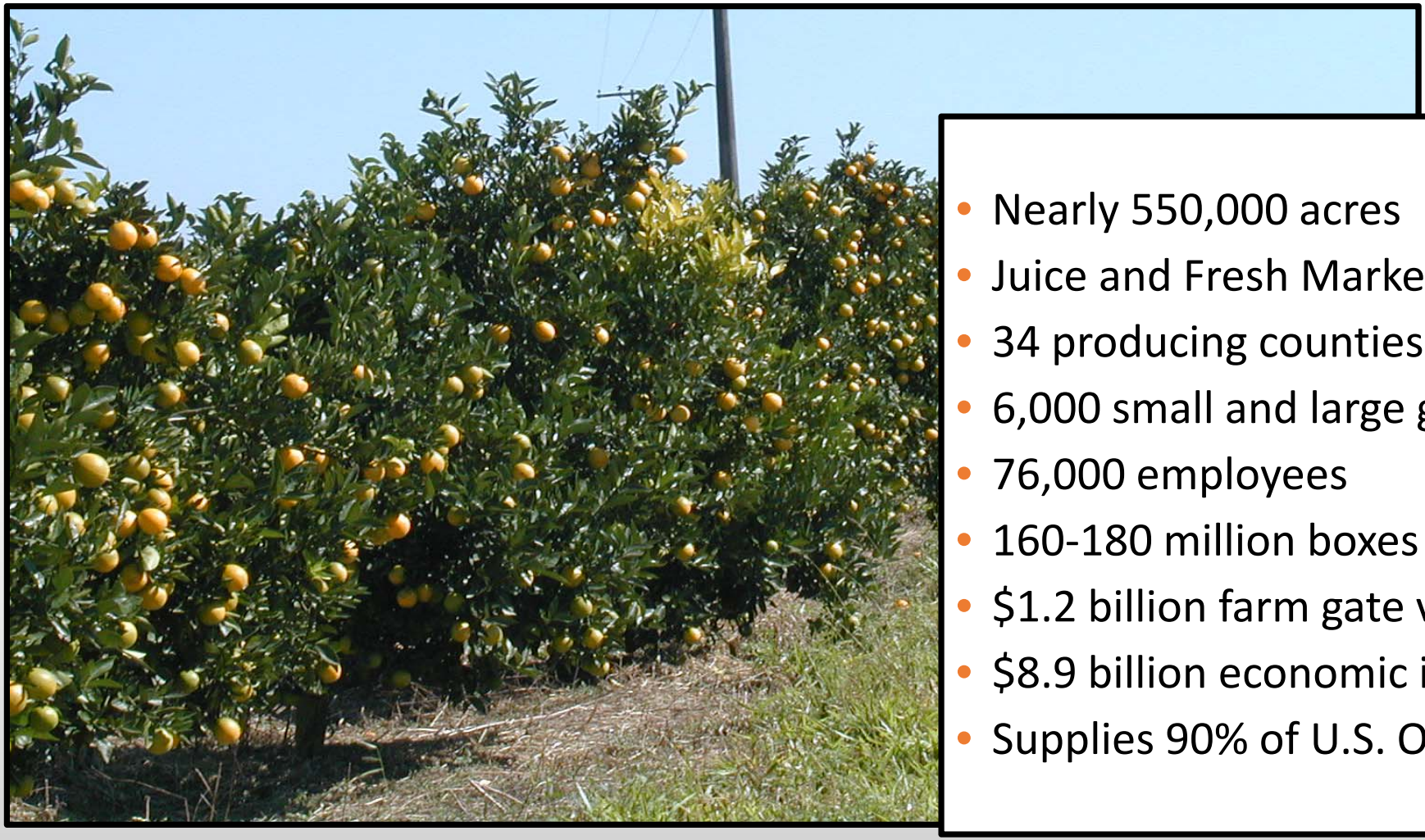
Citrus Research and Development Foundation, Inc.

