



# Industry Perspective: The Challenge of Managing Huanglongbing (HLB) and its Vector, the Asian Citrus Psyllid (ACP)

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# How much do you enjoy citrus?



# Huanglongbing - HLB

## “Yellow Shoot Disease”

- Most severe of all citrus diseases
- “*Death sentence*” for citrus trees
- Does not discriminate between a backyard and a production grove
- Affects most plants within the citrus family (Rutaceae)
- No known therapeutics
- No “known” resistance



# Huanglongbing - HLB

## “Yellow Shoot Disease”

First described in China



Sectoring –  
yellow shoots



# HLB - Leaf Symptoms

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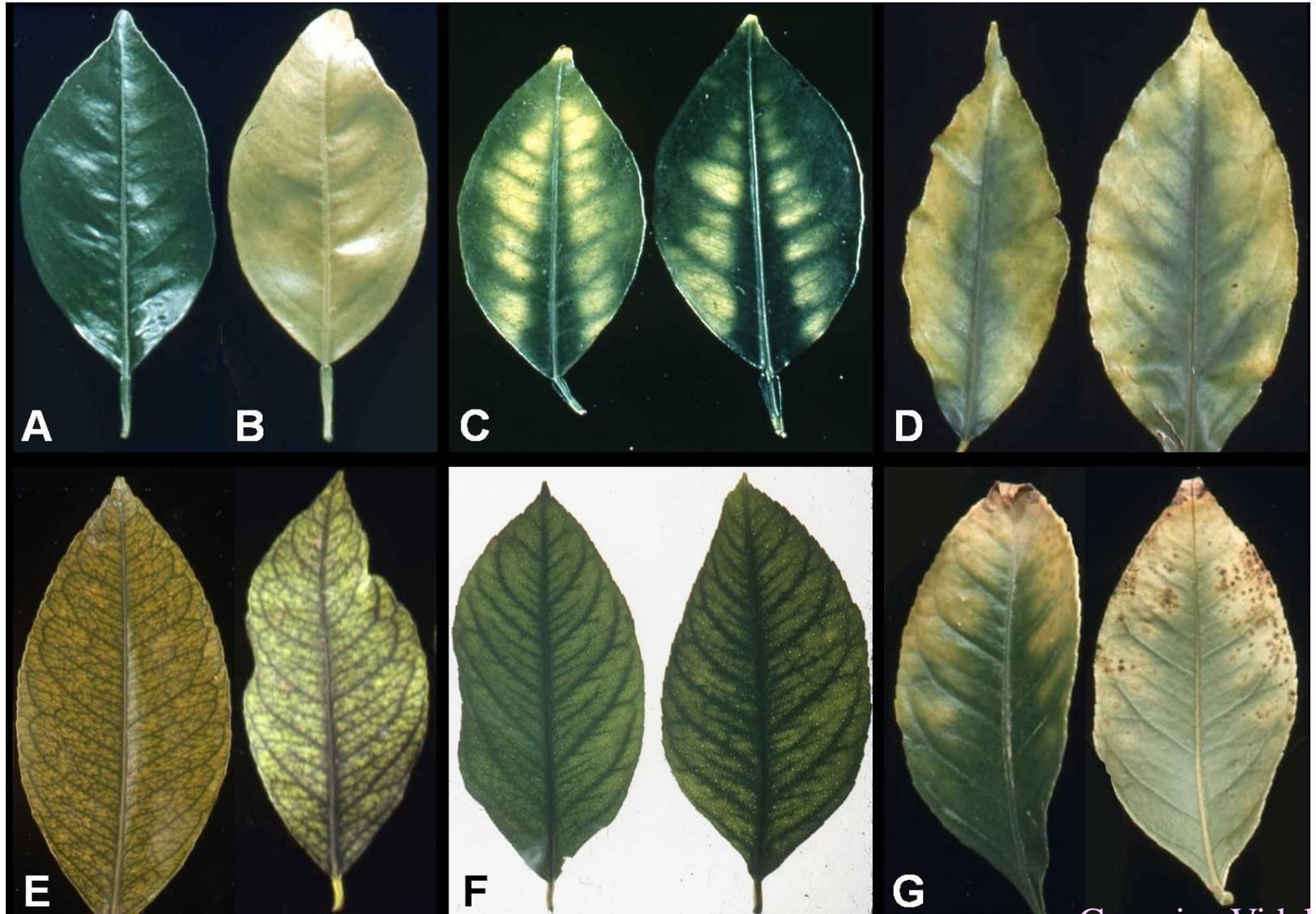
Blotchy Mottle



