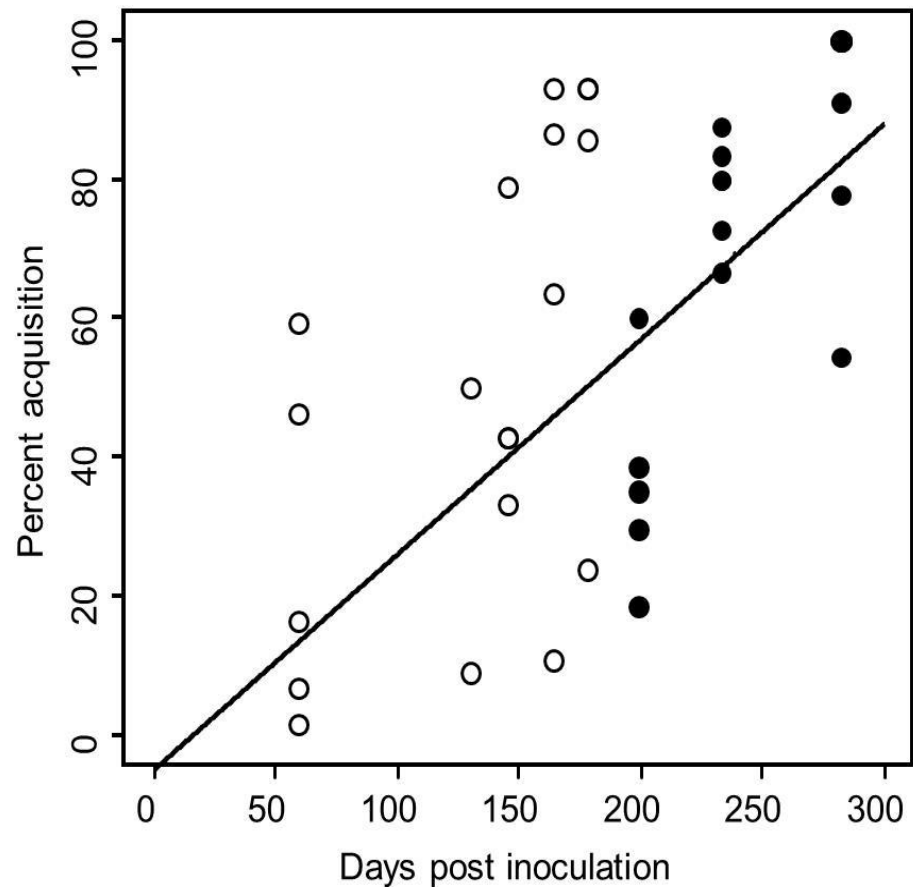
> 2 yr in the field?

But, psyllids can acquire from infected trees after < 2 mo

< 2 wk?

