

Persea Species Restoration in Laurel Wilt Epidemic Areas



SFTIC 34th Southern Forest Tree
Improvement Conference

Melbourne, Florida



Ambrosia beetles are typically *harmless*
But, some are causing mass tree mortality



Xyleborus glabratus – redbay ambrosia beetle

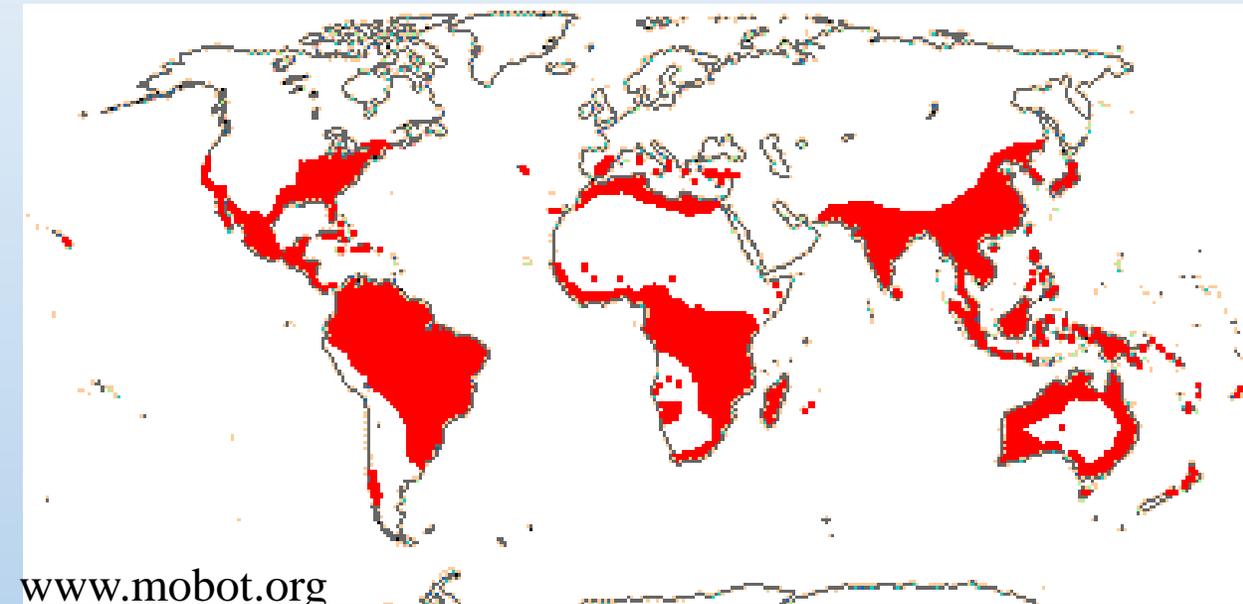


Clonal symbiosis!

Raffaelea lauricola - Ophiostomatales



Lauraceae are dominant canopy species throughout the tropics



- Over 3000 species so taxonomy is poorly understood
- Important essential oils: repel insects, perfumes, spices, fragrant wood and medicine
- Agriculturally important: avocado and spices

