Huanglongbing- Current Status and Management in Florida

Michael Irey

Outline

- Spread in Florida
- Management of the disease
- Concerns in other areas

- A few recommendations of things we learned the hard way.....

Is HLB “THE REAL DEAL”?

April 19, 2007

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Is HLB “THE REAL DEAL”?

December 16, 2008

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Initial Discovery

- CAPS Survey - The Cooperative Agricultural Pest Survey Program is a combined effort by state and federal agricultural agencies to conduct surveillance, detection, and monitoring of exotic plant pests of agricultural and natural plant resources and biological control agents. Survey targets include plant diseases, insects, weeds, nematodes, and other invertebrate organisms.

CAPS Survey

- August 2005 Homestead area of South Florida
- Initially found in two locations
  - Asian family farm (Citrus maxima, pumelo)
  - Dooryard tree (Citrus hystrix)

Many times symptoms will not be "perfect" or the trees will be in poor condition

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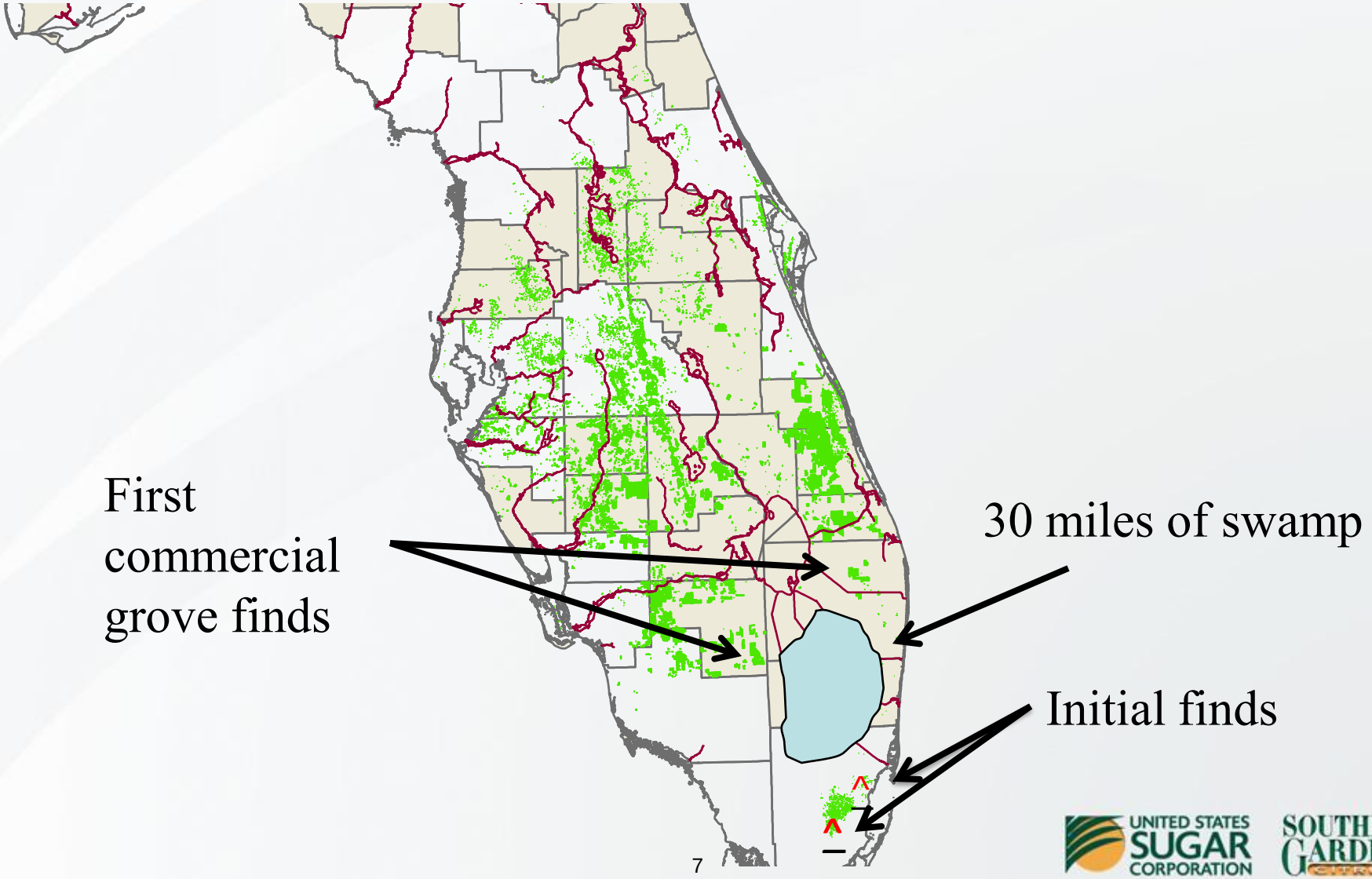
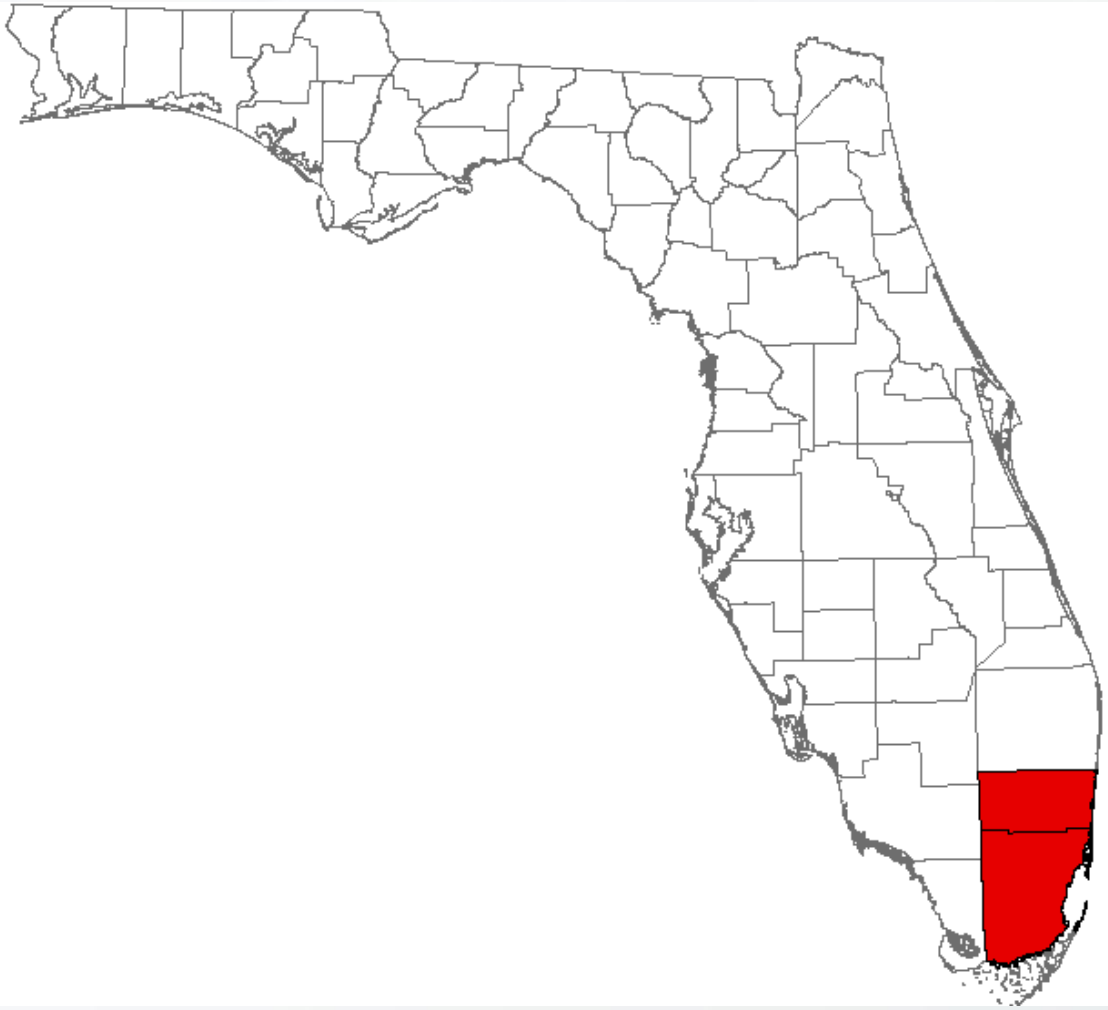
Initial discovery and Spread

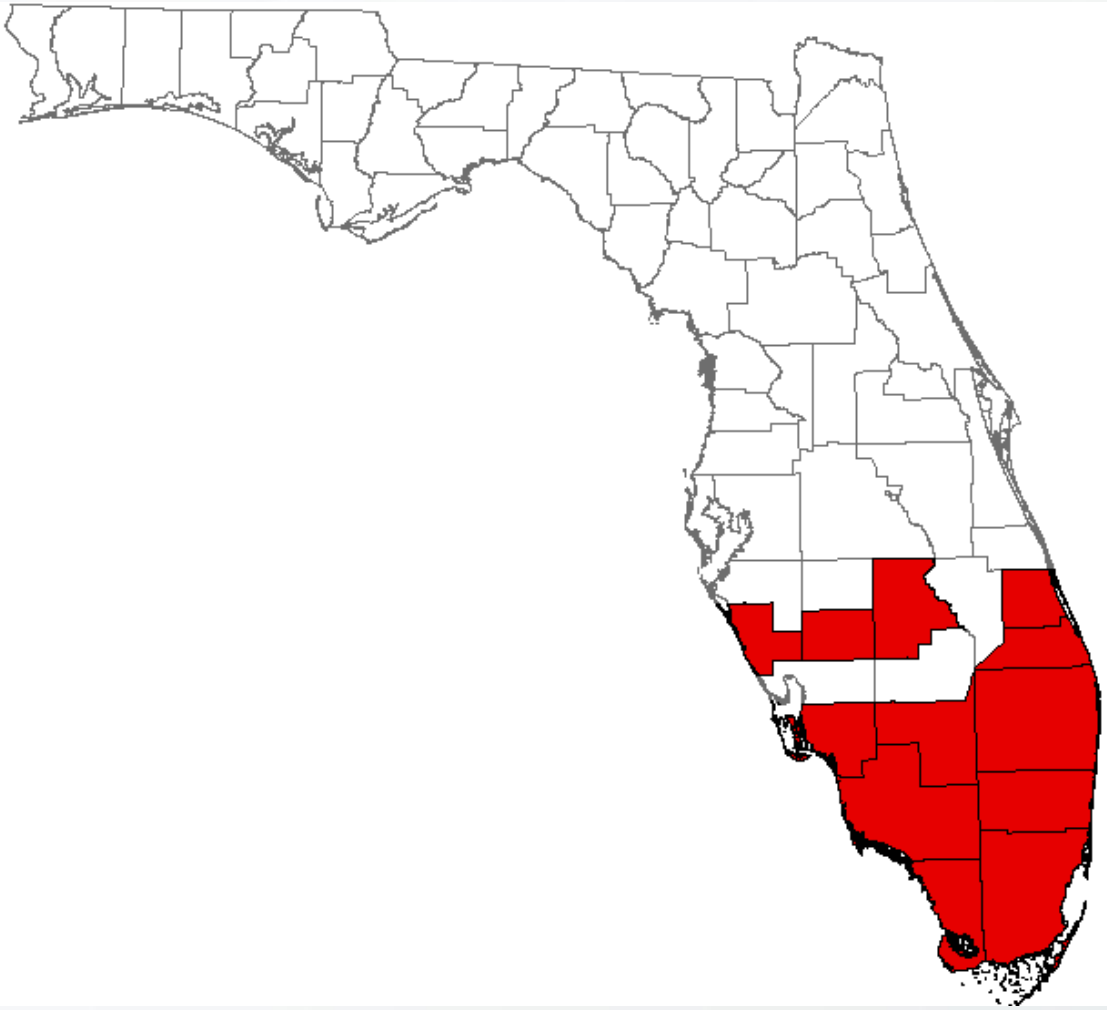


HLB - October, 2005



2 counties

HLB – April, 2006



12 counties

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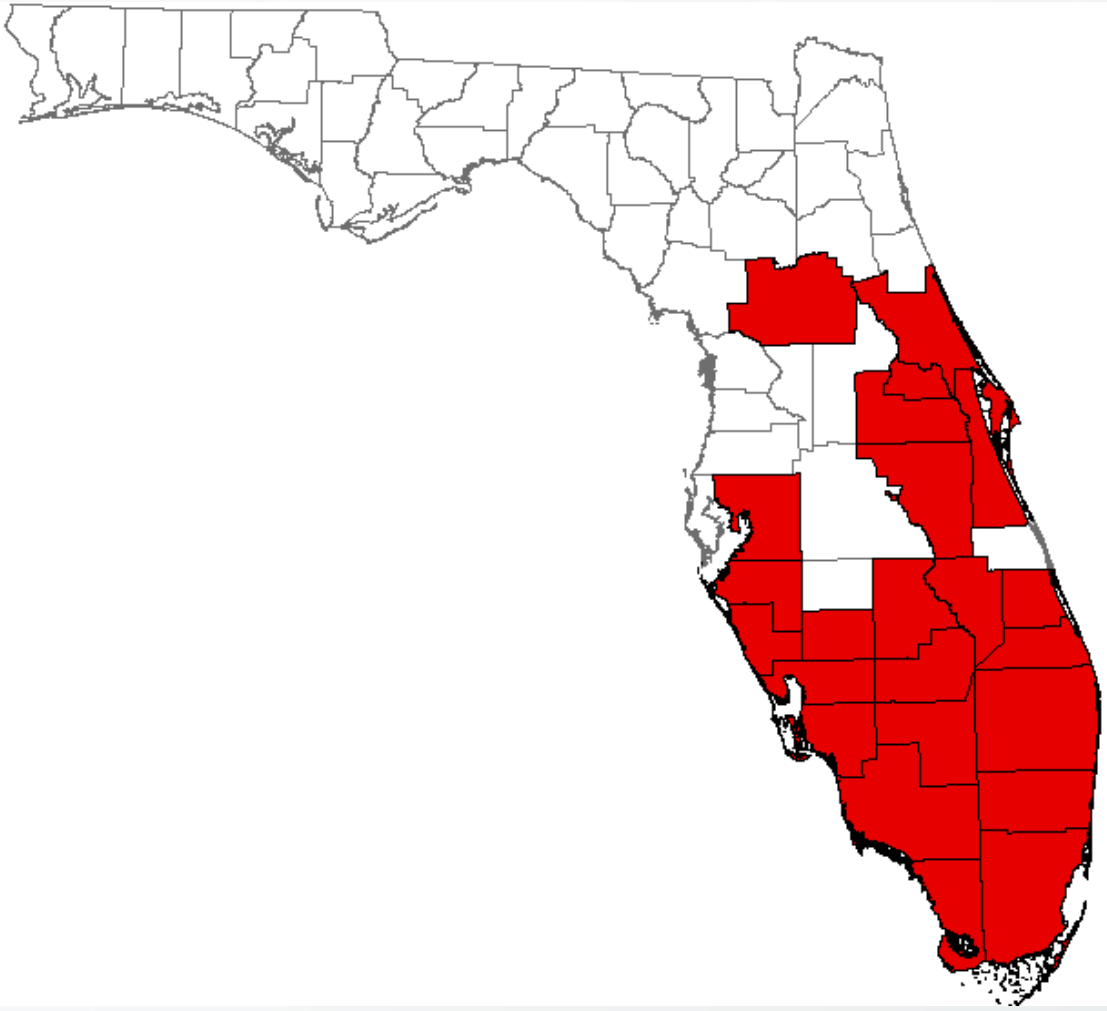
HLB - June, 2007