HLB: An Iconic Industry's Fight for Survival

Farm Foundation Round Table
January 2015

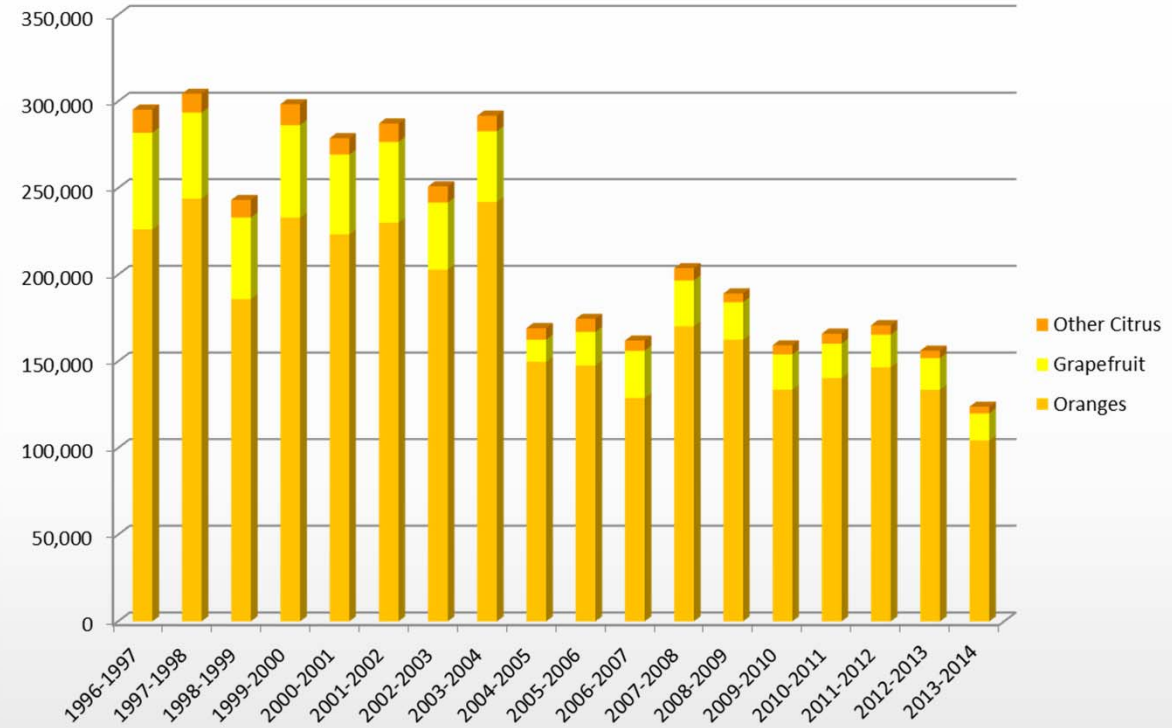
Harold Browning, Chief Operations Officer

Profile: Florida Citrus Industry at Risk



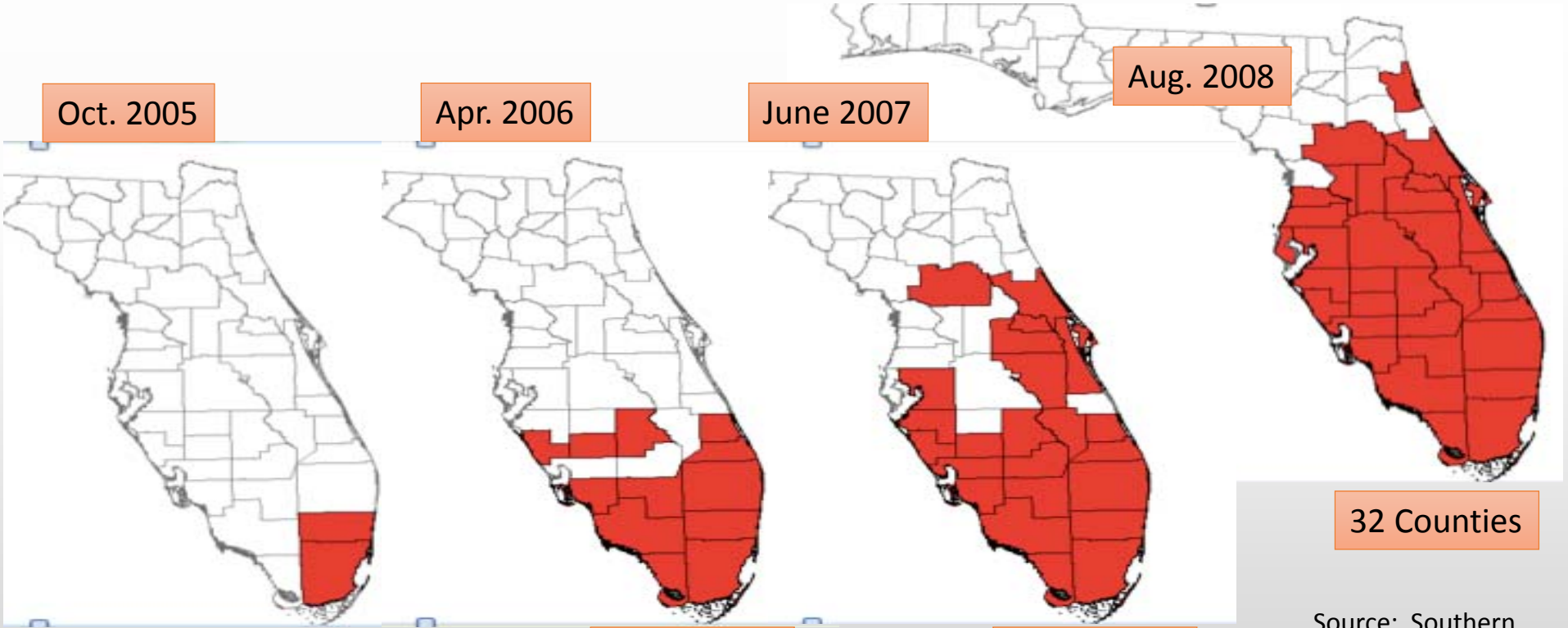
- Nearly 550,000 acres
- Juice and Fresh Marketing
- 34 producing counties
- 6,000 small and large growers
- 76,000 employees
- 160-180 million boxes of fruit
- $1.2 billion farm gate value
- $8.9 billion economic impact
- Supplies 90% of U.S. OJ

Florida Citrus Industry HLB Situation



- All Florida Groves Infected
- Increasing Tree Decline
- Significant fruit drop
- Crop loss 13% (2013), 18% (2014), ? (2015)
- Average Annual Loss $1 billion, 2006/07 to 20130/14
- Estimated Job Loss Related to HLB is over 10,000

