

Huanglongbing: The Disease

Asian Citrus Psyllid: The vector



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Huanglongbing - HLB

“Yellow Shoot Disease”



Leaves point up



Yellow
sectoring



Huanglongbing - HLB “Yellow Shoot Disease”

Healthy Tree



Asia



Brazil



Florida

HLB - Fruit Symptoms



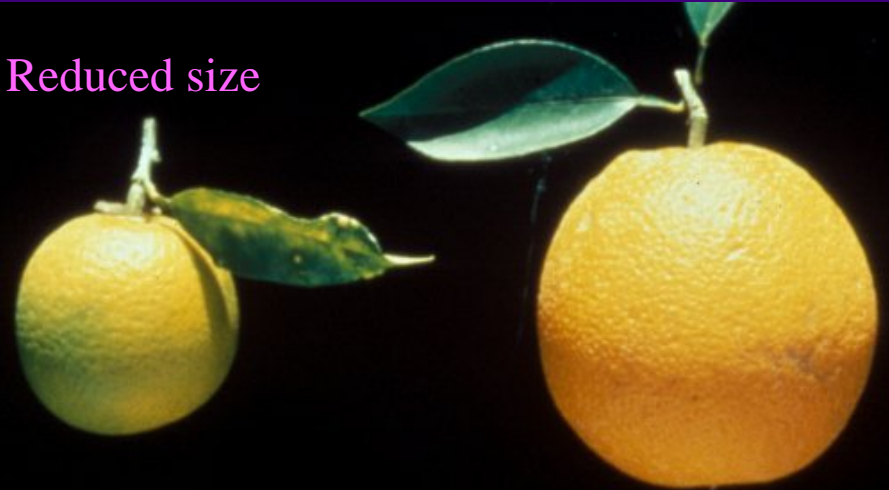
- Excessive & premature fruit drop
- Poor color - often remains green at bottom of fruit
- **Extreme bitter taste - not fit for juice!**

HLB: Fruit Symptoms

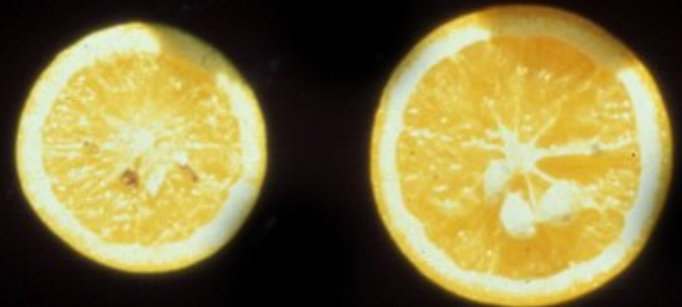
Asymmetry



Reduced size



Aborted seeds

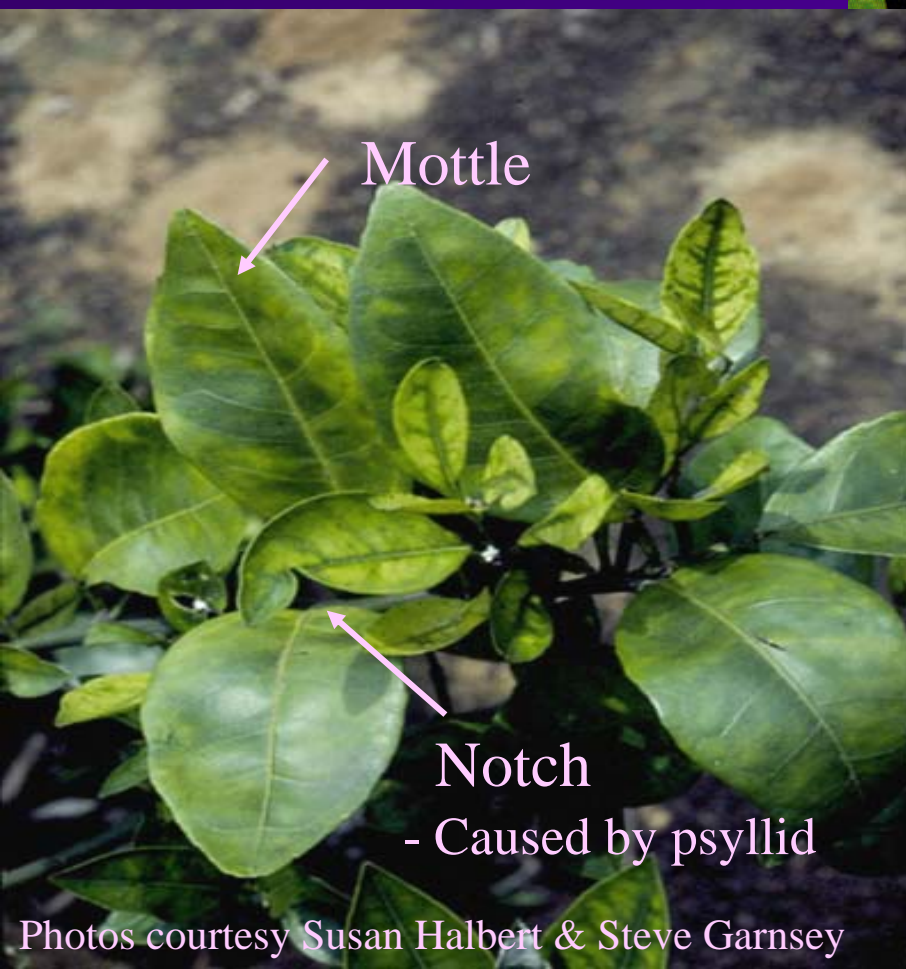


Greening

Normal

HLB - Leaf Symptoms

“Blotchy Mottle”