Lots of spread before any evidence of disease

Early detection is critical but challenging



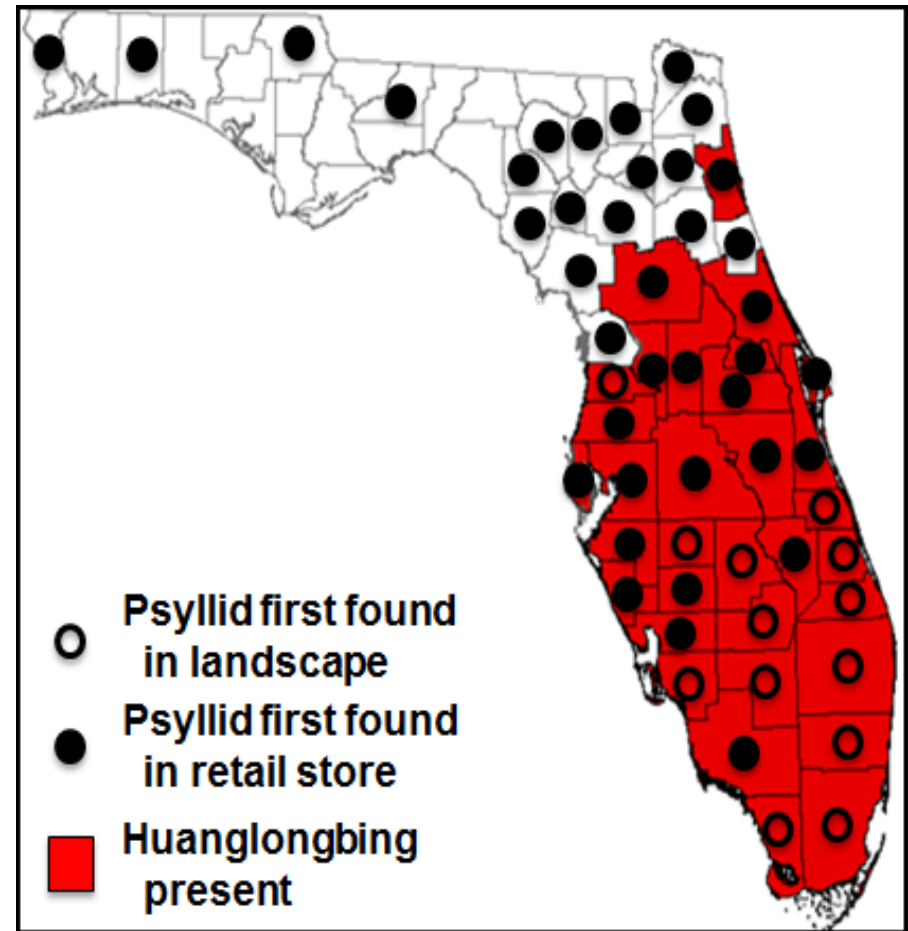
HLB and ACP spread rapidly in Florida

ACP was first detected in 1998, after which it spread rapidly statewide

- assisted by shipment of infested ornamentals

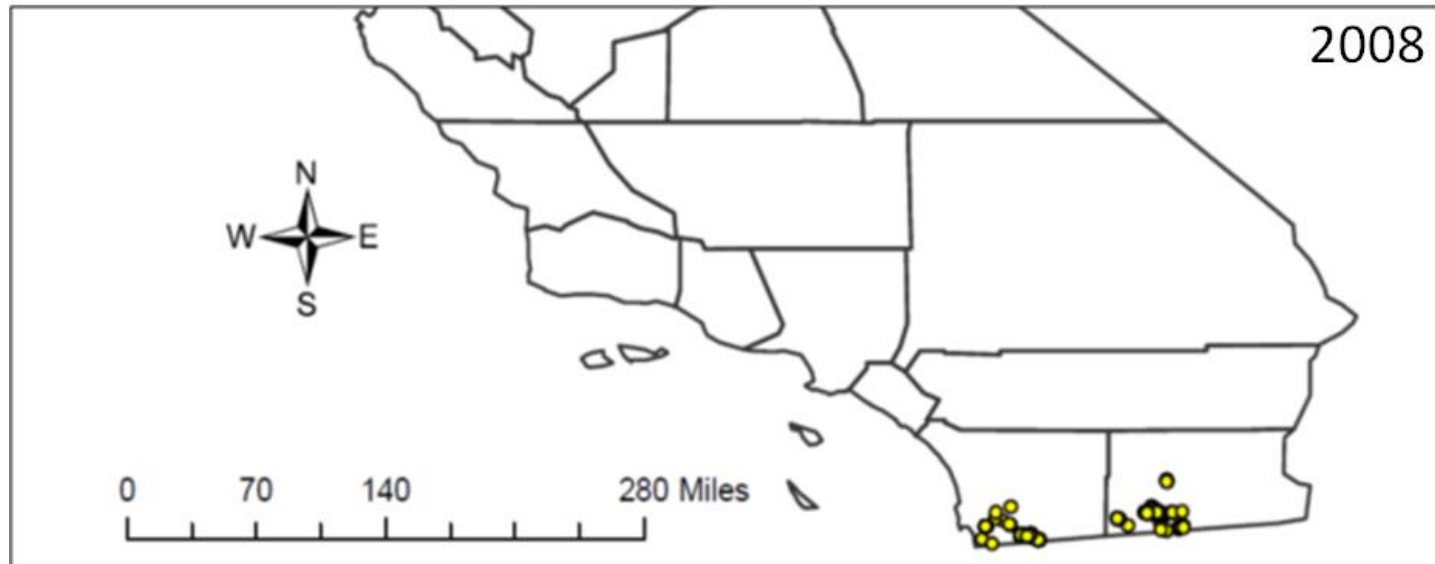
Within 3 years HLB spread to all citrus growing regions

- citrus production is ~1/2 of what it was
- production costs 50+% higher



Where are ACP and HLB in California?

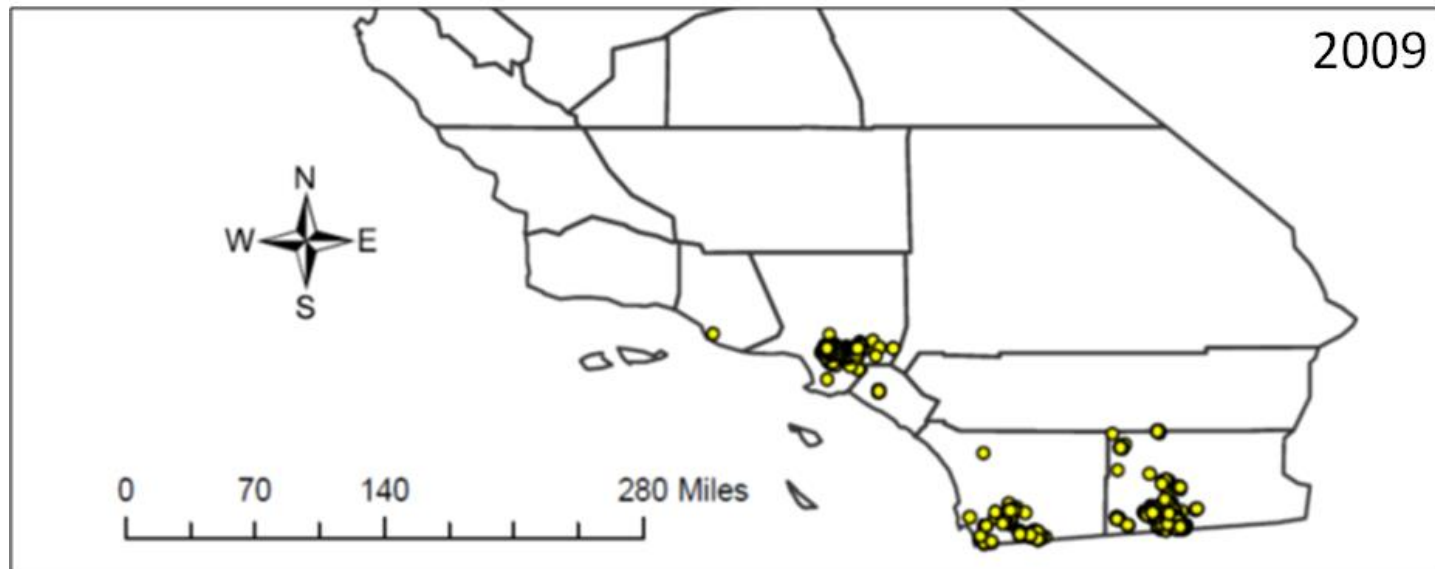
ACP was found in San Diego in 2008, via Mexico? It is now prevalent in Southern California and select areas further north



First found in residential citrus in San Diego; Imperial shortly afterward

Where are ACP and HLB in California?

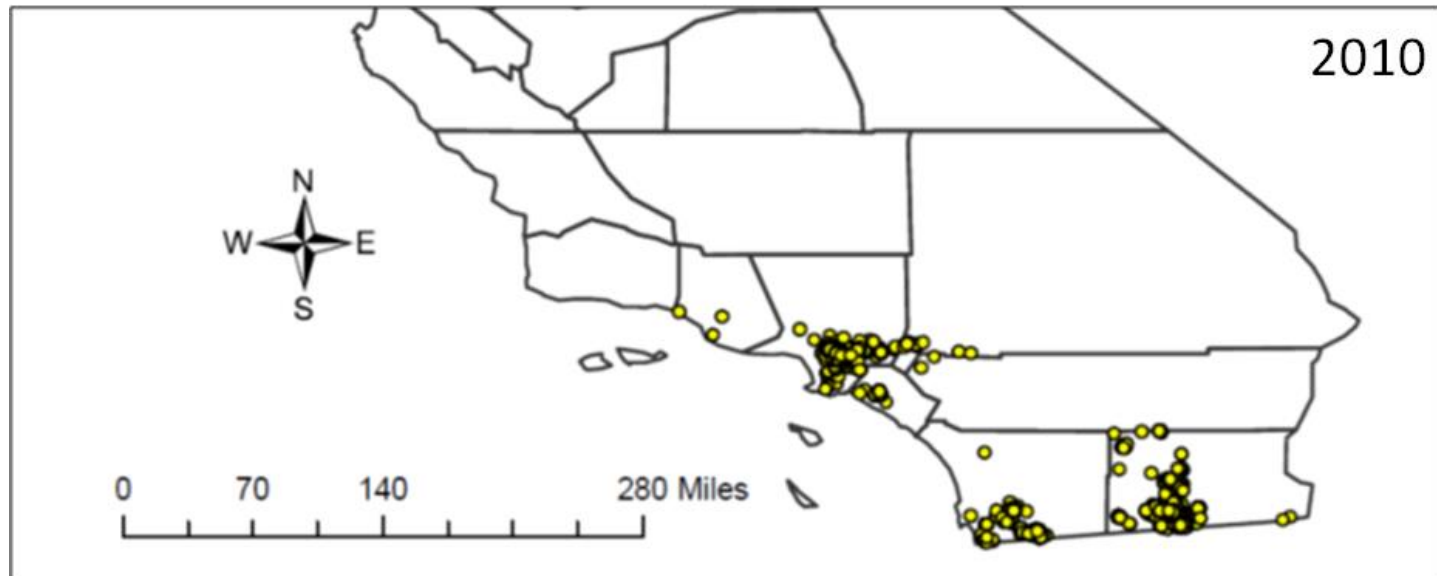
ACP was found in San Diego in 2008, via Mexico? It is now prevalent in Southern California and select areas further north