24 counties

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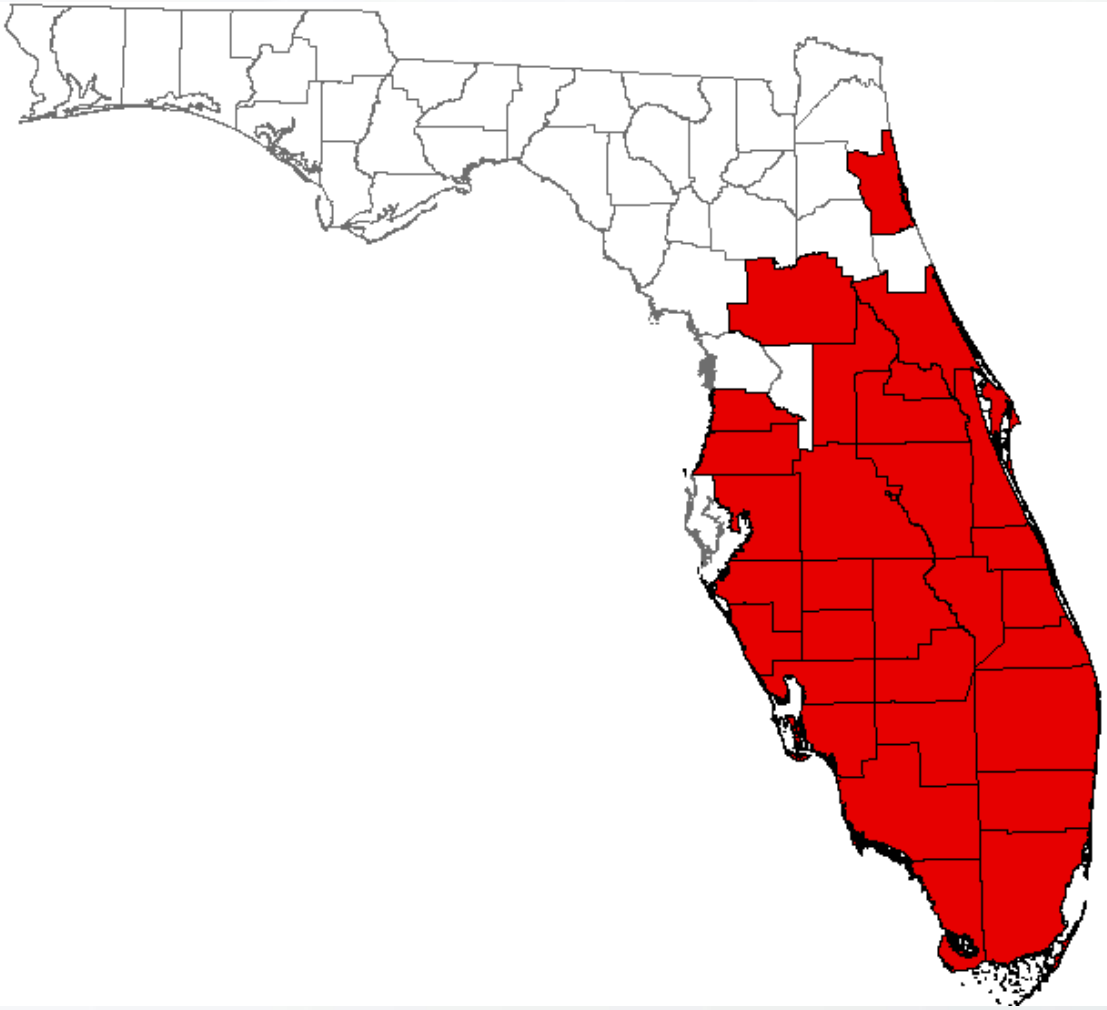
HLB – February, 2008



30 counties

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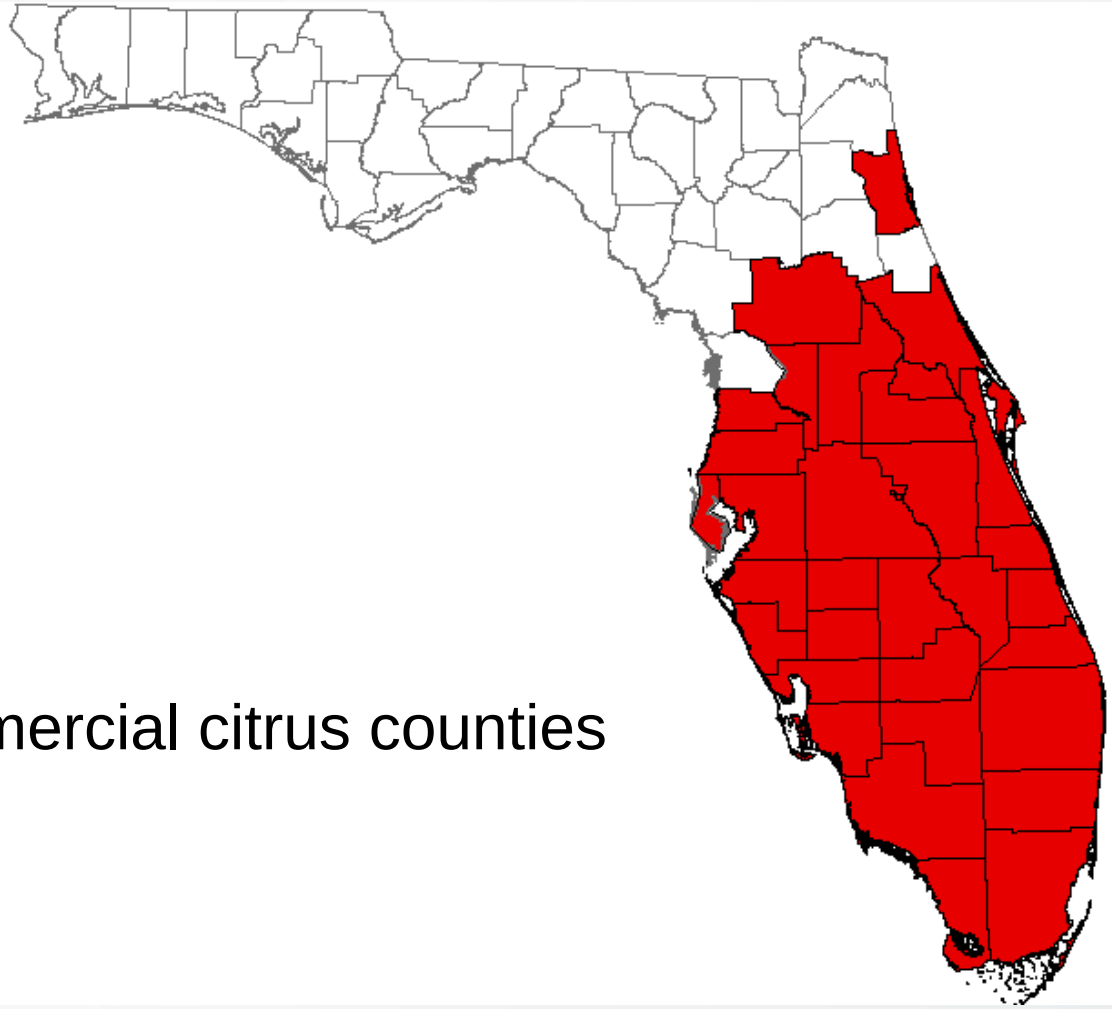
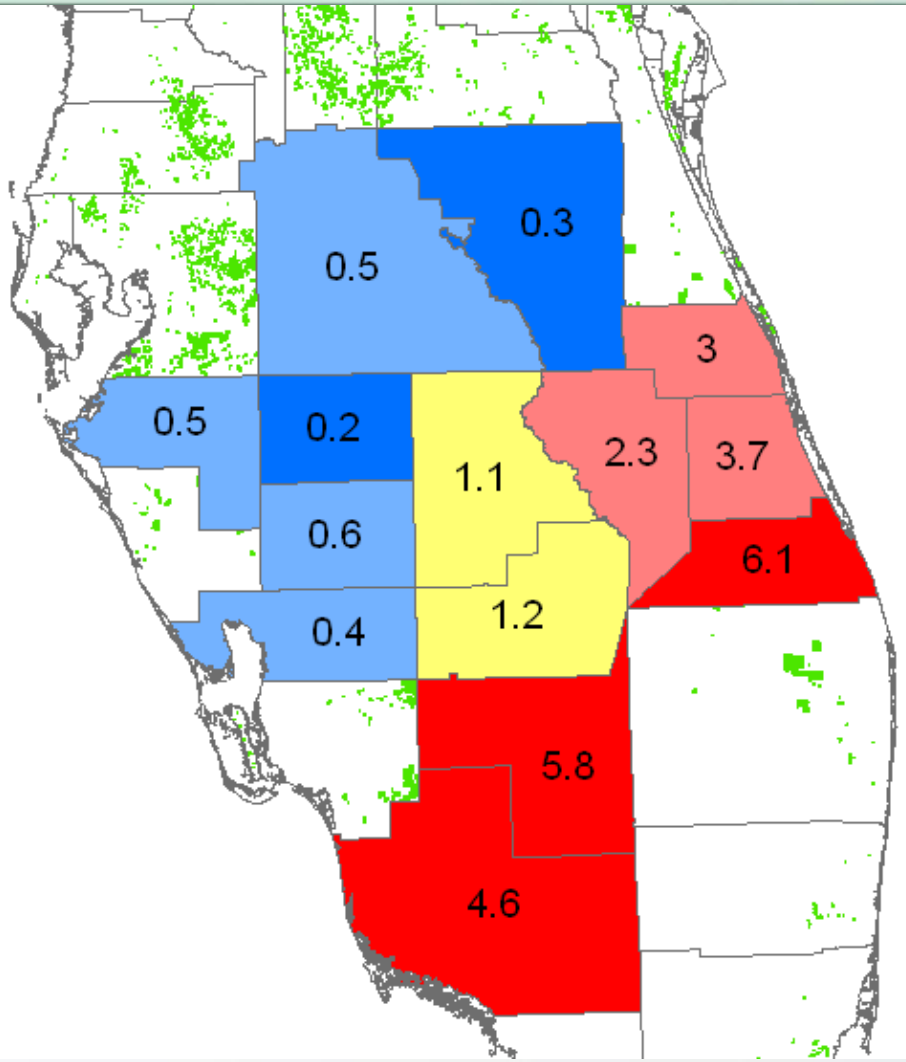
HLB - August, 2008



All commercial citrus counties

% Infected Trees (in blocks w/HLB) – 2008 Scouting



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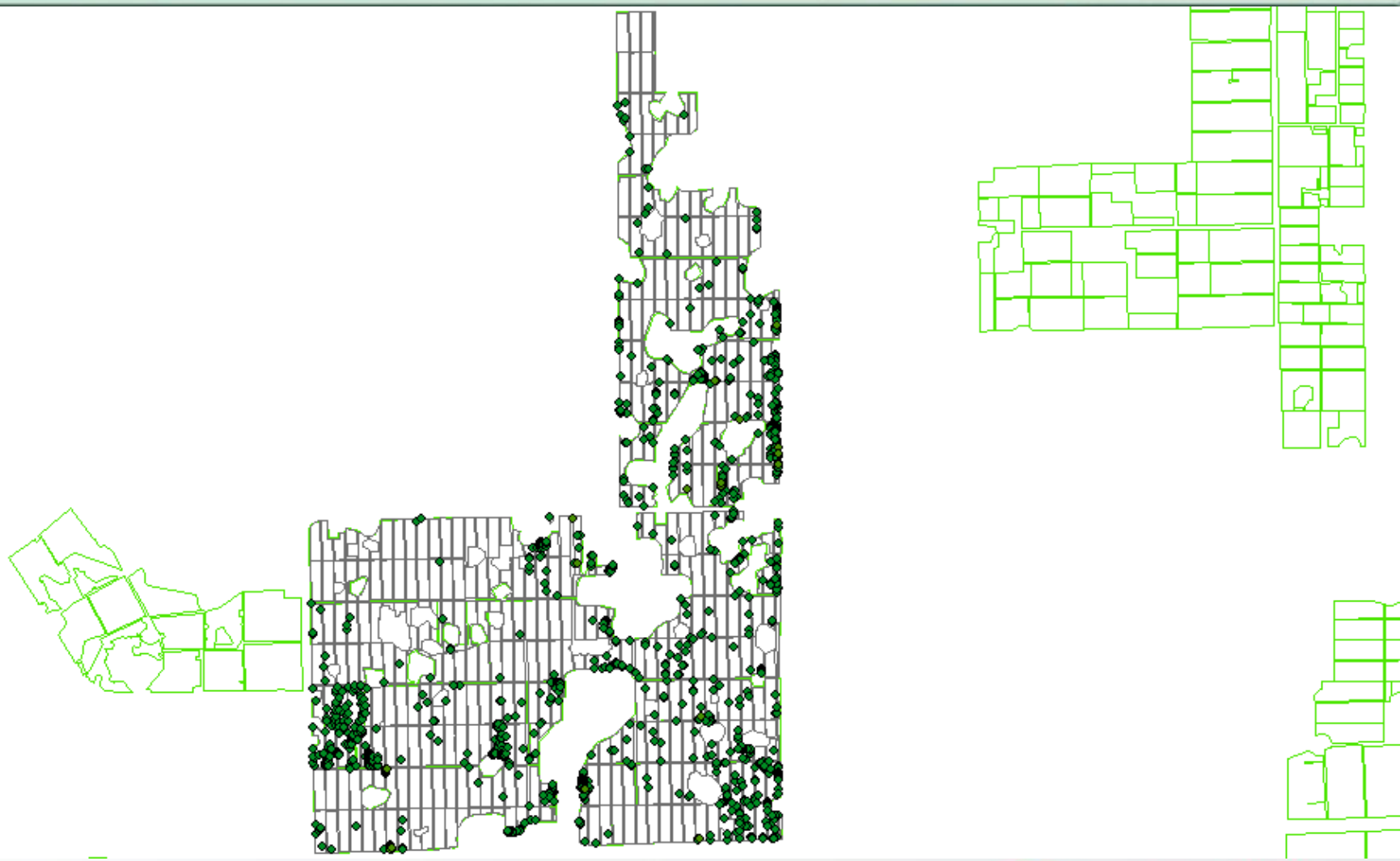
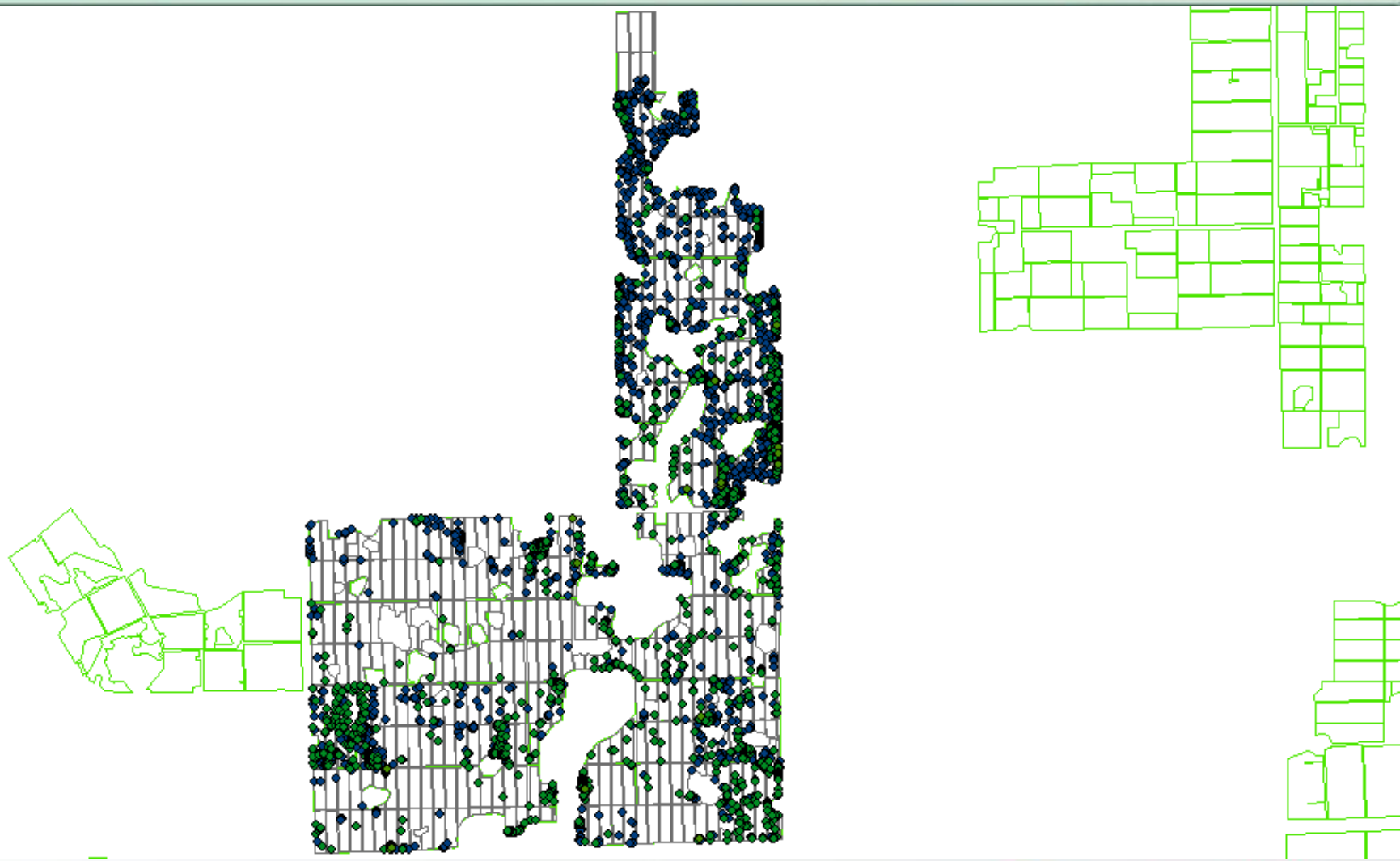
Within Grove Spread

