

# Innovations in plant disease diagnosis at the UF IFAS Plant Diagnostic Center

In-service Training Feb 22, 2017



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"Hub" SPDN resource lab for the Southeast (1/5)  
Surge capacity  
\$1.7 million built in 2012  
Iso-based accreditation



# Diagnostic Services

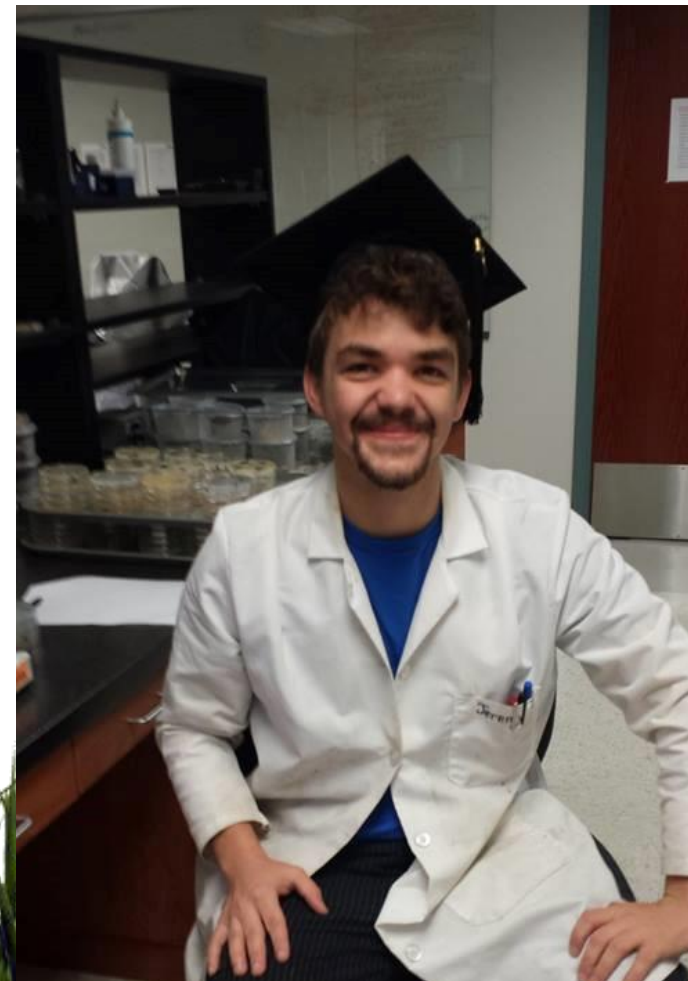
- Offered within the state and globally
- Provide accurate diagnoses in a timely manner
- Connect research driven management recs
- Clientele include:
  - Growers
  - Extension agents
  - Turfgrass managers
  - Nursery producers
  - Greenhouse managers
  - Pest control operators
  - Consultants
  - Citizens
  - Extension faculty
  - State and federal partners



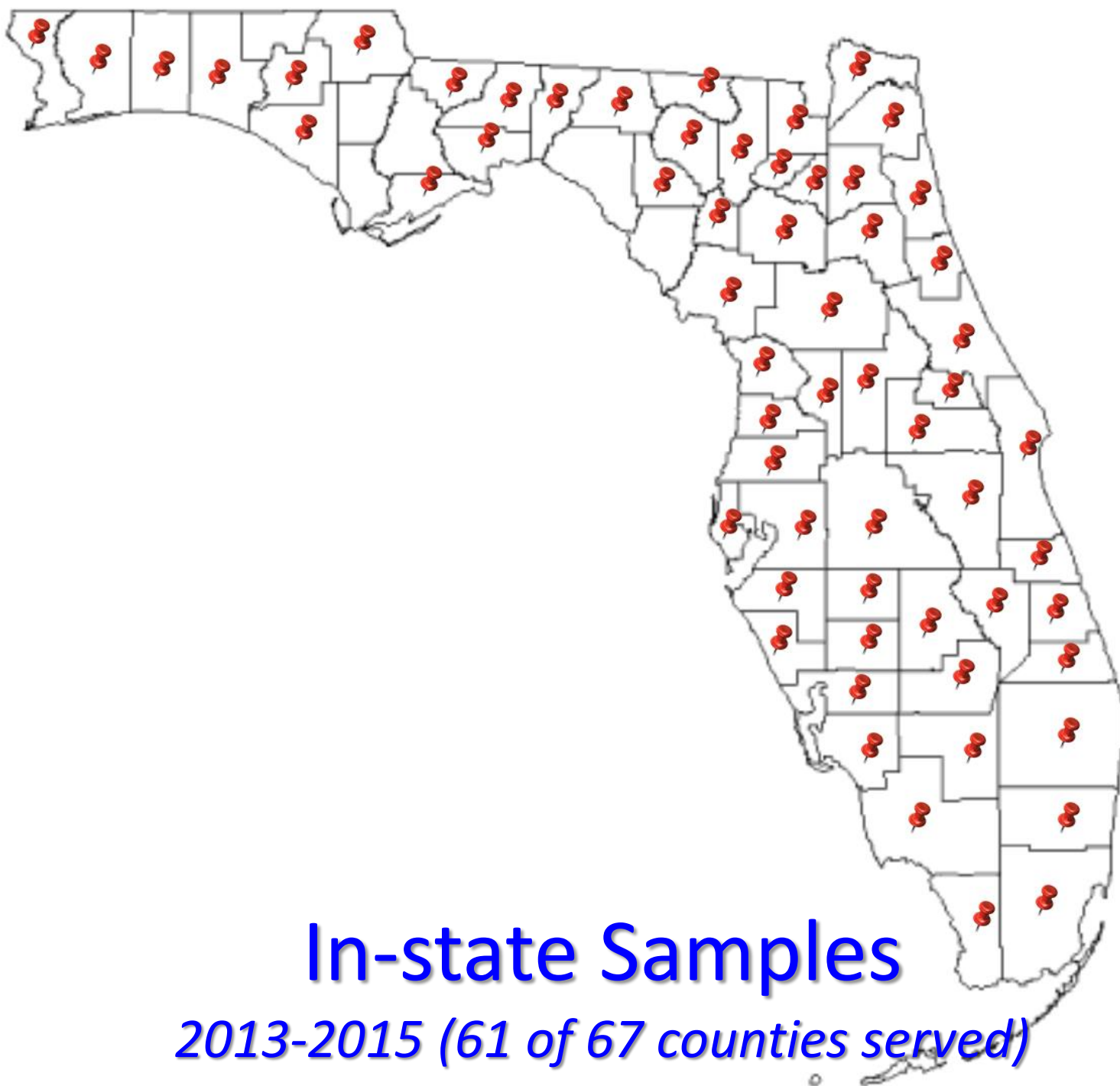


# Rapid Turf Diagnostic Service

- Full time RTDS diagnostician
  - Jeremy Welter
- 2016 numbers: 829 samples
- Specific media and protocols
  - Rapid turnaround results
  - Research driven management options
  - Higher costs, higher fees