Documented in Los Angeles and quickly spread; some detections in Orange and Ventura

Where are ACP and HLB in California?

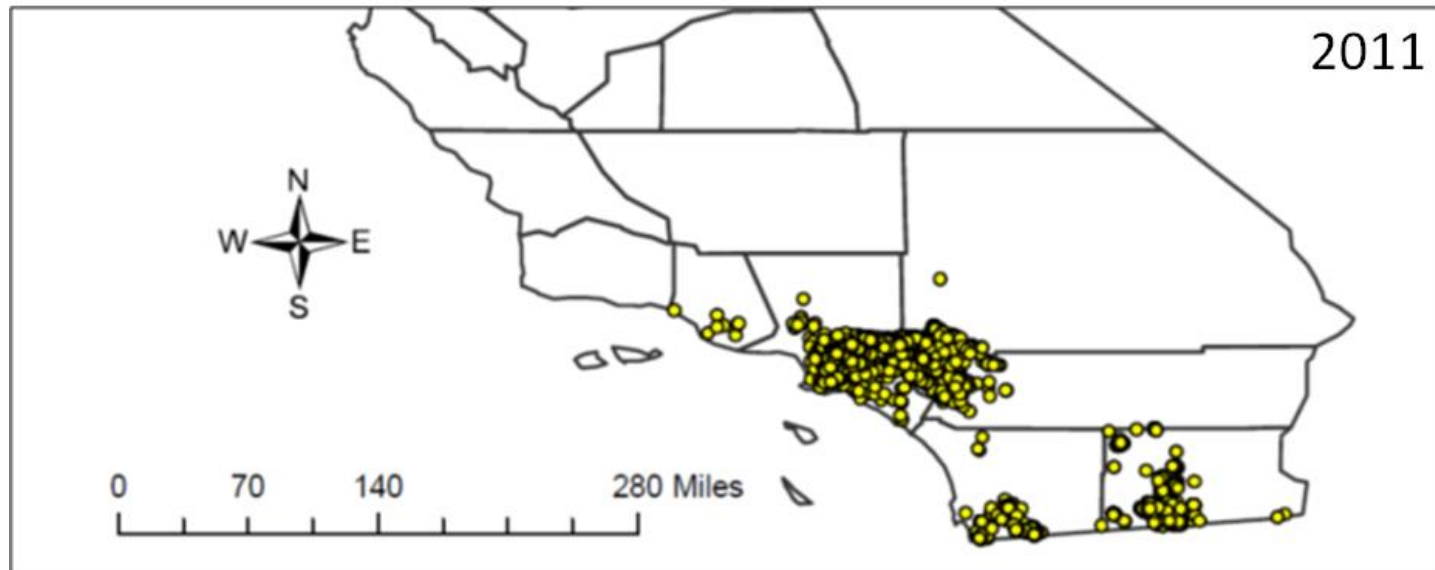
ACP was found in San Diego in 2008, via Mexico? It is now prevalent in Southern California and select areas further north



Spread east from Los Angeles into San Bernardino and Riverside Counties

Where are ACP and HLB in California?

ACP was found in San Diego in 2008, via Mexico? It is now prevalent in Southern California and select areas further north

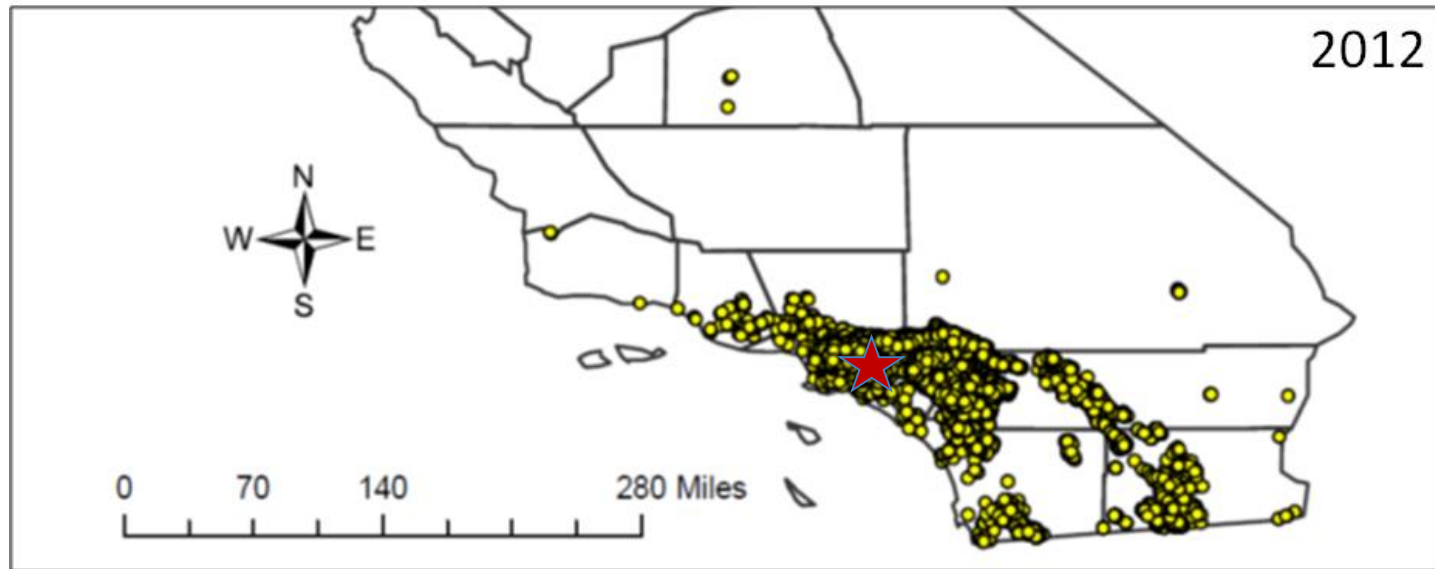


Continued spread south and east from Los Angeles

First nursery and commercial citrus finds

Where are ACP and HLB in California?