Within Grove Spread

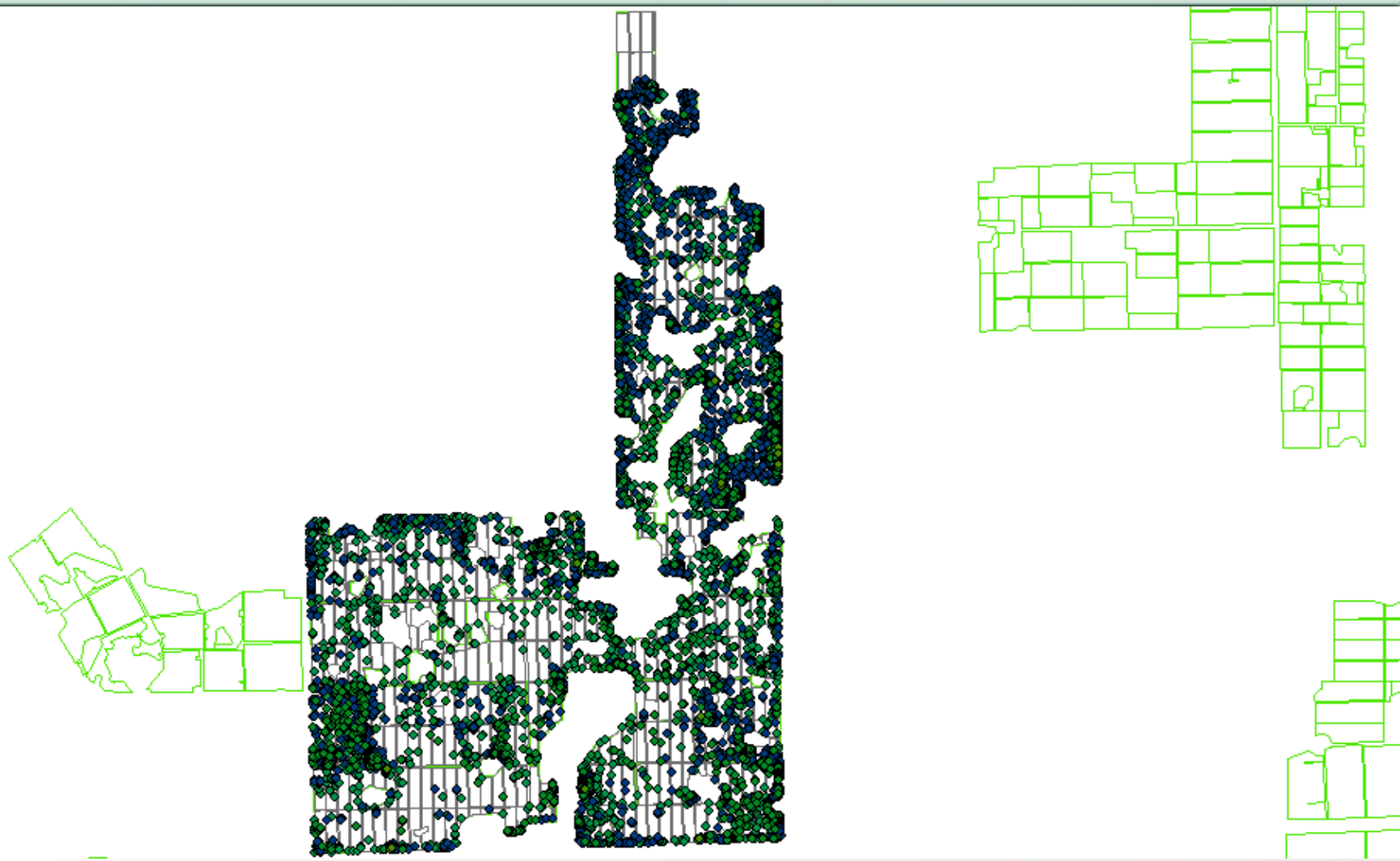
Within Grove Spread



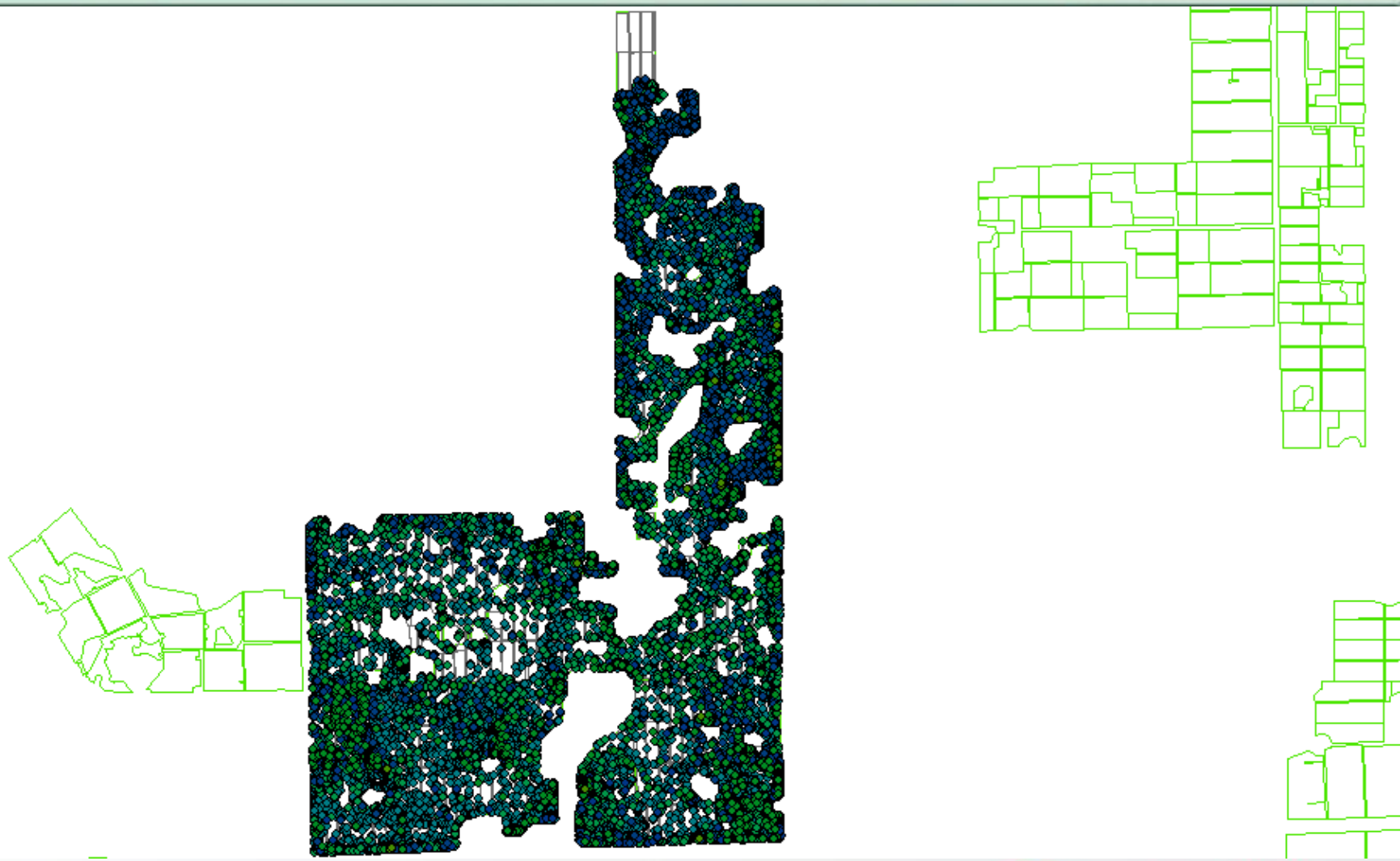
Within Grove Spread



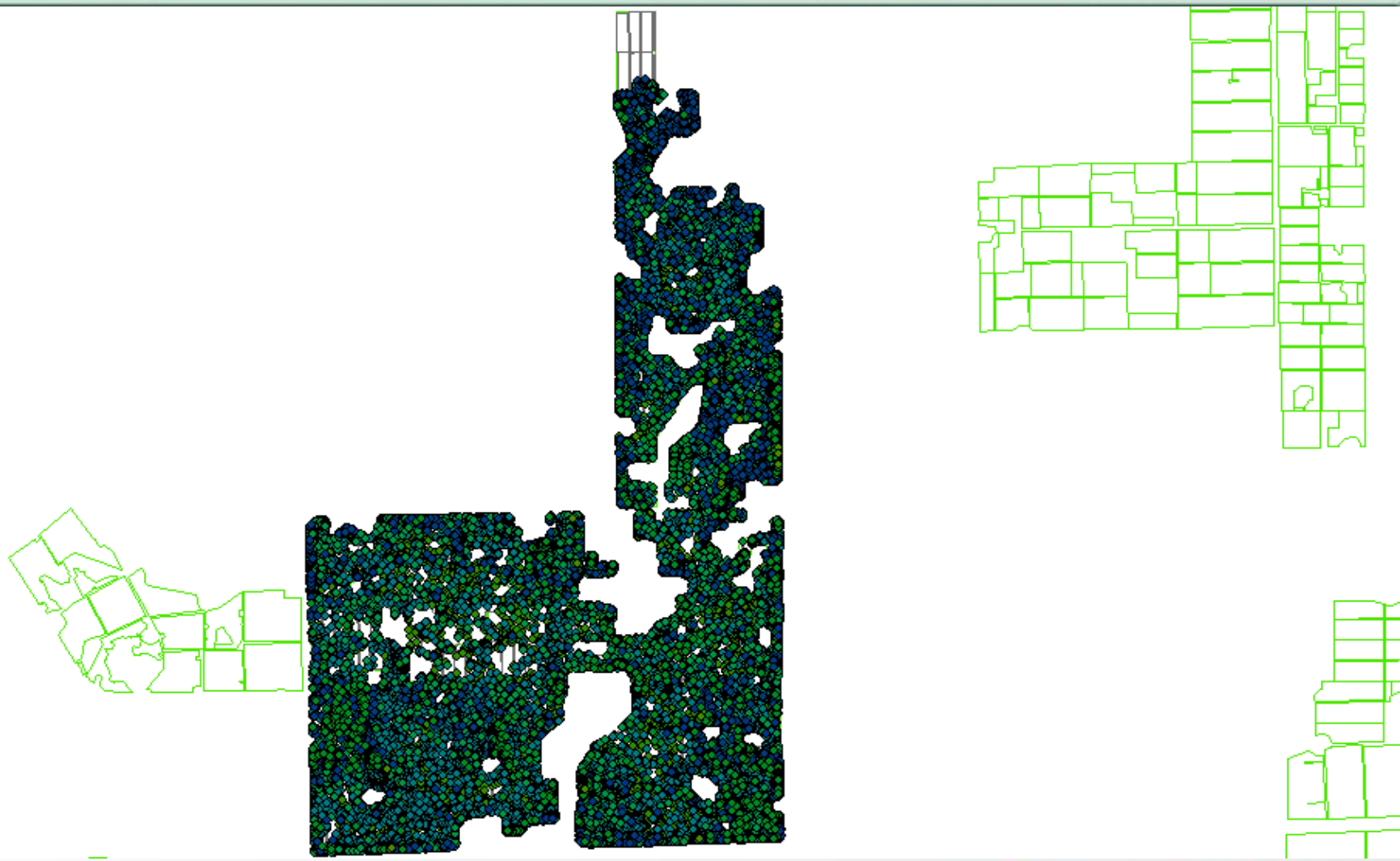
Within Grove Spread



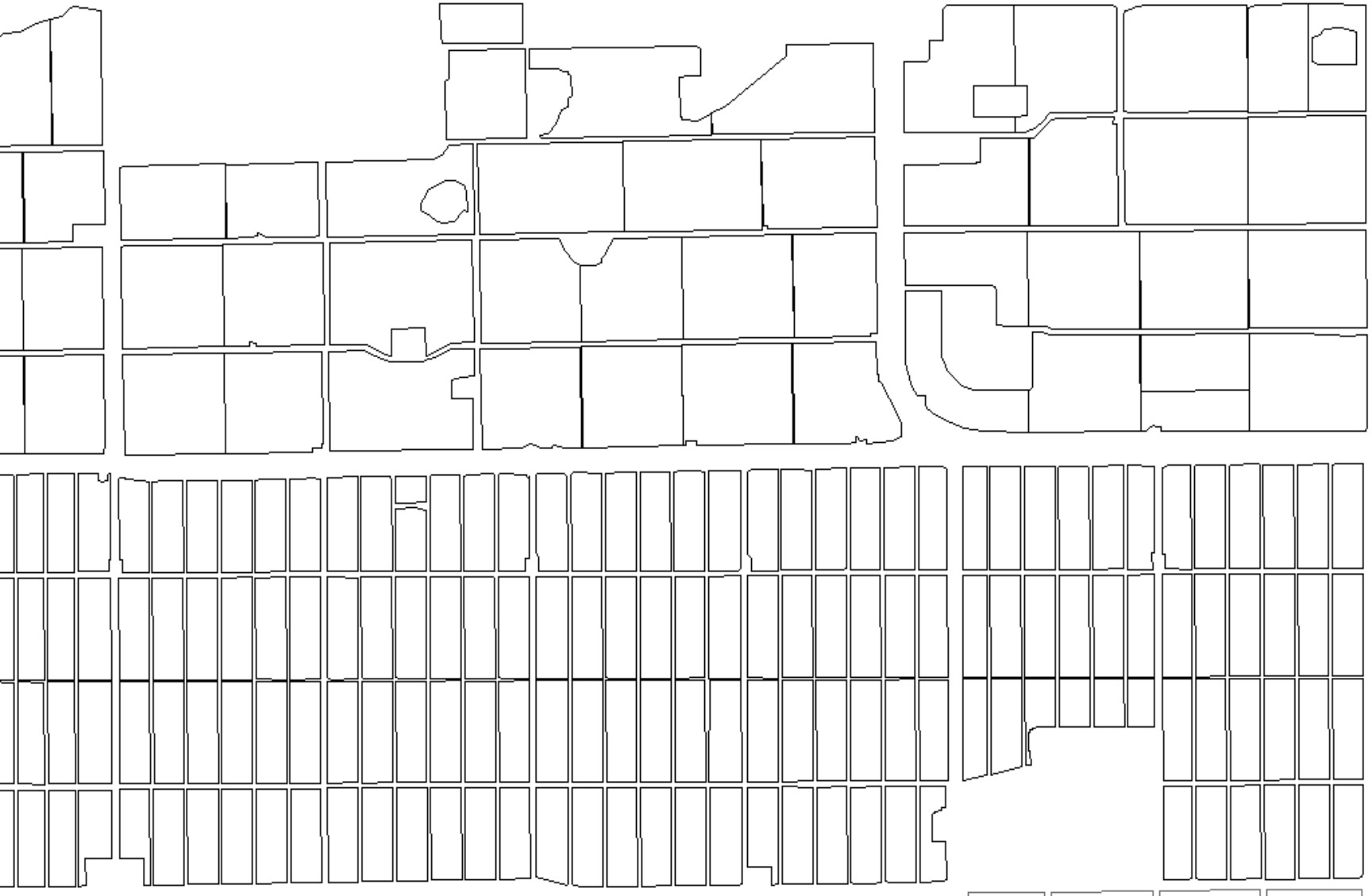
Within Grove Spread



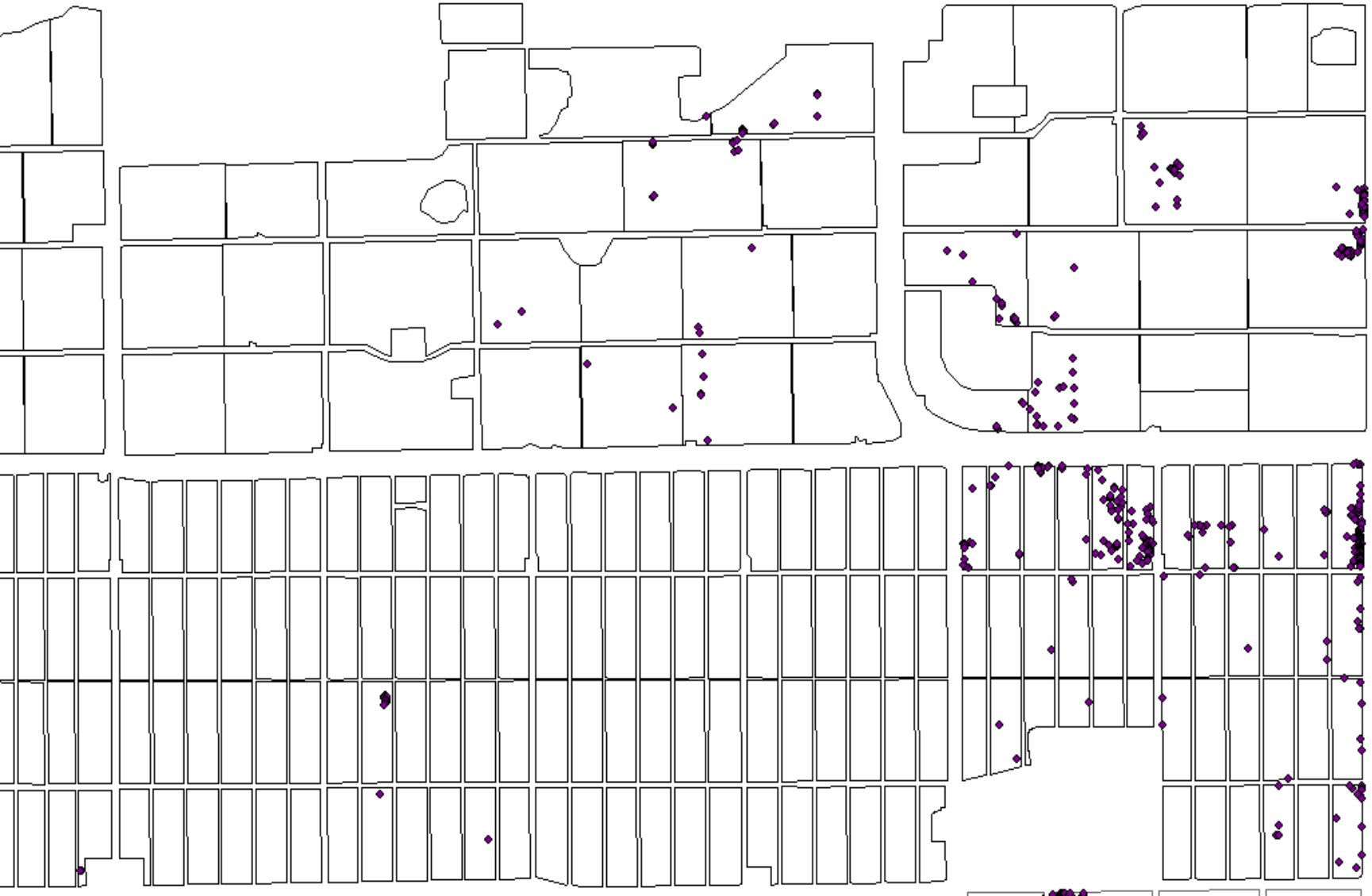
Within Grove Spread



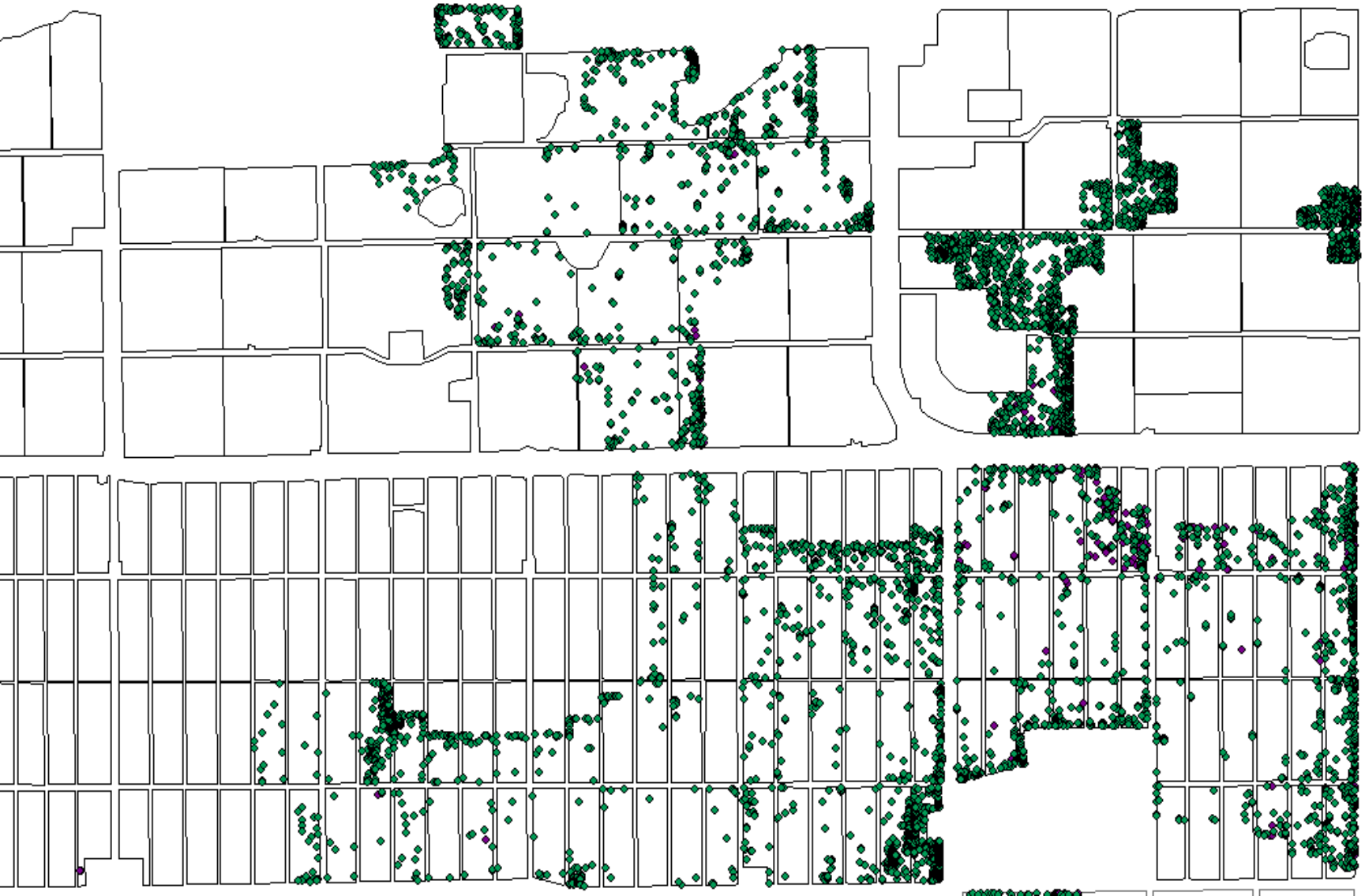
Within Block Spread



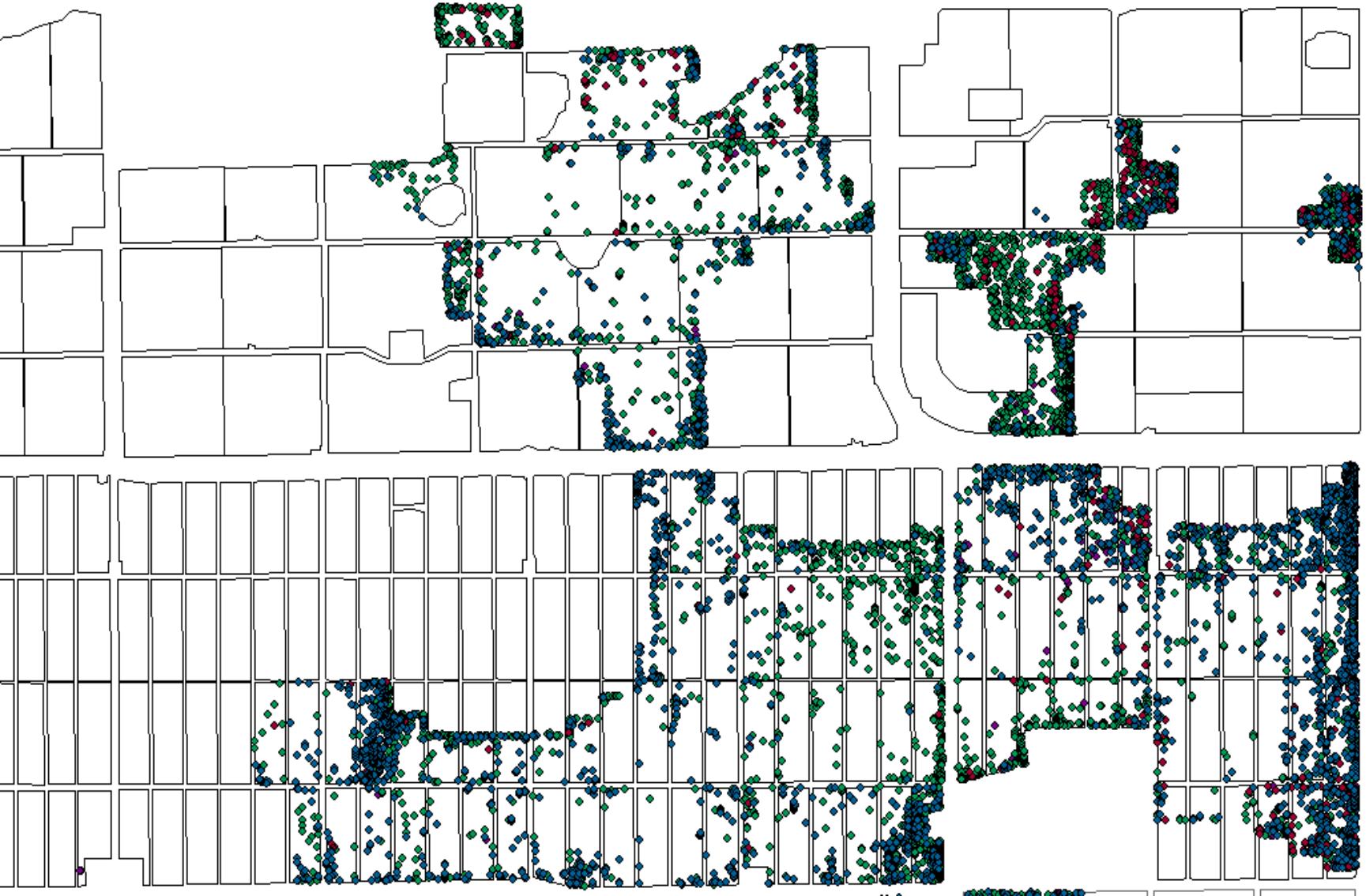
Within Block Spread



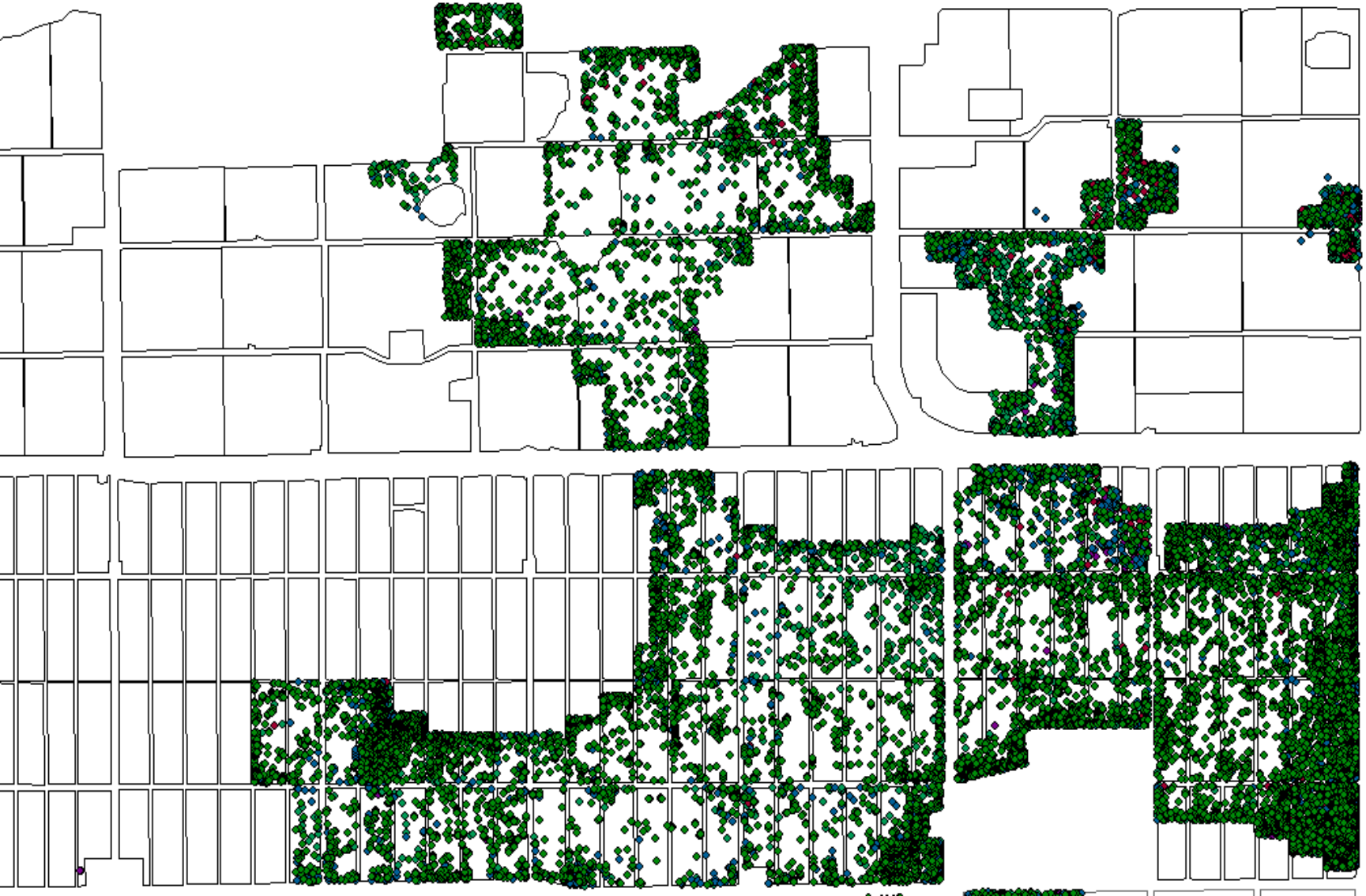
Within Block Spread – Edge Effect



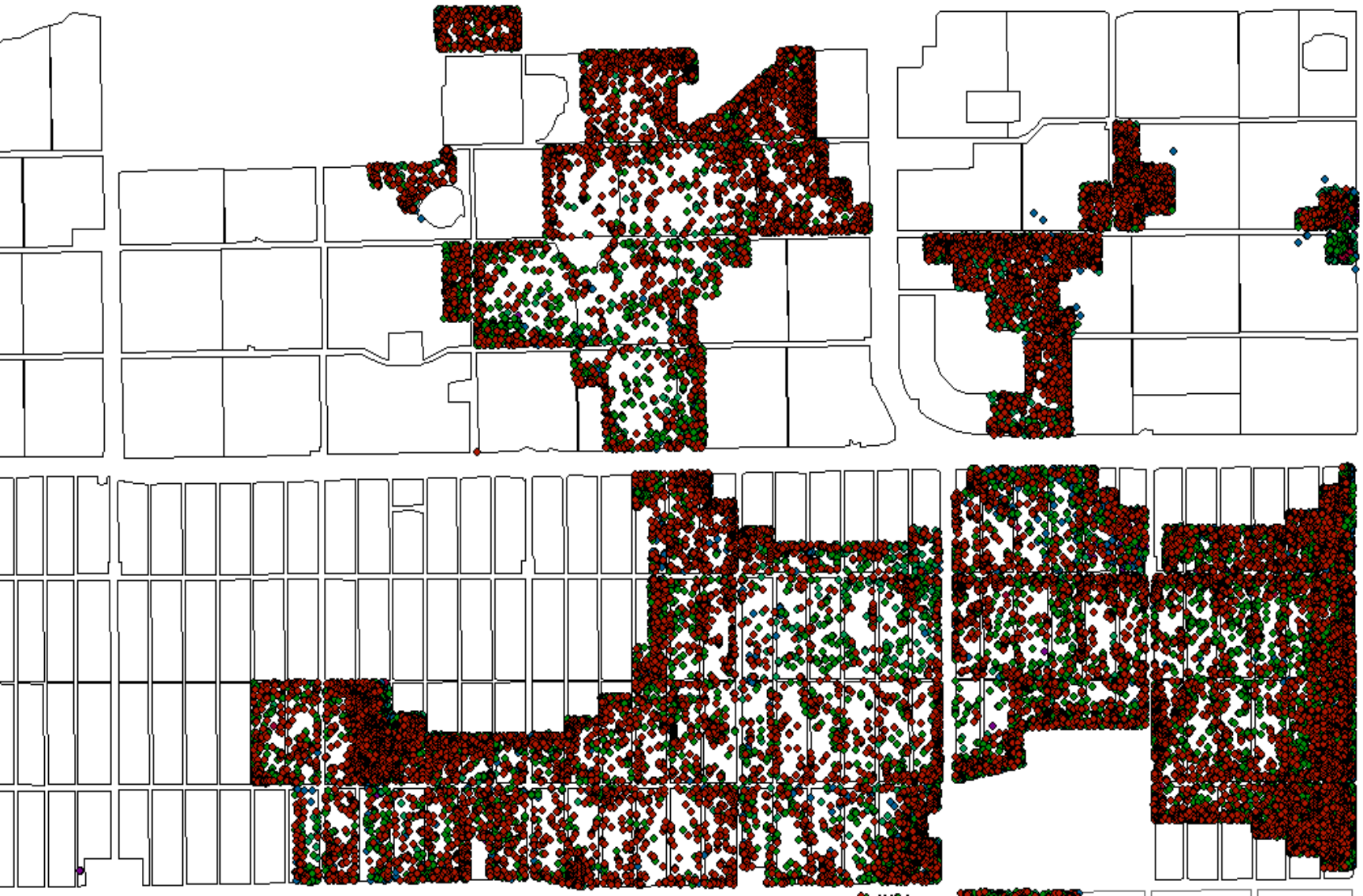
Within Block Spread – Edge Effect



Within Block Spread – Edge Effect

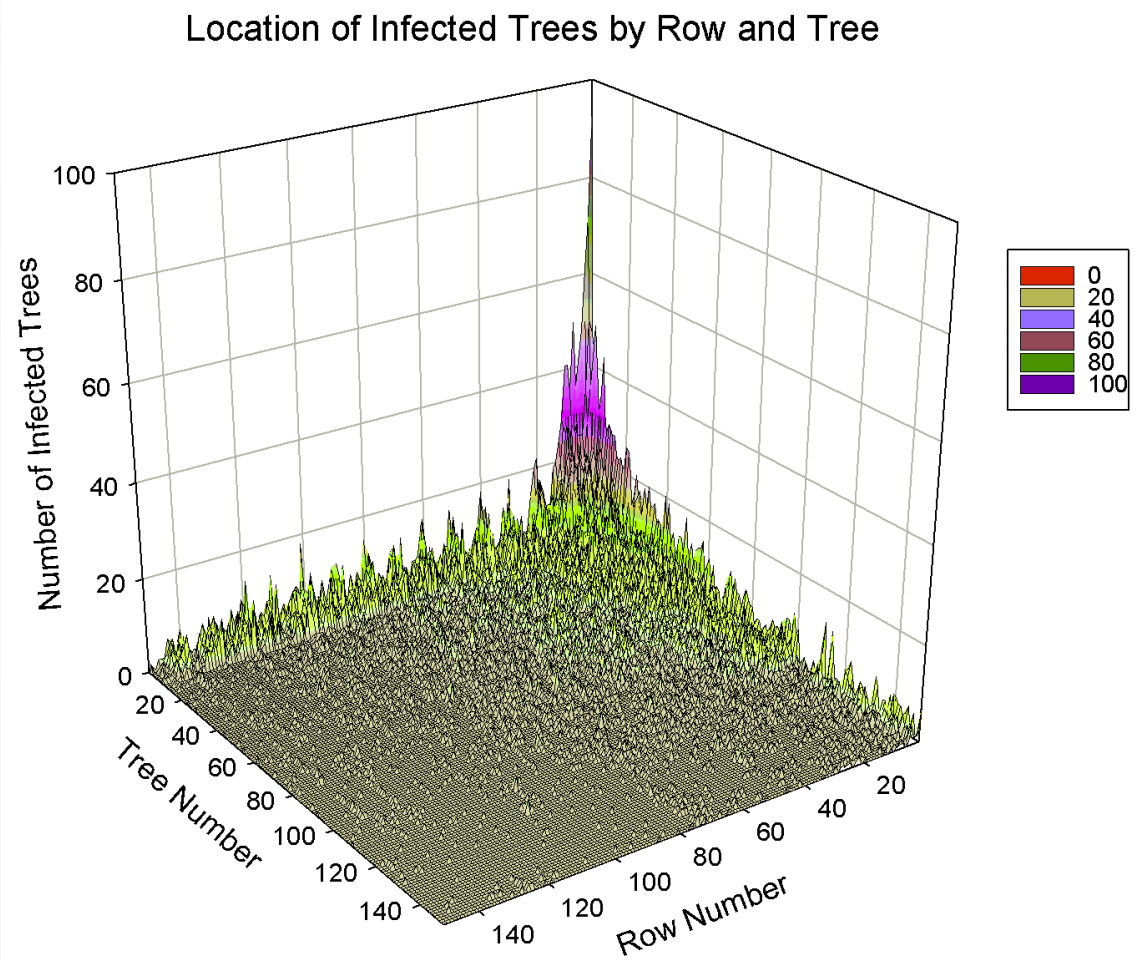


Within Block Spread – Edge Effect



Edge Effect

- Edge effect has been seen in many countries
- Possibly can exploit this when making country-wide surveys.....



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Situation in Florida at the Time of Discovery

- Initial delimiting survey indicated that HLB was too widespread to attempt eradication
- At the end of the citrus canker eradication program
  - Mandatory tree eradication would be a tough sell
- Nurseries and budwood sources were not protected (was in process)

No Mandatory Tree Elimination

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Plan of Attack

- Nursery regulations
  - All trees must be produced under screen/plastic
- Grower education
- Establish disease management programs
  - Scouting
  - Tree removal
  - Psyllid control
  - Use of healthy replant material
  - Others
- HLB laboratories made available to the growers
- Increase in research funding

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The 2006 Florida Statutes

