

Laurel Wilt Impacts, Expansion and Future in the Everglades

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sfwmd.gov



Swamp Bay (*Persea palustris*) in the Greater Everglades

- Common Tree Species
- Found in Hardwood, Cypress Swamps and Tree Islands



Swamp Bay and Wildlife

- Important Wildlife Food, Fruit is consumed by Birds, Bears, Rodents etc.
- Sole host for the Palamedes Butterfly (*Papilio palamedes*), Red Bay Psyllid (*Trioza magnolia*)



Tree Islands

- Higher Elevation than surrounding landscape
(*limestone/organic soils*)
- ~10% of Land Cover
- Contributor to Biodiversity and Ecosystem Processes.
- High Species Diversity
- Important Wading Bird Nesting Habitat
- Critical Wet Season Habitat/Refugia
- Priority in Everglades Restoration Efforts



Tree Islands

- Swamp Bay Abundance Highly Variable
- Very little quantitative data available on tree species composition on tree islands.
 - Engel et al. 2009: Importance value 0- 43.4
 - Dem Systems Inc. 2005: 0- 34% Stem Density
 - Wetzel et al. 2008: Mean cover 1.1%



2013- Tree Island in WCA-3A

Imagery Interpretation

- Preliminary evaluations to determine extent of canopy disturbance
- Compared 2013 and 2014 imagery in known infestation areas
- Digitized symptomatic trees to calculate proportion of canopy disturbance

January
2013



December 2014





Tree Island: 1 acre

Laurel Wilt: 0.03 acres

Percent Cover: 3%

*Percent cover estimates are based on December 2014 Google Earth imagery.

January
2013

December 2014





Tree Island:

1.52 acres

Laurel Wilt:

0.1 acres

Percent Cover:

7%

*Percent cover estimates are based on December 2014 Google Earth imagery.

January 2013



December 2014





Tree Island:
2.6 acres

Laurel Wilt:
0.55 acres

Percent Cover:
21%

*Percent cover estimates are
based on December 2014
Google Earth imagery.

Fate of Infected Swamp Bays

- Very little ground based data available
- Several observations of resprouting
 - Will/when resprouts be affected eventually?
 - Additional stress on coppicing trees from deer browsing and flooding?

“...it seems likely that most, if not all, mature swamp bays will disappear from Everglades tree islands in the near future.”

James Snyder 2014

Impacts of Swamp Bay Die-Back to Tree Islands

- Reduced fruit availability for birds and mammals.
- Loss of foliage to (insect/animal) obligate herbivores (Palamedes butterfly etc.)
- Invasive plant encroachment in canopy gaps
 - Brazilian Pepper (*Schinus terebinthifolius*)
 - Old World Climbing Fern (*Lygodium microphyllum*)

Old World Climbing Fern

(*Lygodium microphyllum*)

- Fern with indeterminate growth
- Readily invades Everglades tree islands
- Extremely high spore production-wind dispersed
- Blankets and eventually displaces native vegetation





Lygodium on tree island in Loxahatchee National Wildlife Refuge

Brazilian Pepper

(*Schinus terebinthifolius*)

- Dispersed by Birds/Mammals
- Invades tree island gaps
- Forms dense stands and displaces native understory species
- Most widespread invasive plant in the Everglades

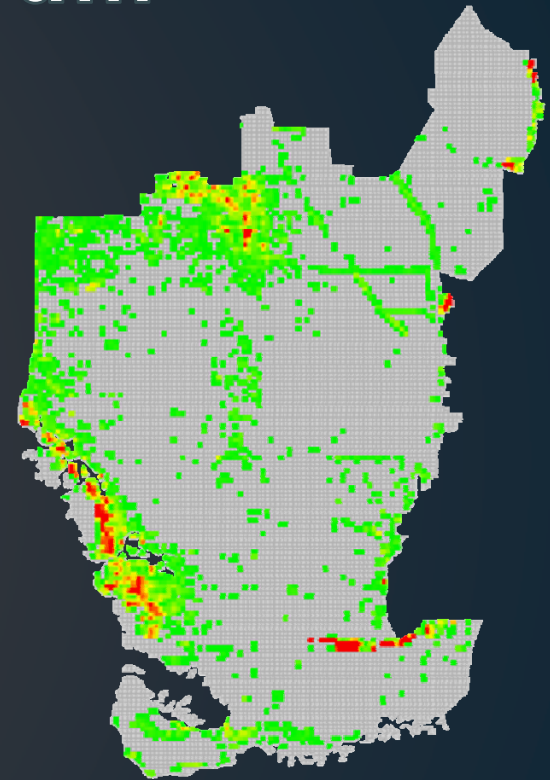


Laurel Wilt in the Everglades

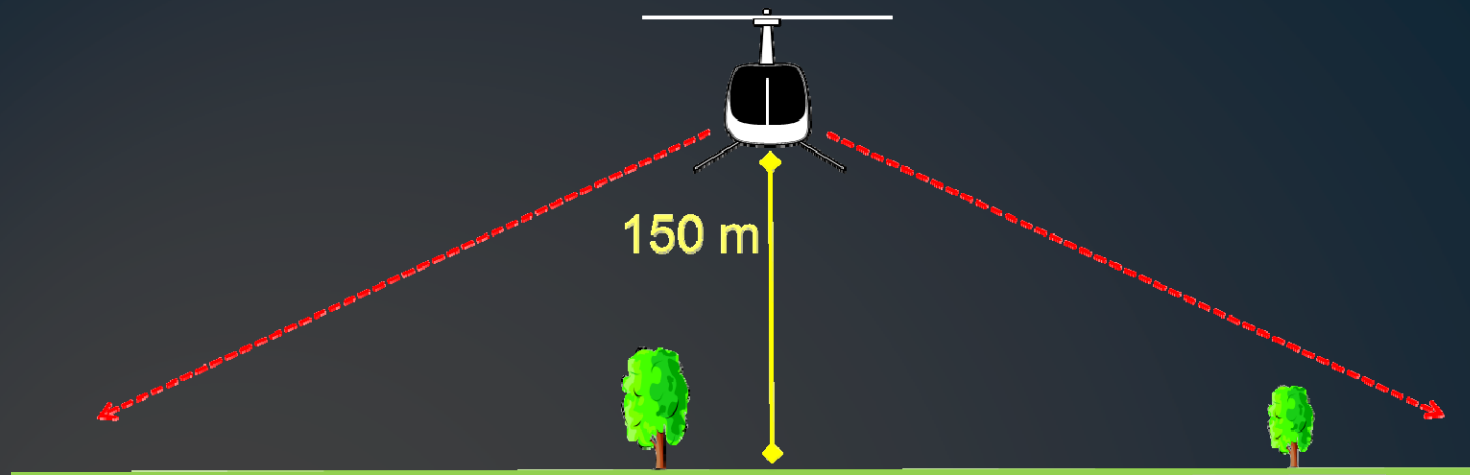
The First Four Years

Everglades Invasive Plant Monitoring Program

- Systematic surveys throughout Everglades
 - 1993 - Present
 - ~2 year intervals
 - Methods evolved; Objectives expanded
- Low flying aircraft with trained observers
- Location and relative abundance estimated