healthy



zinc



greening



HLB Leaf Symptoms

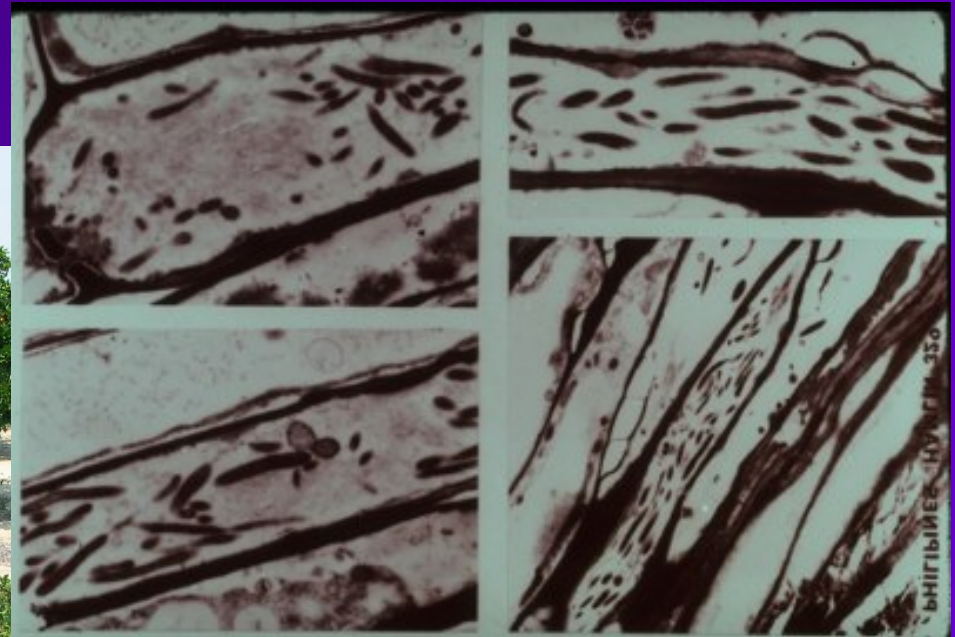


Yellow color pattern is not symmetrical across mid-vein

Causal Agent



Photo by Mike Irey



“Huanglongbing: one disease, several different agents!!”

J. Bove

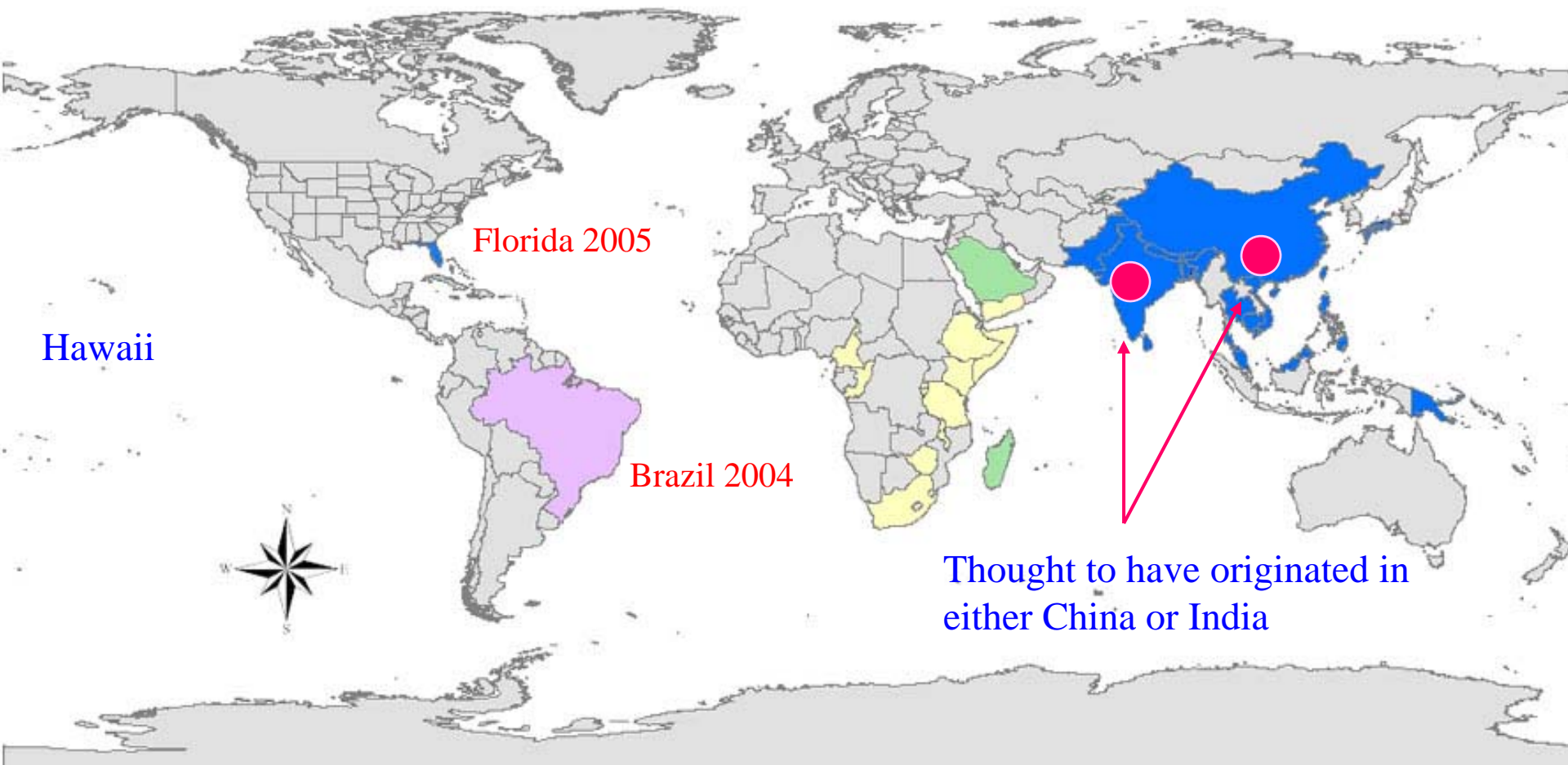
3 strains/species of *Liberibacter* (bacteria)