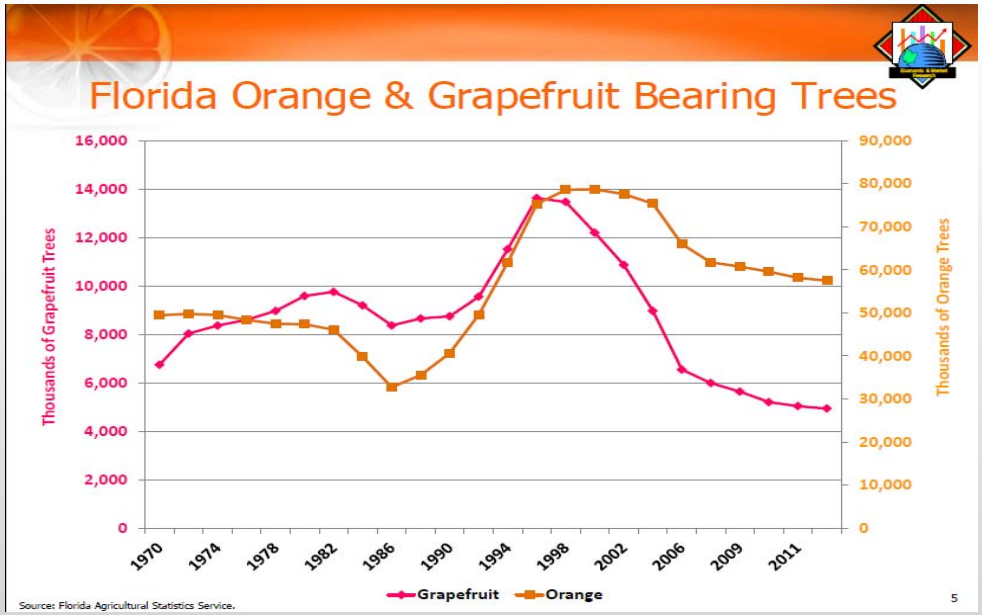
Disease Spread in Florida



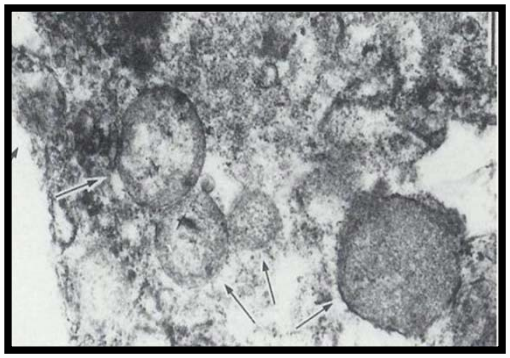
Source: Southern Gardens Citrus

Economic Impacts of HLB

- Increased costs of production
  - Regular inputs
  - Supplements
  - Correcting soil, water conditions
  - Psyllid vector treatments
- Diminishing yields
- Lost efficiencies
- Uncertainty > Indecision