**In-state Samples**  
*2013-2015 (61 of 67 counties served)*



# National Samples

## 2013-2015



25 states  
and  
territories



# International Samples

*2013-2015*

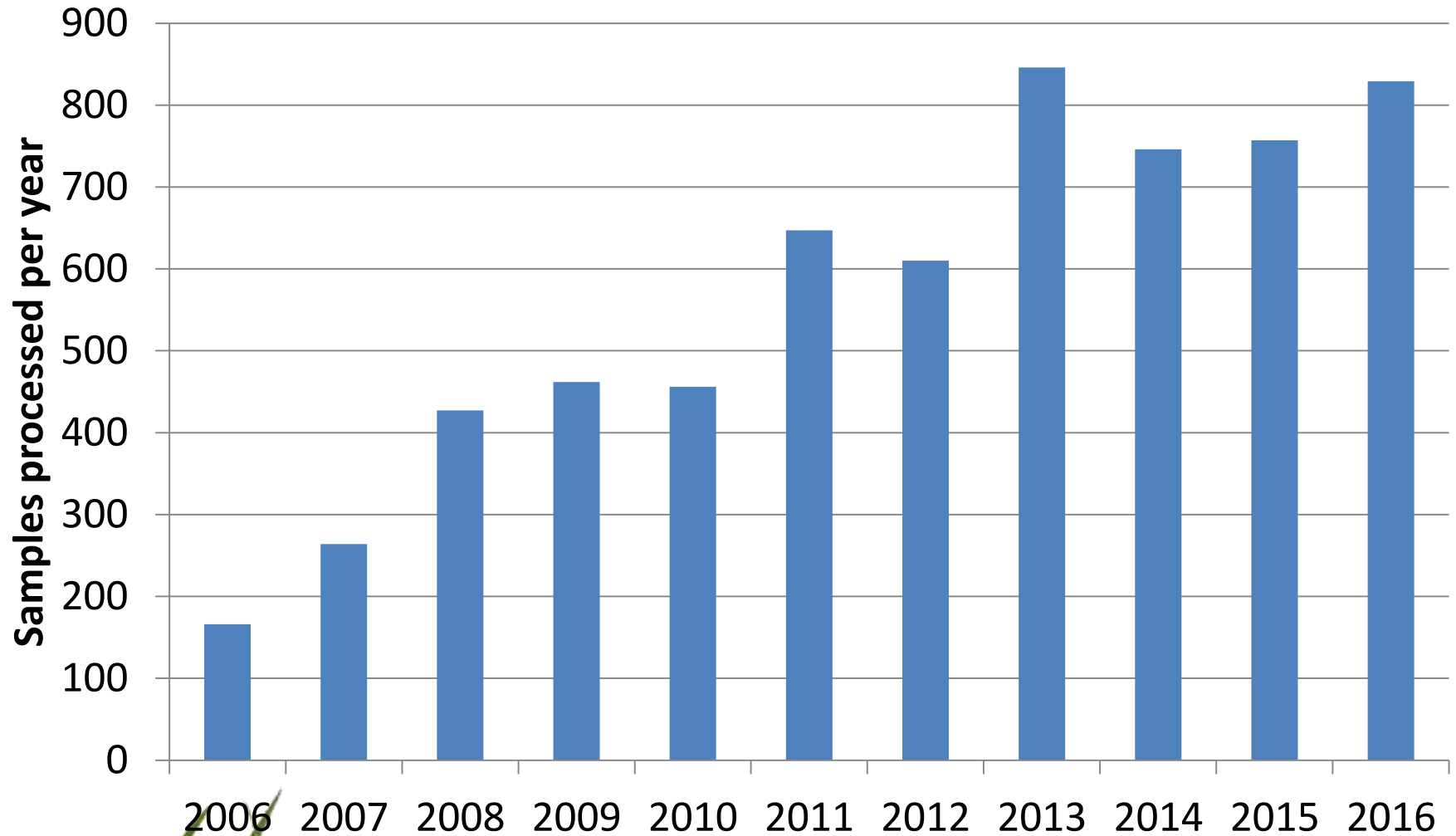
20+ countries served



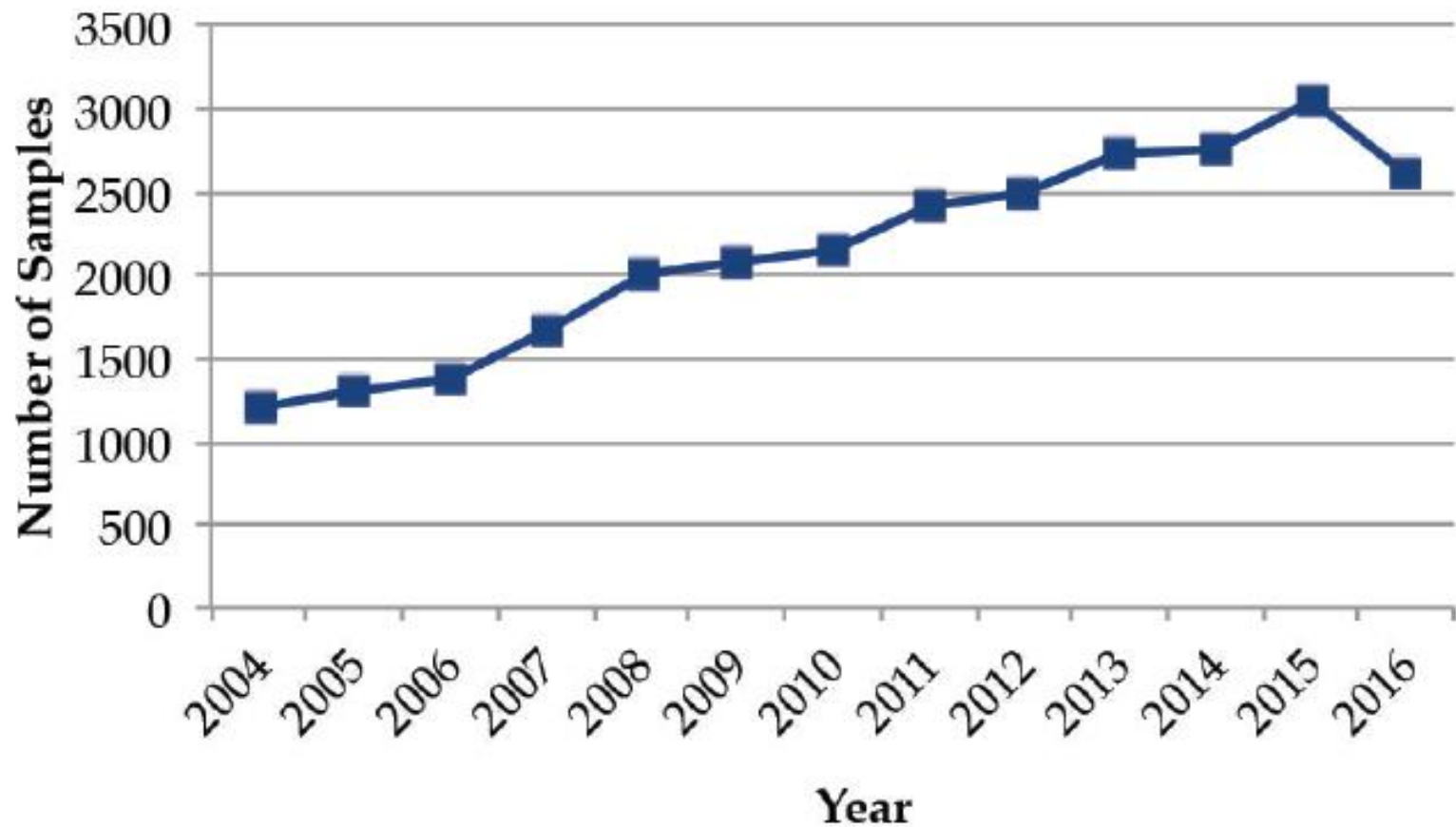
UAE, Hong Kong, Singapore, Guatemala, British Virgin Islands, Australia, Bahamas, Bermuda, Brazil, Qatar, Canada, Barbados, Cayman Islands, Mexico, Dominican Republic, Venezuela, Ethiopia, Spain, Taiwan, China