Title XXXV AGRICULTURE, HORTICULTURE, AND ANIMAL INDUSTRY | Chapter 581 PLANT INDUSTRY | View Entire Chapter

581.1843 Citrus nursery stock propagation and production and the establishment of regulated areas around citrus nurseries.--

(1) As used in this section, the term "commercial citrus grove" means a solid set planting of 40 or more citrus trees.

(2) Effective January 1, 2007, it is unlawful for any person to propagate for sale or movement any citrus nursery stock that was not propagated or grown on a site and within a protective structure approved by the department and that is not at least 1 mile away from commercial citrus groves. A citrus nursery registered with the department prior to April 1, 2006, shall not be required to comply with the 1-mile setback from commercial citrus groves while continuously operating at the same location for which it was registered. However, the nursery shall be required to propagate citrus within a protective structure approved by the department. Effective January 1, 2008, it shall be unlawful to distribute any citrus nursery stock that was not produced in a protective structure approved by the department.

Grower Education

- Grower meetings throughout the state
- Opened up our groves for hands-on training of scouts and managers
- On-farm grower training
- HLB symposiums

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Reaction by Florida Growers

- Varied reaction by growers and covers entire gamut of positions – from denial to matching the SGC program
- Major concerns:
  - Growers who choose to do nothing
  - Abandoned groves
- Many growers are looking for the “Silver Bullet” solution