Brazilian Pepper Distribution
2013

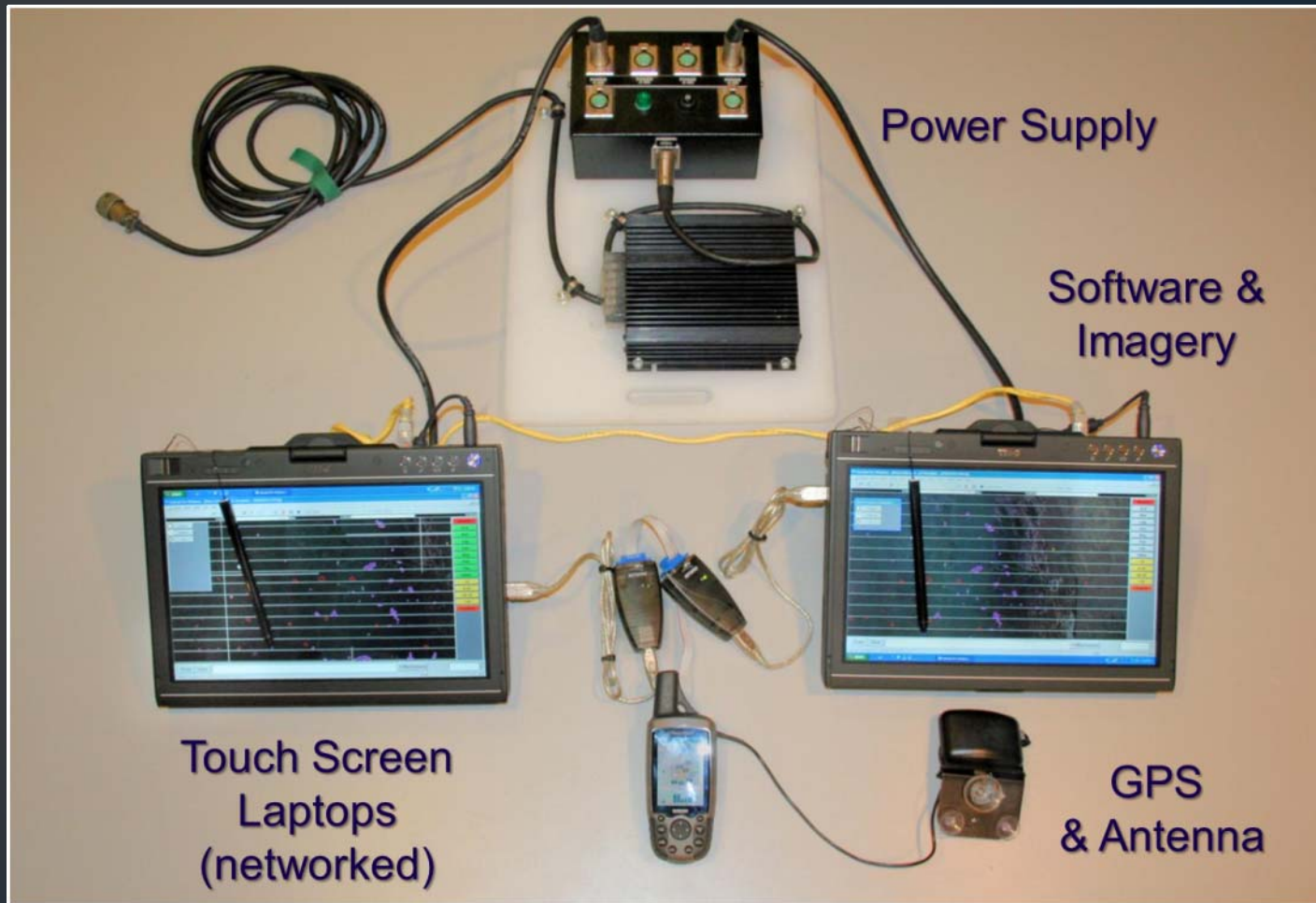


Digital Aerial Sketch Mapping

- Developed by USFS to map pest outbreaks
- Adapted to Everglades Invasive Plant Monitoring Program in 2008
 - Cost effective for large landscapes
 - Reasonable accuracy for visible target species in Everglades (e.g. melaleuca, Australian pine)