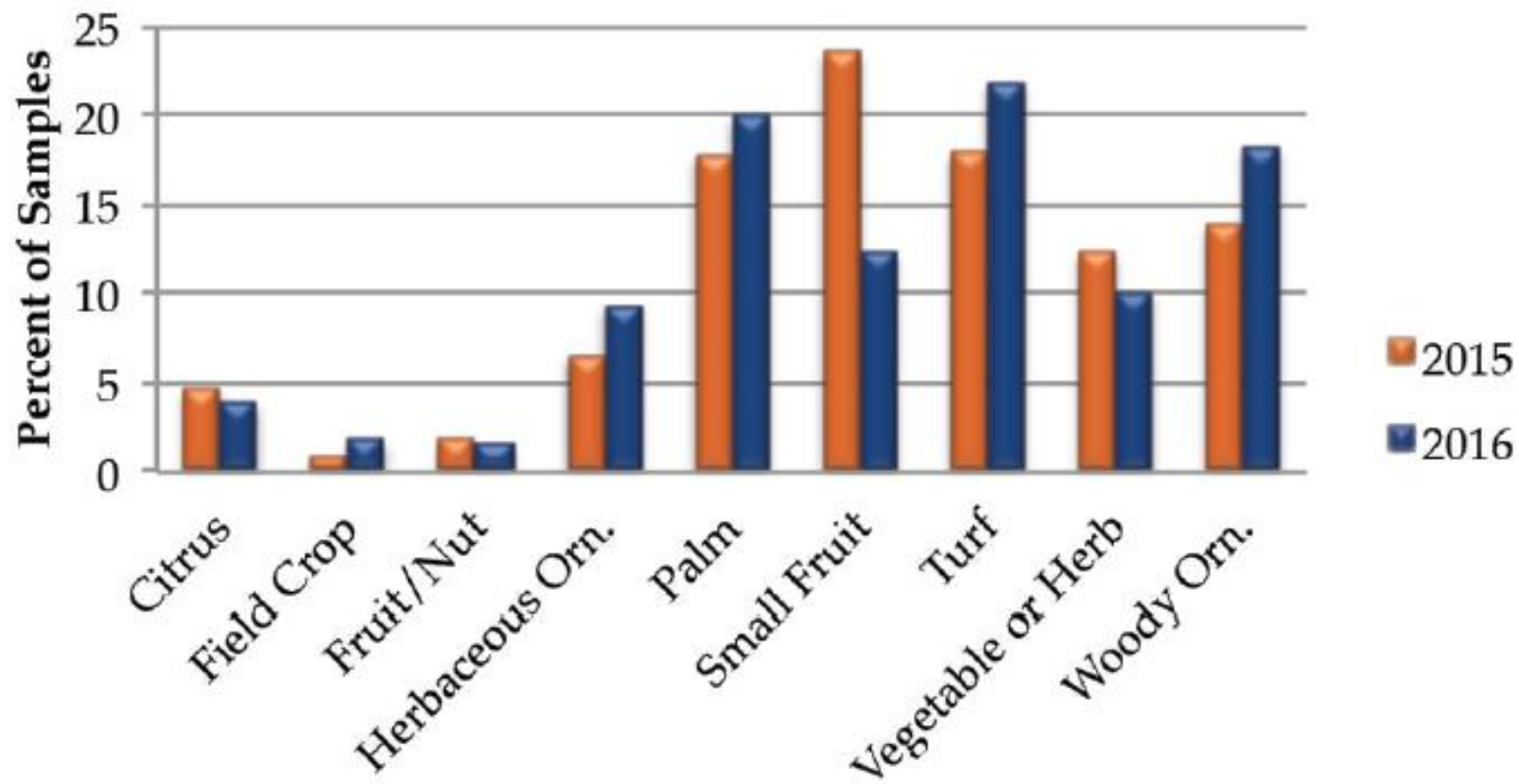
## UF IFAS Rapid Turfgrass Diagnostic Service



## PDC Samples from 2004-2016



## Sample Type







# Education and Training

- Offer graduate internships and assistantships
- Train extension agents, growers, master gardeners, and diagnosticians
- Provide publications and fact sheets with up-to-date information concerning emerging diseases and management options
- Every sample represents an opportunity to educate



# Impacts

- Work with clientele to manage plant health
- Effective management strategies reduce unnecessary pesticide applications
- Early detection = lower management costs

With razor-thin margins in many plant production systems,  
precision management = profitability





# Our lab

- Approximately 12 staff at any one time, most are part-time students
- 2 full-time diagnosticians, 1 support staff
- Expert lab for Caribbean and SE US
- Serving the citizens of Florida for over 60 years

