

# Sassafras at an Impasse?

## An update on laurel wilt in southern forests



Albert "Bud" Mayfield  
USDA Forest Service  
Southern Research Station



Webinar Series Spring 2024

**17 April 2024**

What is laurel wilt?  
What causes it?

# Laurel Wilt

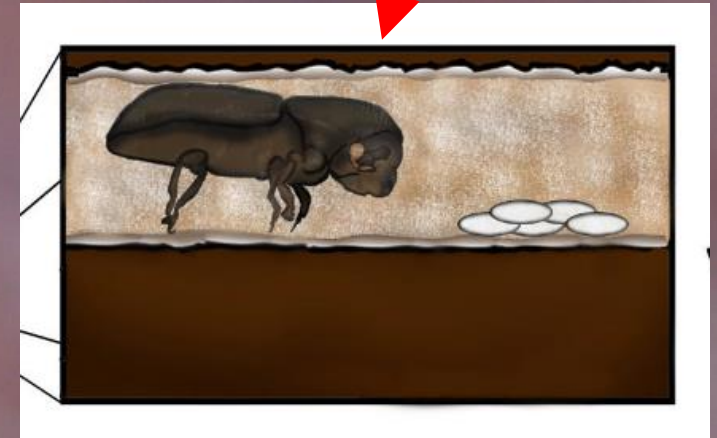
- A vascular wilt disease
- Caused by a fungus (*Harringtonia lauricola*)
- (Usually) carried into trees by a non-native ambrosia beetle vector



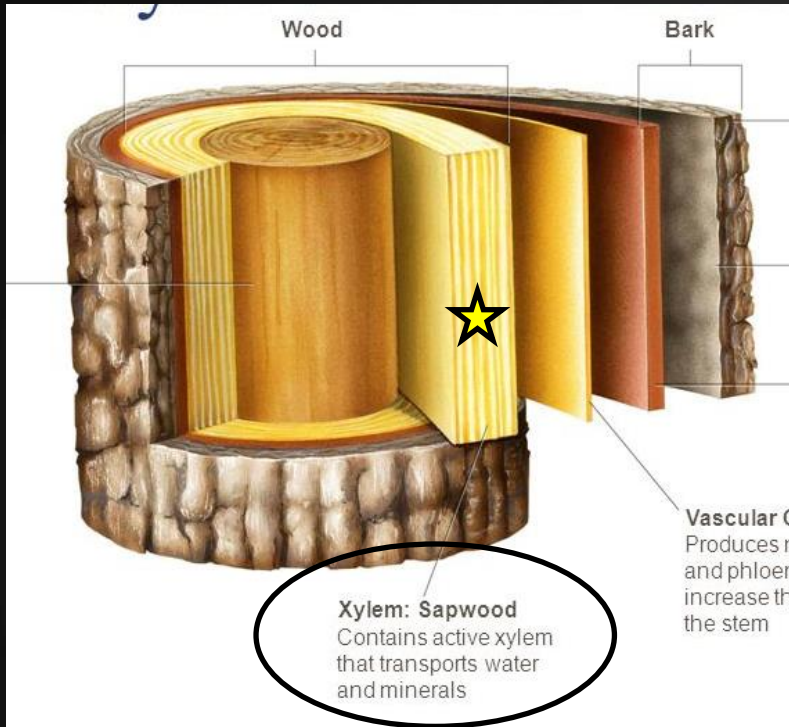
**Redbay ambrosia beetle**  
*Xyleborus glabratus*  
A “fungus farmer”