- Experience in Brazil supports the fact that “no action” will create a situation that is ultimately too late in the future

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Disease Management Programs

- In the beginning, we realized that we would have to make many decisions with very little data
- Conventional disease management programs
  - Disease-free trees
  - Psyllid control
  - Scouting and roguing
- Alternative treatments
  - Nutritional programs
  - SAR
- Very little or no data for either approach....

HLB Laboratories

- When HLB was first found in Florida there were no laboratories available to handle routine grower samples
  - The existing labs were mainly set up to handle regulatory samples
- The availability of a lab to run grower samples was considered “critical” to the establishment of disease management programs
  - Early detection
  - Delimiting surveys
  - Scout training

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HLB Laboratories

- Southern Gardens opened lab to the industry in October2006. UF SWFREC opened lab in Feb 2008.
  - High throughput
  - Free to the grower
  - “Make the right thing easy”
  - Get growers “on a program”
- Not regulatory labs, more geared to the grower
  - “Only the grower knows what his grove should look like...”
- Good source of data

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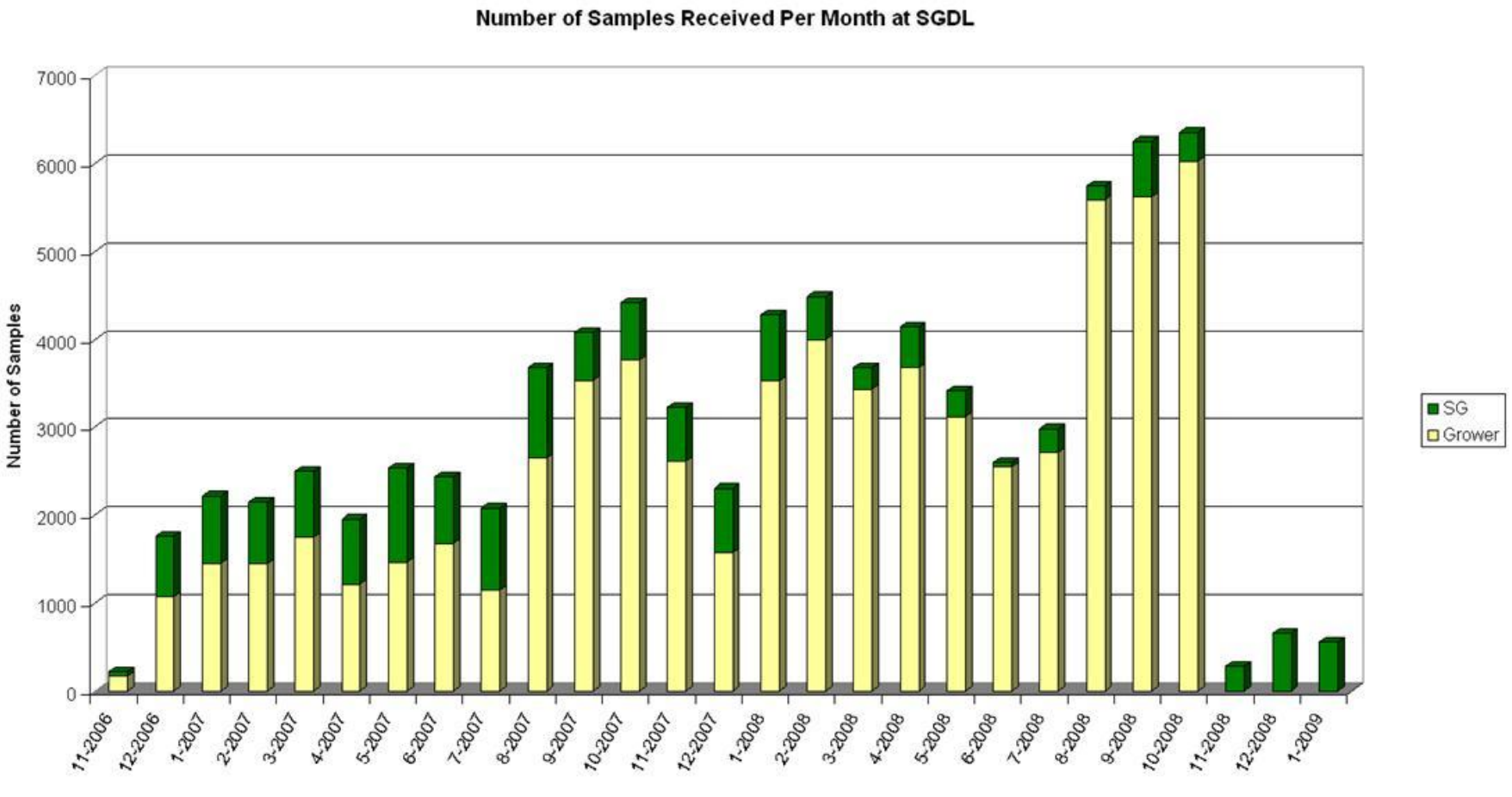
HLB Laboratory Data



Over 110,000 samples run to date

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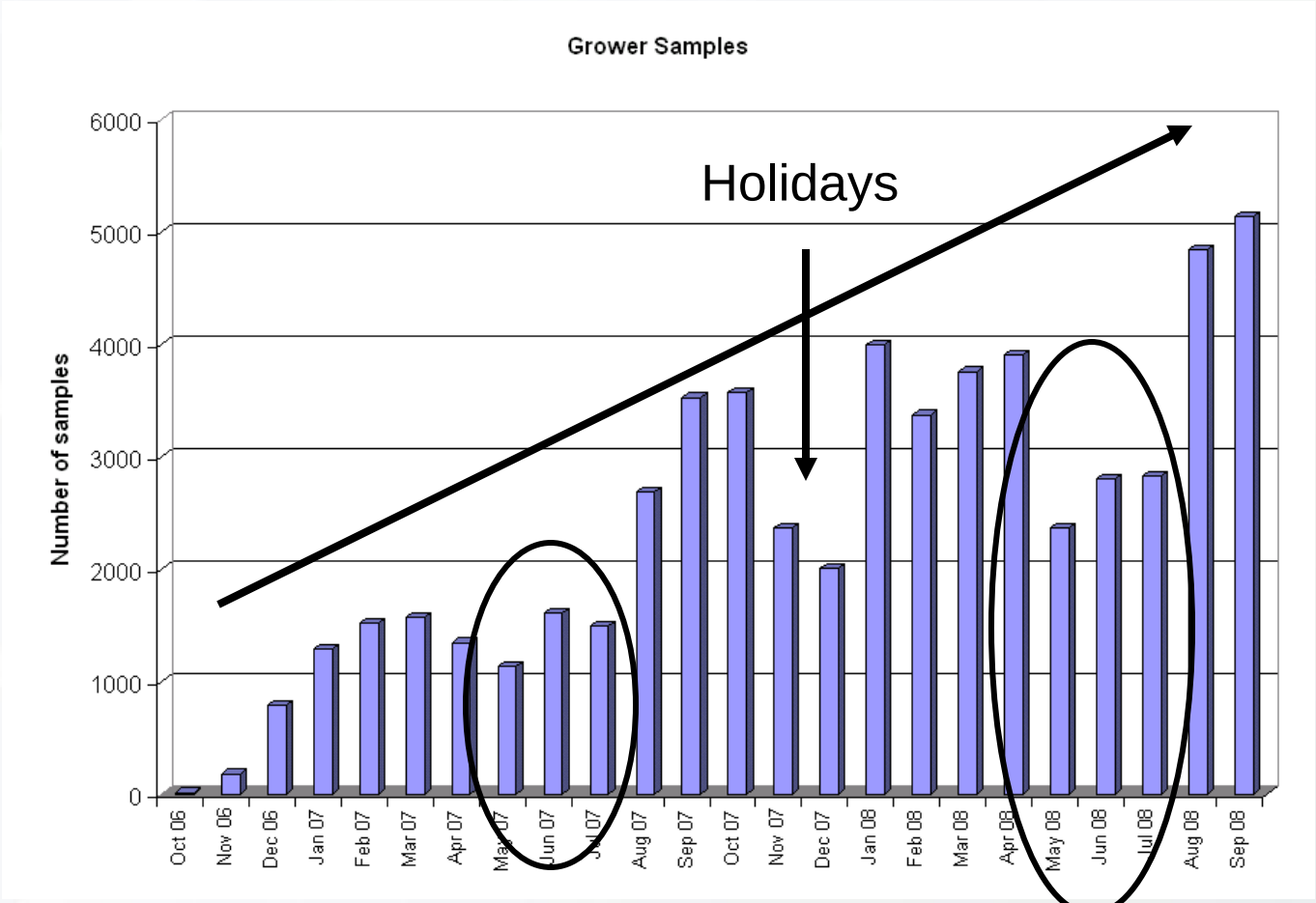
Grower Samples by Month

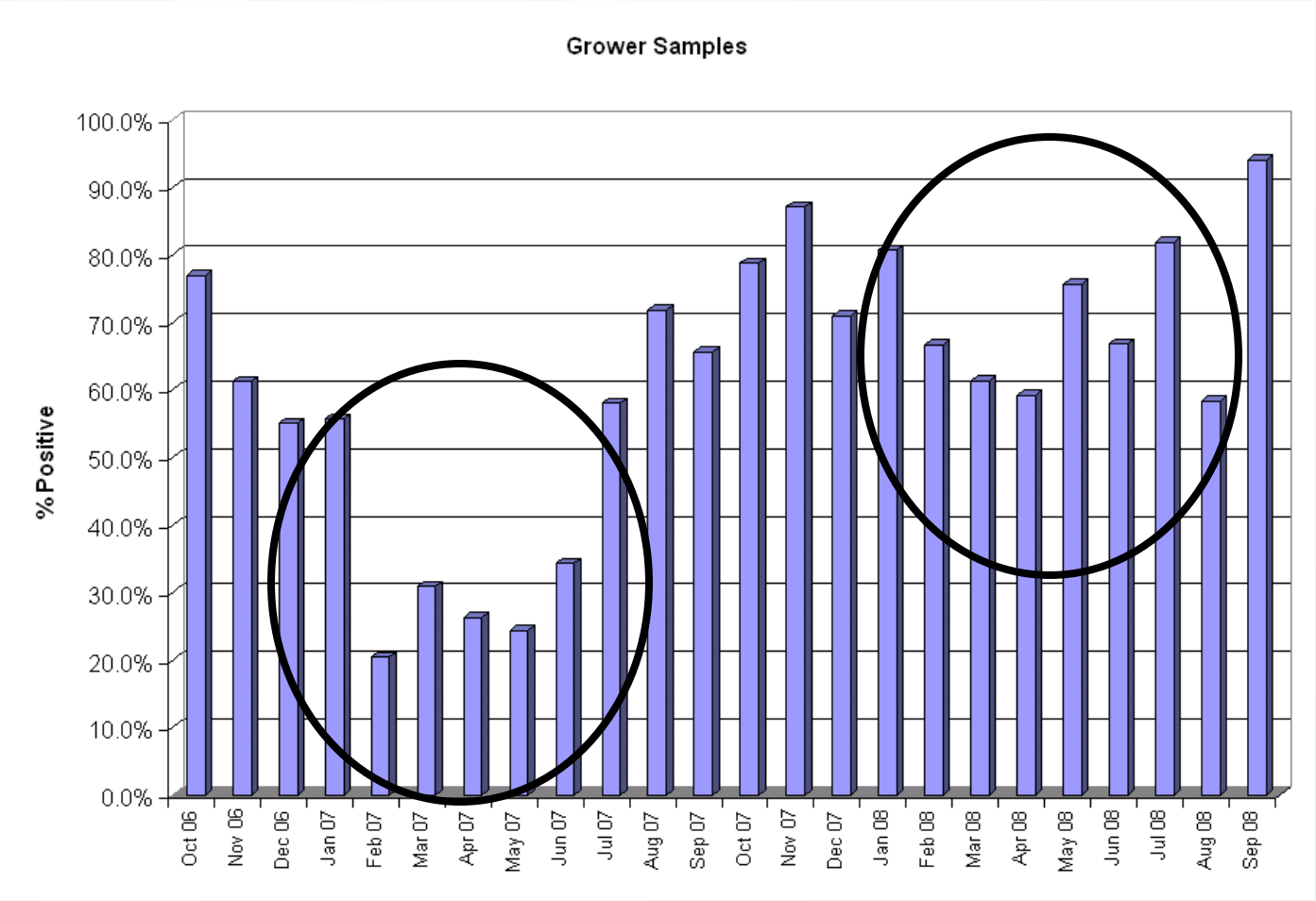


- Increasing sample volume (disease incidence increasing)