**NPDN**  
National Plant Diagnostic Network  
*Diagnostics to Meet Plant Health Needs*







# Our lab

- Diagnosticians have passed APHIS proficiency panels for HLB, and *Phytophthora ramorum*
- We train diagnosticians from across the globe to do what we do

**PDN**  
Plant Diagnostic Network  
to Meet Plant Health Needs



# Florida blueberry industry

- Niche market industry (March to May)
- About 6000 acres currently in production
- 2015 harvest of over 25 million pounds worth greater than \$82 million
- Establishment costs are high ~\$25,000 per acre
- Plants produce for 7 years, yields decline through yr 10, relatively high production costs

<http://edis.ifas.ufl.edu/fe1002>



# Bacterial Wilt

- Caused by *Ralstonia solanacearum*
  - Soil-borne bacterium with a wide host range
  - Common scourge of tropical agriculture
  - Very difficult to control where it occurs
  - Infects a wide host range of 250 species in 54 families
- First reported in Florida in 1897 on tomato
  - Occurs commonly on tomato and potato (brown rot)
  - Occasional problem of eggplant and tobacco in the last 100 years





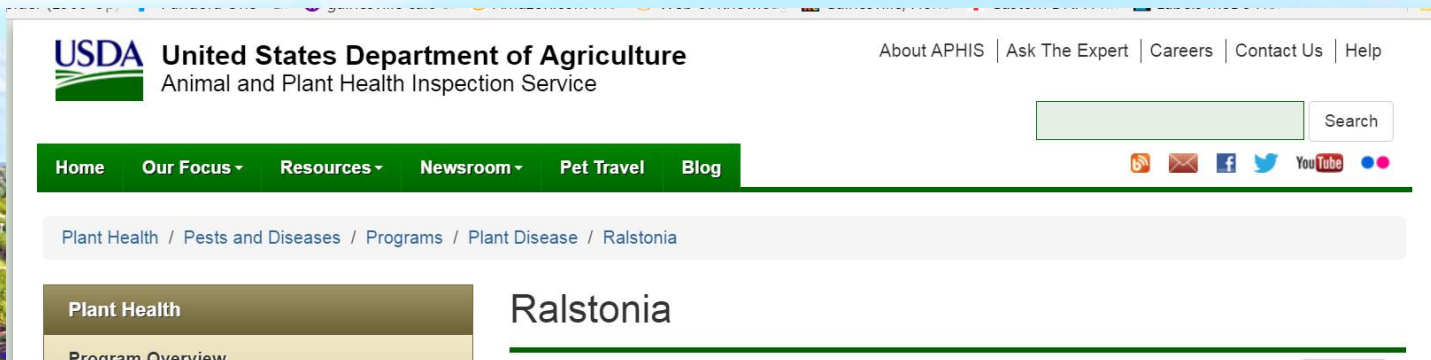
# Bacterial Wilt

- Previously reported on blueberry only once (in New Jersey in 2012)
  - Cultivar Bluetta was affected
  - 20 year-old bushes rapidly died
  - Quarantine and eradication efforts ensued
    - Little else known about that occurrence
    - USDA APHIS have cultures of the strain responsible



# Bacterial Wilt

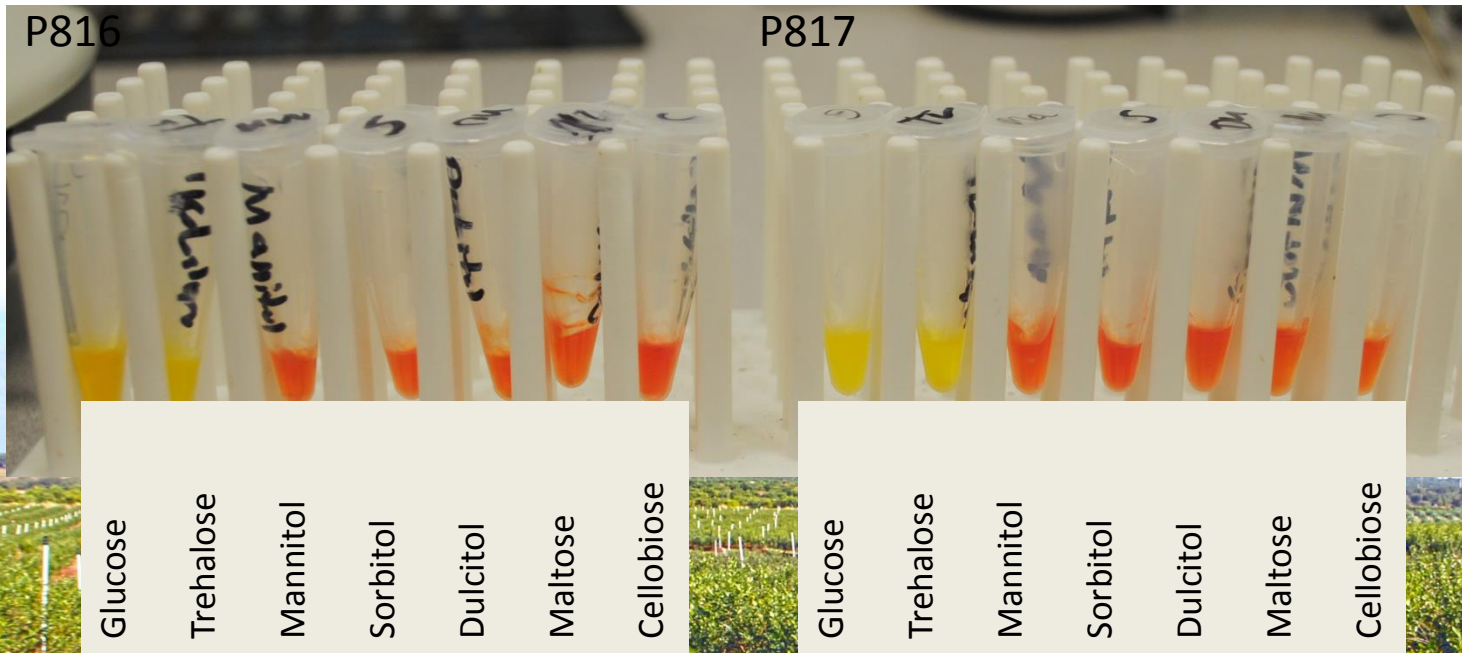
- One subpopulation of *R. solanacearum* is known to cause serious brown rot disease in temperate climates
  - Race 3 biovar 2 has caused many costly problems for potato production where it has been introduced (Europe)
  - In 2002, R3bv2 was listed as a Select Agent and is subject to the strictest biosecurity regulation
  - Accidental importation on geranium cuttings has occurred and elicited significant quarantine and eradication efforts