Non-native Lauraceae susceptibility to *Raffaelea lauricola*



Lindera megaphylla
(Asia)
20 days PI
overall tolerant but not
resistant

Cinnamomum pedunculatum
(Japanese cinnamon)
30 days PI
wilt some, then stop



Persea podadenia (Mexico)
overall susceptible
30 days PI

~35 more species to test

Known hosts in the USA

Persea borbonia - Redbay

Persea palustris – Swamp bay

Persea humilis - Silkbay

Persea americana - Avocado

**Persea indica*

Cinnamomum camphora – Camphor tree

Sassafras albidum - Sassafras

**Umbellularia californica* – California bay laurel

Laurus nobilis – European bay laurel

**Lindera benzoin* - Northern spicebush

^a*Lindera melissifolia* - Pondberry

^a*Litsea aestivalis* - Pondspice

**Licaria triandra* - Gulf licaria

**Ocotea coriacea* - Lancewood

**Persea mexicana* – Mexican redbay

*artificial fungal inoculation

^a threatened or endangered

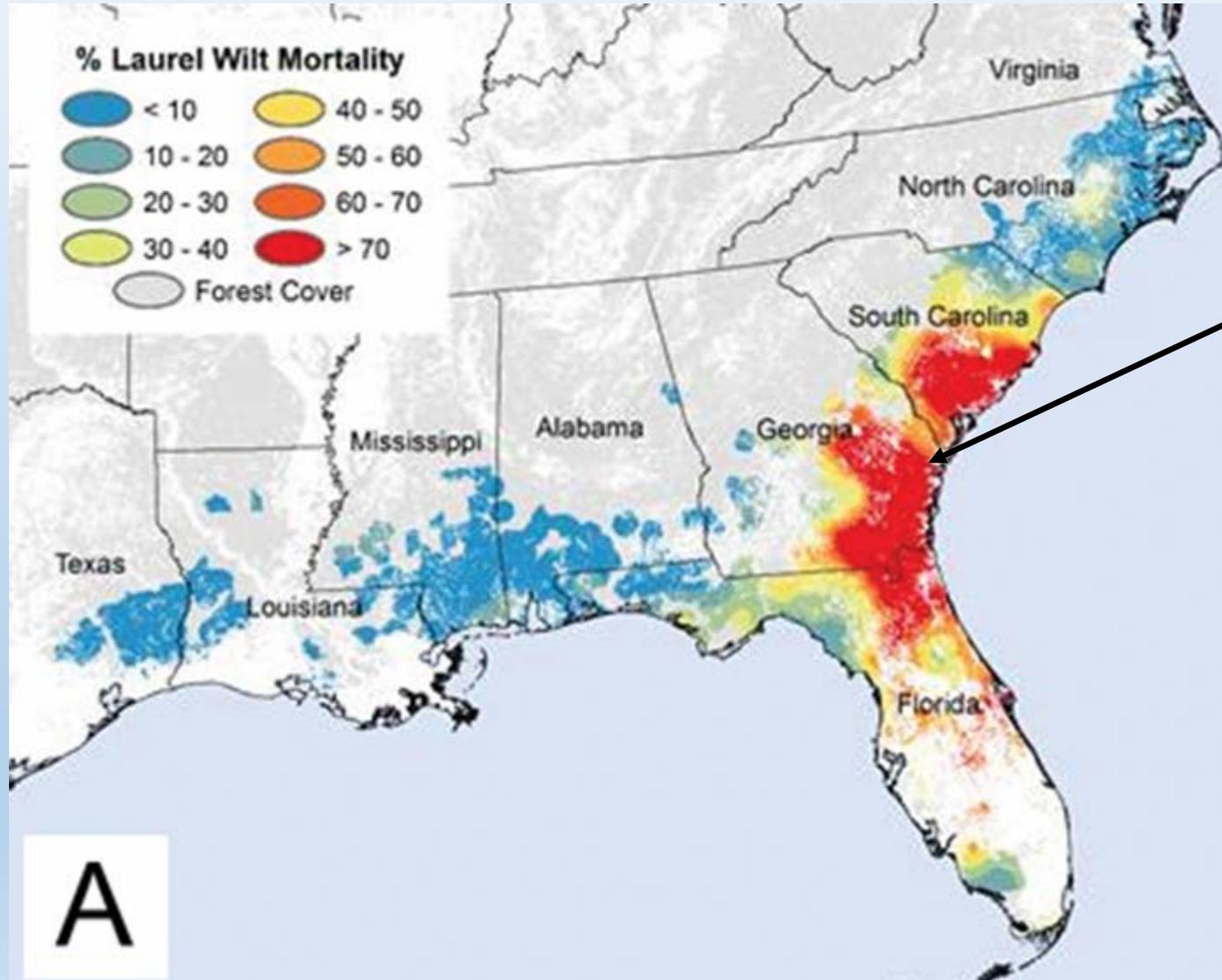


Palamedes swallowtail (*Papilio palamedes*)