- Periodicity of samples (symptom expression vs time of year)

N=58,158

Percent of Samples Positive by Month



- Periodicity of detection (vs symptoms)
- Frequency of detection declines beginning in Feb and increases in July

N=58,158

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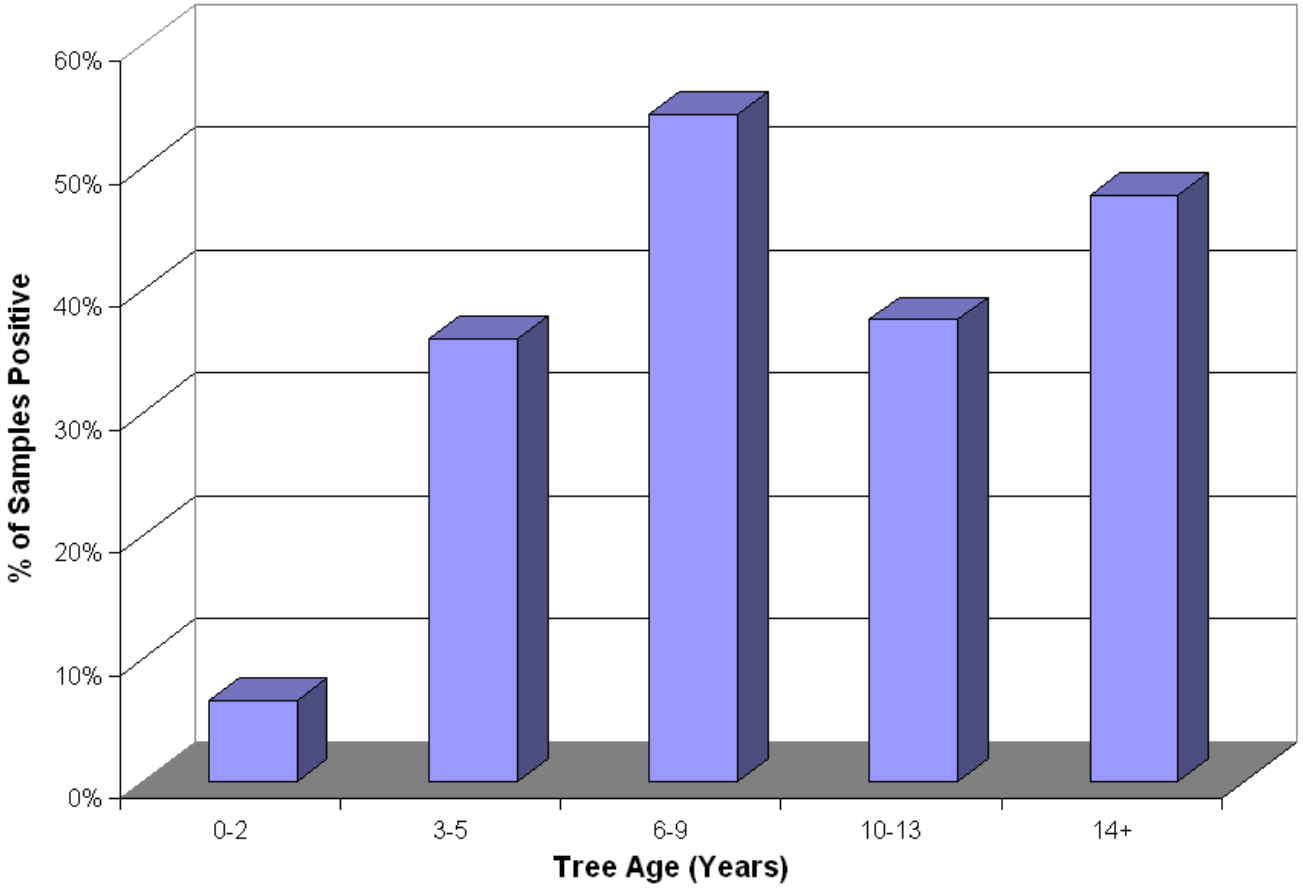
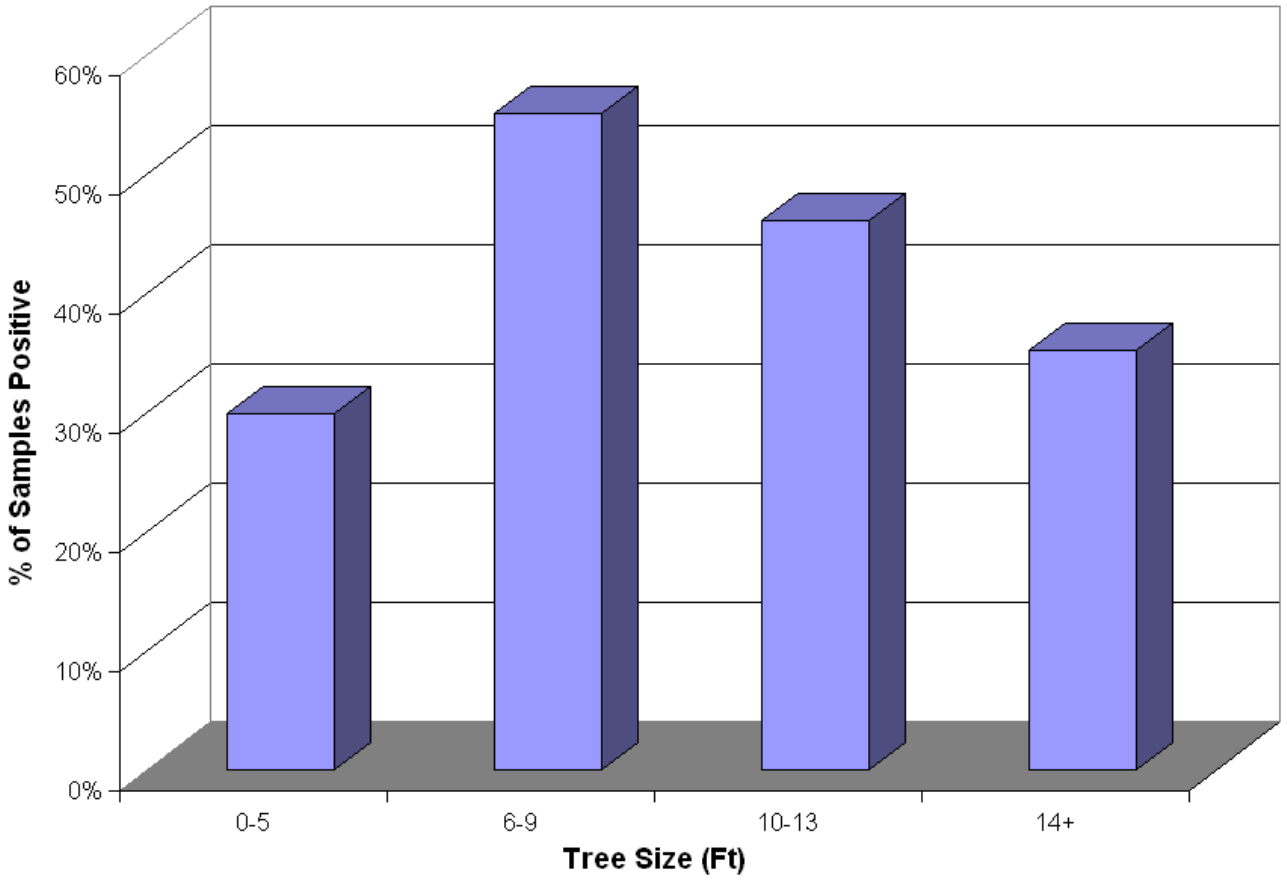
% of Positive Samples by Tree Age



- Highest infection level in trees 6-9 years old

N=9,705

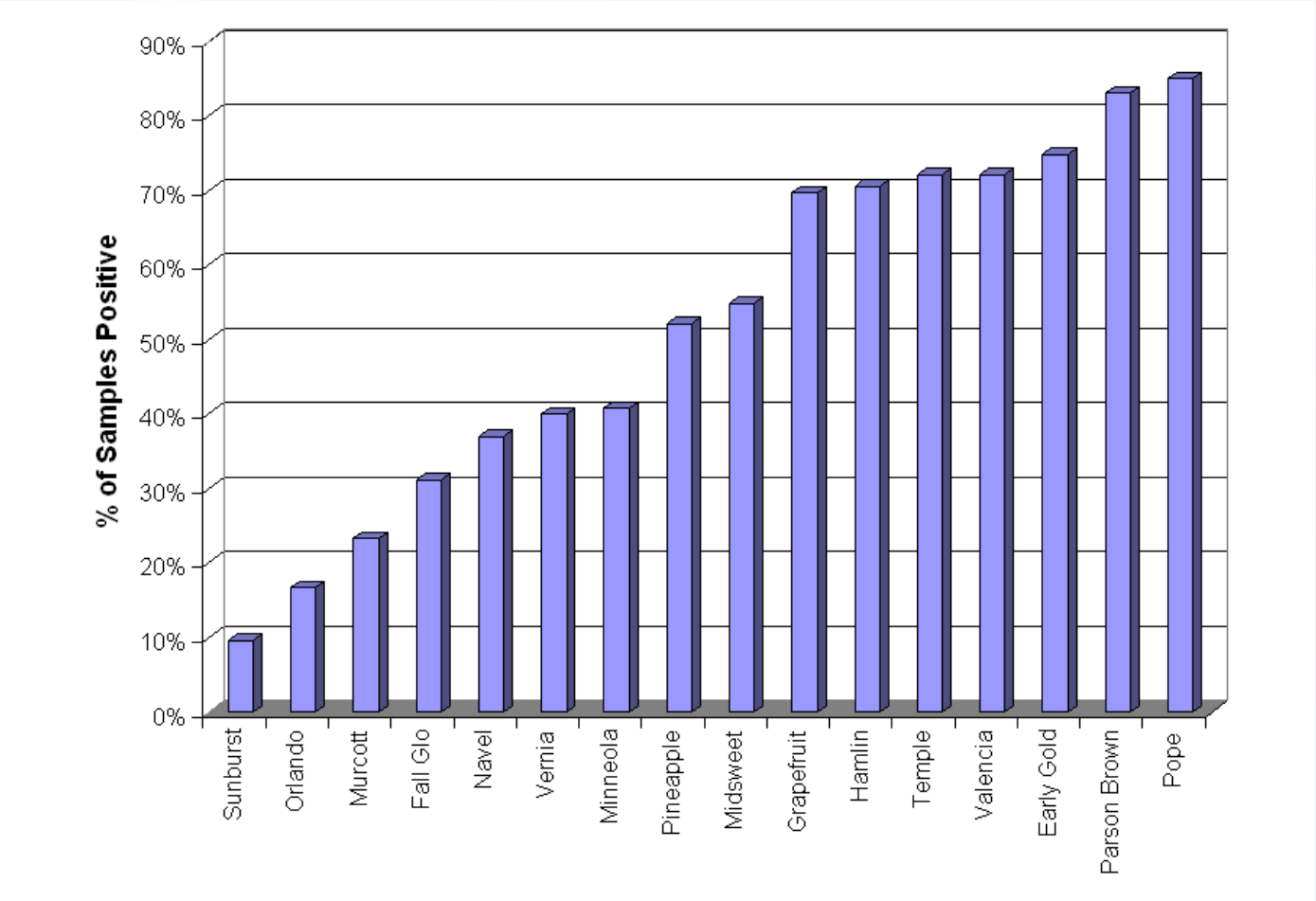
% Positive by Tree Size



- Highest infection level in trees 6-9 ft tall

N=8,597

% Positive by Scion



- Oranges and grapefruit most susceptible
- Tangerines and tangelos more resistant

N=36,903

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Research Funding

- Pre HLB: University of Florida and USDA – in-house budgets, some grants
  - Some HLB research but limited
  - Mostly done elsewhere
- Pre HLB – Grower funding, about $1,500,000US per year
- Post HLB – Grower, Federal, and State funding up considerably.
  - First round of funding about $16,800,000, seeking continuing funding at the same level

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Research Funding

- FCPRAC – Florida Citrus Production Research Advisory Council oversees the process
  - Competitive bids
  - National Academy of Sciences hired to make recommendations
- Projects cover a wide range of research areas
  - Chemical control, detection, pathogen genetics, transgenics, economics, transmission, psyllid population studies, etc.
  - Reports are available at:

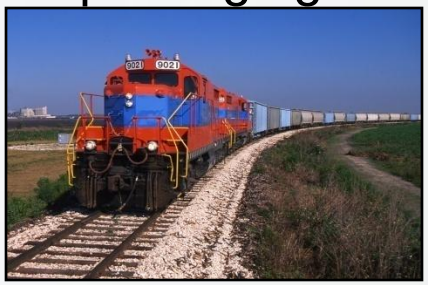
    http://www.fcprac.com/reports.html

Management of HLB

A case study

United States Sugar Corporation / Southern Gardens Citrus

- 181,000 acres
  - 151,000 acres sugar
  - 30,000 acres citrus
- North America's most efficient sugar milling operation
  - 42,000 ton per day mill (design capacity, commissioned 2008-09 season)
  - Built in 3 phases over 3-year period while original mill was operating
- 1 integrated refinery with packaging: 15 million cwt capacity
- Railroad operations
  - 278 miles of track
  - 28 locomotives
  - 1138 railcars



- 1 citrus factory: 21 million box capacity
  - 120 million gallons per season
- NFC aseptic storage: 56 million gallons
- Total 1800 employees

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PRODUCTION

- 151,000 total sugar acres
- 140,000 acres harvested annually
- 6.5 million tons sugarcane produced
- 700,000 tons of sugar produced
- 1.95 million tons bagasse produced
- 30-35 million gallons molasses produced
- Three million boxes of oranges
- 120 million gallons of 100% pure, premium Florida orange juice

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Basic Control Strategy

- Maintain Low Incidence of HLB

Basic Control Strategies

- Inoculum management – intensive survey and tree removal
- Control of the insect vector
- Use of disease-free planting material
- Regional approach

Control Strategies - 1

Inspection and Tree Removal

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Inspection for HLB at Southern Gardens

- 36 Scouts (Inspectors) on ~16,500 acres
- Scouts work in pairs, walking both sides of a tree row
- HLB/greening suspect trees are flagged, including small flag on symptomatic branch
- Final confirmation of suspect trees is performed by three experienced, well-trained “Senior Scouts”

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Inspection – Walking Survey

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Frequency of Inspection

Try to inspect grove 4 times per year

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Scouting for the Asian Citrus Psyllid

4 Scouts
for ACP

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Data Collection

Infected trees are GPS referenced for documentation, analysis and future reference.