ACP was found in San Diego in 2008, via Mexico? It is now prevalent in Southern California and select areas further north



First ACP finds in the Central Valley

First HLB detection (Hacienda Heights)

First California detection of HLB

HLB pathogen is graft transmissible

Illegally imported citrus trees or budwood are sources of infection

Infected budwood was brought into California illegally and grafted onto a residential tree

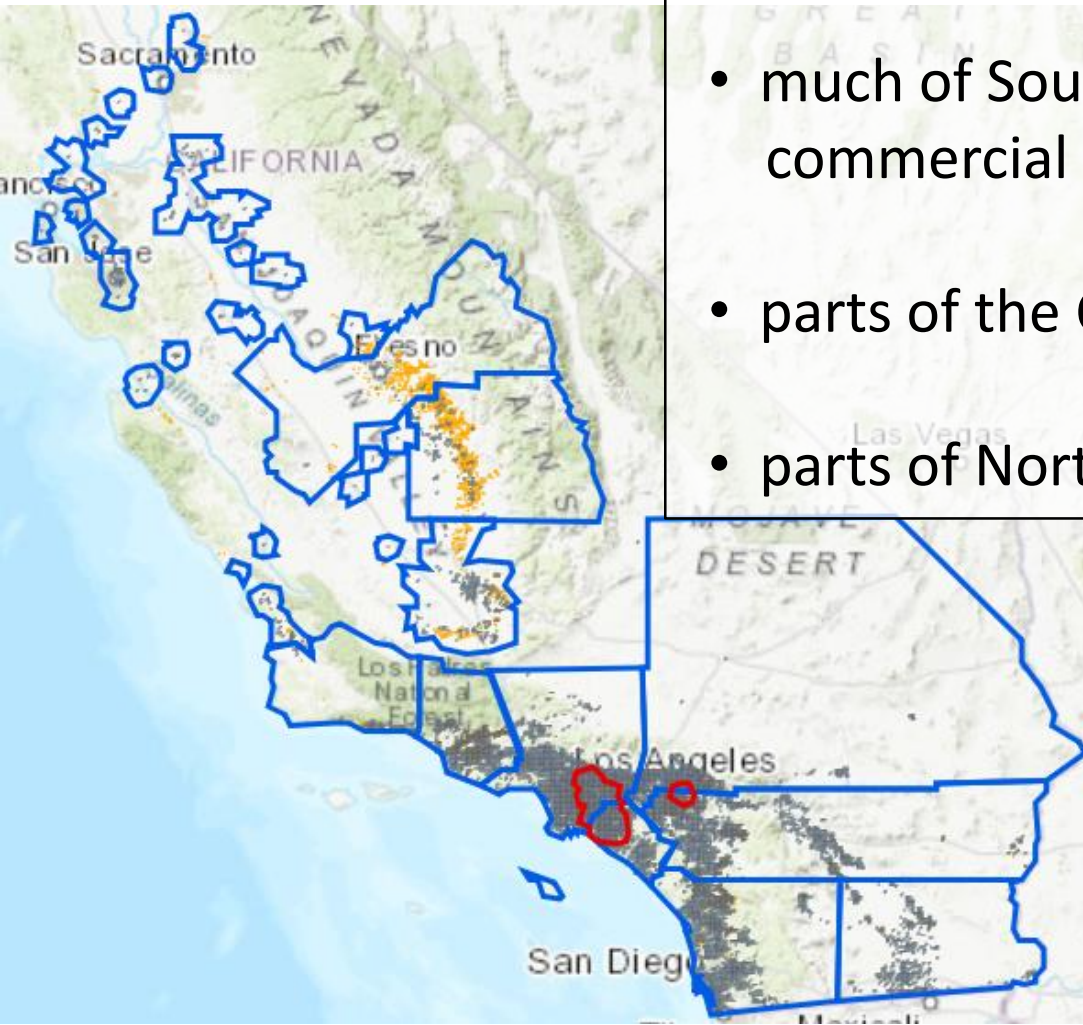


It is critical to obtain disease-free trees and budwood from reputable nurseries

Where are they now?

ACP is present throughout urban/ suburban Southern California

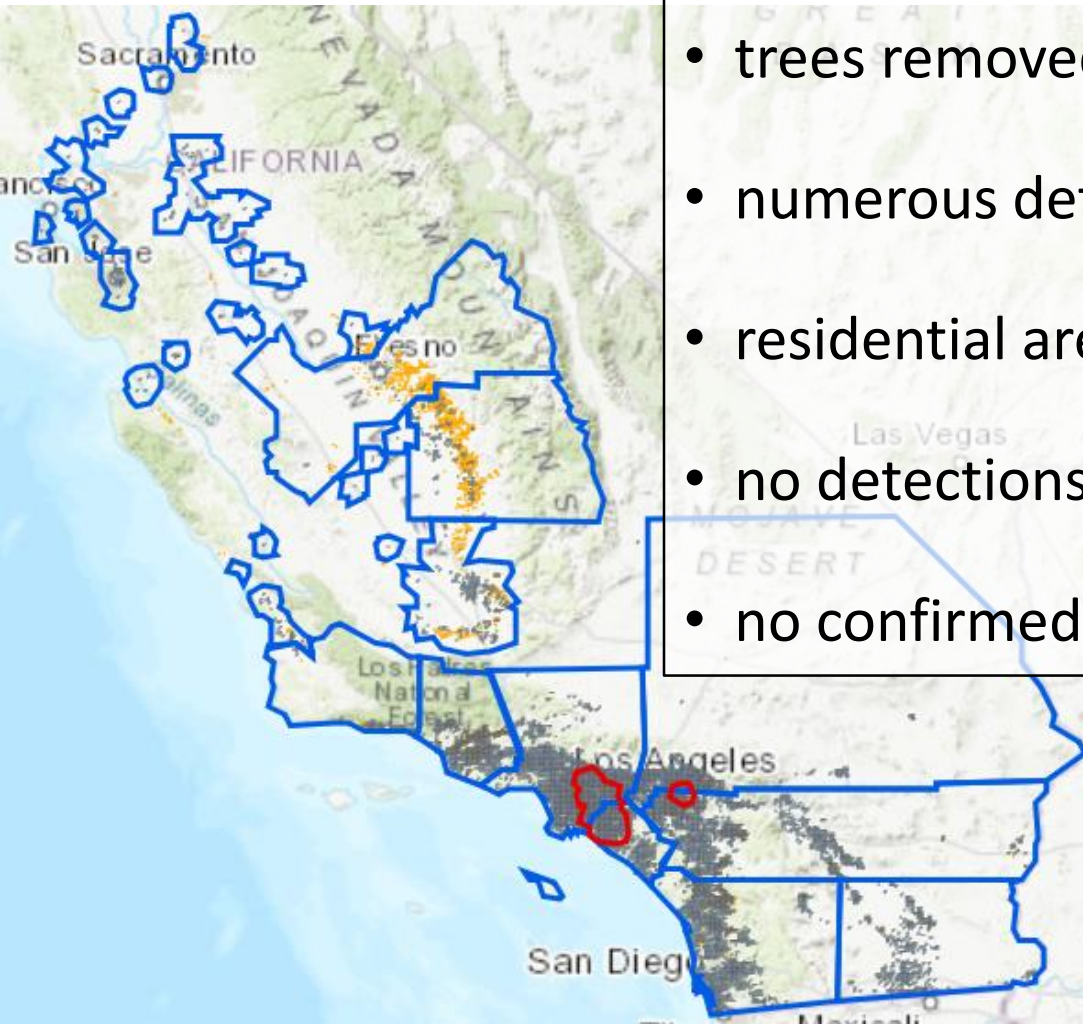
- much of Southern California commercial citrus
- parts of the Central Valley
- parts of Northern California