M.D. Ulyshen

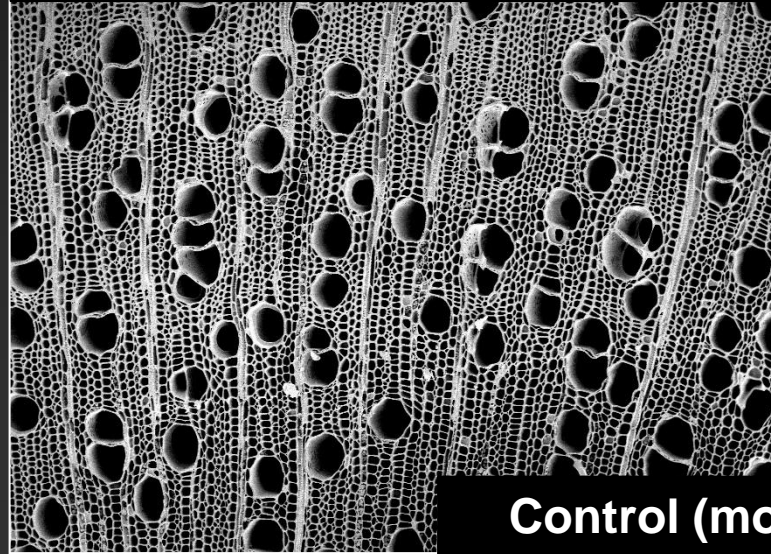


# Vascular Wilt Disease

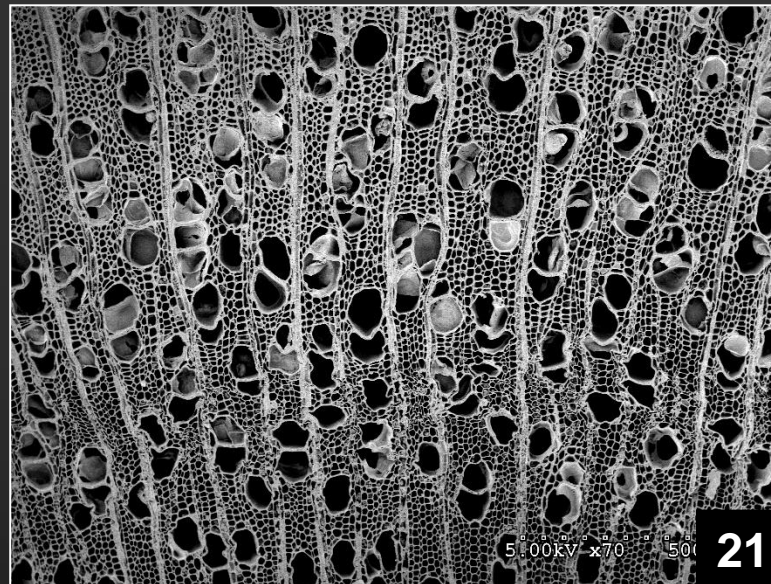
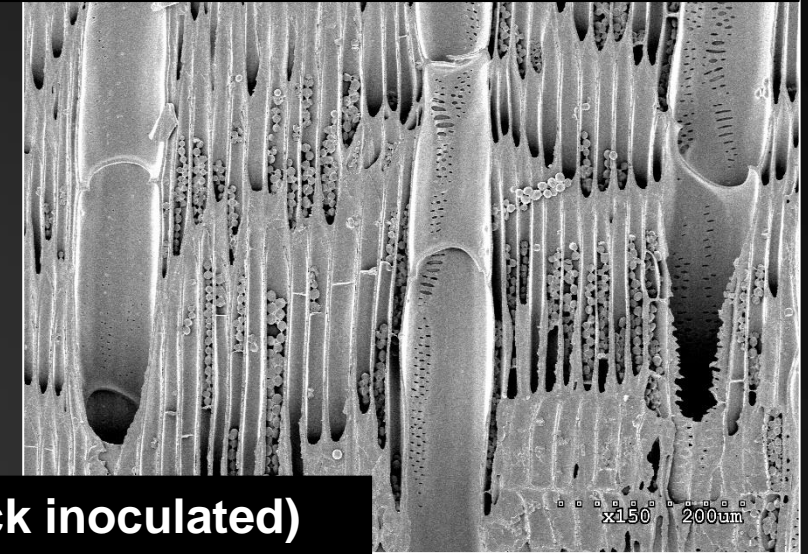


Laurel wilt results from a hypersensitive response by the host to presence of the pathogen in the xylem