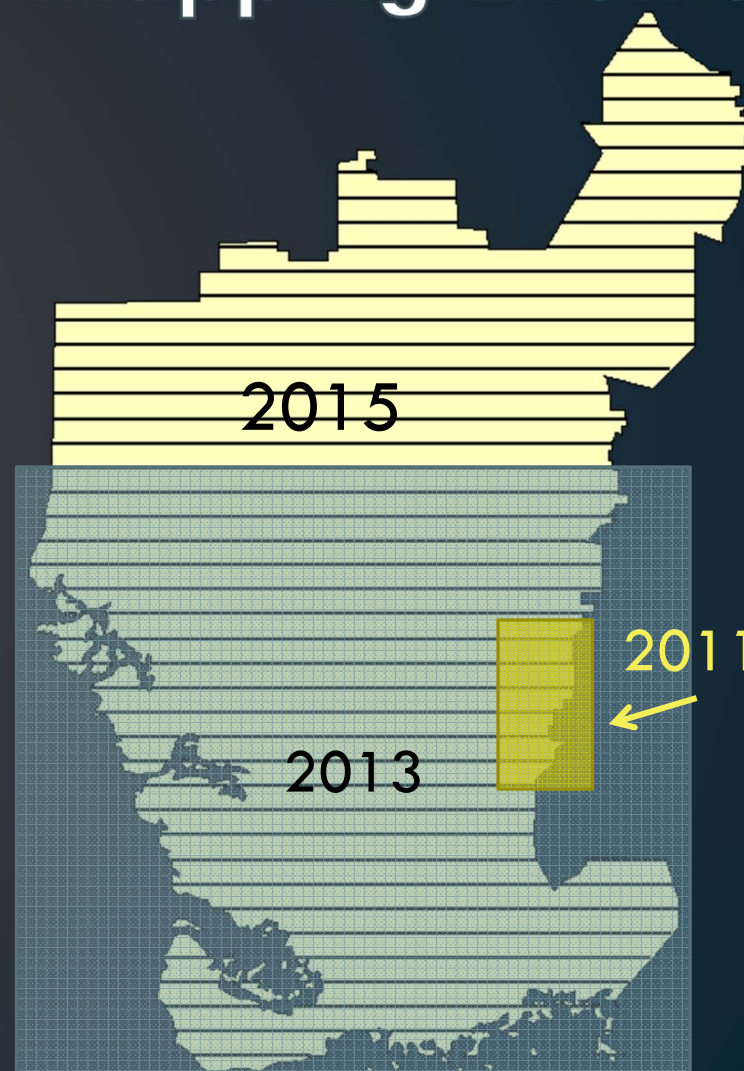


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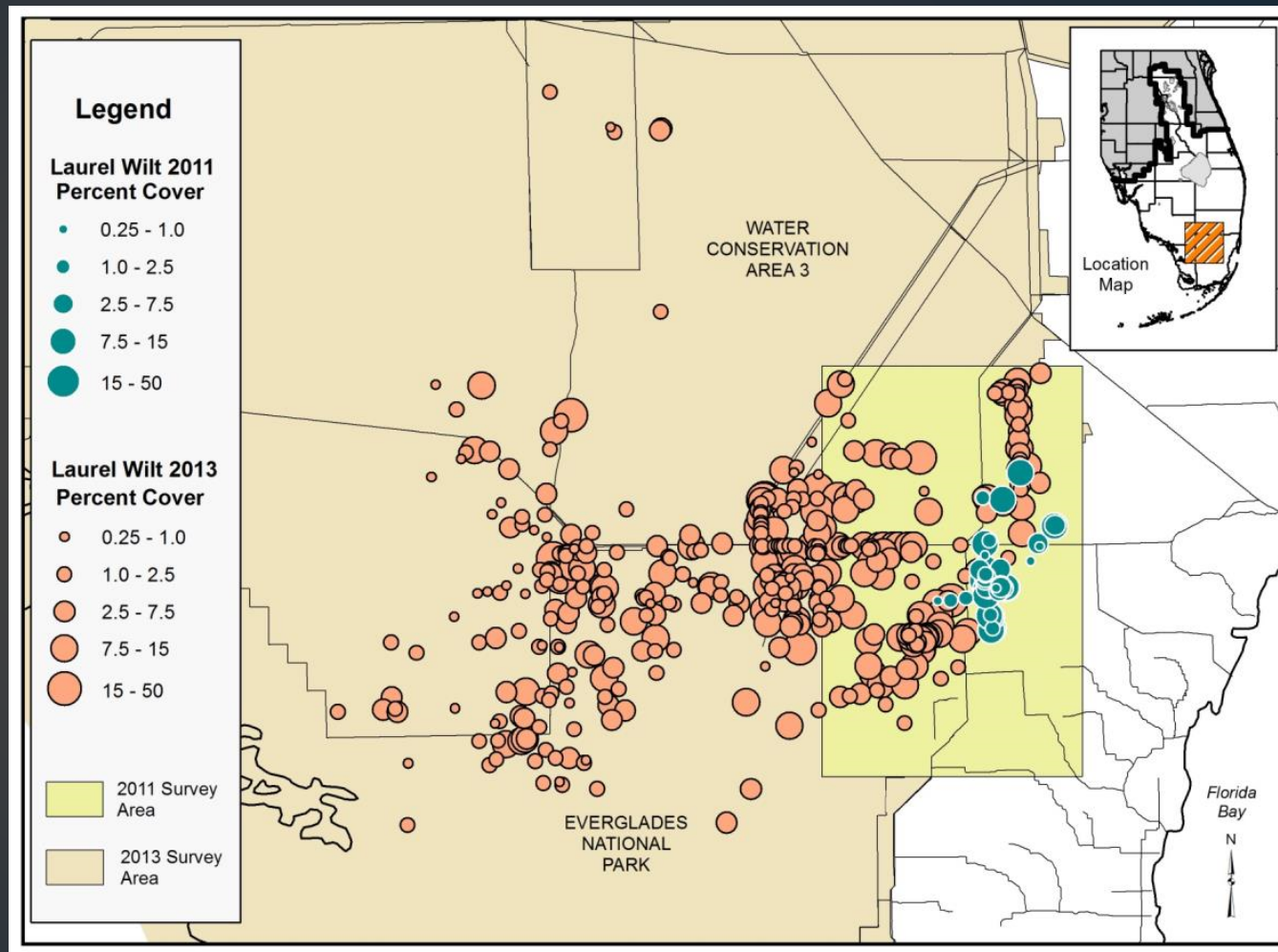


Everglades Laurel Wilt Mapping Events

- **2011**: Collaboration with FDACS-DPI
- **2013**: SFWMD/NPS LW Inventory
- **2015**: SFWMD/NPS Systematic Reconnaissance Flights (SRF)