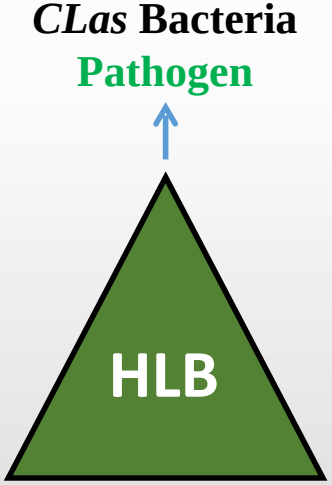


The HLB Disease Triangle



***CLas* Bacteria**
Pathogen

Asian citrus psyllid
Vector



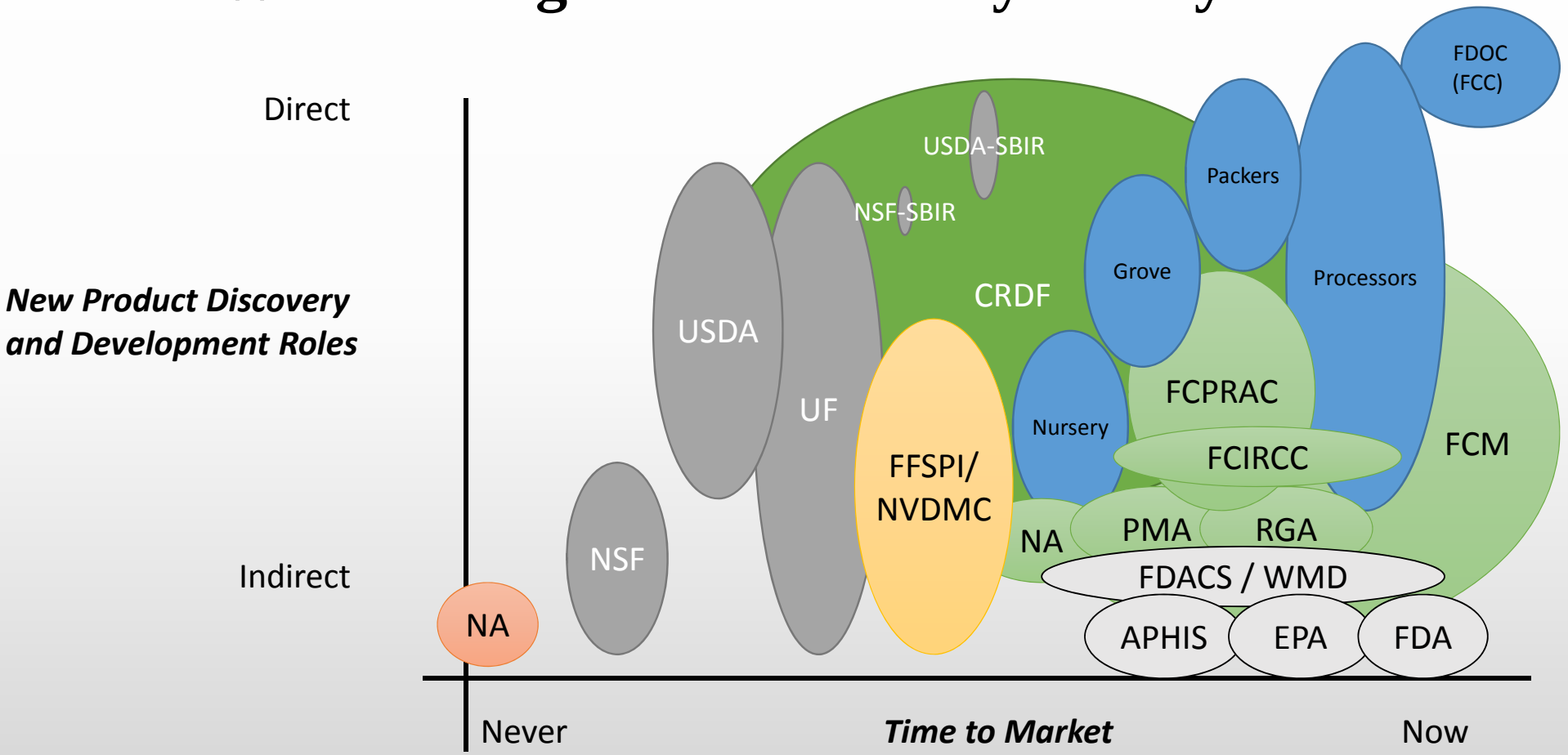
Citrus Tree
Host

Progressive Biological Impacts of HLB

TIME

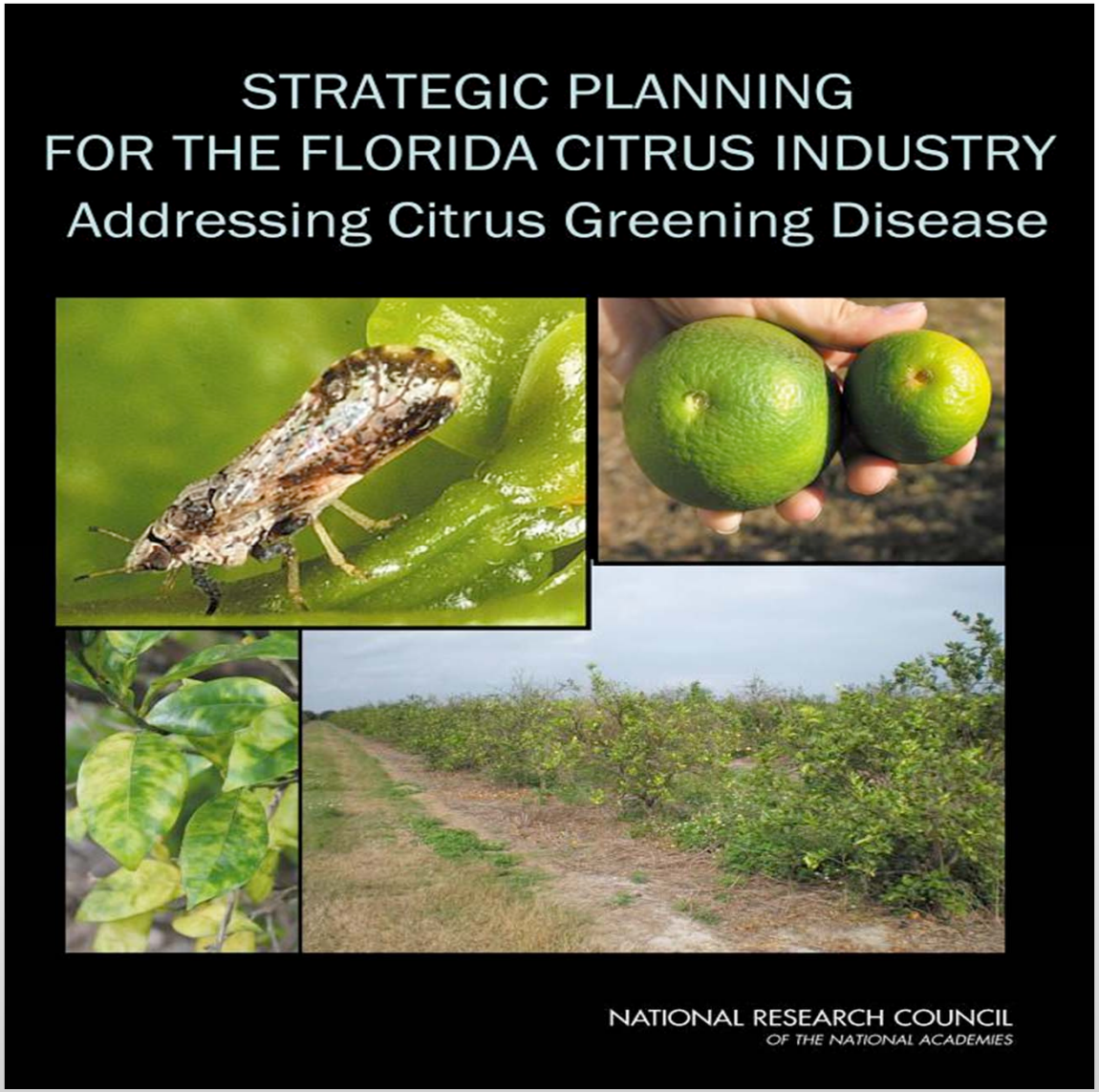
- Inoculation into leaves by psyllid
- Systemic movement in vascular tissue
- Mottling of leaves (starch)
- Debilitation of root systems
- Decline of limbs, thinning of canopies
- Small, off-flavored fruit
- Pre-harvest fruit drop increase
- Overall tree decline
- Increasingly compounded by other stresses