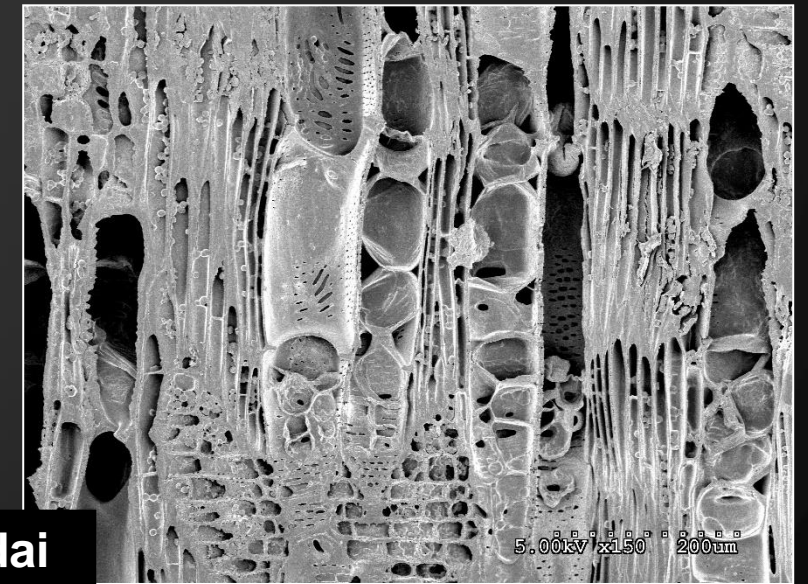
## Tylose formation plays a role in xylem dysfunction



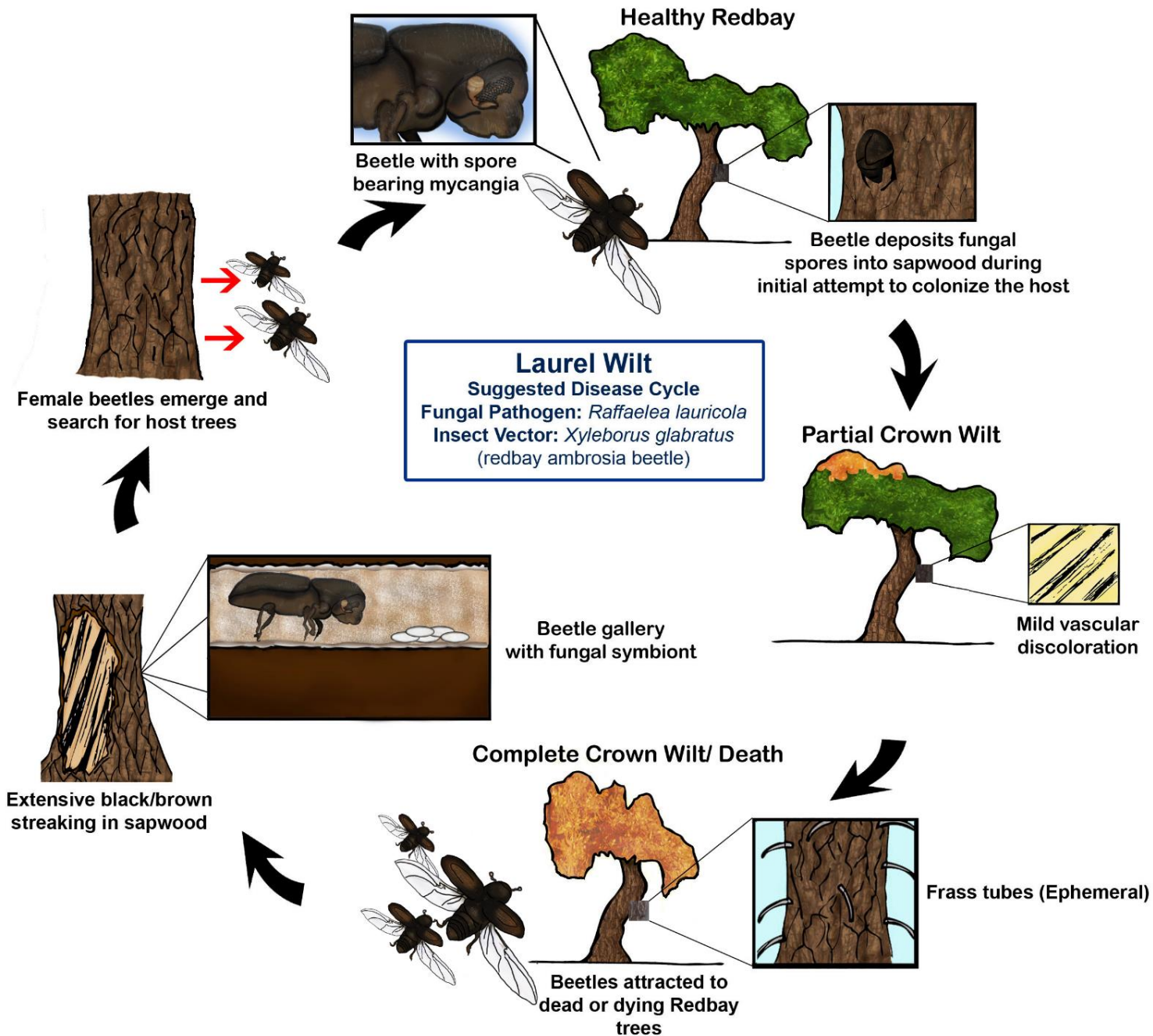
Control (mock inoculated)