Where are they now?

Since 2012, there have been 500+ confirmed cases of HLB

- trees removed, additional monitoring
- numerous detections in psyllids
- residential areas of LA, Orange, Riverside
- no detections in commercial citrus
- no confirmed detections in Central Valley



What is being done to mitigate the impact of ACP and HLB?

1. Statewide monitoring for ACP and HLB
2. Quarantines established around infested areas
 - regulated movement of host plants
 - regulated movement of bulk fruit
3. Treatments of residential citrus
4. Biological control
5. Area-wide management of commercial citrus
 - chemical control of ACP, bactericides

Movement of citrus nursery stock

Compliance agreement

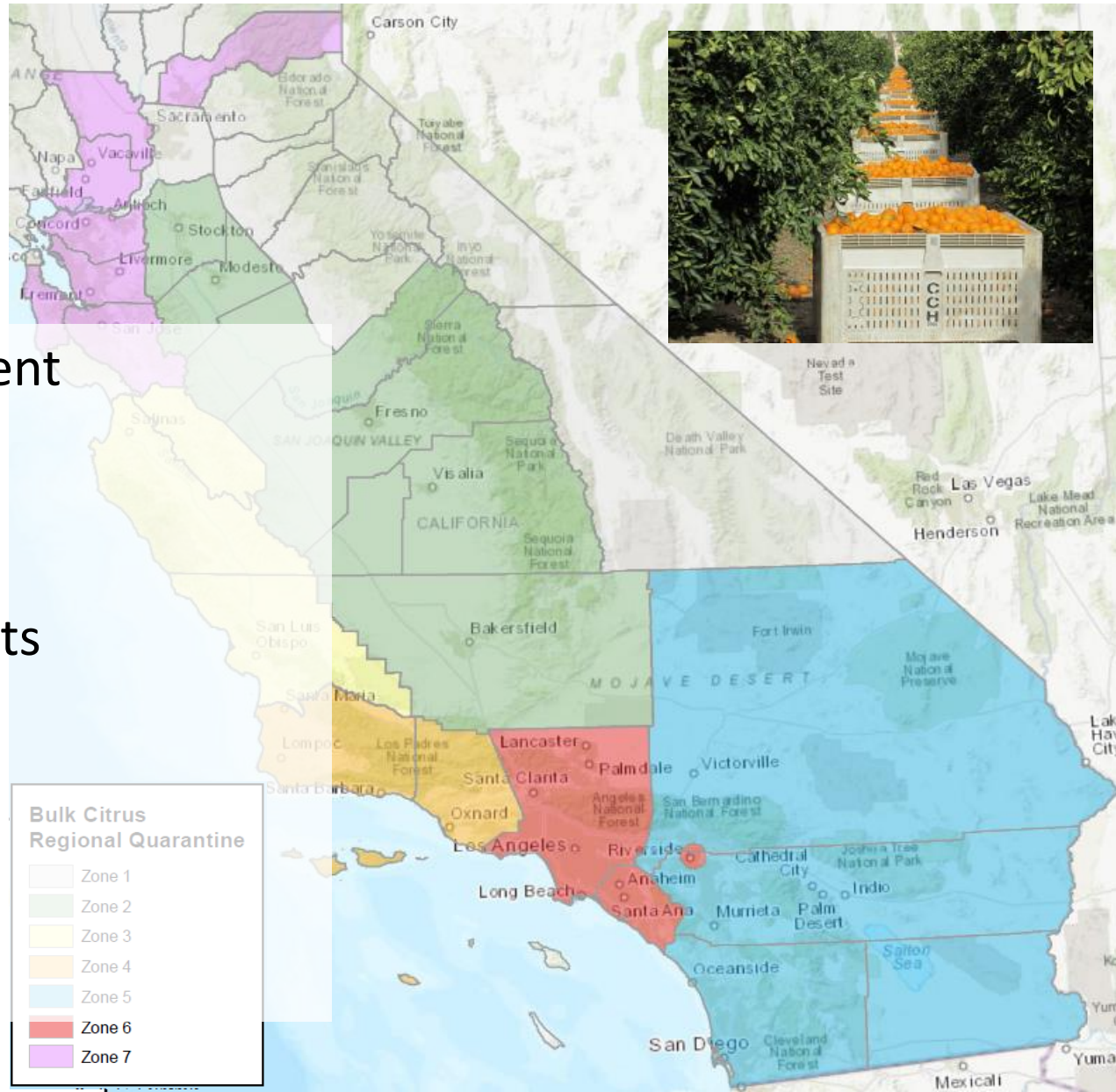
Mandatory insecticide treatments

- soil drench with systemic neonicotinoid
- foliar application of pyrethroid

[CDFA LINK]



Movement of bulk citrus



Compliance agreement

Tarping

Insecticide treatments

In field washes

[CDFA LINK]