UF

Laurel Wilt Disease-Widespread and High Mortality

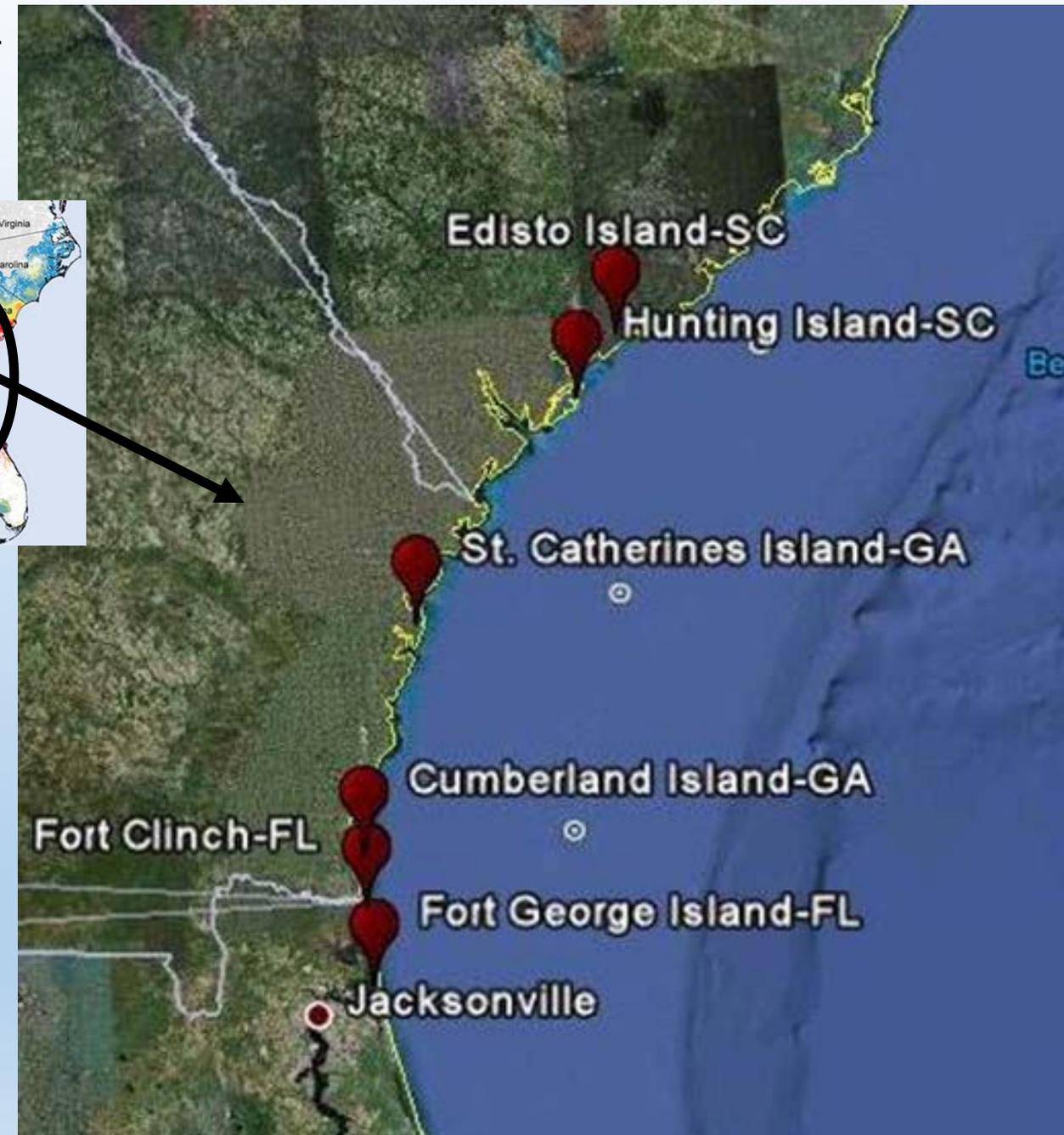
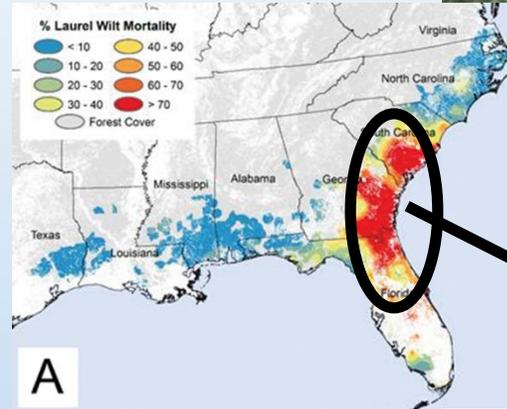
Percent redbay laurel wilt mortality