- unculturable
- associated with phloem

2 phytoplasmas

- unculturable
- wall-less mycoplasma-like bodies
- associated with phloem
- yellowing & shoot proliferation





Distribution of HLB strains: blue = Asian; yellow = African; green = Asian and African; pink = Asian and American

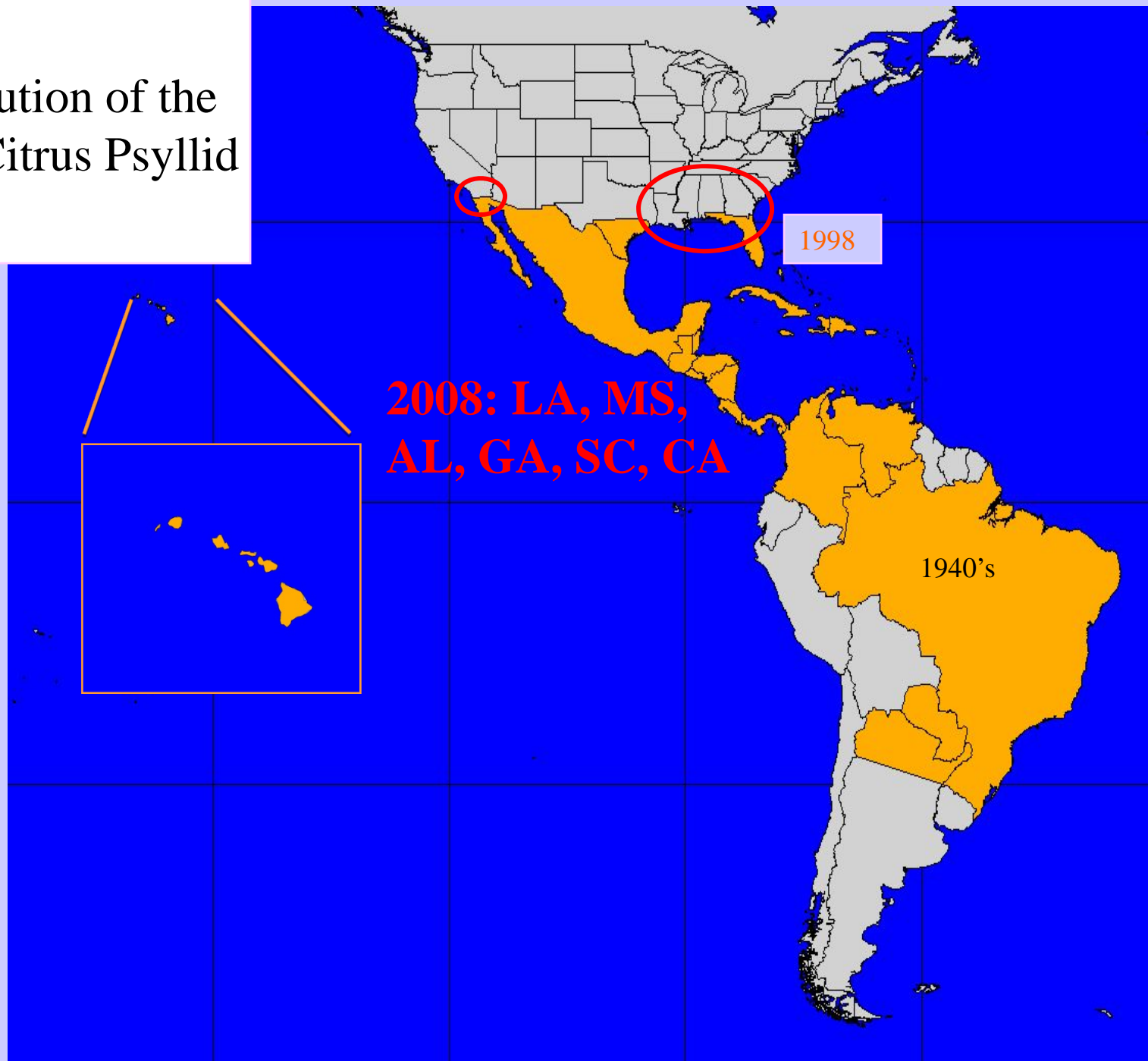
2 Known Species of Vector

- *Diaphorina citri* - Asian citrus psyllid
- *Trioza erytreae* - African citrus psyllid

*Under laboratory conditions, both psyllid species can transmit *Liberibacter* strains



Distribution of the Asian Citrus Psyllid



Asian citrus psyllid life cycle:

Adult

Egg

5 nymphal instars

Nymphs can only survive on new flush



Wing pads on
later stages

Adult psyllids usually feed on the underside of leaves (2-4 mm)

When feeding, they tip their body at a 45° angle



Eggs are bright yellow-orange, almond-shaped and are laid on the tips of growing shoots or in the crevices of unfolded “feather flush” leaves



Liberibacter appears to multiply in the psyllid

Psyllid retains the bacteria FOR LIFE!



When citrus leaves expand, the tips are twisted where psyllid feeding has taken place

Mature citrus trees can withstand flush damage, however the growth of new plantings will be retarded.



What To Look For



- Notched leaves
- Lots of wax
- Nymphs & eggs on new flush
- Adults more in center of tree
- 45° feeding angle of adults
- Use a hand lens
- Study tree for 10 min+



California Response

- Formation of a task force: Steering, Science & Technology, Communication, Regulatory Committees
- Science & Technology Committee draft Action Plan
- Regulatory Committee address pesticide use
- Communication Committee educate public

Potential Pathways Into California



Potential Pathways Into California



Photos by David Kellum



Murraya and other Rutaceous plants
used as green filler

Additional Host plants of Huanglongbing and the Asian Citrus Psyllid

Murraya paniculata - orange jessamine (also jasmine)



Both HLB & ACP



Photo: E.E. Grafton-Cardwell

Murraya paniculata is the preferred host of psyllids, *M. exotica* - a little less so

It is a common hedge plant in both Brazil and Florida

Most ornamental nurseries and home stores supply this plant



photo: Manjunath Keremane

Bergera koenigii (formerly
Murraya koenigii)



ACP only



Bergera koenigii (curry leaf plant) is an excellent host for psyllids
Greening has not been reported in this host
The plant is commonly present in some kitchen gardens