2011 & 2013 LW Inventory



Rodgers, L., Derksen, A., and Pernas, T., *Florida Entomologist* 2014

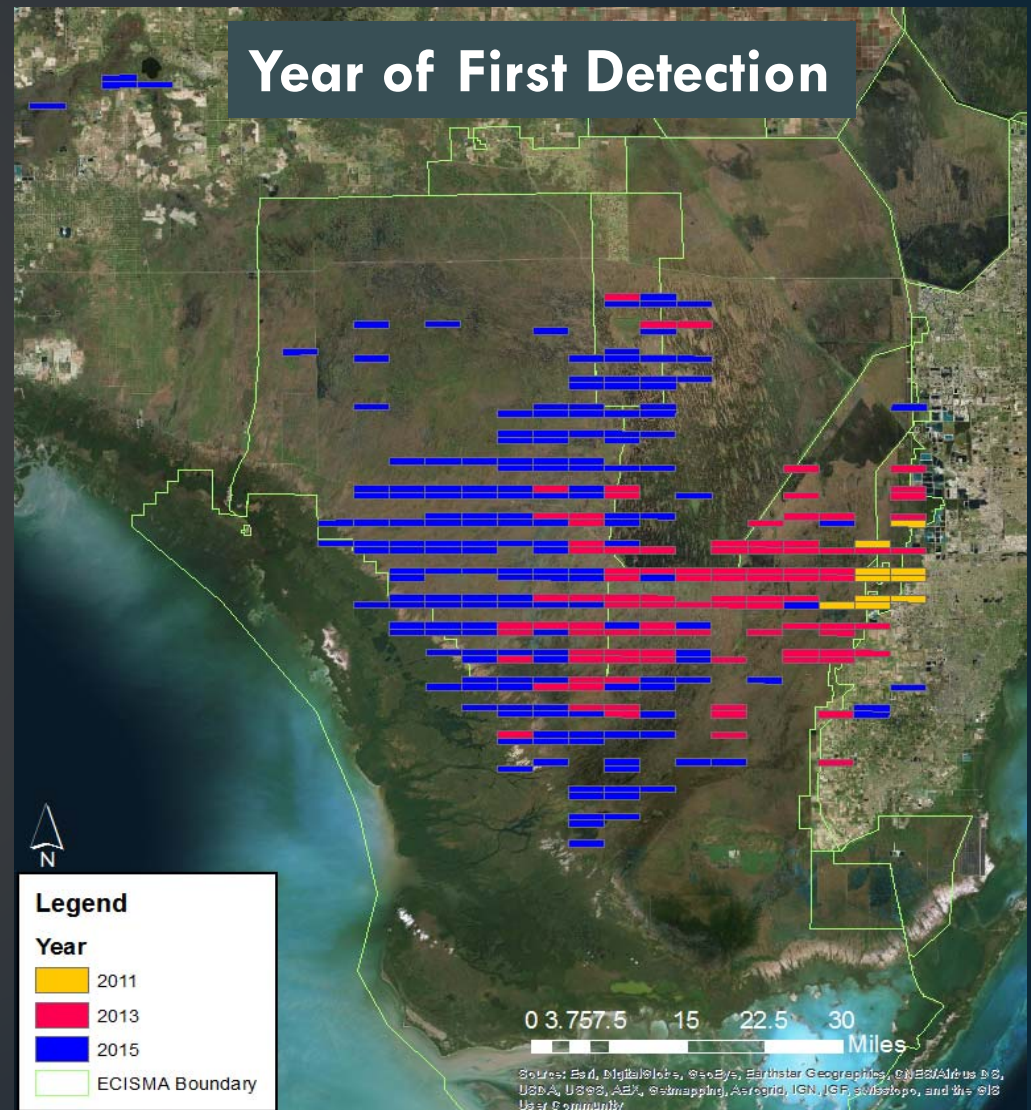
2015 Systematic Reconnaissance Flights

- Transects spaced 4 km
- Abundance estimated along continuous belt transects



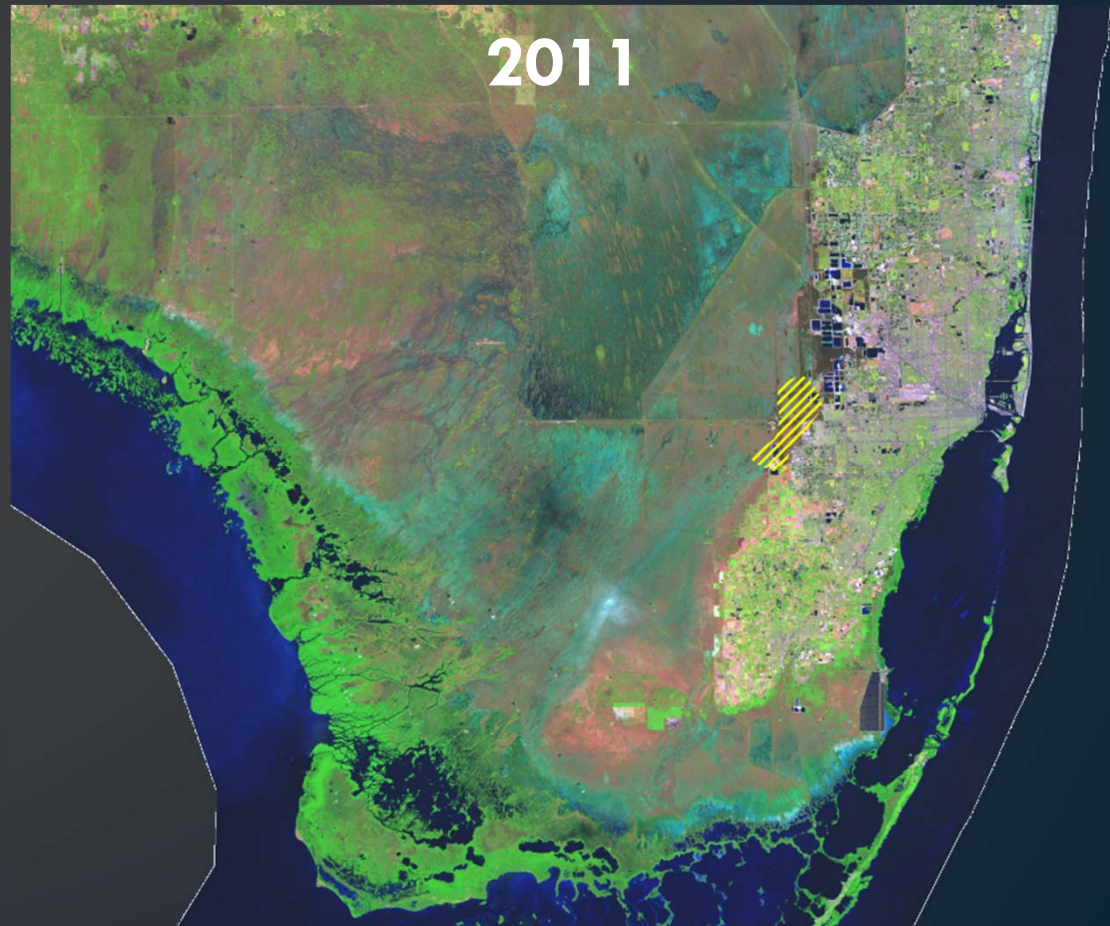
Initial Laurel Wilt Detection: 2011-2015

- Presence/absence and abundance calculated for 1x5 km cells
- East to west spread across landscape