Initial detection of
Xyleborus glabratus
2002

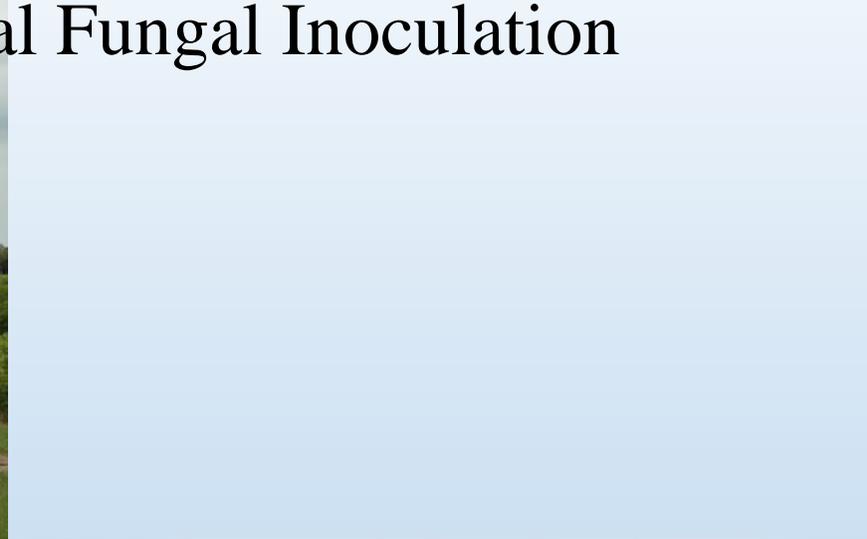
Collection and Propagation of Surviving Redbay

- Sampled 2009 – 2013
After 1st wave of dieback
- 6 sites with high mortality
 - ❖ Coastal maritime forests
 - ❖ 6-15 genotypes per location
- Chose asymptomatic survivors
- Trees from stem cuttings
 - ❖ Resistance screen using artificial fungal inoculation
 - ❖ Genotyped with 6 SSR loci- each unique



Resistance Screening

Artificial Fungal Inoculation



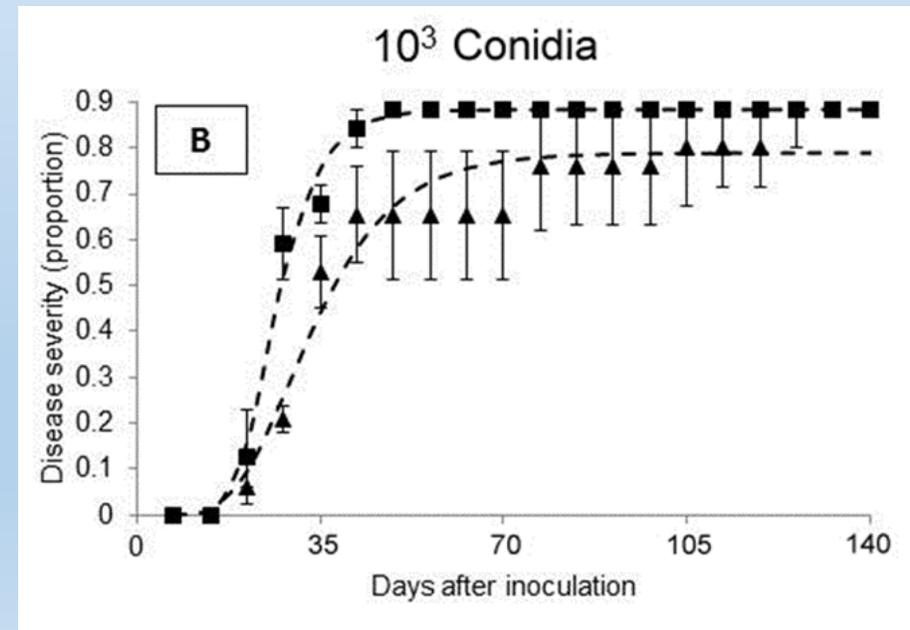
~60 surviving genotypes
tested with 4-6 clonal
replicates each

~3000 spores per tree



Disease Parameters Measured for 124 days

1. Days until disease symptoms appear (16-76 days)
2. Rate of disease development
3. Weekly wilt severity, 1 to 10 scale
4. AUDPC: area under disease progress curve show curve
5. Mortality: number of genotype replicates that died