# *Ralstonia* in Florida

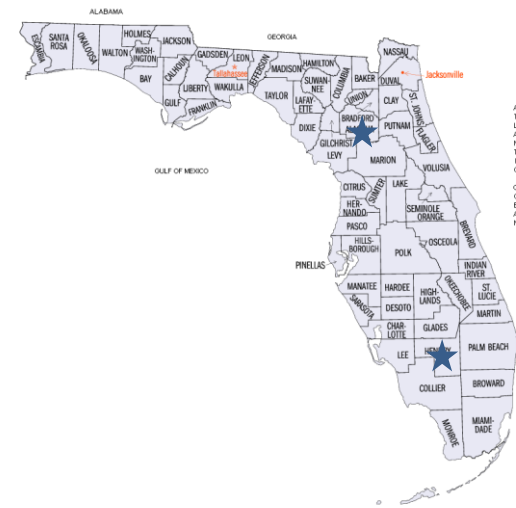
- The isolates from blueberry are not the “select agent” Race 3 Biovar 2
  - Two independent methods of confirmation, DNA and carbon utilization
  - Groups with isolates from ornamental plants, tomato

Blueberry strains (Biovar 1) (Photo by Dave Norman)



# *Ralstonia* in Florida

- Isolates from 5 blueberry farms ranging from Alachua Co. to Hendry Co. are being characterized
- There is significant variation in the isolates, but all have tested negative for Race 3 biovar 2
- Extension has cooperated with FDACS DPI and APHIS PPQ
- Quarantine and eradication efforts are unlikely at this point





# Variety specific?

- All of the positives have been plants of the Arcadia variety
- other varieties from the positive farms inter-planted with Arcadia have tested negative



# Symptoms

- Similar to bacterial leaf scorch (*Xylella*)
- marginal scorching of leaves, dieback, stem blight, plant death
- symptoms move down the row more rapidly than across
- Xylem of plants loaded with bacterial ooze clogging vasculature causing wilt

























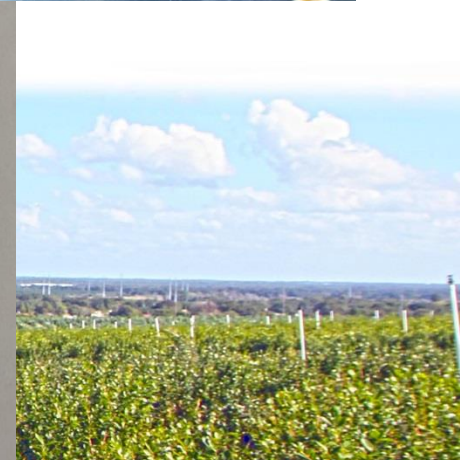
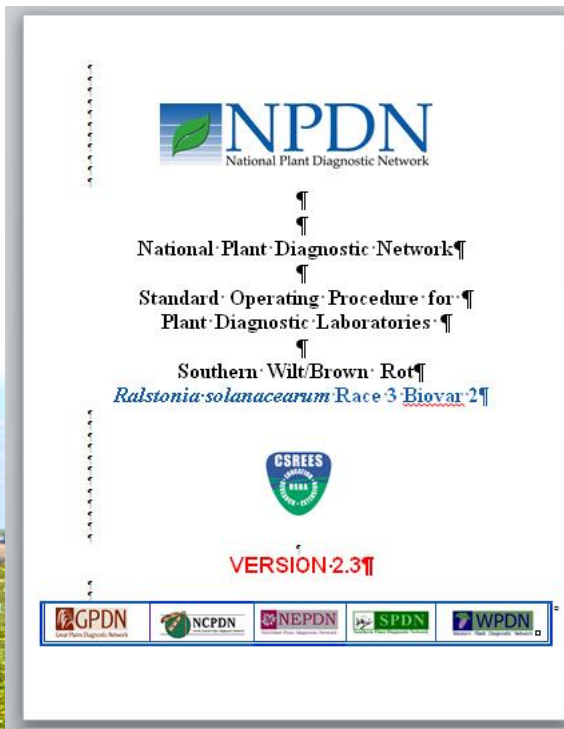
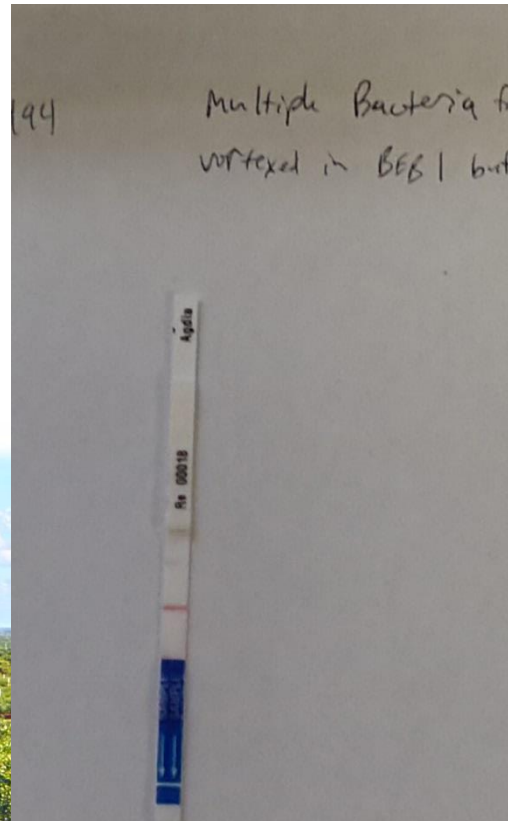
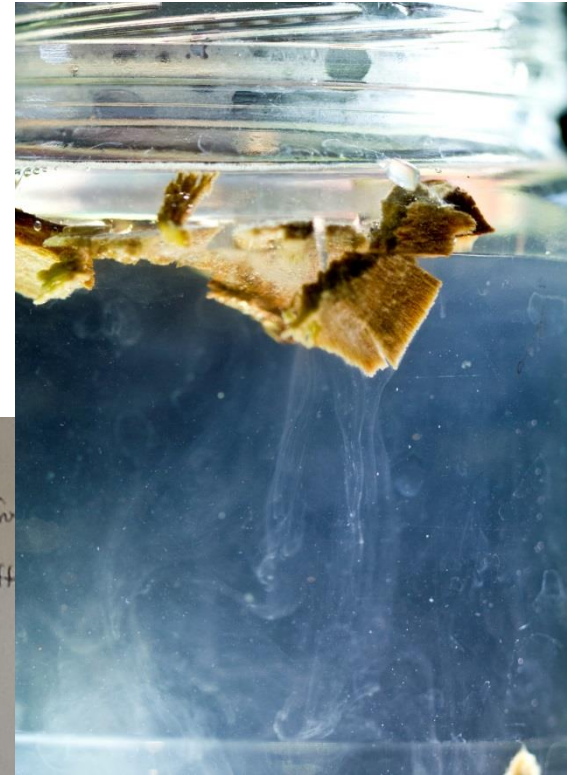
# Testing for *Ralstonia*