How to Mobilize a Response Within a Segmented Industry and System



Assistance in Developing a Response to HLB

- NAS involved 2008-2010 in planning
- Increased investment in 2008-09
- NRC study published in 2010
- CRDF formed as non-profit research sponsor



CITRUS RESEARCH AND DEVELOPMENT FOUNDATION

WHAT IS CRDF?

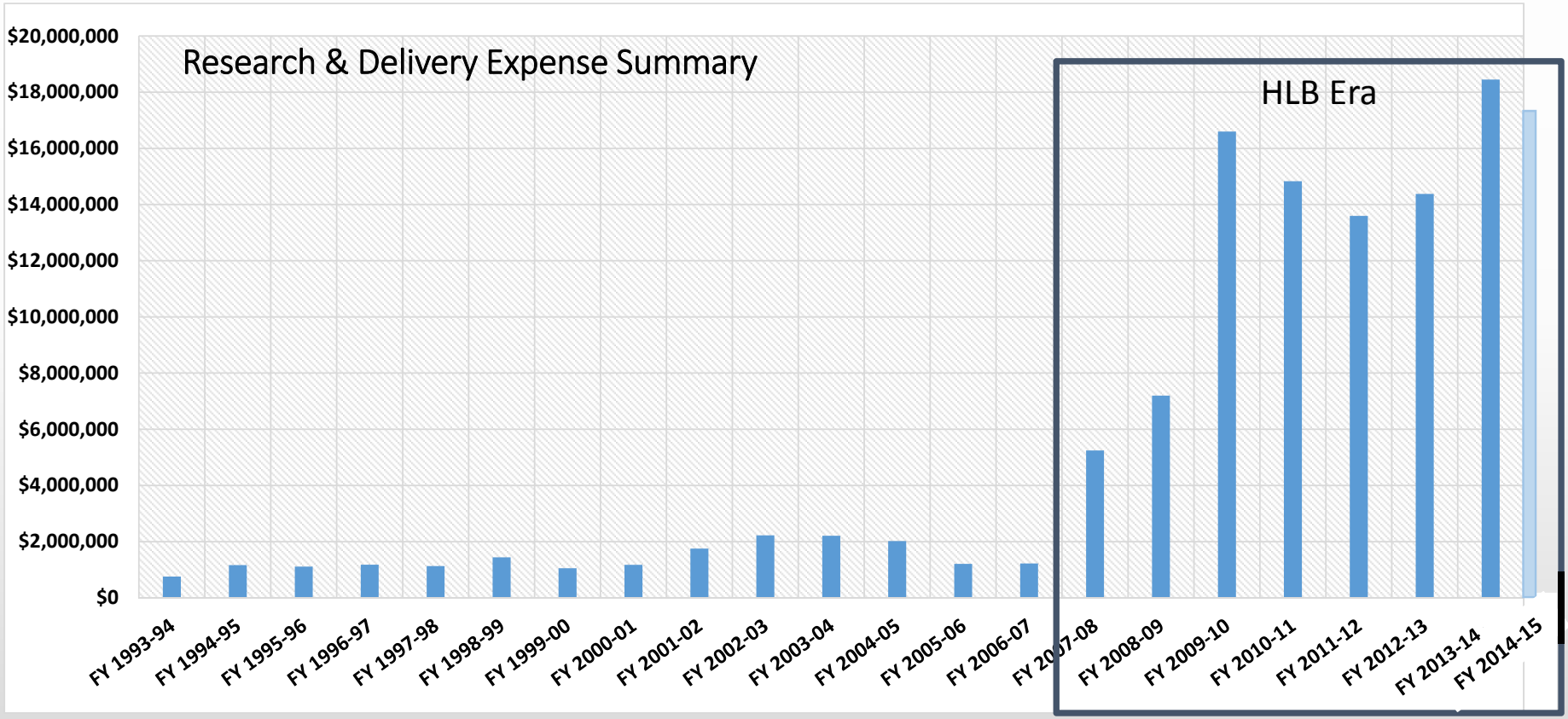
To address the need for an organization to manage research , the Citrus Research and Development Foundation (CRDF), a 501(c)(3) non-profit corporation was formed in April, 2009