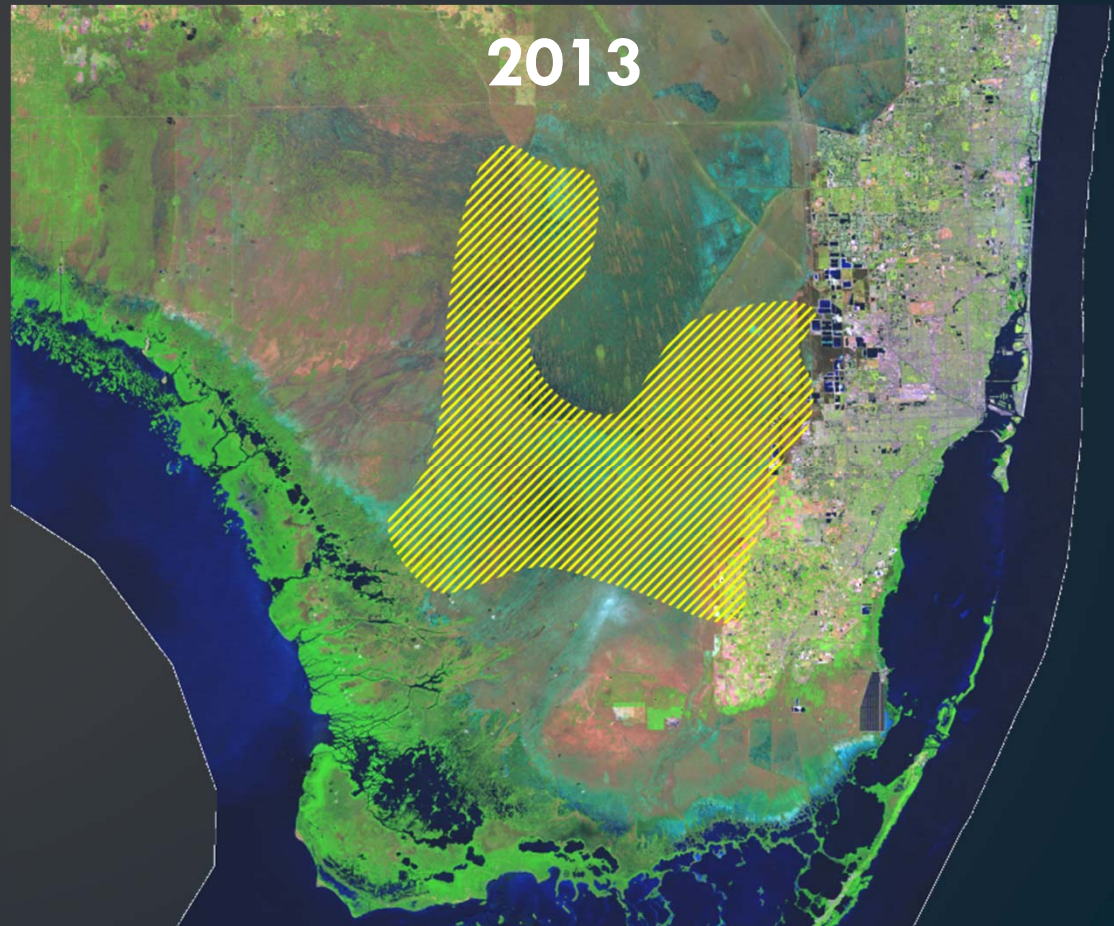
Extent of Occurrence 2011

- 5,624 ha



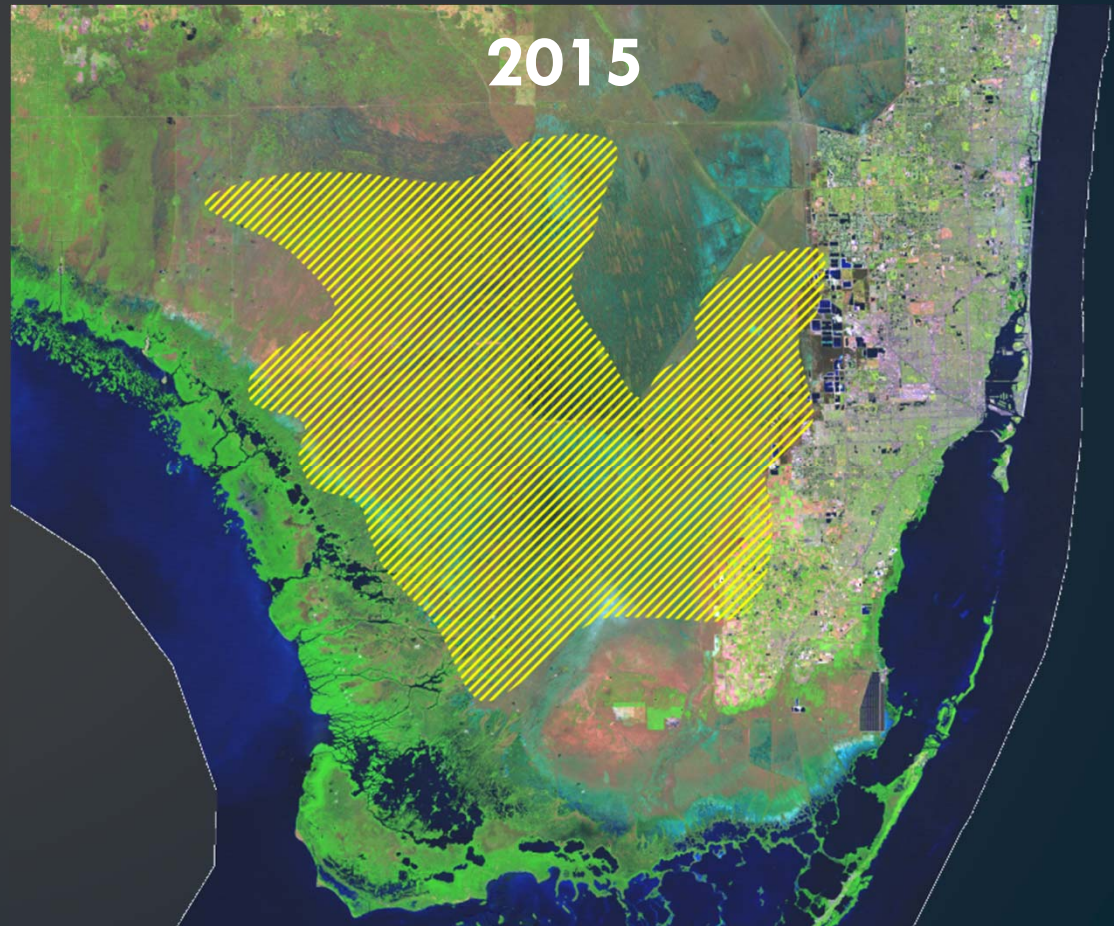
Extent of Occurrence 2013

- 189,757 ha