- look for symptoms similar to *Xylella*, but running down a row or in large circular areas in fields
- the cultivar Arcadia is known susceptible
- send samples to the UF IFAS Plant Diagnostic Center in Gainesville,
  - UF/IFAS Plant Diagnostic Center  
Bldg. 1291, 2570 Hull Road  
Gainesville, FL 32611
- [pfharmon@ufl.edu](mailto:pfharmon@ufl.edu)



# Testing for *Ralstonia*

- Streaming test
- Immunostrip test





# Blueberry bacterial wilt samples

11-17-16 handling protocol

## Check paperwork

Are other tests needed/requested or only bacterial wilt? Is the farm location and cultivar noted? Call submitter with ANY questions. Start a blue sheet.

## Look for symptoms

Take pictures of foliar symptoms, whole plant. Cut stem and crown across and longitudinally, take pictures. Make notes on blue sheet.

## Select symptomatic tissue

Discolored crown/stem tissue. Take slices of small stems or chips of large stems/crowns.

## Test for streaming

Chips/sections into a small flask of sterile tap **water** (no more than a couple mL), check at 10 min.

## Immunostrip for *Ralstonia* sp.

Small chips/stem sections into **buffer** and check strip at 10 minutes..

## Streak for culture

Take small amount of water from streaming test container, streak onto NA plate. Start a bacterial sheet.

Streaming (+)  
Immunostrip (+)

Streaming (-)  
Immunostrip (+)

Negative, stop testing

Immunostrip (-)  
Streaming (+)  
Immunostrip (-)  
Streaming (-)

## qPCR for *R.s.* and *Rs32*

Start a pink sheet for molecular. Boil cellular suspension from culture if culture is available. If no culture, extract DNA from symptomatic plant tissue via Stool kit and restreak for culture from plant tissue onto NA. Don't forget to do A and B extractions and qPCR runs.

Negative, stop testing

Culture (+)  
Rs qPCR (+)  
from culture

Culture NG (-)  
Rs qPCR (+) from plant material

**Positive, diagnosis**

Culture (+)  
qPCR (-) from culture  
Culture NG (-)  
qPCR (-) from plant material

# Management

- EDIS publication:  
<http://edis.ifas.ufl.edu/pp332>
- Exclude the pathogen from your farm
  - Avoid movement of soil and water onto the farm
  - Sanitize equipment, tools
  - Do not use surface water for irrigation
  - Purchase clean, healthy plant material



# Management

- Host plant resistance
  - So far, Arcadia is the only known susceptible SHB
  - Resistance in other crop plants has had minimal impact where the disease occurs
    - Resistance hasn't held over time or in different areas
  - Screening protocols will be incorporated in the UF IFAS blueberry breeding program
  - Need more research in this area, more time





# Management

- K-Phite is an example product that is labeled for the disease and for blueberry
  - chemigation
    - 2 to 4 quarts in at least 200 gal of water per acre
  - drench
    - 2 to quarts in at least 100 gal of water
  - banded application
    - 2 to 4 quarts in at least 20 gal of water followed by light irrigation
  - 7 to 28 day interval



# Management

- Protection options
  - no data on blueberry
  - these methods were shown effective preventing infection of geranium grown in infested soil
    - they do not cure infected plants





# Regulatory/Quarantine

- FDACS DPI and APHIS have been notified
  - Extension is cooperating with regulatory
  - It is not clear what regulatory action, if any, will be taken
- FDACS DPI has requested that all new positives in the plant disease clinic continue to be reported



# Mosaic disease of St. Augustinegrass

## January 2017 Update



Philip F. Harmon, Ph.D.  
Professor and Extension Specialist  
Jane E. Polston, Ph.D.  
Professor and Virologist  
UF/IFAS Plant Pathology Department





# Viral turfgrass diseases

- St. Augustinegrass
  - St. Augustine decline cause by *Panicum mosaic*
    - *Tombusviridae* group transmitted by sap common in Texas, **not known to cause a problem in Florida**
    - Floratam is resistant
  - Mosaic caused by *Sugarcane mosaic virus*
    - *Potyviridae* group transmitted by sap and aphid
    - Virus also causes disease in *Cynodon*, *Paspalum*, *Digitaria*, *Pennisetum*, and various grass crops



# History of mosaic

- In the 1960s a symptom of broken streaks of yellow leaf blade discoloration (mosaic) was noted in rural Palm Beach Co.
- Later associated with SCMV, no report of necrosis and plant death prior to 2013
- One turfgrass professional reports he's seen it since 2011 in southern Pinellas Co.
- Mosaic has been a problem in Pinellas Co. since then, killing Floratam lawns
- The disease has been detected in other parts of the state as well





# Mosaic symptom



# Systemic necrosis





# Dieback of stolons and shoots



Floritam lawns are killed within about three years. Floritam resodded into lawns with mosaic will die in fall.

Lawns may also have other diseases at the same time, but managing them does not prevent Floritam from dying.

Floritam →







Not Floratam→

Floratam→





A photograph of a residential lawn. The foreground is dominated by a large area of grass that is heavily discolored with brown and tan patches, indicating disease or stress. Several distinct, parallel tracks of lighter, more uniform grass run across the lawn, likely from a lawnmower. In the middle ground, there is a large, rounded, green shrub. To the left, a small body of water is visible, bordered by palm trees. In the background, a white house with a red-tiled roof is partially obscured by more palm trees. The sky is clear and blue.