AUDPC: area under disease progress curve

Resistance Screening Reveals Tolerance Not Resistance

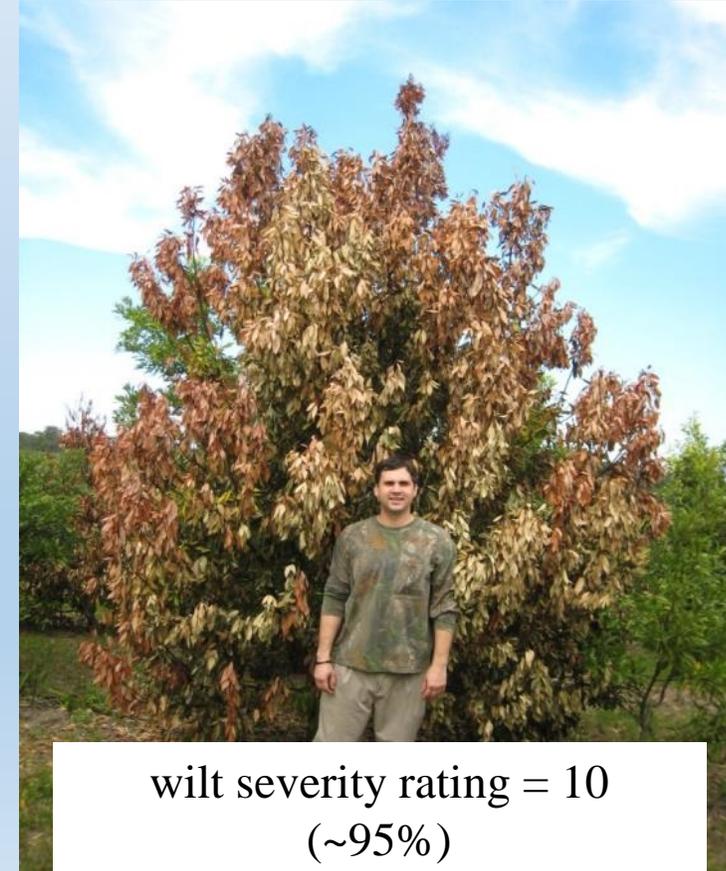
7 Tolerant Genotypes

- Slower disease progression
- Lower severity ratings
- No mortality



Remaining Genotypes

- More rapid disease progression
- Higher severity ratings
- High mortality



Preserving germplasm



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Plant Protection Program



*View of Black Hills showing trees recently killed by mountain pine beetle (*Dendroctonus ponderosae*). Photo credit: Chris M Morris, flickr.com, CC BY 2.0*

The Plant Protection Program encompasses a variety of activities and resources that engage public gardens in forest health protection and plant conservation. Click on any of the following links to learn more about how your garden can participate!

Educational Outreach: Use our interpretive signs and plant labels to enhance the experiential learning opportunity that your garden provides and educate visitors about a wide variety of topics

Restoration: Where to plant



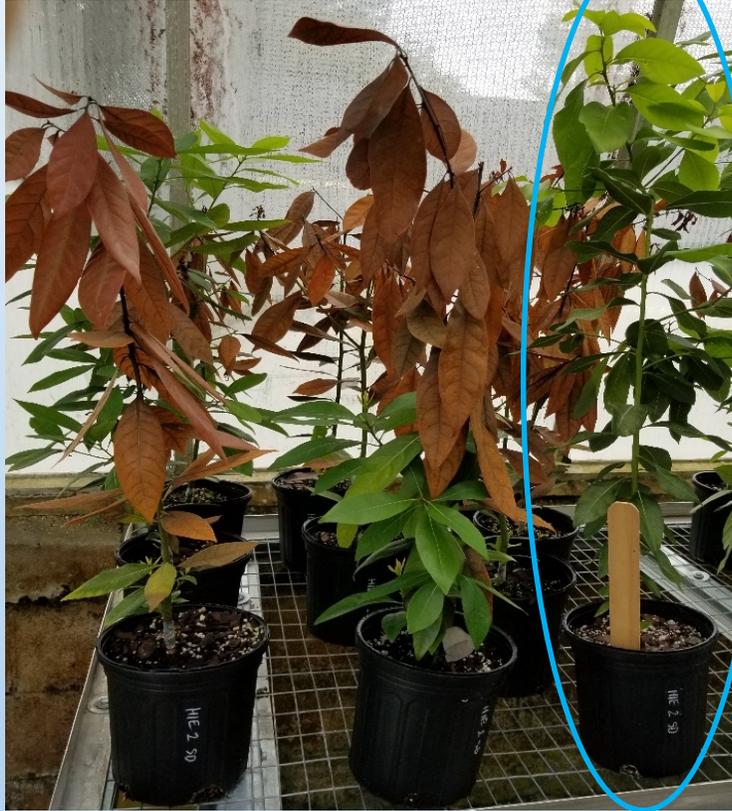
3 sites comparing redbay seedlings and cuttings:

- light over each plant
- soil moisture and nutrients
- growth
- damage assessment



Restoration: What to plant

Is tolerance heritable in seedlings?