The organization is headed by a 13-member board, 10 individuals from industry and 3 from University and State Department of Agriculture

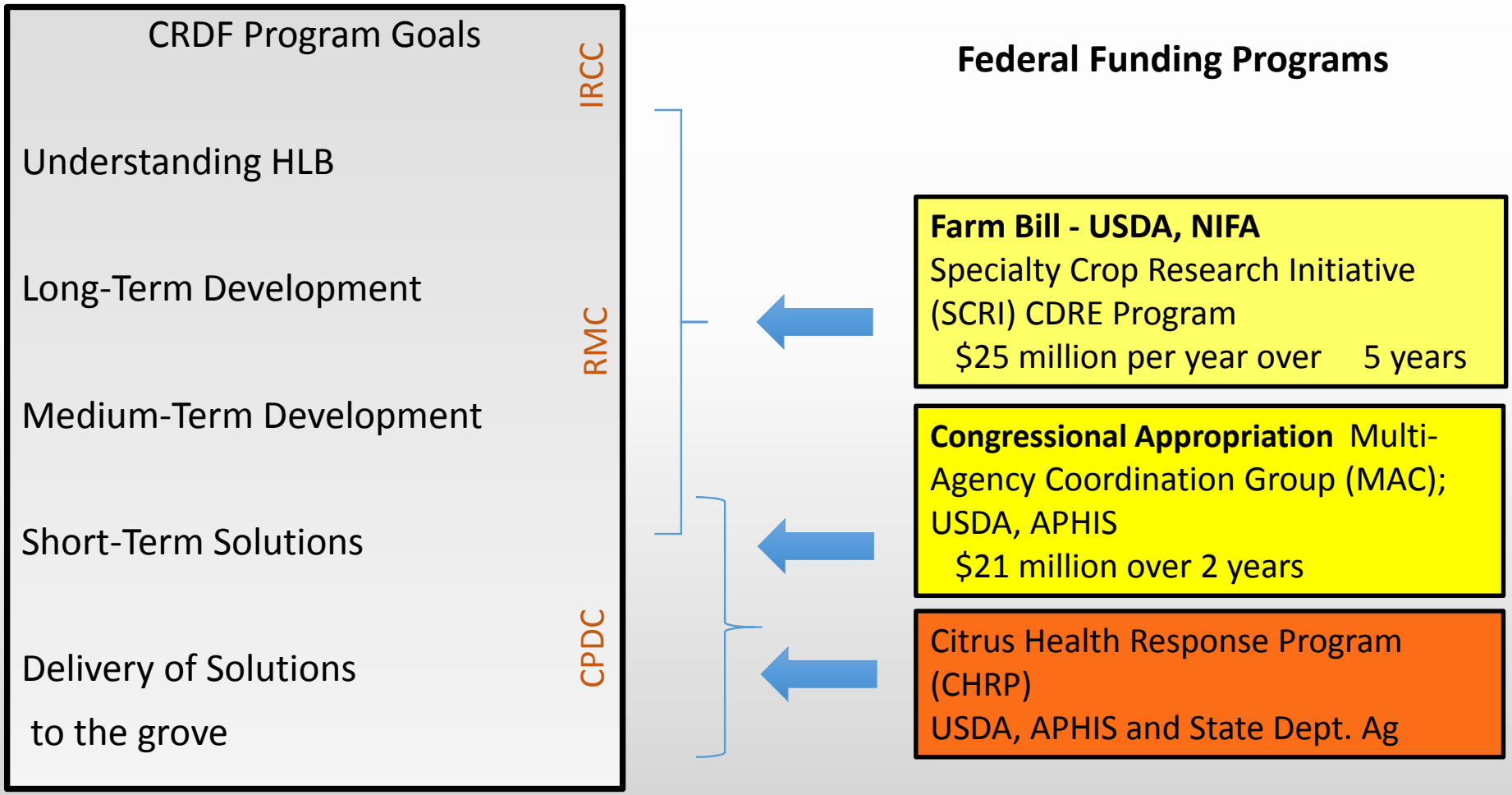
The Mission of CRDF

Advance disease and production research and product development activities to ensure the survival and competitiveness of Florida citrus growers