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Trees confirmed as HLB-infected by Senior Scouts are painted on trunk…

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Tree Removal – Clipped not Pulled

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Tree Removal – Clipped not Pulled

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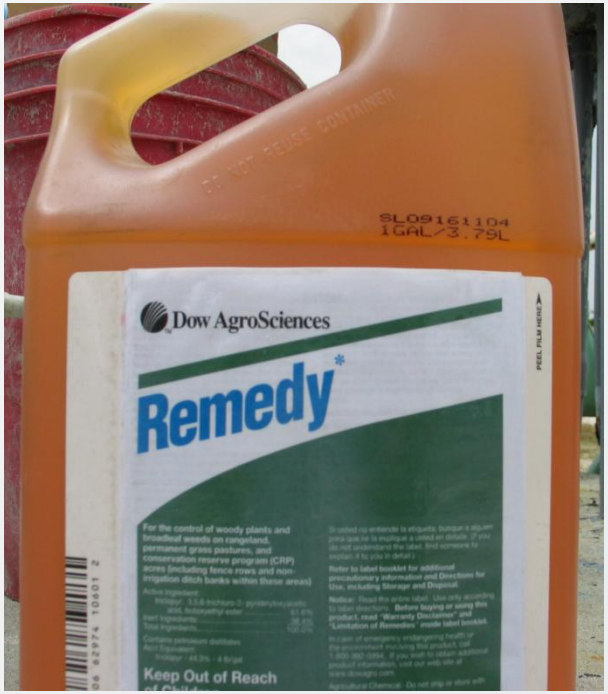
Tree Removal – Herbicide to Kill Stump



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Scouting – Others

- Many companies have hired a “Disease Manager” – qualifications vary from tractor driver to Dr. Plant Medicine (DPM)
  - Internal scouting crews (size ranges from 1 to 60)
  - Contract crews
- Contract scouting crews
  - No set number of times per year
  - Some do it once and that is it, and others are on a program
  - Others not scouting at all for fear of possible effects on contracts
- Very little quality control on the scouting crews
  - Some send samples in the to SGC diagnostic lab, others don’t
  - I have seen some very erratic results indicating that some crews may be tagging trees with other maladies (may make the grower decide to do nothing)

Control Strategies - 2

Psyllid Control

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Psyllid Control

- Pre – HLB
  - No specific control measures for ACP
  - Spray program was essentially a copper and oil program with miticides applied on an as needed basis
- Post – HLB
  - Intensive ACP management program
  - Insecticides applied in every grove spraying operation
  - Emergency applications applied by air as needed

Spray Program – Pre Canker and HLB

- **Dormant Spray-**December/January: Urea & Nutriphite
- **Post Bloom Spray**- March/April: Oil, Nutriphite, Potassium Nitrate, Nutritional
- **1st Summer Oil-** May/June: Oil, Copper, Potassium Nitrate, Nutritional
- **2nd Summer Oil-** July/August: Oil, Copper, Nutriphite, Nutritional, and miticide (if needed)
- **3rd Summer Oil-** September/October: Oil, Copper, Nutritional, and miticide (if needed)

- **Young Trees Only-** March/April and August: Admire trunk/soil drench applications

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Spray Program – Post HLB

- **Dormant Spray-**December/January: Urea, Nutriphite, Danitol 2.4 EC
- **Systemic Control-** December/January: Temik
- **Post Bloom Spray**- March/April: Oil, Copper, Nutriphite, Potassium Nitrate, Nutritional, Dimethoate 5 Pound (Aqueous Formulation)
- **1st Summer Oil-** May/June: Oil, Copper, Potassium Nitrate, Nutritional, Provado 1.6 F
- **2nd Summer Oil-** July/August: Oil, Copper, Nutriphite, Nutritional, Lorsban 4EC and miticide (if needed)
- **3rd Summer Oil-** September/October: Oil, Copper, Nutritional, Provado 1.6 F and miticide (if needed)
- **Young Trees Only-** March/April and August: Admire trunk/soil drench applications

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Psyllid Levels After Start of Psyllid Control Program

Courtesy of Dr. David Hall, USDA ARS HRL, Fort Pierce

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Psyllid management in CREC groves

Courtesy of Dr. Mike Rogers UF/Lake Alfred

- **January**

  Temik 33 lbs / A
- **February**

  Danitol (fenpropathrin) 16 oz / A
- **March**

  Bloom = no sprays
- **April**

  Post bloom spray = carbaryl 4F 2 Qts / A
- **May/June**

  1st oil spray + imidacloprid foliar spray 16 oz / A
- **July/August**

  2nd oil spray + chlorpyrifos 4E 5 Pts / A
- **September**

  No sprays unless high psyllid populations observed
- **October**

  carbaryl 4F 2 Qts / A
- **November/December**

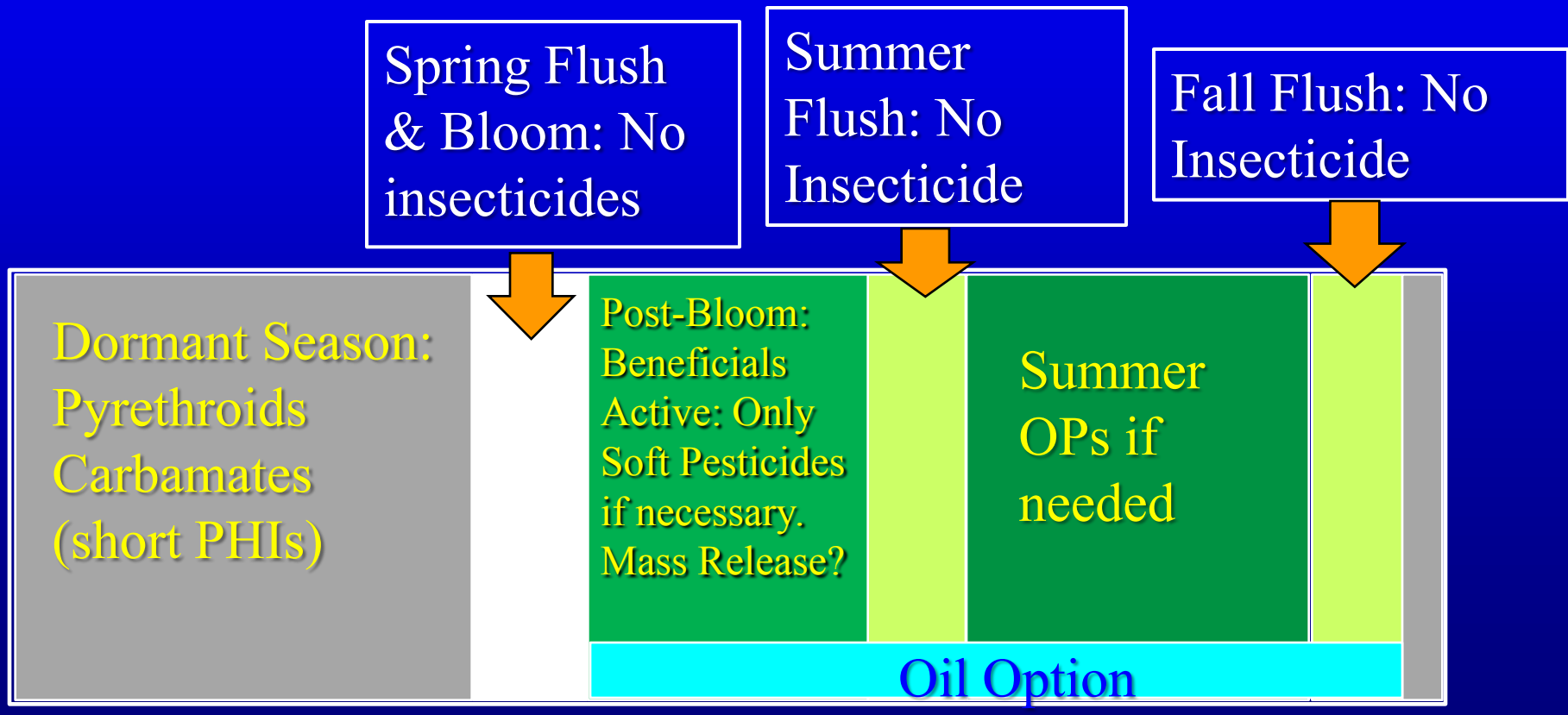
  No sprays unless high psyllid populations observed

UF UNIVERSITY of FLORIDA IFAS Citrus Research and Education Center

Psyllid Manangement Plan for Mature Citrus

- Monitor populations year round
- Dormant spray(s) with short PHI adulticide
- No sprays on flushes
- Only soft chemistry post bloom
- Oil program option throughout growing season
- OPs in summer and before fall flush if necessary

Courtesy of Dr. P. Stansly UF/SWFREC



The point is that some sort of psyllid control is necessary!

Most people are controlling the psyllid (chemical control) even if they are not removing the trees!

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Control Strategies - 3

CLEAN NURSERY STOCK


Canker Control Area
DO NOT ENTER THIS GATE
No Trespassing
Must Have Spray Down


Canker Control Area
DO NOT ENTER THIS GATE
No Trespassing
Must Have Spray Down


SELECT PERSONEL


mayer

Cost of Managing HLB

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Economics

- Inspection - $110.00 per acre
- Tree Removal - $60.00 per acre
- Resets & Planting - $56.00 per acre
- Psyllid Control - $250.00 per acre
- **Total HLB Cost - $476.00 per acre**
- **Total Production Cost - $1,376.00 per acre**

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Economics

- Lost Production
  - –Through February 2009, have removed 392,352 trees
  - –@6.3lbs solid per box and 2.25 boxes per tree
  - = 1,548,626 loss in boxes or a loss of $9,756,341 over 3 years

Economics

- 16,500 ac X $476/ac X 3 Years = $23,562,000
- Lost production = $9,756,341

Total $33,318,341

Recent Trends and Developments

- Importance of dormant spray
- Regional treatments
- Low volume sprays
- New insecticide labels
  - Chemicals
  - Uses
- Alternative treatments – being tested but little data, mostly observational...
  - Nutritional programs
  - SARs

Nutritionals and SARS

- Mostly being used by companies and growers that have decided not to remove trees
  - "If I remove the trees I wont have anything left"
  - "Will farm the land until it is unproductive or I sell it"
- Have had some initial positive responses
- By default it means that you are willing to accept high levels of infection – cant turn back
- Unknown how long they can keep the trees going
- Unknown if it will be possible to replant young trees/groves in the presence of high levels of infection

So are we winning?

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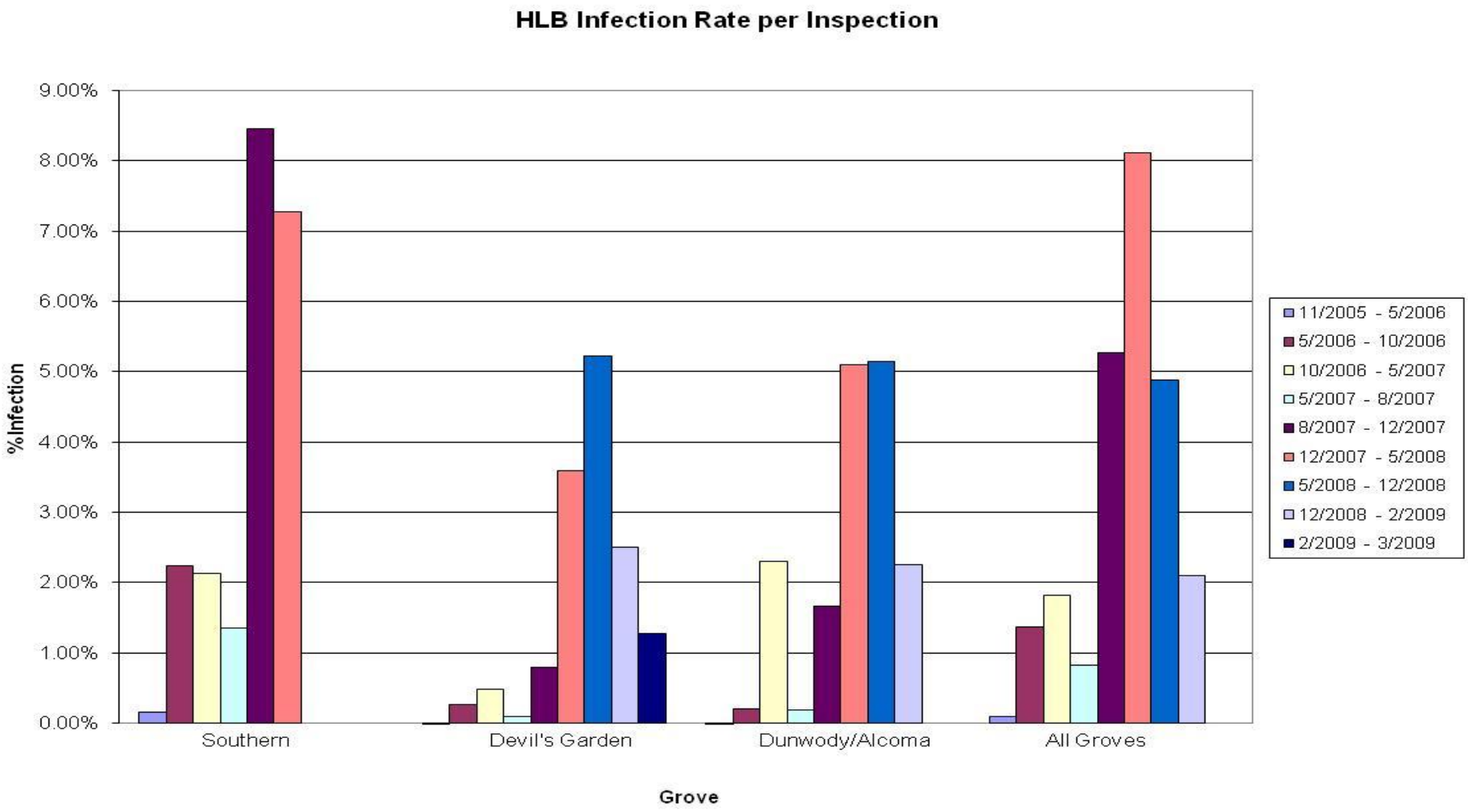
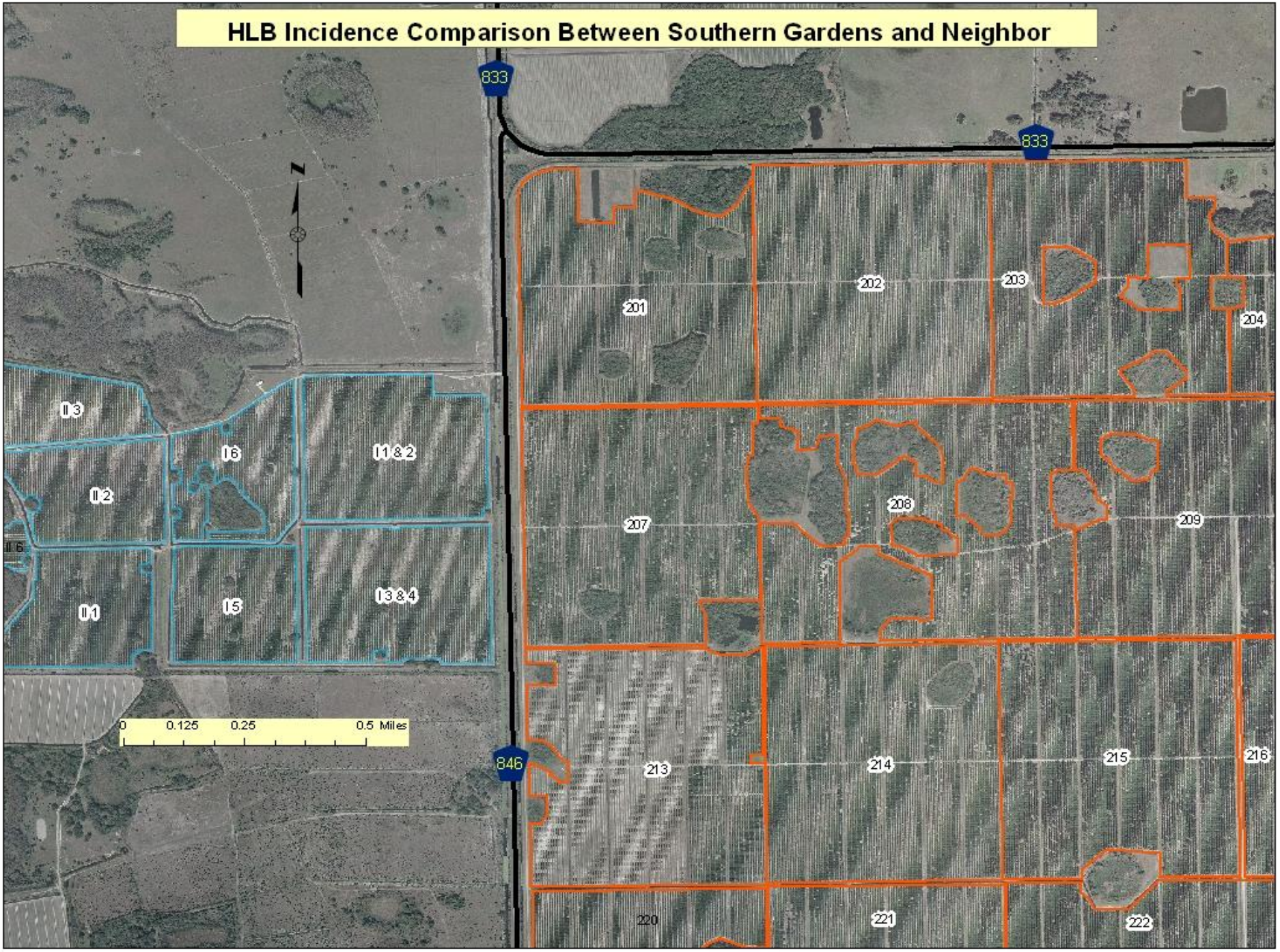
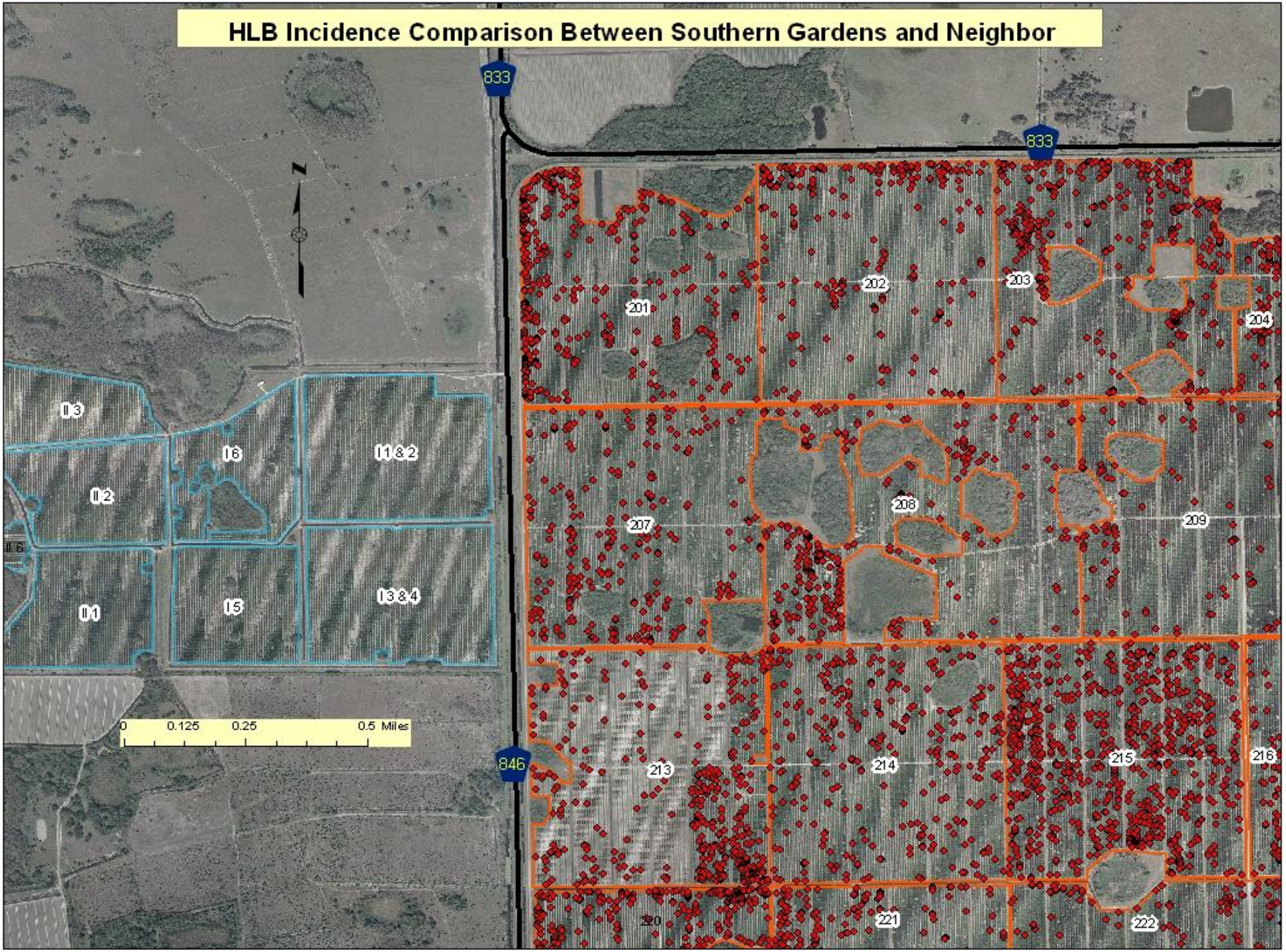
SOUTHERN GARDENS CITRUS