3 months PI
Susceptible

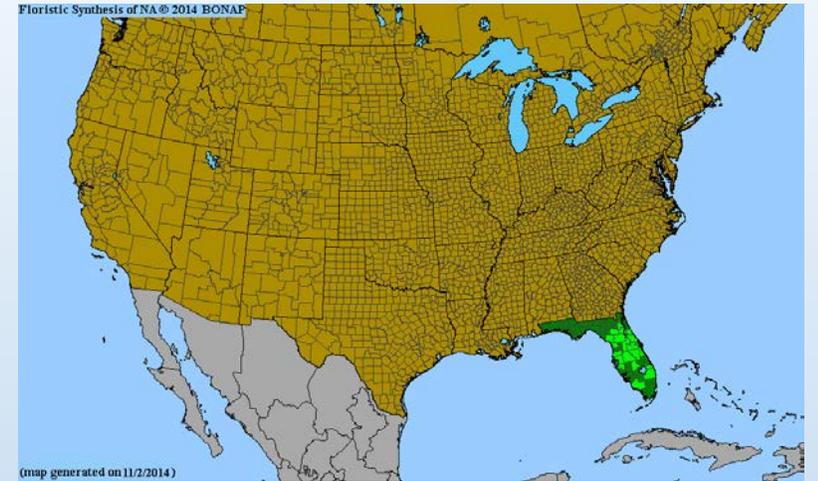
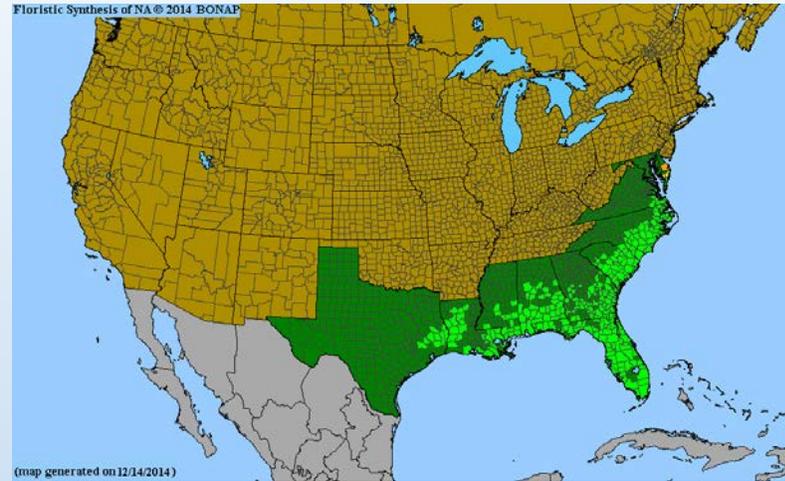
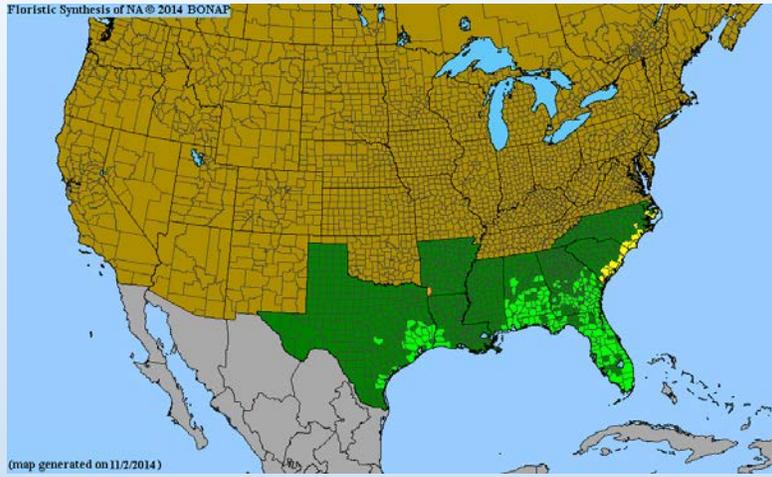