Notch  
- Caused by psyllid



# Don't be Fooled by Symptoms



# Huanglongbing - HLB

## “Yellow Shoot Disease”



Pre-mature fruit drop  
Huge Problem in Florida

Tree growth and life expectancy is reduced, poor leaf production

**Imparts an insipid, off-flavor to the fruit**

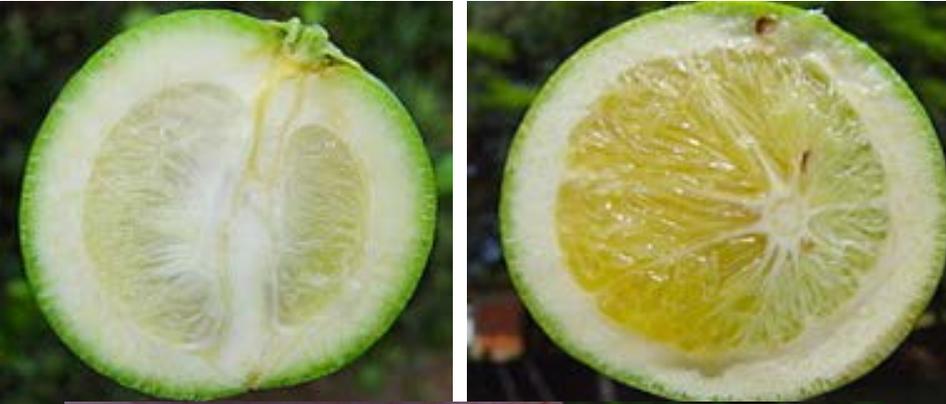


# HLB: Fruit Symptoms

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## Asymmetry



## Reduced size



Greening

Normal

# Causal Agent .....

*Candidatus Liberibacter* – a bacteria

- asiaticus
- africanus
- americanus

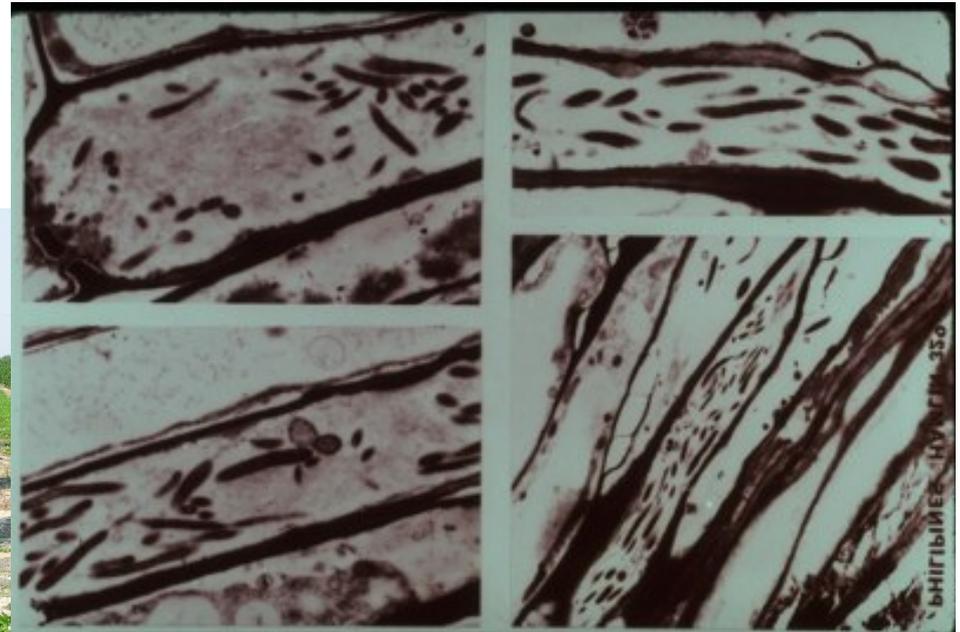