21 dai



Photos by Randy Ploetz, Univ Fla.  
(see Inch and Ploetz (2012) *For. Pathol.* 42: 239)



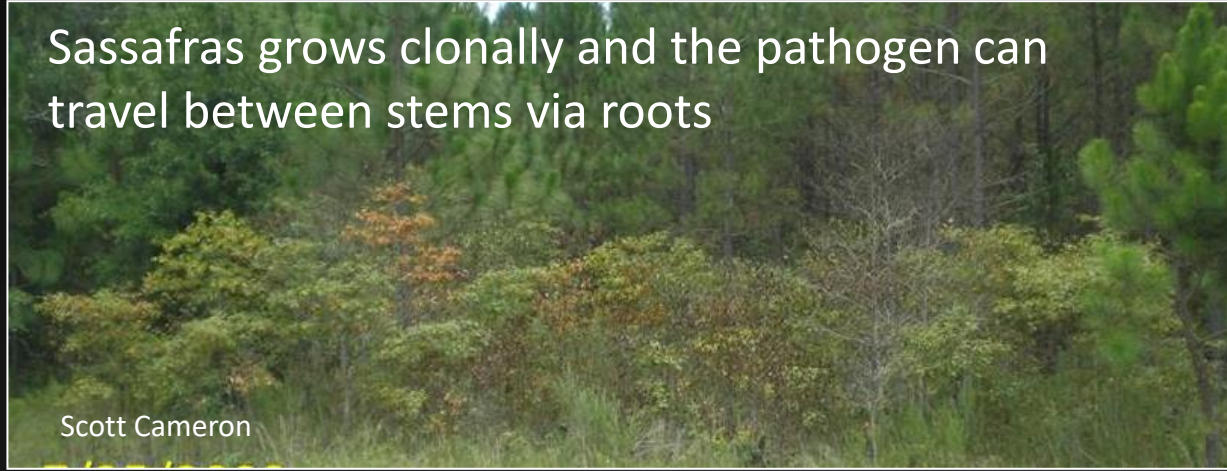
# Proposed Laurel Wilt Disease Cycle Model in redbay

M. A. Hughes<sup>1</sup>, A. E. Mayfield<sup>2</sup>, J. Thomas and K. Olson  
 plantdochughes@gmail.com amayfield02@fs.fed.us jeffreythomasart.com kelseyoy.com  
<sup>1</sup>University of Florida, School of Forest Resources and Conservation, Gainesville FL  
<sup>2</sup>USDA Forest Service