Extent of Occurrence 2015

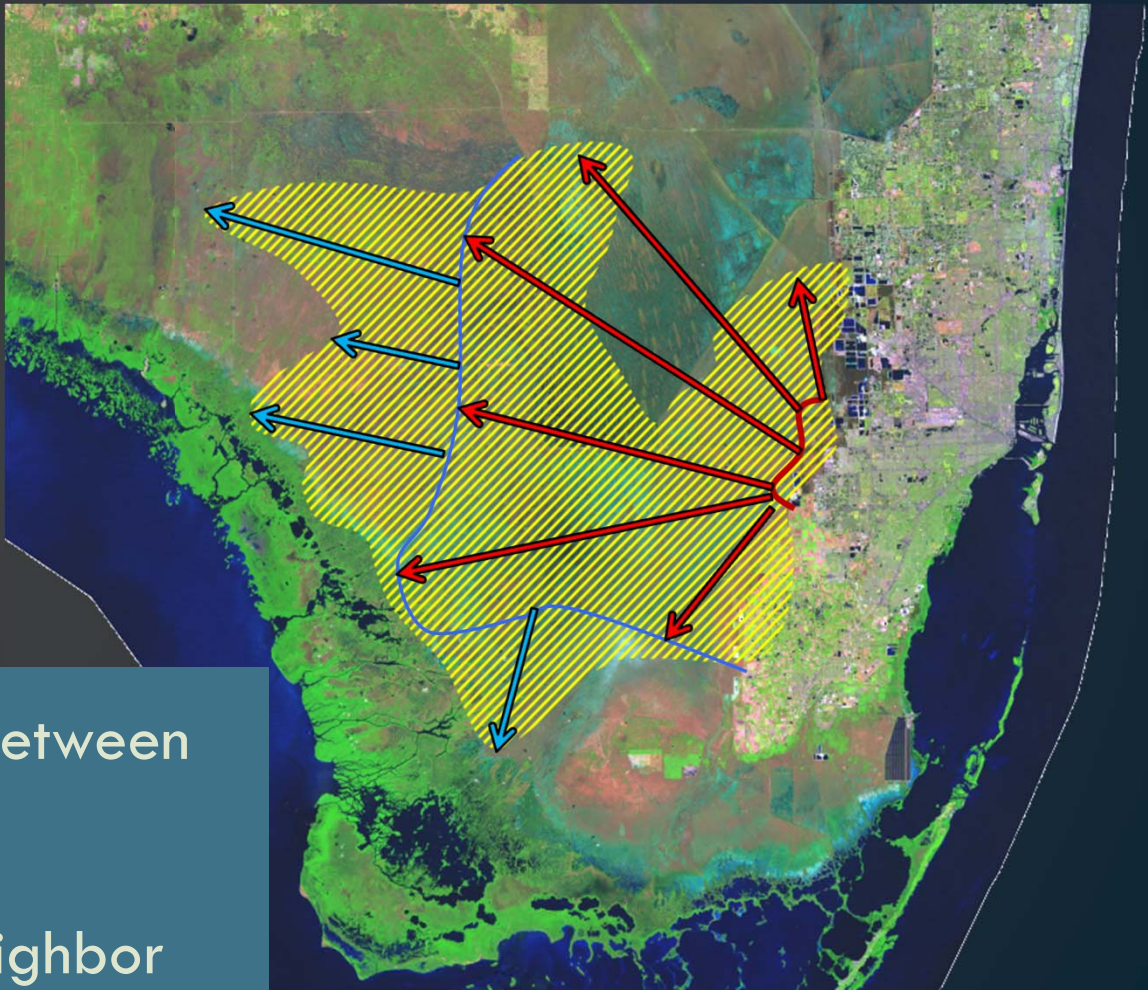
- 372,052 ha



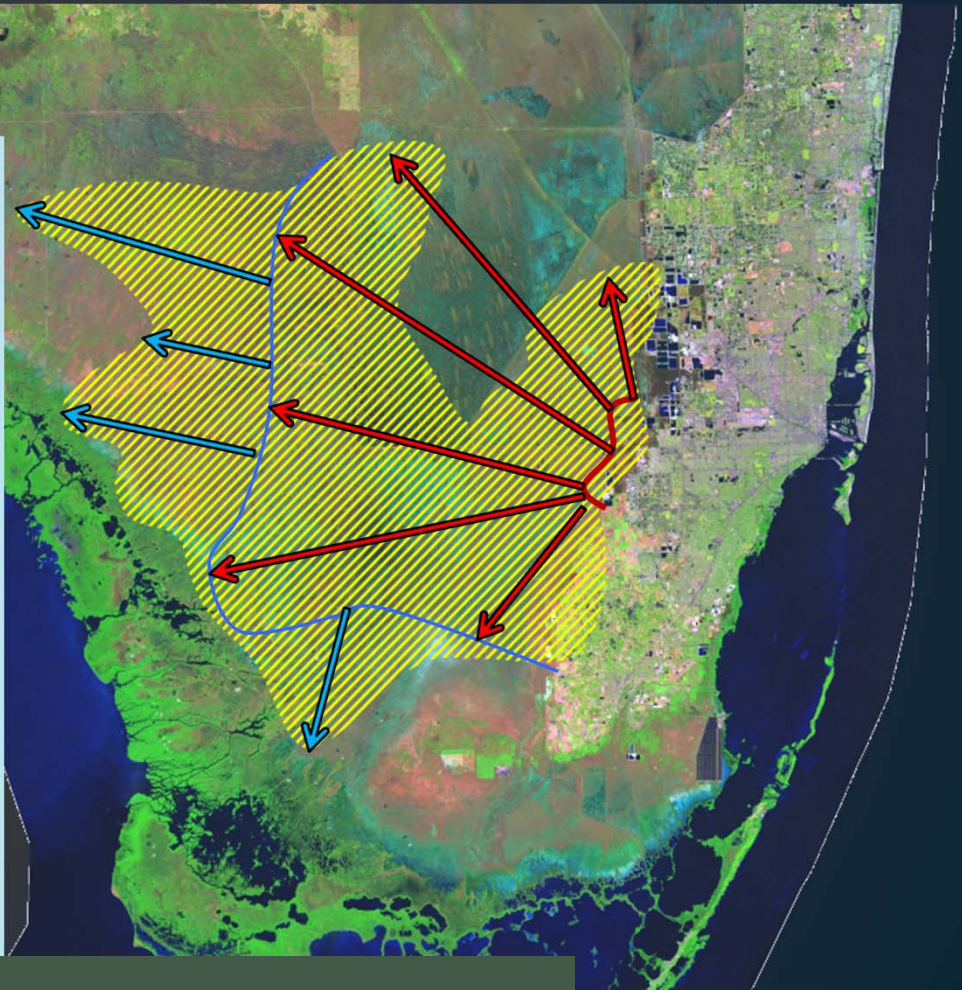
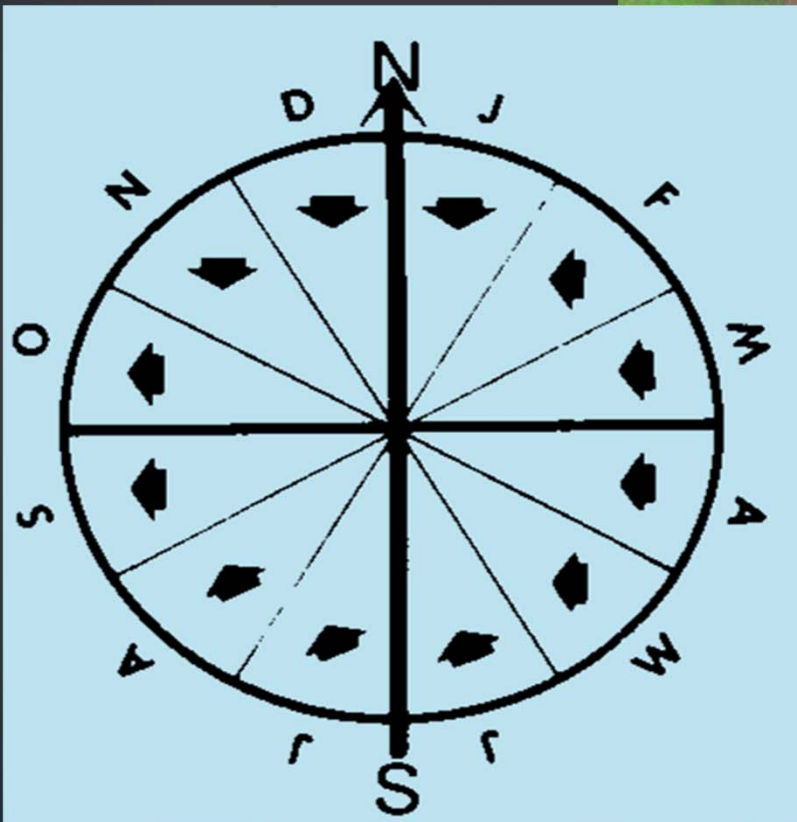
Expansion Rate