Residential treatment program

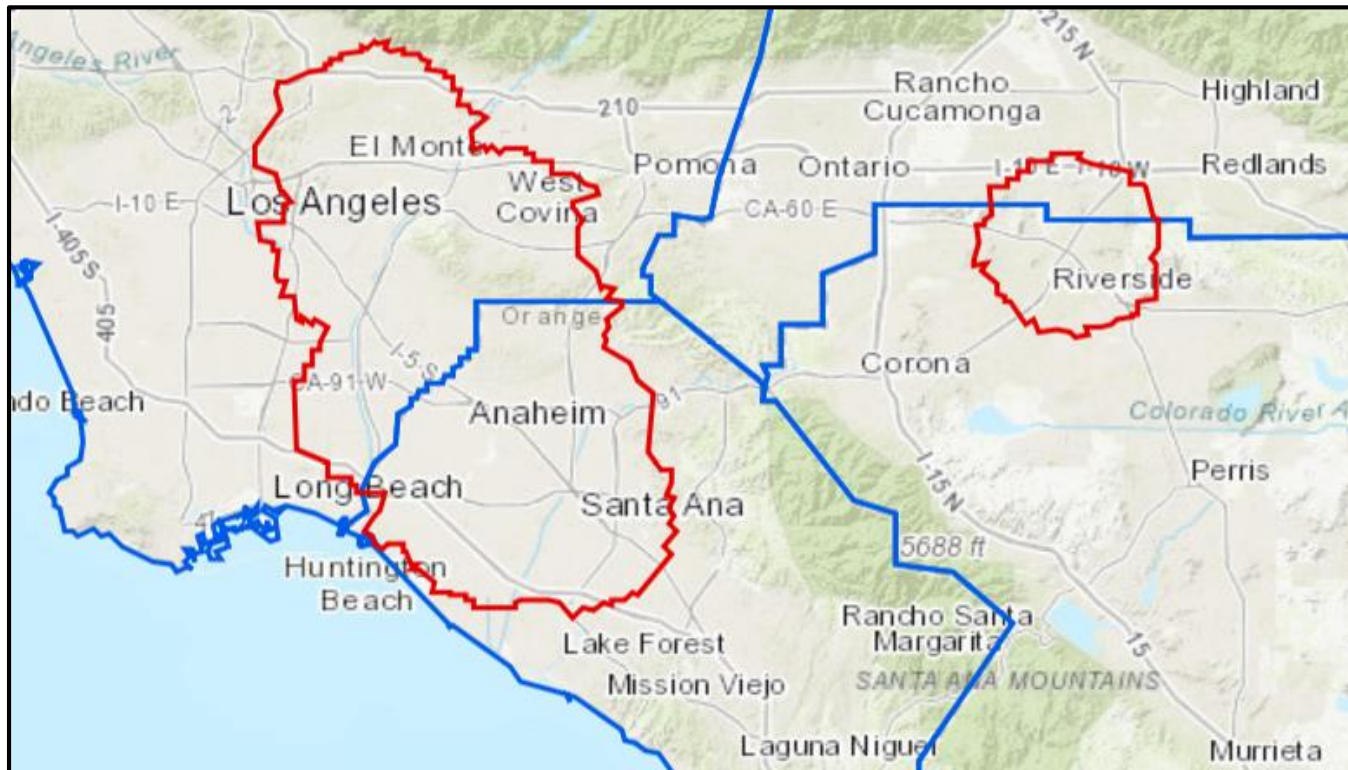
Voluntary, CDFA administered program to treat for ACP in select neighborhoods using a combination of insecticides:

- cyfluthrin (Tempo) a foliar pyrethroid
- imidacloprid (Merit) a systemic neonicotinoid