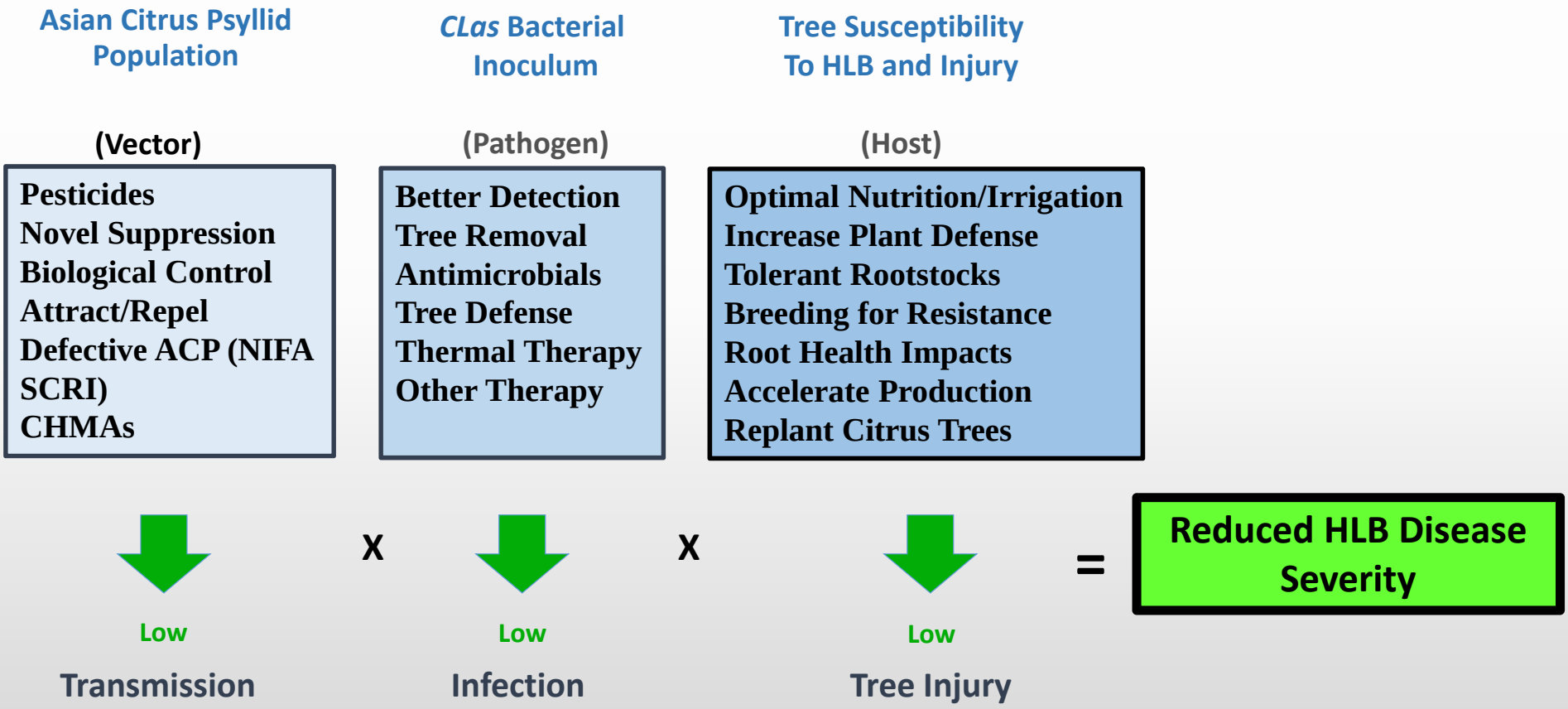
Citrus Industry Research Investments



CRDF and Federal Funding Programs – HLB



Ultimate HLB Management



Research Goals – Short-Term Delivery

Retain Health of Existing Trees
– Critical for Near-Term Industry Survival

Provide Tools for Success of New Plantings
– Necessary for Stabilizing Loss of Acreage

Coordinated Grower Practices

Citrus Health Management Areas (CHMAs)

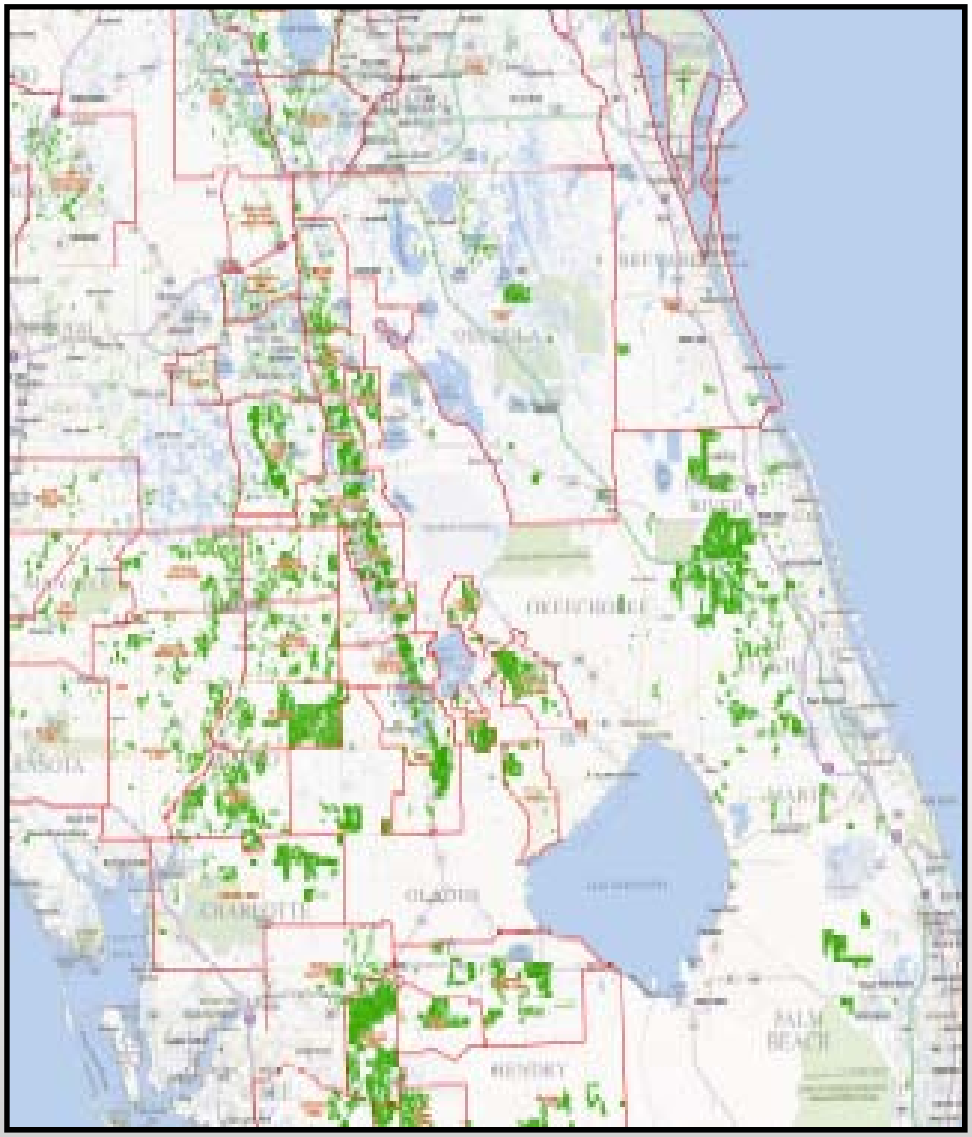
Grower Driven, Voluntary
Broader area action better than patchwork