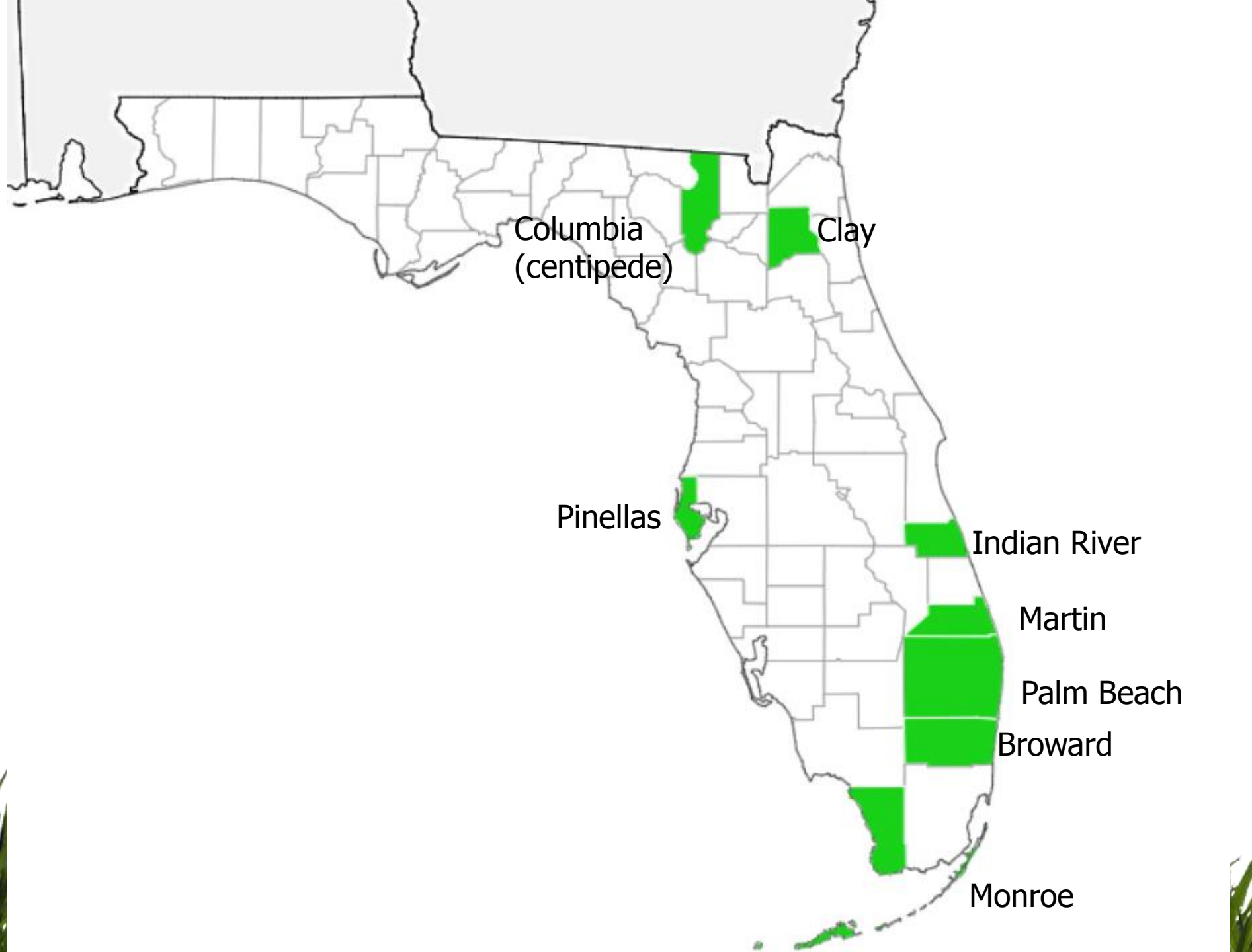
Mower tire tracking with disease symptoms



# Mosaic distribution

- Initially Pinellas Co., hundreds of lawns affected, lawns start to die in the September time frame
- Outbreak in Palm Beach Co., greater than 1000 lawns estimated across the county
- Positive samples in Martin and Indian River
- St. Lucie and Miami Dade very likely positive
- Broward and Monroe counties positive
- Clay and Columbia Co. positives, not as severe or widespread

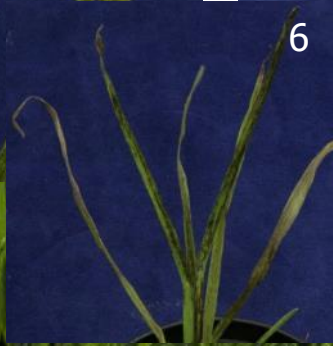
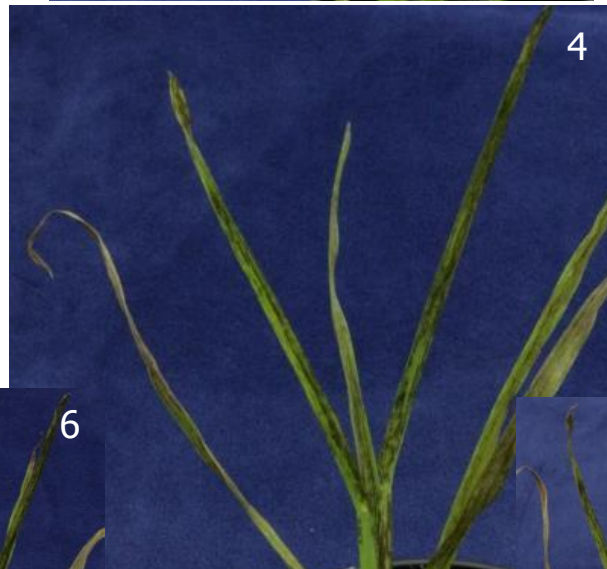
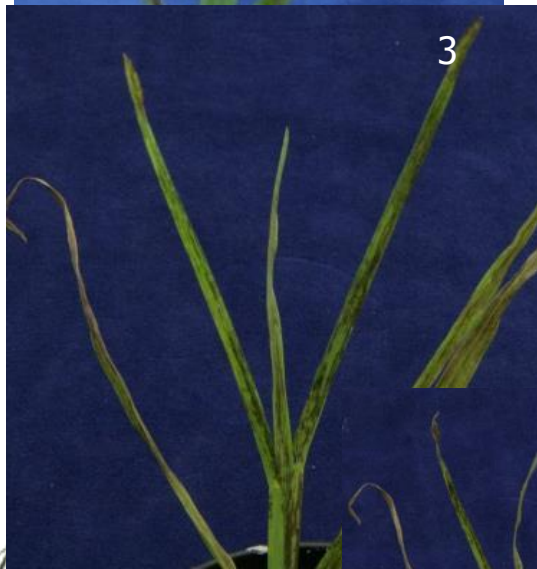
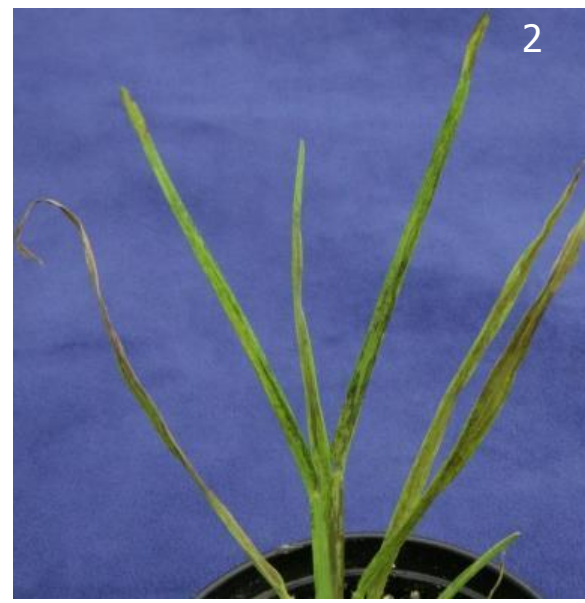