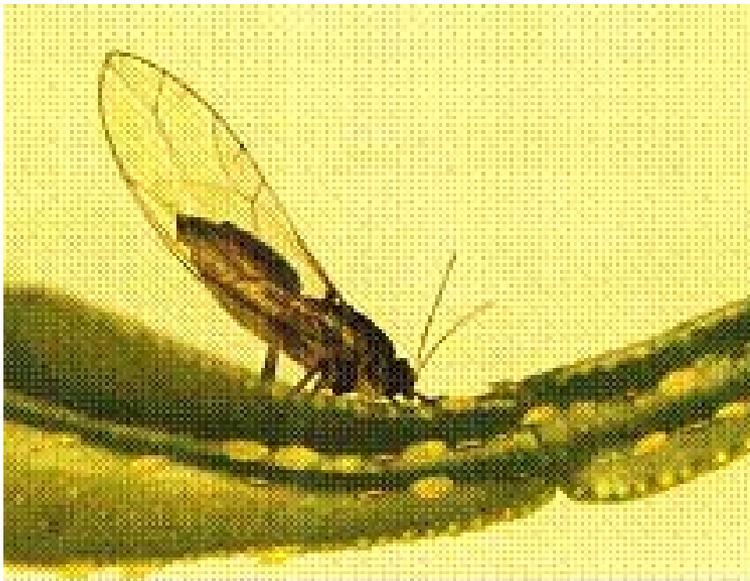
Photo by Mike Irey

Lives in phloem-associated cells

## 2 Known Species of Vector

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

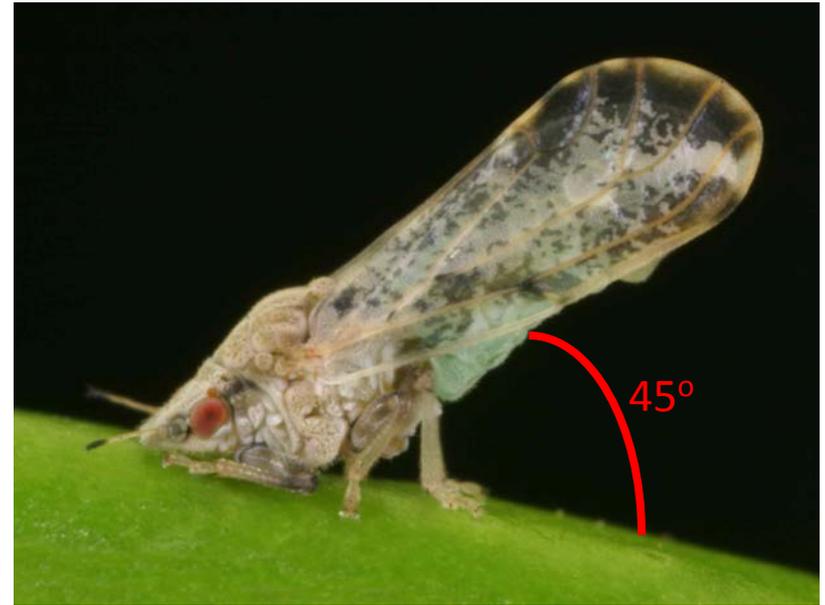


# The vector .....

## *Diaphorina citri* – Asian citrus psyllid



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



# Problems/Complications with Detection

- Symptoms resemble mineral deficiencies, toxicities or other diseases
- Visual symptoms take years to develop
- 30% root mass lost before above ground symptoms are observed