- 2011-13
 - 26.6 km/yr
- 2013-15
 - 16.2 km/yr

- Mean Min Distance between tree islands
 - 1.1 km
- Maximum nearest neighbor
 - 11.6 km

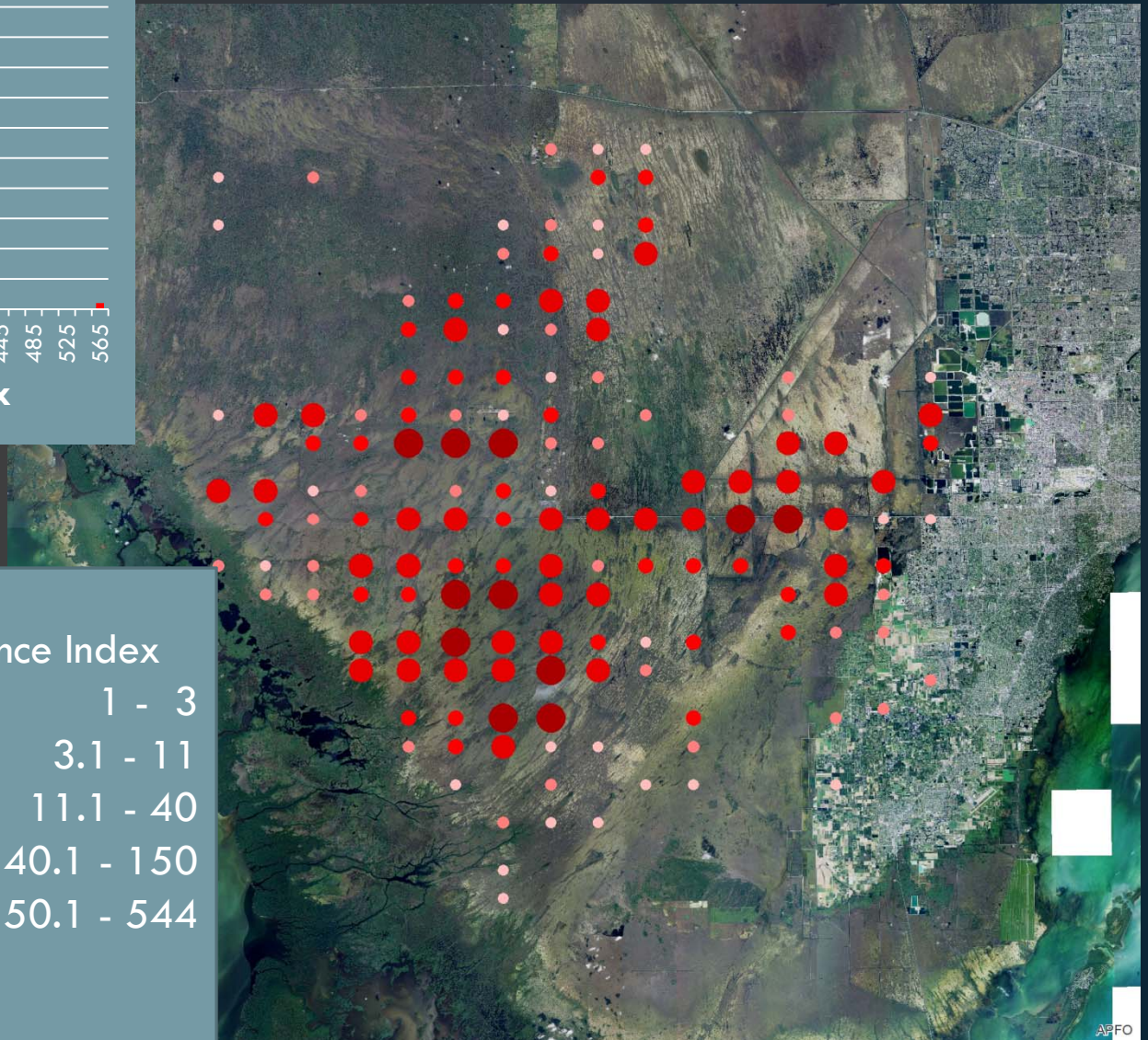
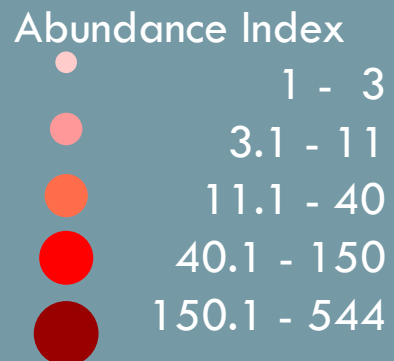
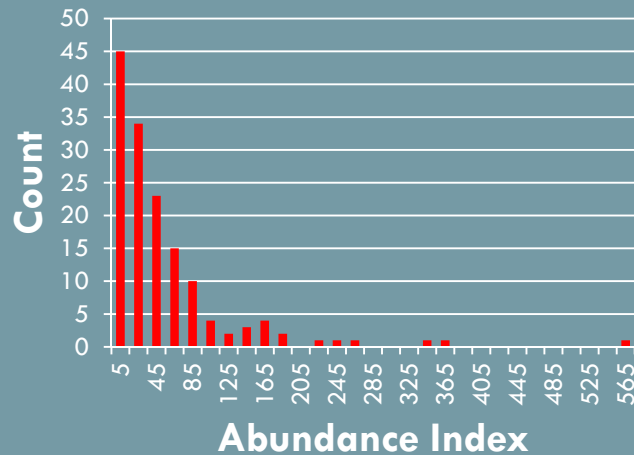