photos: Manjunath Keremane

Clausena lansium

(Lour.) Skeels: wampi, wampee



ACP and maybe HLB

Fortunella crassifolia, margarita
Meiwa kumquat, Nagami kumquat



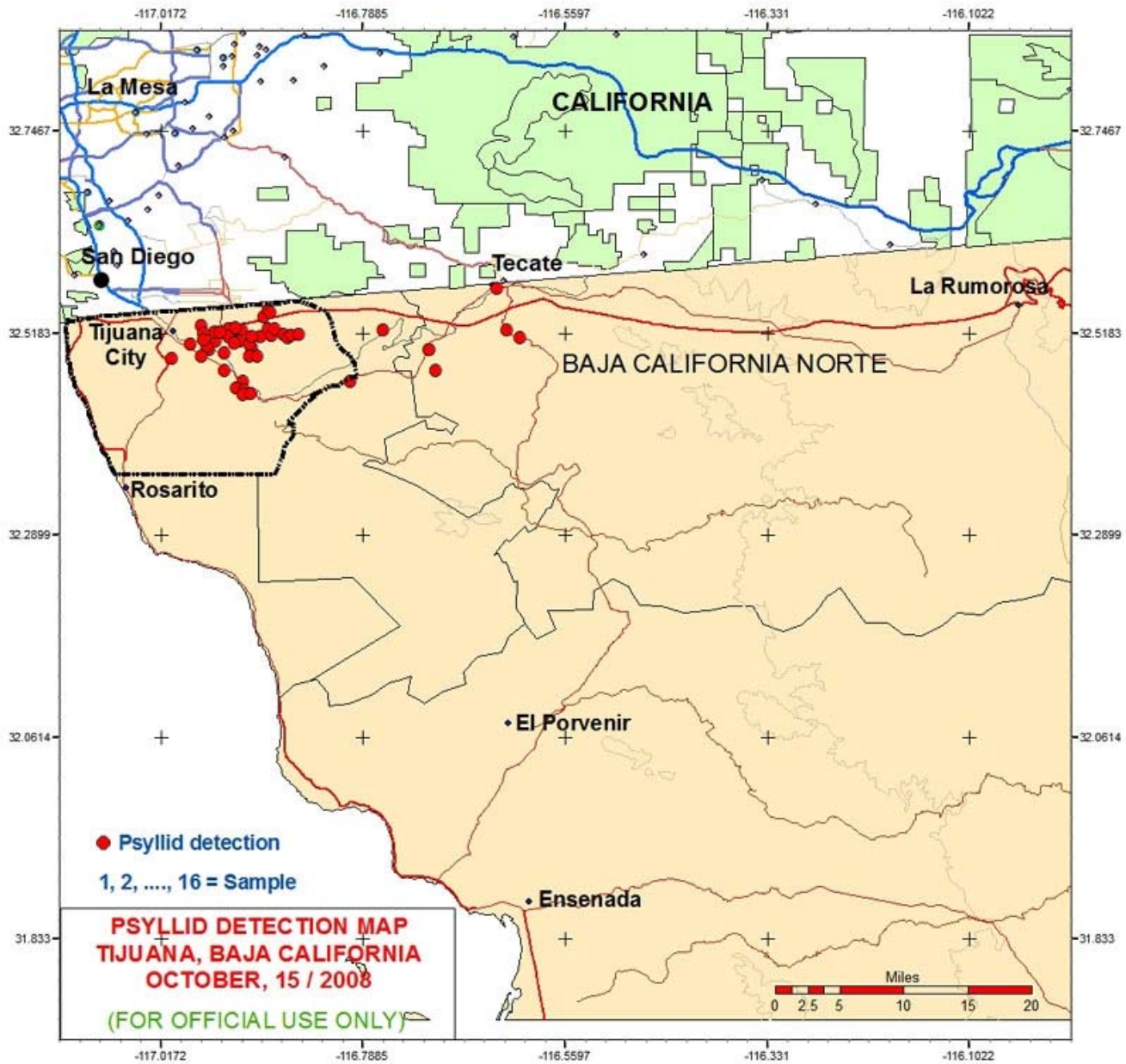
Both HLB & ACP

Severinia buxifolia

(Poiret) Ten. : Chinese box-orange



Both HLB & ACP

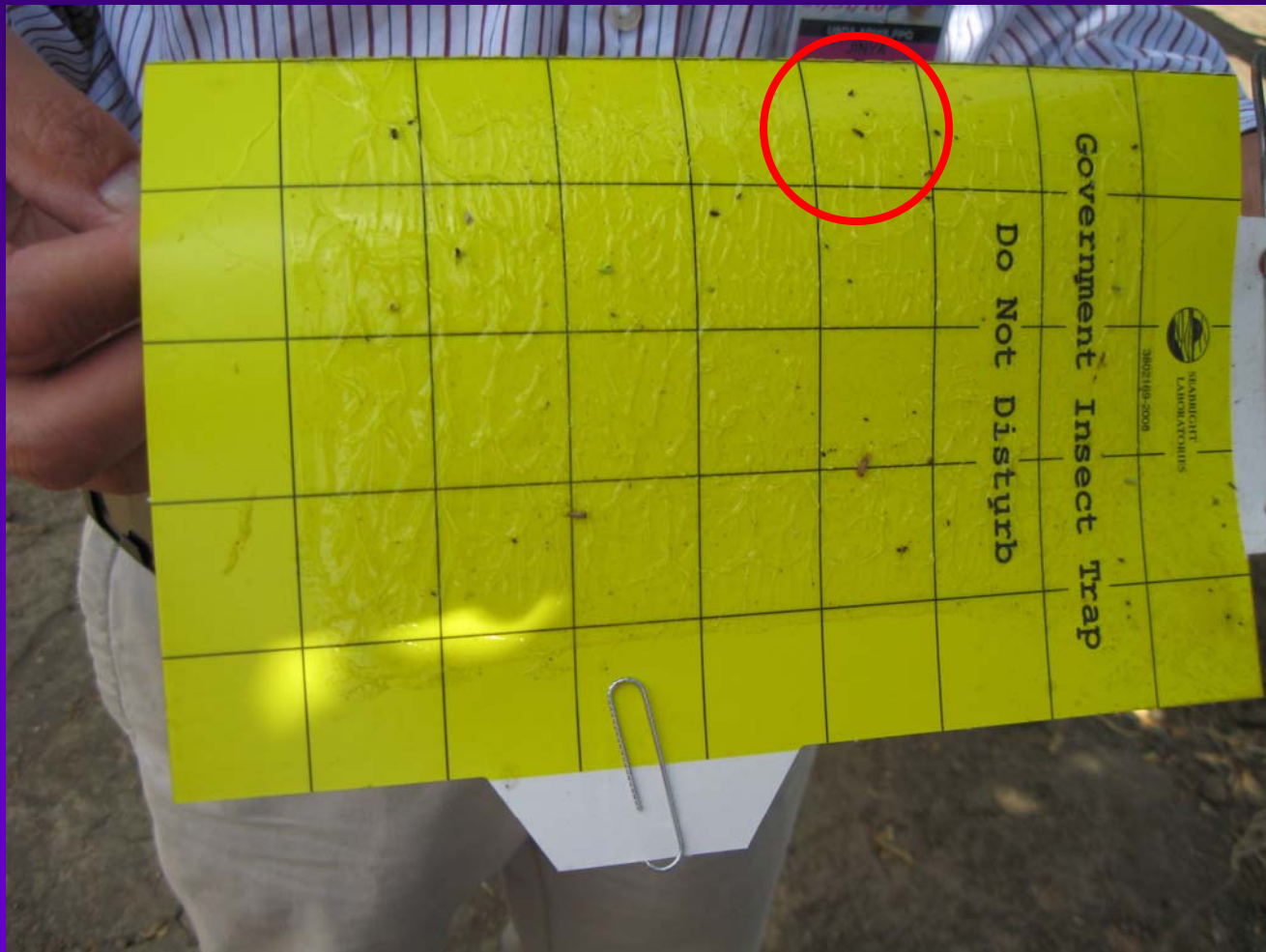


Dooms Day Has Arrived!!!

August 29, 2008

- CDFA Entomologists identified insect collected on yellow panel trap as *Diaphorina citri* - Asian citrus psyllid
- Adult female detected at a residence in a lemon tree just north of Highway 54 and west of Highway 125

ACP on a Sticky Trap





- Adult female
- confirmed by USDA
- Delimitation Survey Initiated



Delimitation Survey

- Visual Survey: all properties within $\frac{1}{2}$ mile radius
- Yellow panel traps: trap density = 100/sq. mile within $\frac{1}{2}$ mile radius of first find; 50/sq.mile within next mile (out 1.5 mile)
- Surveys will continue for 3 life cycles past the last psyllid find