# Problems/Complications with Detection

- Pathogen has not been cultured
- Pathogen is unevenly distributed within a tree
- Challenging to collect a good sample for lab analysis
- Polymerase chain reaction (PCR) is the USDA-approved diagnostic method
- Need pre-symptomatic detection methods

# Additional Host Plants of HLB and ACP



*Murraya* – orange jasmine



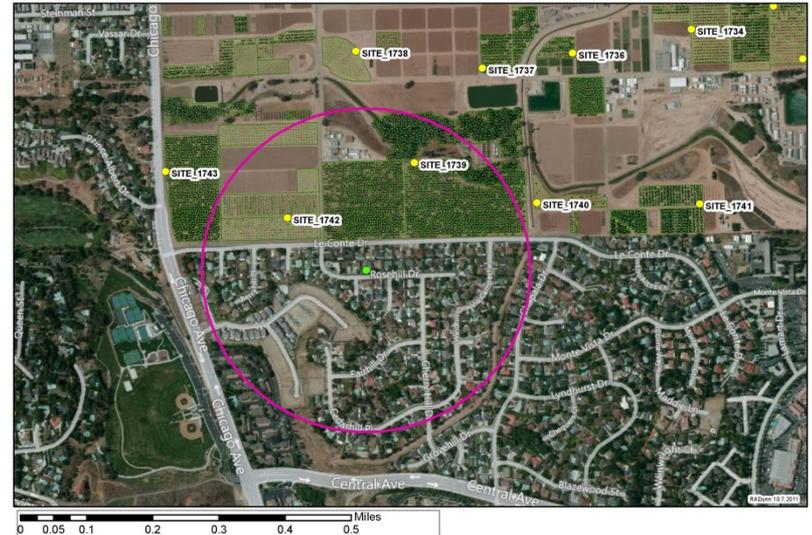
*Clausena* - wampee



*Fortunella* - cumquat



*Severinia* – Chinese box-orange



## How do you look for HLB-affected trees in urban areas?

- Test psyllids – but not a regulatory item
  - Able to fly – which tree did it acquire the bacteria from?
  - Not every psyllid feeding on a known HLB+ tree acquires the bacteria
- Must have Liberibacter-positive plant material

Amy Harmon  
July 27, 2013

A Race to Save the Orange by Altering Its DNA



Trees that are infected by disease are cut down and burned in Clewiston, Fla., at groves owned by Southern Gardens Citrus. Richard Perry/The New York Times

## Challenges

- No known ACP attractants
- No known therapeutics
- No USDA-approved early detection methods
- ACP has almost never been eradicated (Reunion Island)
- Areawide treatment for ACP requires cooperation

Florida estimates the  
collapse of their  
industry in 2 years!!!

## More Challenges



Citrus Stubborn  
*Spiroplasma citri*  
Endemic to California

# New Plantings Must:

- Originate from certified disease-free sources
- Produced and maintained within certified protective structures
- This requires substantial financial investment!



# Buy Organic ???



- Loss of organic farming operations
- Conundrum for treatment programs (conventional vs organic)
- Organic products do not have long residual activity, must be applied more frequently
- Research needed

# Partnerships: Crucial for survival

- Disease cannot be conquered alone
- Regulatory enforcement: USDA-APHIS & State Departments of Agriculture, Customs & Border Patrol
- Research: USDA-ARS, Industry (FL – Citrus Research & Development Foundation, CA - Citrus Research Board), Federal funding sources, universities



# Mass-rearing of *Tamarixia radiata*

Dan Flores, USDA, APHIS, Texas

Richard Stouthamer, Mark Hoddle, UC Riverside



Released in SoCal in December 2011

Continued releases

Good evidence of parasitism

Evidence of establishment



Parasitic wasps (*Tamarixia radiata*) are mass-reared inside field tent



# HLB'S TOLL: PLOWING CITRUS GROVES INTO PEACH ORCHARDS

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## FLORIDA GROWERS BEGINNING TO DIVERSIFY