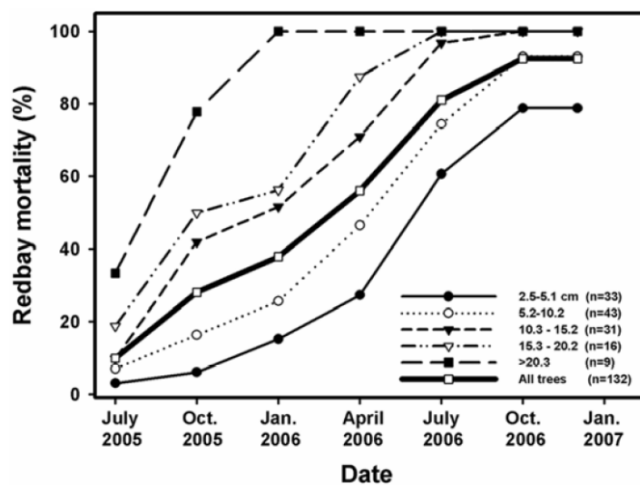
Prevailing Winds a Primary Driver of Dispersal Direction?



*Monthly Prevailing Winds, Miami
US Department of Commerce Climatological Data, 1970*

2015 Laurel Wilt Abundance





Fraedrich et al. 2008. *Plant Disease*

Patch Persistence			
Present	2011	2013	2015
2011	10	5	0
2013	0	100	60
2015	0	0	239

Legend

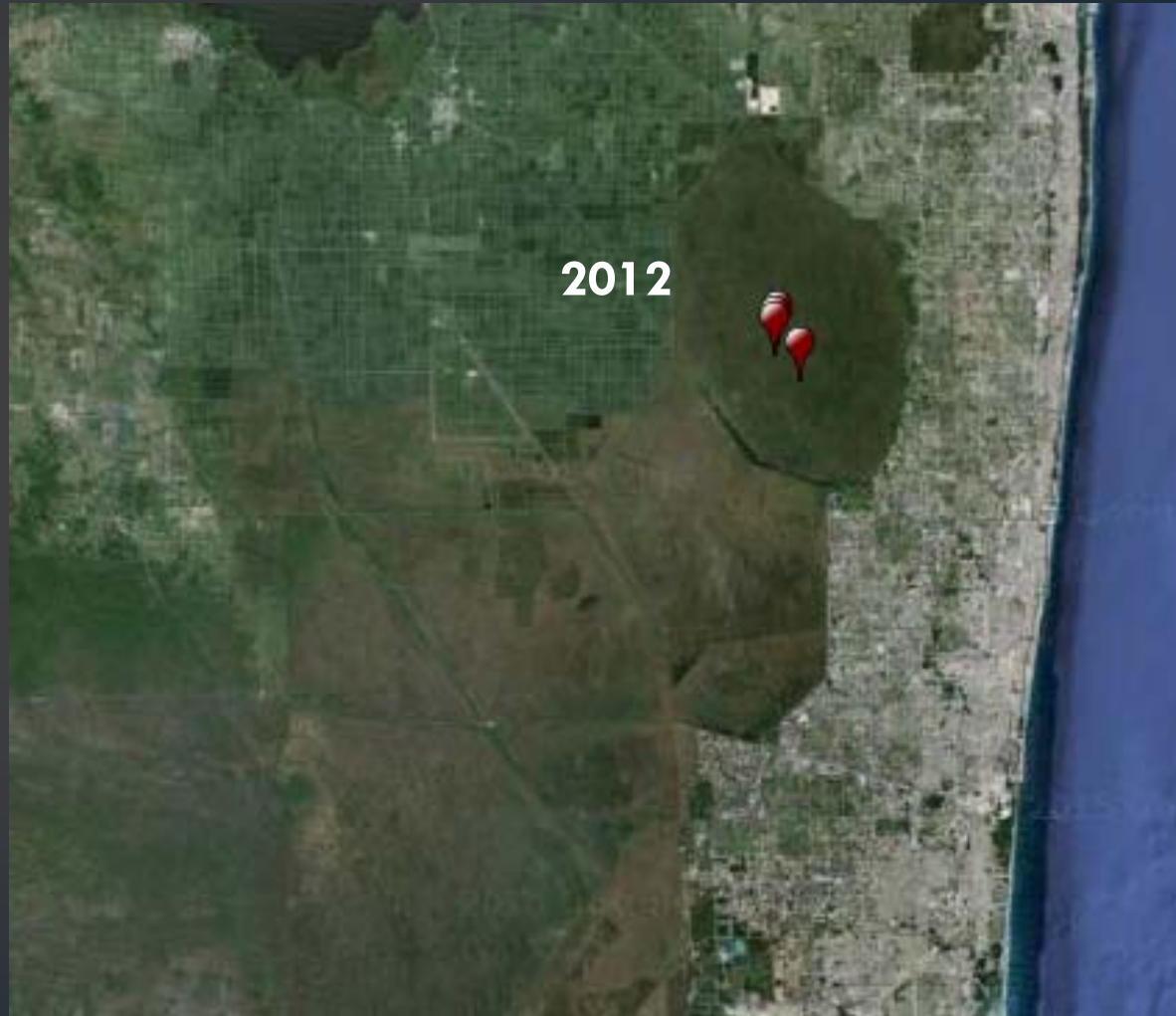
Years



0 2.5 5 10 15 20 Miles

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Loxahatchee National Wildlife Refuge



Summary

- Swamp Bay is an important component of many Everglades tree islands:
 - Structure
 - Function
 - Diversity
- Swamp bay reductions likely to impact some wildlife species
- Heavily impacted tree islands may be vulnerable to invasion

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Summary

- First wave of LW spread over 372k ha of Everglades in 4 years.
- LW persists <4 years at (1 x 5 km scale)
- Tree Island level impacts a function of swamp bay abundance
 - Varies across landscape
 - Southern WCA 3B, western Shark River Slough, and SE Big Cypress NP most impacted
 - John Snyder's prediction will likely be correct

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