Visual Survey of Host Trees

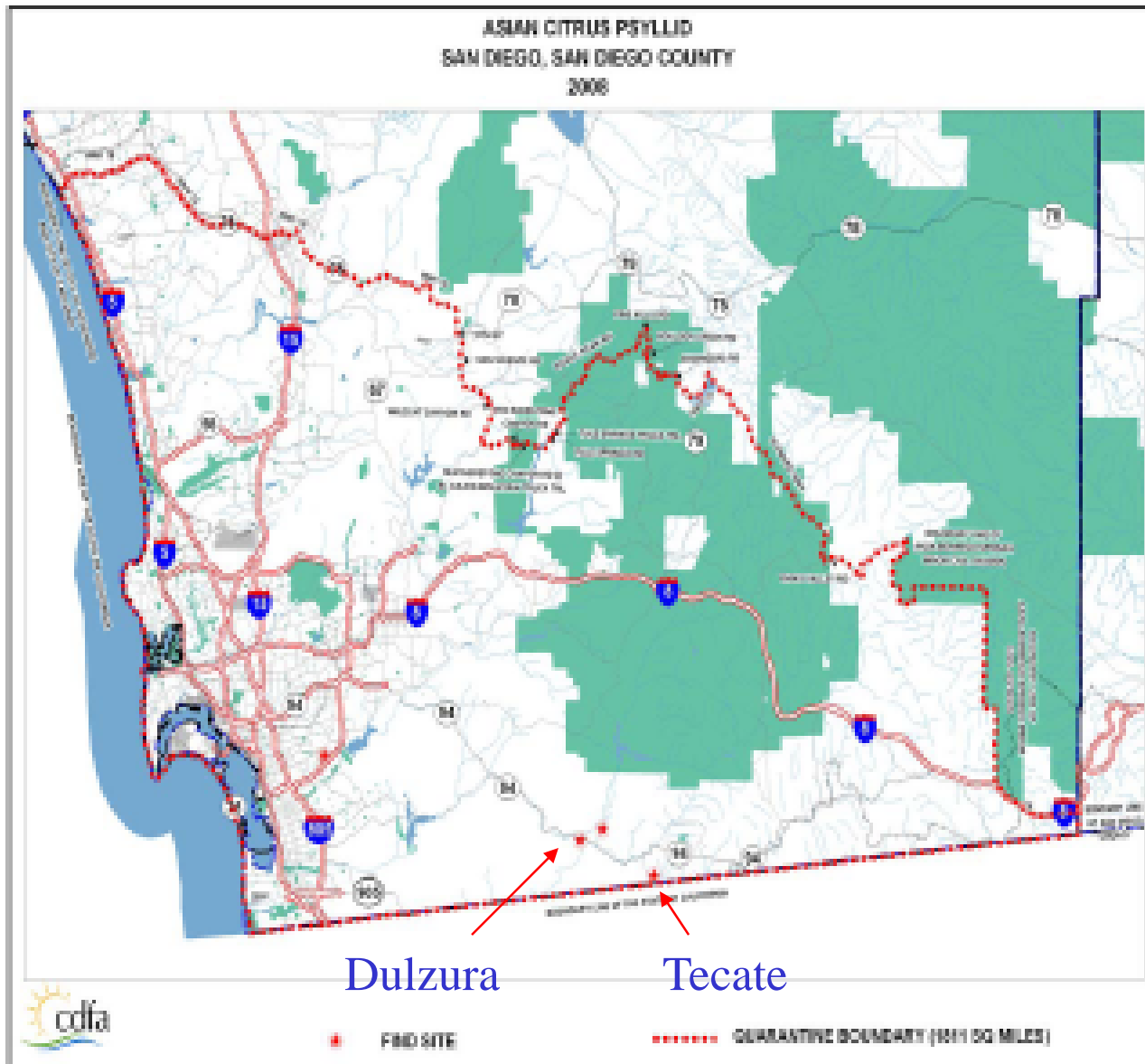


Psyllids in aspirator



Regulatory Actions

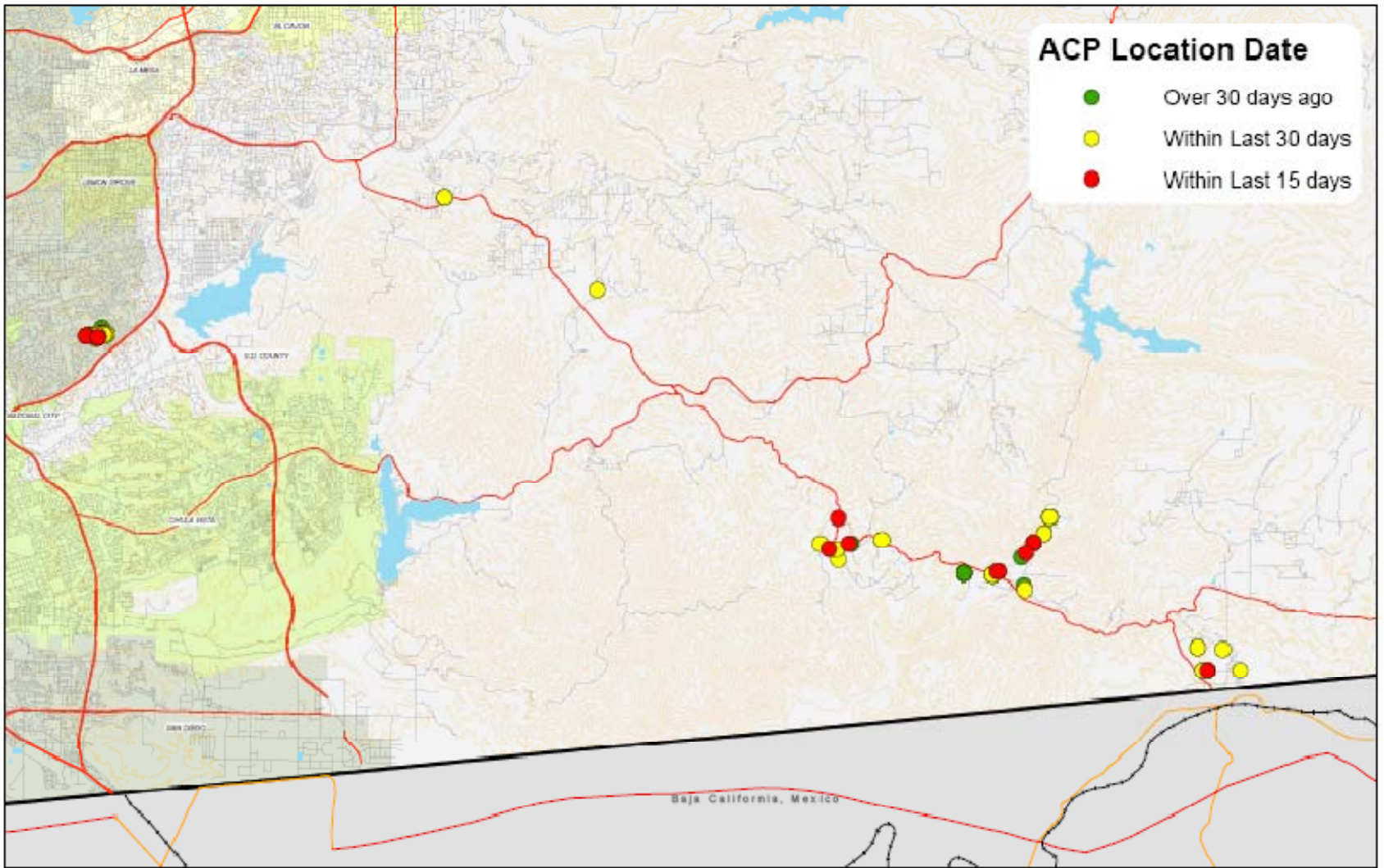
- Hold notices issued for all businesses within a 5-mile radius of the find
- This included any wholesale or retail nurseries, or entity that ships citrus plants
- Quarantine Implemented
- Cannot move citrus materials outside of the quarantine area



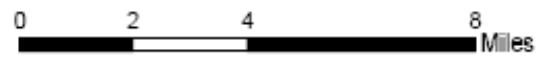
September 17, 2008

- Ground treatments began
- Foliar application of PyGanic
- Soil drench of Merit - a systemic
- Treatments continue
- Tempo now registered for residential use