% Infection by Inspection Cycle




HLB Incidence Comparison Between Southern Gardens and Neighbor
833
833
N
201
202
203
204
II 3
I 6
I 1 & 2
II 2
207
208
209
II 6
II 1
I 5
I 3 & 4
0
0.125
0.25
0.5 Miles
846
213
214
215
216
220
221
222


HLB Incidence Comparison Between Southern Gardens and Neighbor
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N
I 3
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I 2
I 1
I 5
I 3 & 4
I 6
201
202
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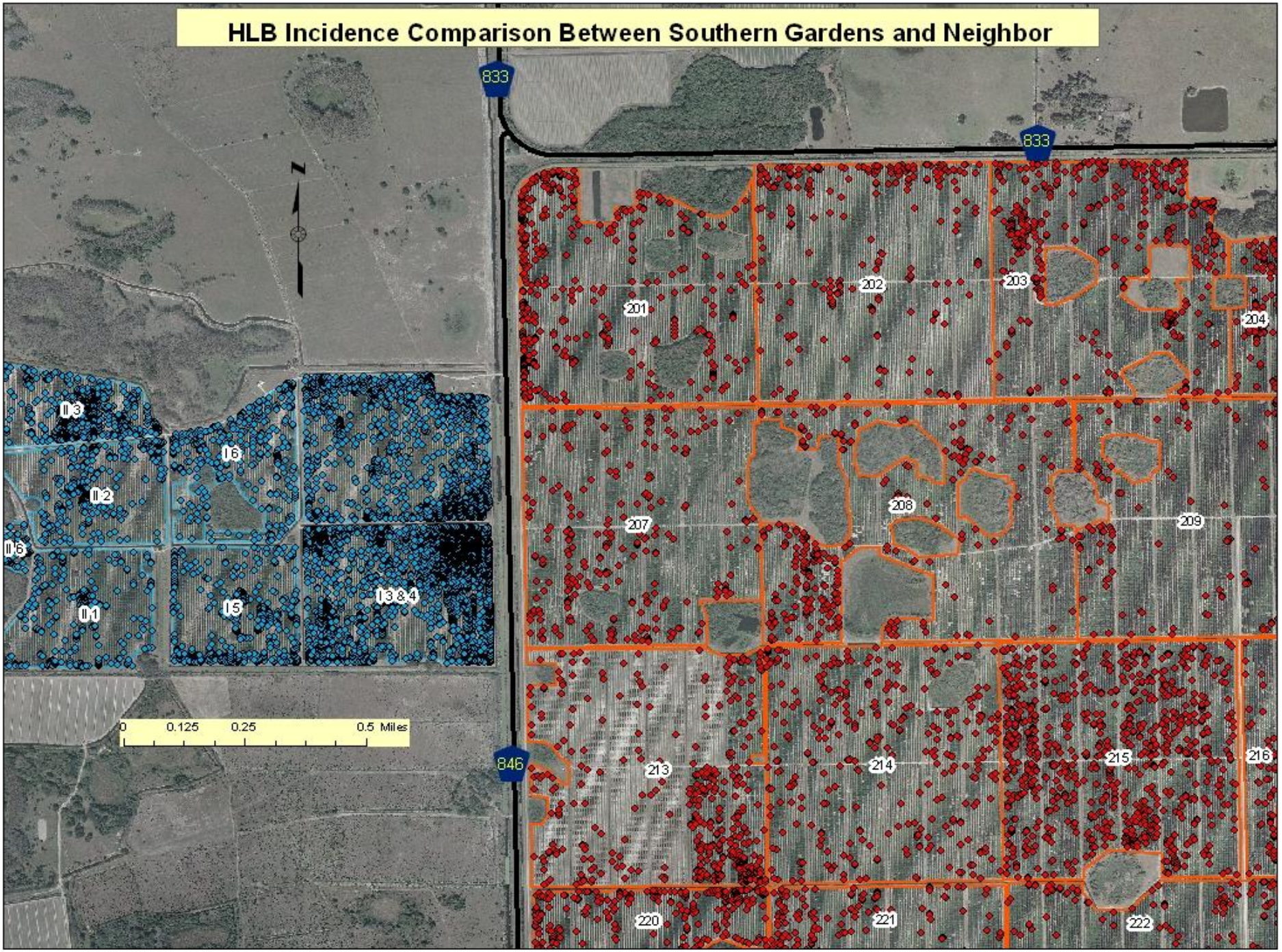
214
215
216
220
221
222
0
0.125
0.25
0.5 Miles


HLB Incidence Comparison Between Southern Gardens and Neighbor
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I 5
I 3 & 4
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202
203
204
207
208
209
213
214
215
216
220
221
222


HLB Incidence Comparison Between Southern Gardens and Neighbor
201
202
208
207
208
213
214
16
11 & 2
15
13 & 4

Cautiously optimistic

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Other States

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Quarantine

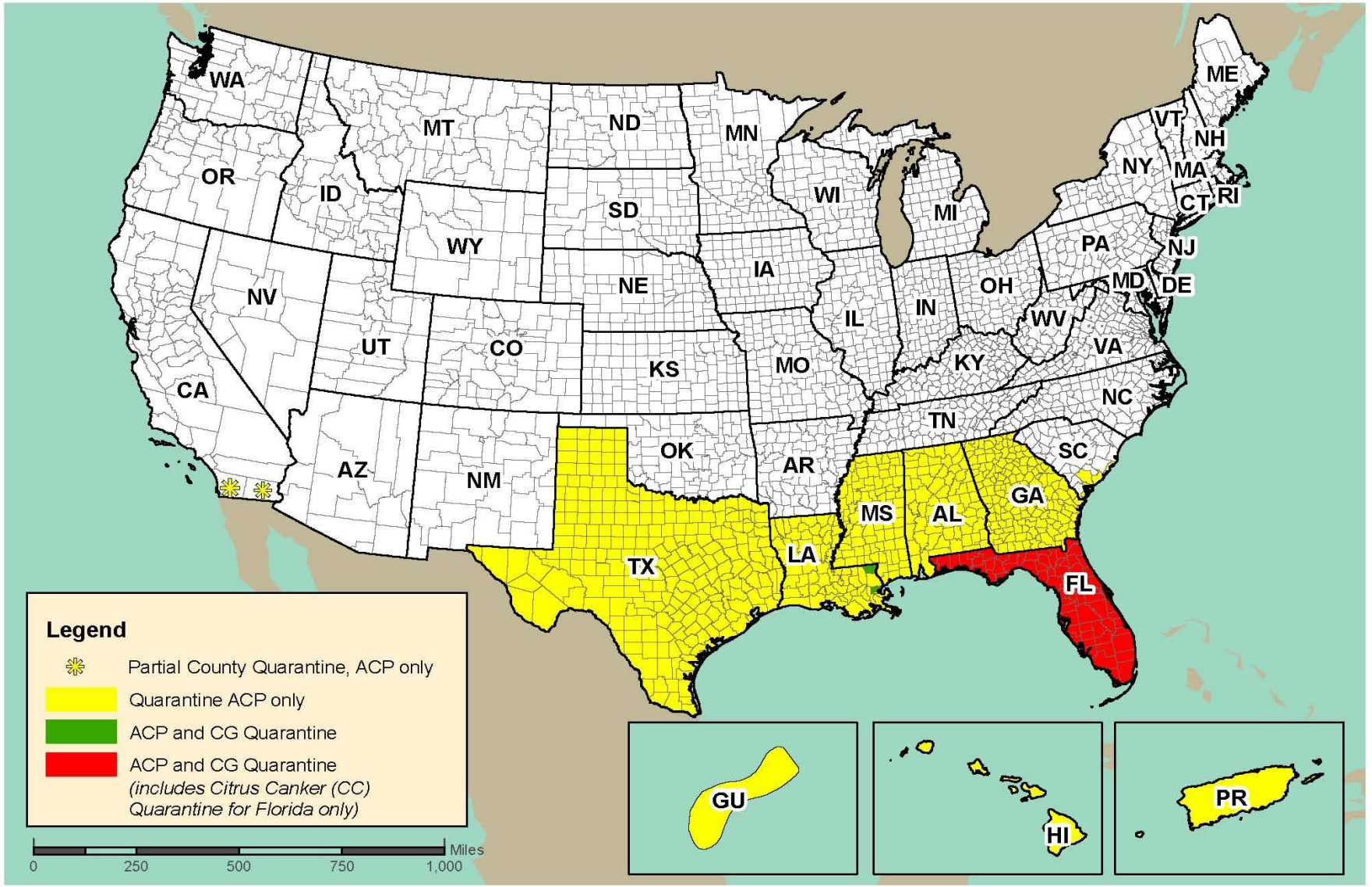
- Federal Law – entire state is under quarantine for the ACP and HLB UNLESS the state establishes a parallel within state quarantine equal to the federal quarantine
  - State can decide if they will do this or not

- The result is that for some states the ENTIRE state is under quarantine and for some only part of the state is under quarantine

USDA
United States Department of Agriculture

National Quarantine
Citrus Greening (CG) and Asian Citrus Psyllid (ACP)

Animal and Plant Health Inspection Service



USDA-APHIS-PPQ
2150 Centre Ave.
Fort Collins, Co 80526

Data Source:
TeleAtlas Dynamap
USDA-APHIS-PPQ

Coordinate System:
Lambert Azimuthal Equal Area
Sphere Clarke 1866 Authalic

Date Created: 02 04, 2009
Time Created: 15:15 hrs MST

Situation in Other States in the US

- Florida
  - Greening, ACP, canker
- South Carolina
  - Greening (1 county), ACP (multiple counties)
- Georgia
  - Greening (1 county), ACP
- Alabama
  - ACP
- Mississippi
  - ACP
- Louisiana
  - Greening (2 counties), ACP
- Texas
  - ACP
- California
  - ACP
- Arizona - none

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What are the Other States Doing?

- Mostly survey and detection
  - Detection would trigger action
  - Action will depend on the state
- Other than Florida – none of the other states have mandatory nursery regulations (production under screen). Detection would trigger rules.
  - Struggling with how to get the rules in place without hardship on nursery owners
- California – survey and detection and eradication/suppression of the ACP
  - Aggressive ACP survey
  - ACP positive sites treated with insecticides

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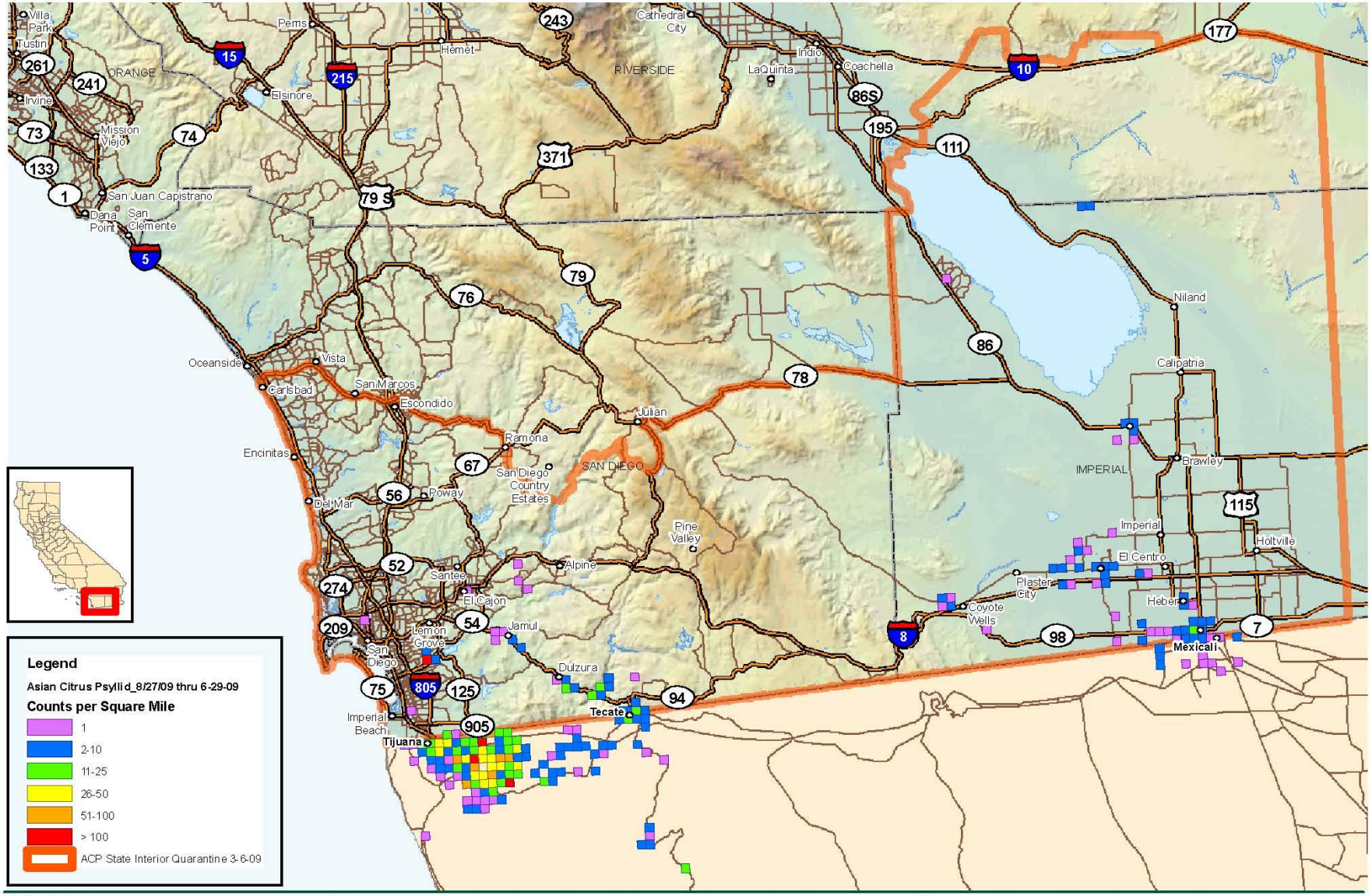
Asian Citrus Psyllid Cooperative Project
California and Baja California

USDA
United States Department of Agriculture

APHIS
Animal and Plant Health Inspection Service



Legend

Asian Citrus Psyllid_8/27/09 thru 6-29-09

Counts per Square Mile

- 1
- 2-10
- 11-25
- 26-50
- 51-100
- > 100
- ACP State Interior Quarantine 3-6-09

USDA, APHIS, PPQ
Western Region GIS Specialist
650 Capitol Mall, Suite 6-400
Sacramento, CA 95814

Coordinate System:
CA Teale Albers, NAD83

Date Created: June 30, 2009

Data Source:
CA Dept of Food & Agric.
USDA, APHIS, IS
TeleAtlas Dynamap

0 5 10 20 30 40 Miles

Lessons Learned the Hard Way....

Lessons Learned the Hard Way....

- **It will get worse before it gets better!**
- Have to stick with the program!
- We should have been controlling the psyllid before we found the disease!
  - When you find it, it has already been there for years
- PROTECT YOUR BUDWOOD (and nurseries)
- High throughput HLB testing lab
  - Not all samples have to be regulatory samples
  - Early detection and management is a key
- **It will get worse before it gets better!**

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Thank you
Questions?