## Field Inoculated 14-14-2-6

## Daily Progress at 64°F



# Research Project 2

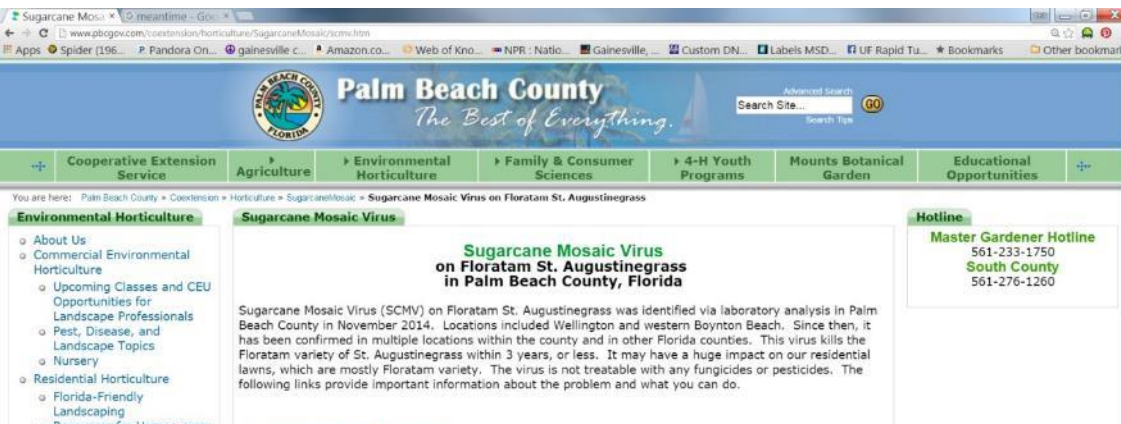
Cultivar	No. Tested 18°C	64°F Symptom	No. Tested 28°C	82°F Symptom
'Floratam' (Farm A)	5	Necrosis	3	Mosaic
'Floratam' (Farm B)	5	Necrosis	5	Mosaic
'Floratam' (Farm C)	4	Mosaic	4	Mosaic
'Bitterblue'	4	Mosaic	4	Mosaic
'Captiva'	6	Mosaic	6	Mosaic
'Palmetto'	6	Mosaic	4	Mosaic
'Raleigh'	3	Mosaic	3	Mosaic
'Sapphire'	5	Mosaic	5	Mosaic
'Seville'	7	Mosaic	7	Mosaic
Sample from Pinellas Co.	8	Necrosis	8	Mosaic





# In the meantime...

- An IPM resource is being updated with the best management practices to date  
<http://edis.ifas.ufl.edu/pp313>
- Palm Beach Co. Extension agent Bill Schall also has created a



UF IFAS Extension  
UNIVERSITY of FLORIDA

## Mosaic Disease of St. Augustinegrass Caused by Sugarcane Mosaic Virus<sup>1</sup>

Phil Harmon<sup>2</sup>

### History of the Disease on St. Augustinegrass in Florida

Mosaic disease of St. Augustinegrass was first reported in the 1960s in sugarcane producing areas of Florida (rural Palm Beach County). The disease was named for the distinct symptom it produced. Differences in susceptibility among St. Augustinegrass cultivars were noted, and resistance was used to minimize the impact of the disease over the last 50 years. The mildest cases of the disease produce symptoms that are easily overlooked and generally are not cause for concern. Survey efforts in the 1970s did not find the virus in St. Augustinegrass in central or north central Florida. In the 10 years prior to 2013, fewer than five samples with mild symptoms were brought to the attention of the Extension turfgrass pathologist at UF.

### Symptoms

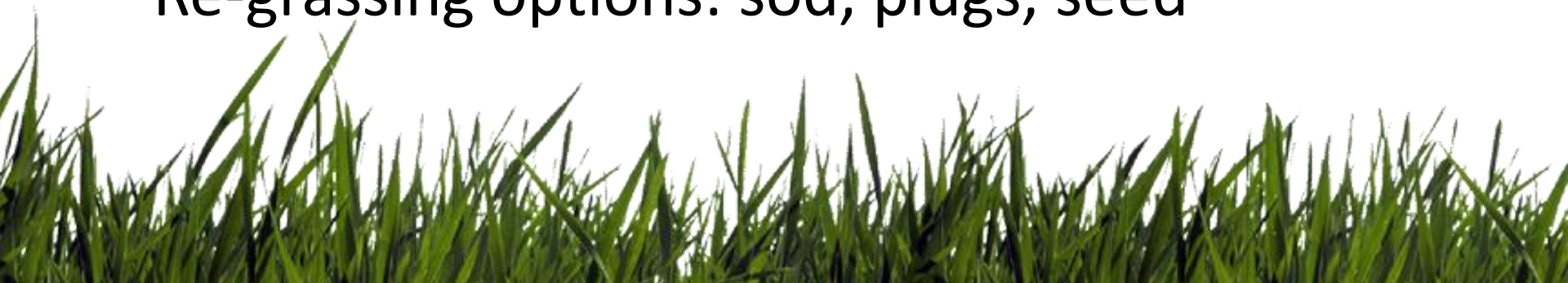
Mosaic disease symptoms occur on many plants, presenting as blotchy or streaky patterns of yellow and green color. Grasses showing mosaic symptoms tend to have broken yellow streaks running between veins on an otherwise green blade (Figure 1). Like most plant disease symptoms, mosaic patterns vary among grass varieties and species that they occur on and change appearance as the disease becomes more severe.



Figure 1. Mosaic symptoms on leaf blades infected with Sugarcane Mosaic Virus.

# Mosaic killed my Floratam, now what?

- Do not re-grass with Floratam
- Select another St. Augustinegrass variety that does not die, it will get the disease
- Re-grass with zoysiagrass—it is not a host for the virus and won't serve as a reservoir
- Let the Floratam die each year in fall and overseed with ryegrass
- Re-grassing options: sod, plugs, seed





Any Questions?

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Facebook: UF Rapid Turf