San Diego County ACP Locations
 October 23, 2008



8/11/08 10:42:00 AM \\GIS\CPD\CPD_0808.mxd

Industry's Plan of Attack

- Goal is early detection and containment
- Setting up a large throughput lab
- Statewide coordination of industry
- Partnership with federal, state, and county

D-vac Systems



Magally Luque-Williams, CDFA



Dr. Jack Qui, USDA, APHIS

D-vac System Use

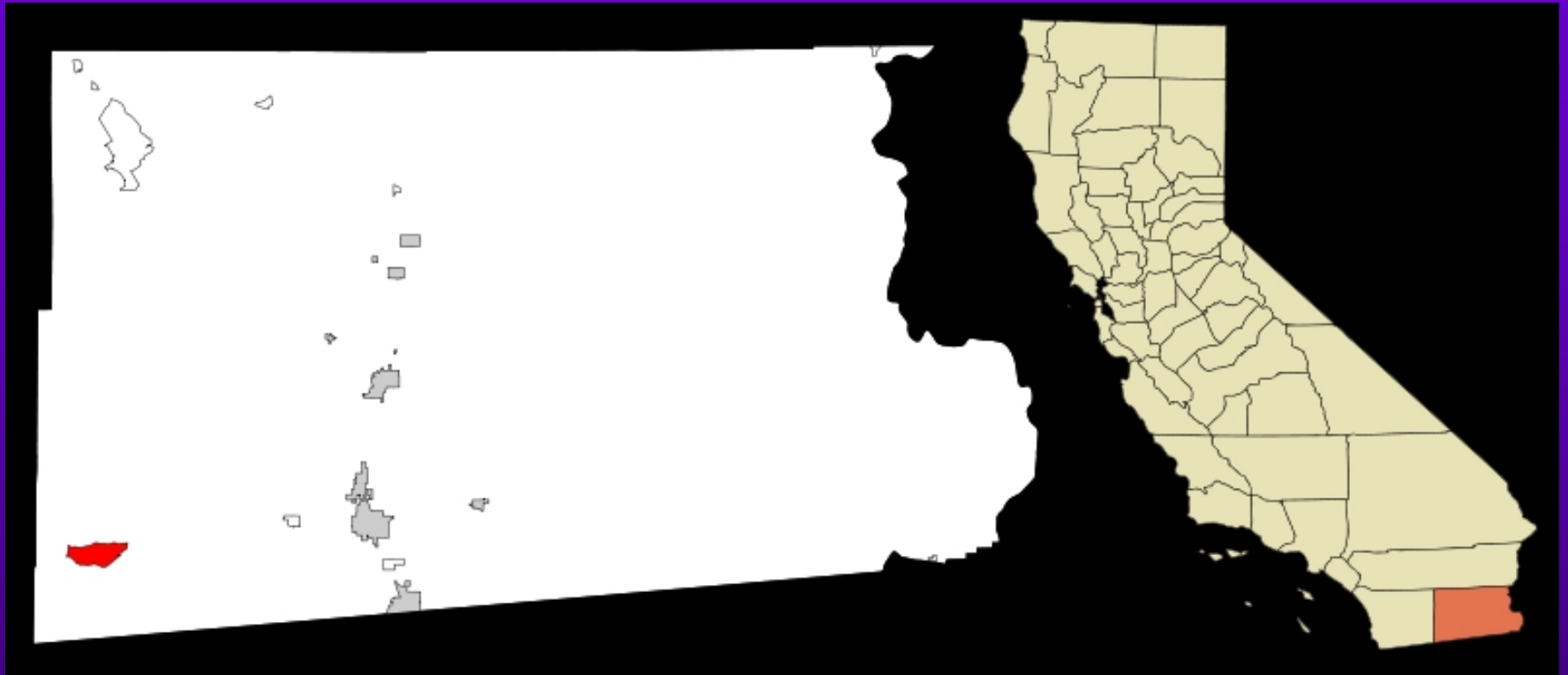


Collection sac (gauze)

Transfer to plastic bag

Industry's Plan of Attack - Nuffer, Smith, Tucker

- educate homeowners (posters, news reports)
- Created website californiacitrusthreat.com
- enlist Master Gardener, CA Rare Fruit Growers
- Goal is to get information to as many people as possible



October 13, 2008: 1st detection in Imperial County –
4 sites, one commercial Clementine tangerine grove

Industry's Plan of Attack

- Coordinate with nursery industry
- Get nursery source trees and stock under protective enclosures
- Retail, wholesale, garden centers – pesticide treatments at wholesale nurseries before shipment to retail
- Train the trainer – as many eyes as possible
- Additional scouting teams

Resources

www.californiacitrusthreat.org

www.cdfa.ca.gov

<http://anrcatalogue.ucdavis.edu> University of California publications on the Asian Citrus Psyllid (Publication 8205) and Citrus Bacterial Canker and Huanglongbing (Publication 8218)

THE END



THANK
YOU