Residential treatment program

Originally treated properties nearby all new detections

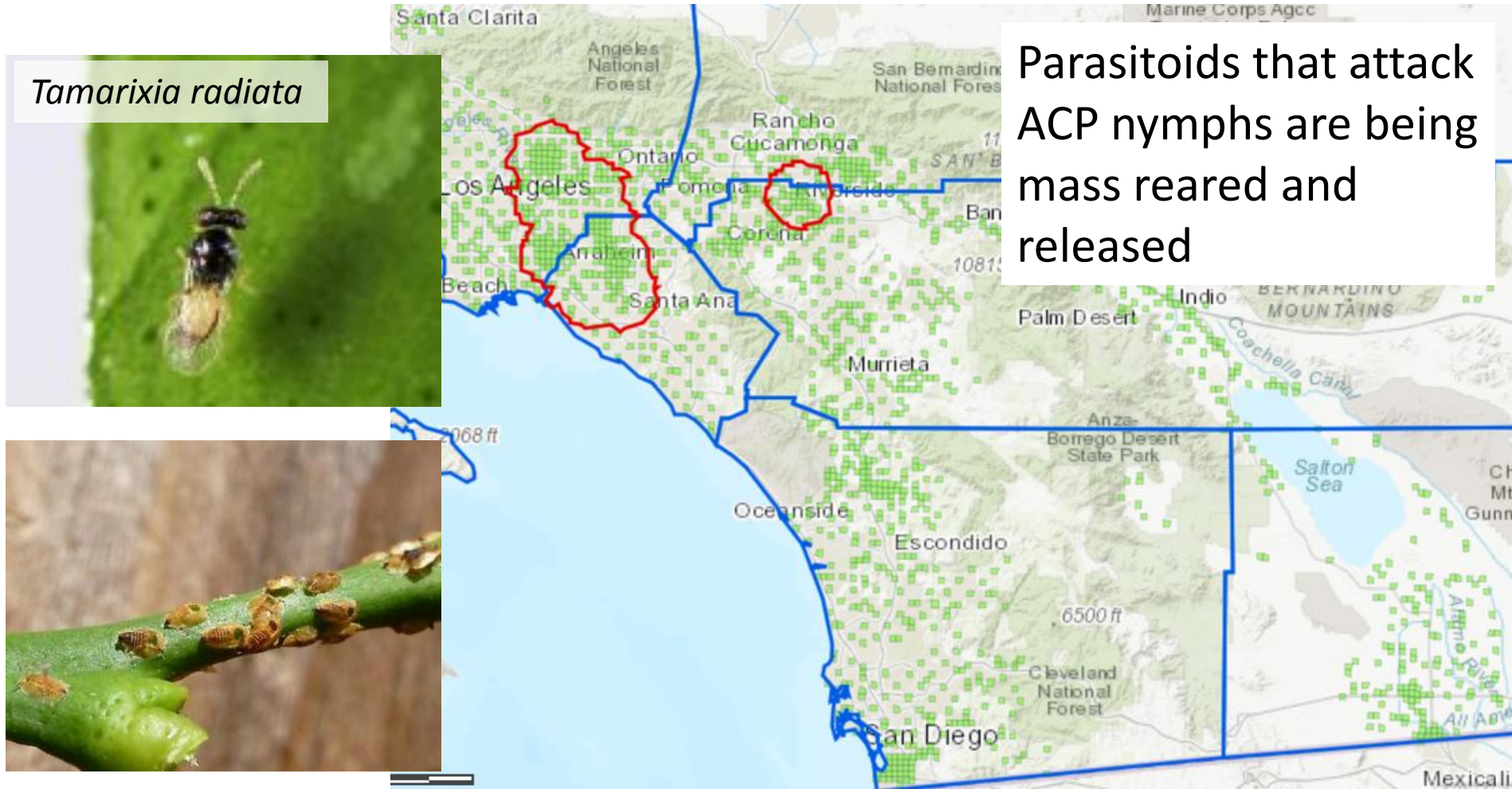


Currently limited to HLB quarantine zones

Mass release of biological control agents

Tamarixia radiata

Parasitoids that attack ACP nymphs are being mass reared and released

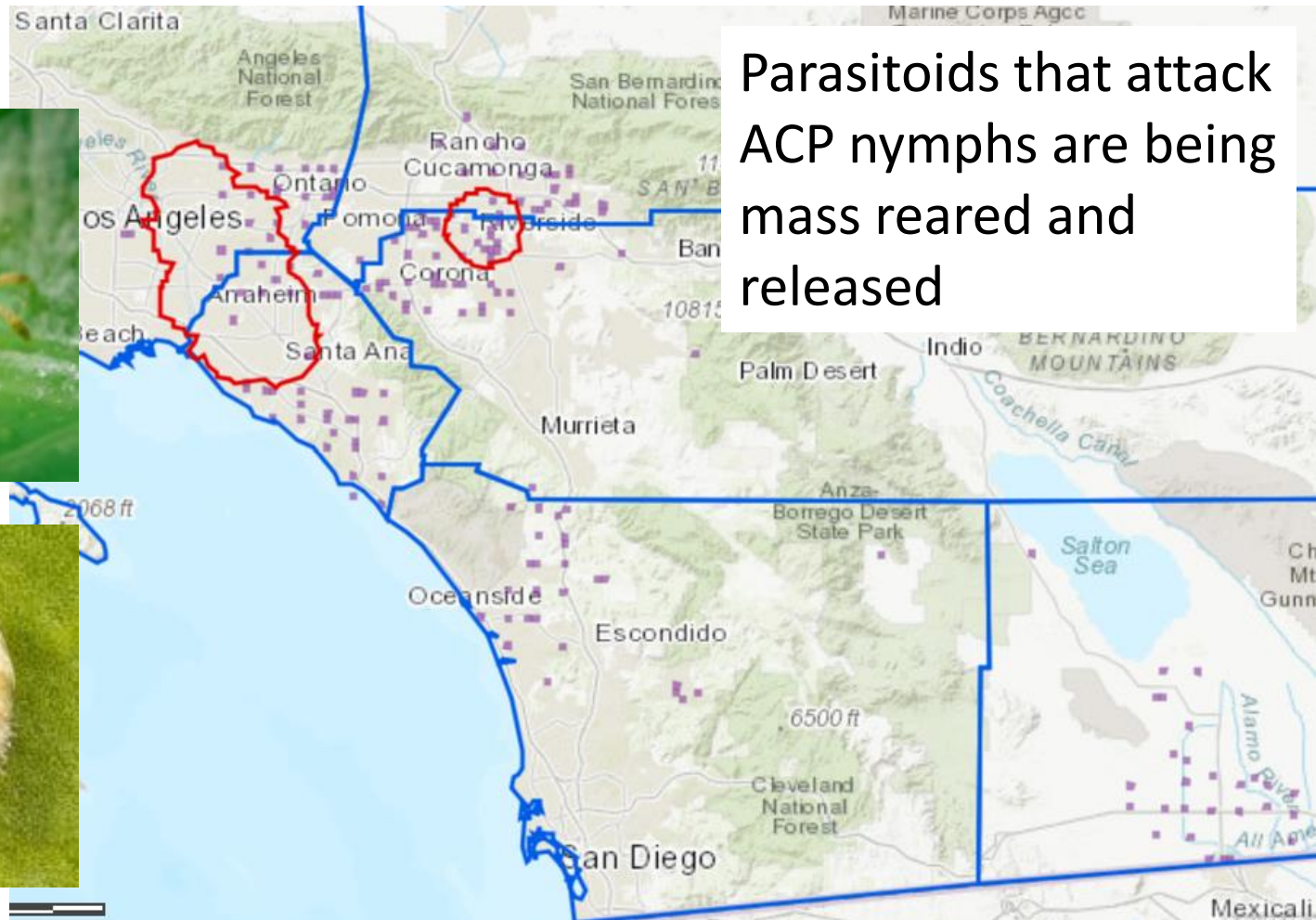


Since 2011, *T. radiata* has been released at thousands of locations

Mass release of biological control agents

*Diaphorencyrtus
aligharensis*

Parasitoids that attack
ACP nymphs are being
mass reared and
released

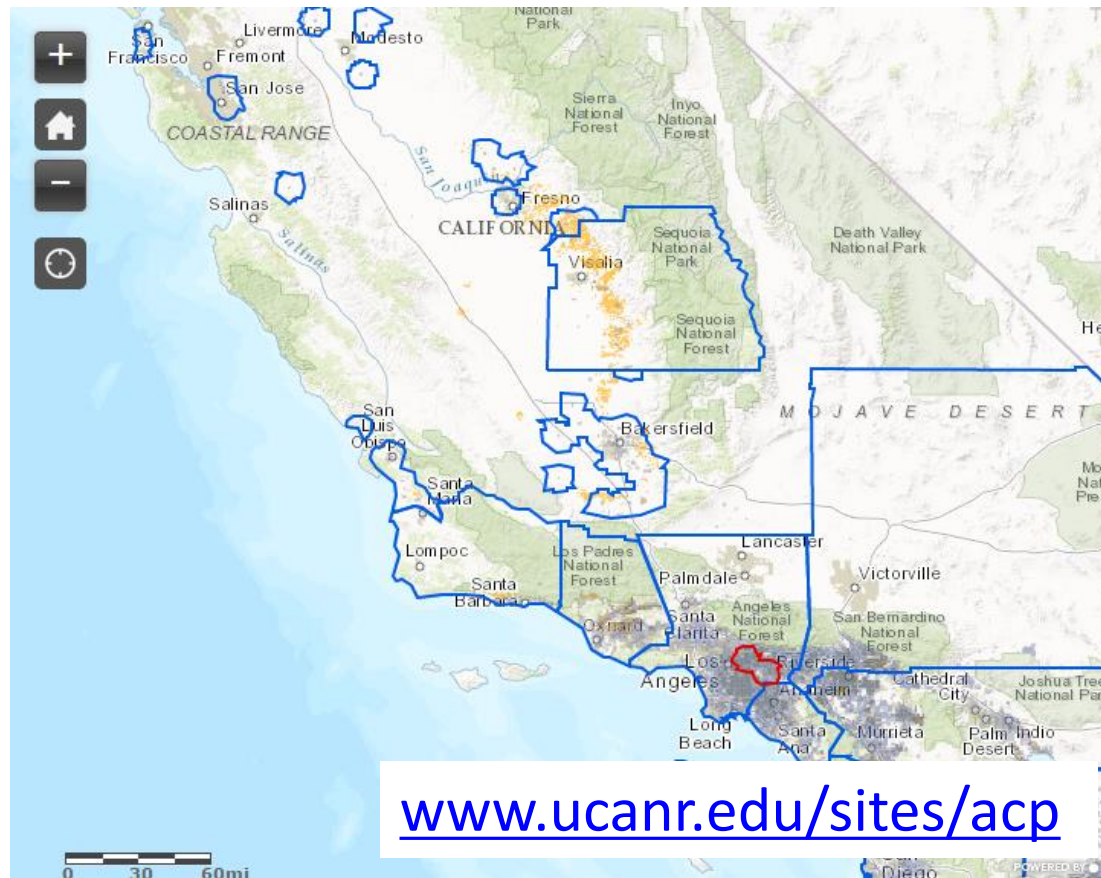


More recently, a second parasitoid has started to be released

How to help? – Help maintain quarantines

Know where you are relative to the pest and disease

Don't move host plants or green waste outside of quarantines



How to Help? - Plant citrus from a reputable sources

1. Don't buy plants whose history isn't known

- not likely to have received appropriate treatments
- at risk of ACP infestation or HLB infection



2. Don't trade/graft plant material

How to help? – Look for the psyllid & disease

Inspect new leaves for ACP adults and nymphs

Look for blotchy yellowed leaves and small oddly shaped fruit

If ACP or suspect symptoms are present, call Ag Commissioner's office or the CDFA hotline



If You Find it: Act Fast, Time is Critical

Think you found the **Asian citrus psyllid or HLB symptoms on your tree.**

Call
800/491-1899

- Time is critical.
- Secure psyllids and leaf samples in a clear, locked sandwich bag, jar or plastic container.
- Contact your local Agricultural Commissioner's office or call the California Department of Food and Agriculture hotline immediately.

How to help? – Disposal of green waste

When citrus trees are pruned, make sure the green waste is:

- Chipped or shredded on site before disposal
- Pruned and dried on site for 1-2 wk before putting in green bin
- Double bagged and disposed



How to help? - Ensure biocontrol is effective

Argentine ants can disrupt biological control

- tend scale, aphids, psyllids
- intimidate or kill parasitoids
- decreases parasitism by 5-10 fold

Control ants to improve biocontrol

- "tanglefoot" around base of tree
- use poison bait stations



How to help? - Insecticides available for ACP control

Type of treatment	Pesticide Name	Effectiveness against ACP	Duration of control	Application timing
Professional treatment	Tempo & Merit	High	Months	Foliar: when psyllids are present Systemic: summer or fall
Homeowner-applied broad-spectrum foliars	Sevin, Malathion	Moderate	Weeks	When psyllids are observed
Homeowner-applied soil drench	Bayer Advanced Fruit, Citrus & Vegetable	Moderate	Months	When psyllids are observed in summer or fall
Homeowner-applied soft foliars	Insecticidal soaps, oils and pyrethrins	Low to moderate	Days	Every 7-10 days especially during flush

Only do applications when ACP is present

Always follow label instructions to minimize impacts on beneficial insects

For more information

UC IPM Quick Tip for homeowners:

<http://ipm.ucanr.edu/QT/asiancitruscard.html>

UC IPM Pest Note:

<http://ipm.ucanr.edu/urbanACP>