3 months PI
Tolerant

water inoculated

*Currently inoculating hundreds

Persea species in Florida



Persea borbonia
redbay

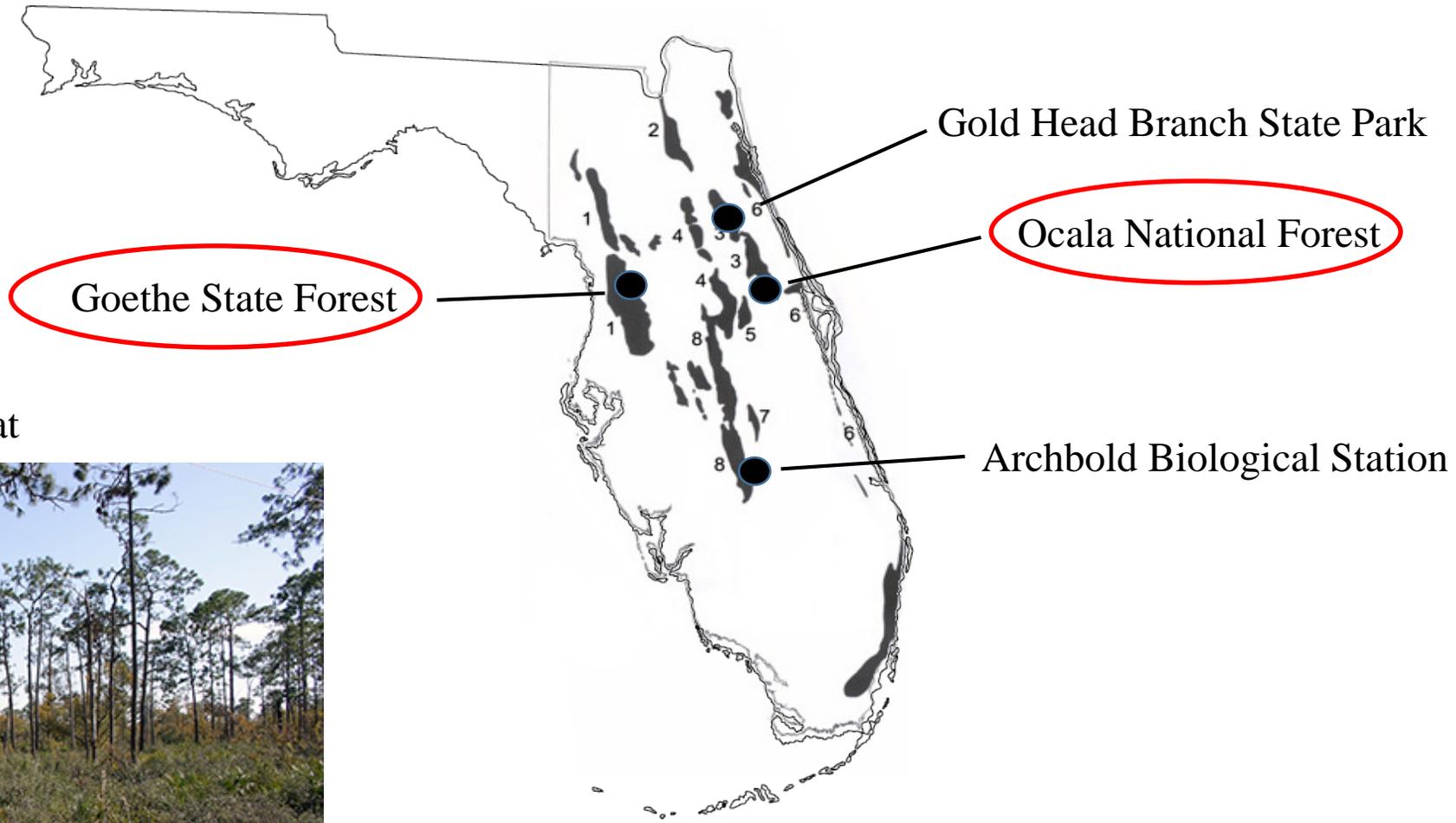


Persea palustris
Swamp bay



Persea humilis
silk bay

60 samples, 17 SSR loci



sandhill habitat



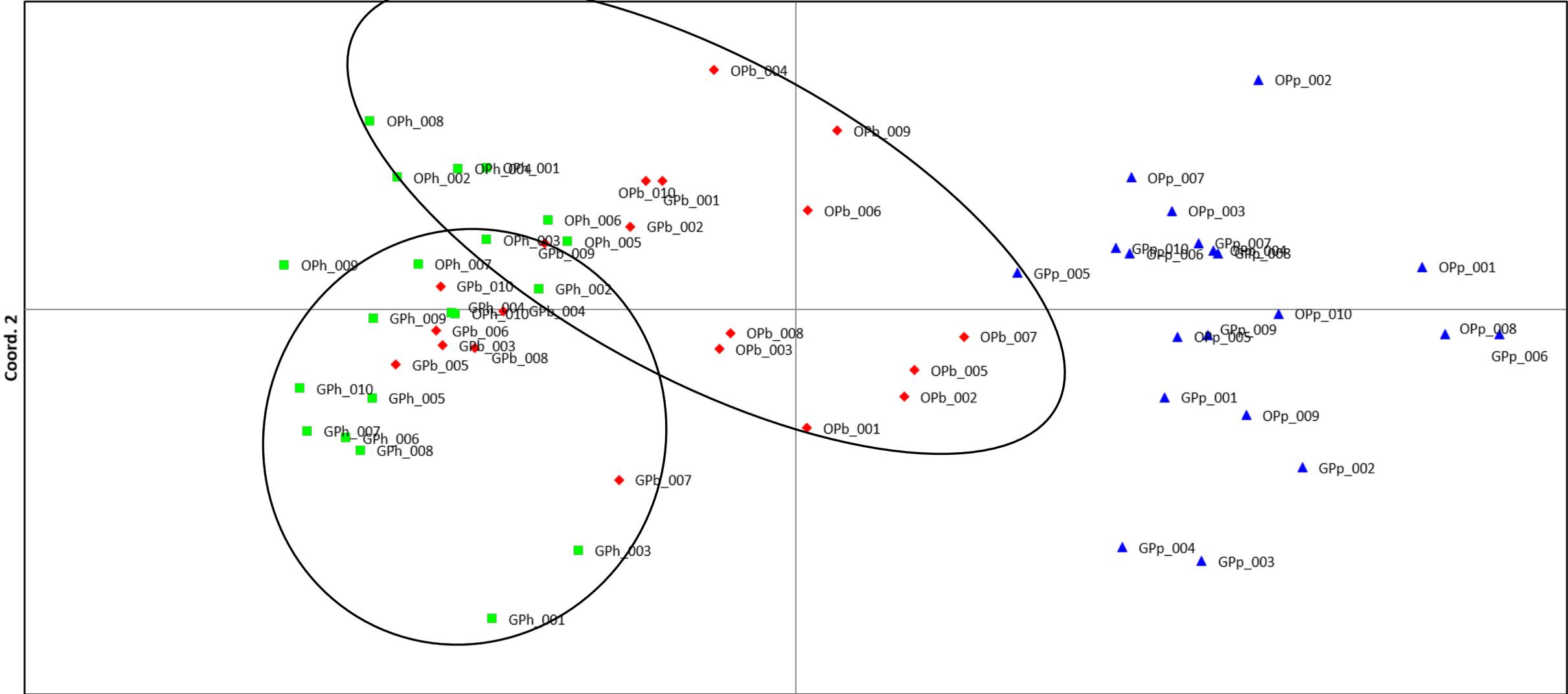
Swamp bay stands out as different

AMOVA: analysis of molecular variance

<u>Populations compared</u>	<u>Fst*-Average population differentiation</u>
all 3 species	0.19
swamp bay, silk bay	0.30
swamp bay, redbay	0.18
silk bay, redbay	0.05
Goethe, Ocala (silk bay & redbay)	0.08

*AMOVA using 9999 permutations, all P values are zero (highly significant)

Principle Coordinates (PCoA)



Silk Bay

Redbay

Swamp Bay

Future Directions

- Go back to 6 original survivor sites
- Florida *Persea* species: more samples/locations
- Continue inoculations non-native Lauraceae



Acknowledgements

Redbay survivor population and host inoculations

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3 *Persea* species in Florida

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Sedley Josserand

(USDA NIFA)



Ordway-Swisher experiment

Jason Vogel

Gage Lapierre

Jason Smith

(UF-IFAS)