# Underground pathogen transmission

Sassafras grows clonally and the pathogen can travel between stems via roots

Scott Cameron



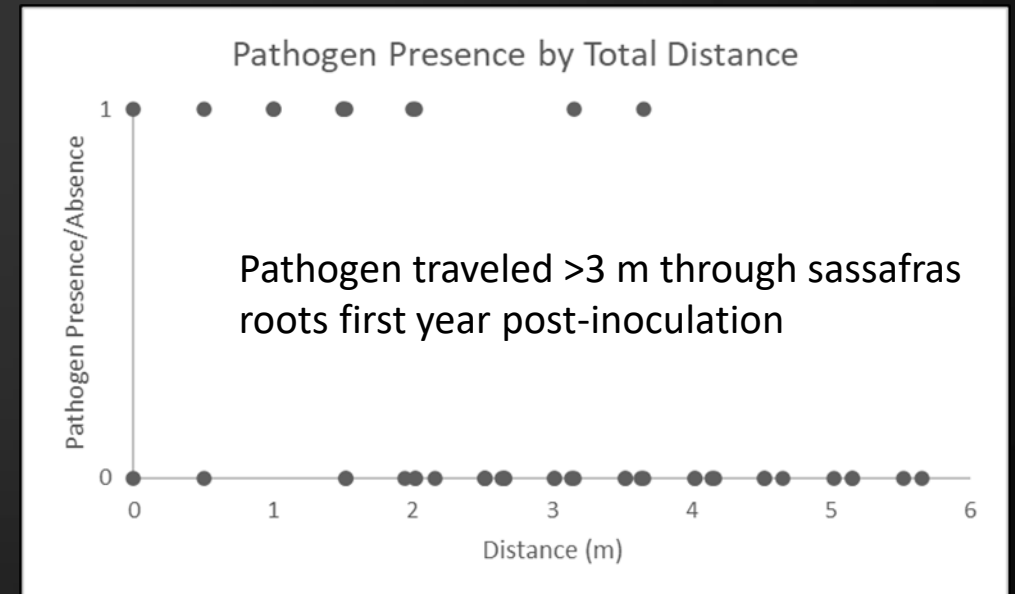
A. Mayfield

Katy Crout, Clemson Univ. MS Thesis, 2021



C

Scott Cameron



# Lateral pathogen transfer to additional ambrosia beetles and other insects

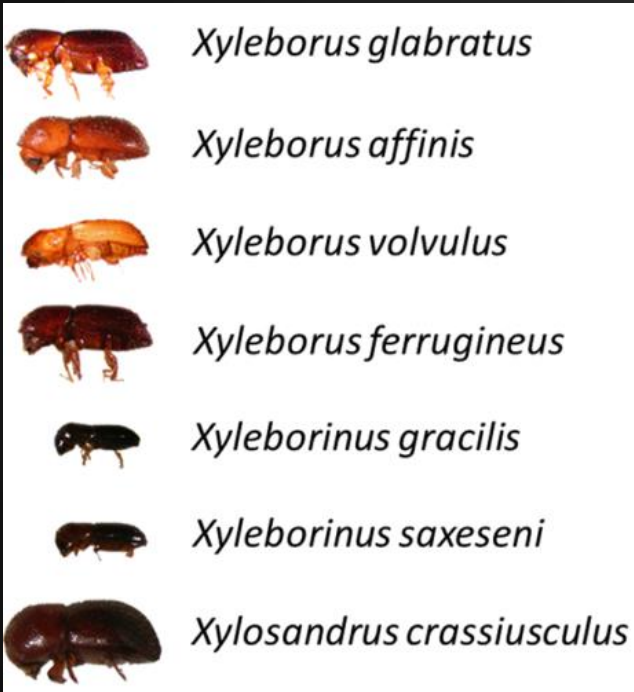
## Presence of the causal agent of laurel wilt disease in sassafras-associated insects

Morgan C. Knutsen, Lynne K. Rieske\*<sup>✉</sup>

*Environmental Entomology*, 52(6), 2023, 1042–1047  
<https://doi.org/10.1093/ee/nvad099>

Department of Entomology, University of Kentucky, S225 Ag Science Center N, Lexington, KY 40546-0091, USA \*Corresponding author, mail: [lrieske@uky.edu](mailto:lrieske@uky.edu)

Granulate ambr. beetle  
 Hidden snout weevil



*Status of these insects as disease vectors in natural forests is uncertain.*

## Lateral transfer of a phytopathogenic symbiont among native and exotic ambrosia beetles

*Plant Pathology* (2014) 63, 54–62

D. Carrillo\*, R. E. Duncan, J. N. Ploetz, A. F. Campbell, R. C. Ploetz and J. E. Peña

Tropical Research & Education Center, University of Florida, 18905 SW 280 Street, Homestead, FL, 33031-3314, USA

R. Woodbridge, R. Olatinwo, and A. Mayfield 2024 (unpublished):

## Results: Objective 2 – Evaluation of *H. lauricola* on ambrosia beetles

Species	No. specimens evaluated	% Positive for <i>H. lauricola</i>
<i>Xyleborus affinis</i>	29	41%
<i>Xylosandrus crassiusculus</i>	17	24%
<i>Xyleborinus saxesenii</i> ★	10	20%
<i>Euwallacea validus/interjectus</i>	6	17%
<i>Monarthrum fasciatum</i>	3	33%
<i>Dryoxylon onoharaense</i> ★	2	100%
<i>Xyleborus ferrugineus</i>	1	0%
<i>Xylosandrus germanus</i>	3	0%
<i>Monarthrum mali</i>	1	0%
<b>Total</b>	<b>72</b>	<b>31%</b>