ACP Distribution and Management:

<http://ucanr.edu/sites/ACP/>

Online ACP & HLB training course:

<http://class.ucanr.edu/>

Asian Citrus Psyllid and Huanglongbing Disease

The Asian citrus psyllid and the deadly Huanglongbing (HLB) disease that it spreads threaten citrus trees in backyards and on farms. The psyllid arrived in Southern California in 2008, and the HLB disease was first detected in Los Angeles in 2012. All types of citrus—including oranges, grapefruit, lemons, and mandarins—are affected as well as a few closely related ornamentals.

What is the concern?

- HLB disease will kill trees in as little as five years.
- There is no cure or effective control method for HLB.
- HLB disease is caused by a bacterium carried from tree to tree by the Asian citrus psyllid.
- Reducing the psyllid population helps to slow the spread of the disease.
- Although the psyllid can damage leaves, it doesn't kill trees by itself, and fruit is safe to eat.

Inspect your citrus trees for psyllids.

- From spring through fall, look for psyllid eggs, nymphs, and adults on newly forming leaves.
- Adults are about the size of an aphid with brownish mottled wings. They feed with their heads down and their "tails" in the air.
- Nymphs are tiny and yellowish, and they excrete white waxy tubules.
- Psyllids feed on plant sap and produce sticky honeydew that may be covered with black sooty mold. However, other citrus pests (e.g. aphids, soft scales) may cause this symptom, too.

What are the symptoms of HLB disease?

What about insecticides?

- If you live where the psyllid hasn't become established, CDA personnel will come apply insecticides and manage the pest for you. They will also test to see if the psyllids are carrying the disease.
- In areas where the Asian citrus psyllid is well established, CDA is asking residents to help reduce psyllid numbers by treating their own infested trees.
- There are no treatments for HLB disease. Diseased trees must be removed to protect any citrus trees around them from becoming infected.
- Treat only when Asian citrus psyllids are present, because insecticides can harm bees and natural enemies needed for other pests.
- Don't apply insecticides when trees are flowering because of toxicity to bees.
- The systemic insecticide imidacloprid provides the best control of nymphs infesting young leaves. It is taken up through roots and retained in trees for up to six months. It should be applied only once a year.
- If a carbaryl spray is used, be sure it makes direct contact with adults and nymphs hidden within new growth.

See Pest Notes: Asian Citrus Psyllid and Huanglongbing Disease at www.ipm.ucdavis.edu for more details.



Brownish adult, yellow nymphs, and white wax of Asian citrus psyllid (left). Symptoms of HLB on leaves and fruit (right).

Minimize the use of pesticides that pollute our waterways. Use nonchemical alternatives or less toxic pesticide products whenever possible. Read product labels carefully and follow instructions for disposal.

For more information, contact your local Extension office or your phone book at ipm.ucdavis.edu.

UC CE

UC CE

landscape and oceans!