Currently focused on ACP suppression
- Chemical treatments
- Biological control releases

Good model for adoption of new tools

Could be extended to other solutions
- Inoculum removal
- Replanting strategies
- Treatment with bactericides
- Implementation of tolerant rootstocks

Important forum for grower demonstration, adoption and education



Goals of *Clas* Chemical Therapy

- Stabilize/reverse decline of chronically infected trees
- Reduce titer in canopy and roots with bactericides
- Allow for recovery of fruit production while replanting
- Treat new infections early
- Immediate need for first tools
- Communication with registrants and regulatory agencies
- Sequential development of better tools
- Not viewed as permanent solution

Thermal Therapy

- Complementary to chemical therapy
- Solar tent and supplemental heat tactics
- Thousands of trees treated
  - Time/temperature refinement
  - Evaluation of *CLas* reduction and tree response
- More growers treating small trees with tents
- Commercial scale-up
  - MAC Federal funding
  - Grower Initiatives
  - Steam-treatment mechanized
  - CRDF Evaluation

Evaluation of Commercially Available Tools

- Naturally Occurring Microbial Products
- Plant Growth Regulators - Fruit Drop due to HLB
- Field Trials of Integrated Practices - Root Health
  - organic compost
  - organic acids
  - acidification of irrigation water and soil
- Evaluation of Advanced Citrus Production Systems
- Inoculum Removal
  - Demonstration of Benefit of Removal
  - Motivate Larger Scale Inoculum Removal - CHMAs

Strategies for New Plantings

New planting incentives
Scale-up of tolerant rootstocks
Advanced citrus production systems
Aggressive ACP suppression
CHMA support and expansion
Demonstration of integrating all available management tools

Everyday Challenges For Citrus

Build-up of disease inoculum in “unmanaged citrus”

Increased costs across the supply chain

Controversy over neonicotinoid insecticides

Grower reluctance to replant

Confidence of lenders

Limited alternative agricultural options for citrus land

Entire infrastructure at risk

Future View

Aggressive management is making a difference

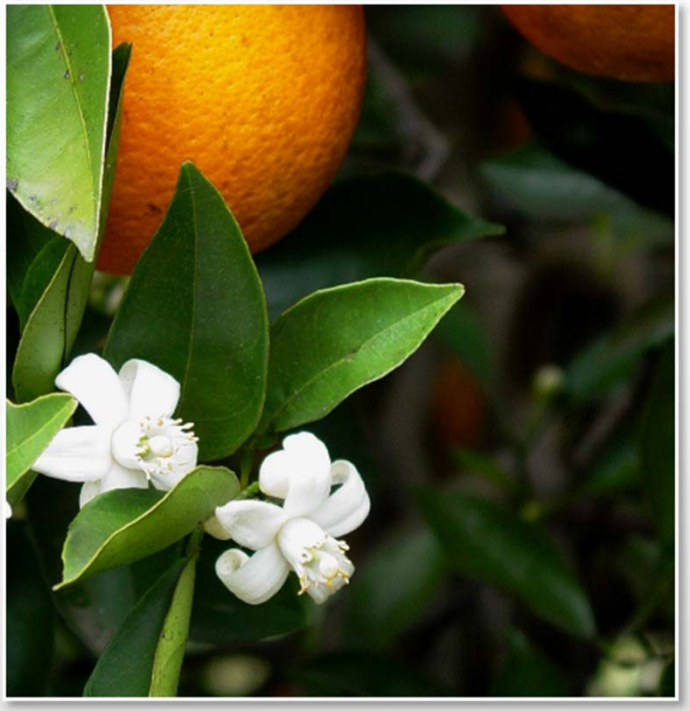
Tools are emerging

Growers are resilient

But, time is running out…..

Citrus is being Seriously Challenged, but Will Remain an Integral Component of Florida's Agriculture and Economy

Thank you!



CRDF is proud to provide support to the Florida citrus industry