★ Not previously reported in literature in association with *H. lauricola*



*Dryoxylon onoharaense*

# Laurel Wilt Distribution and Spread

# Disease History

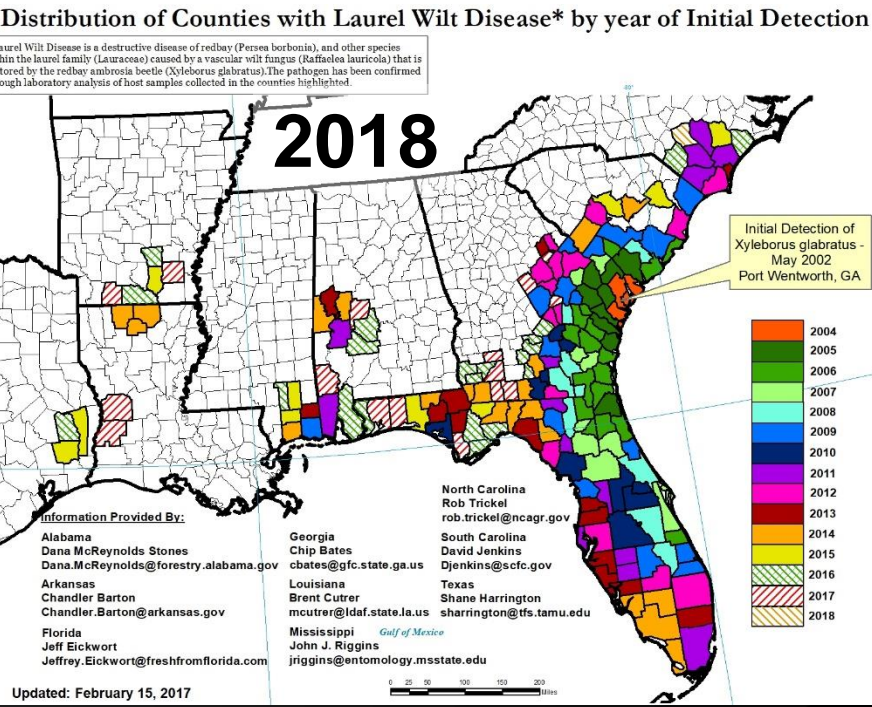
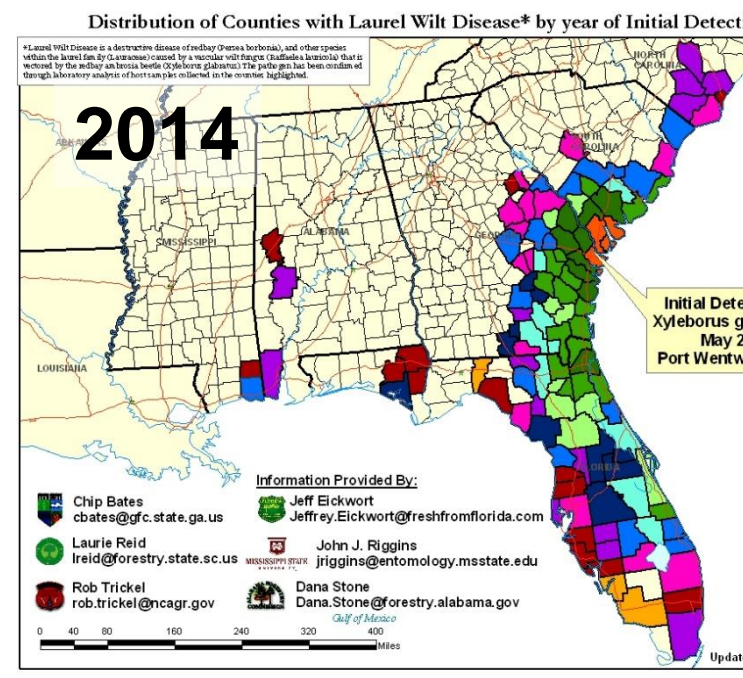
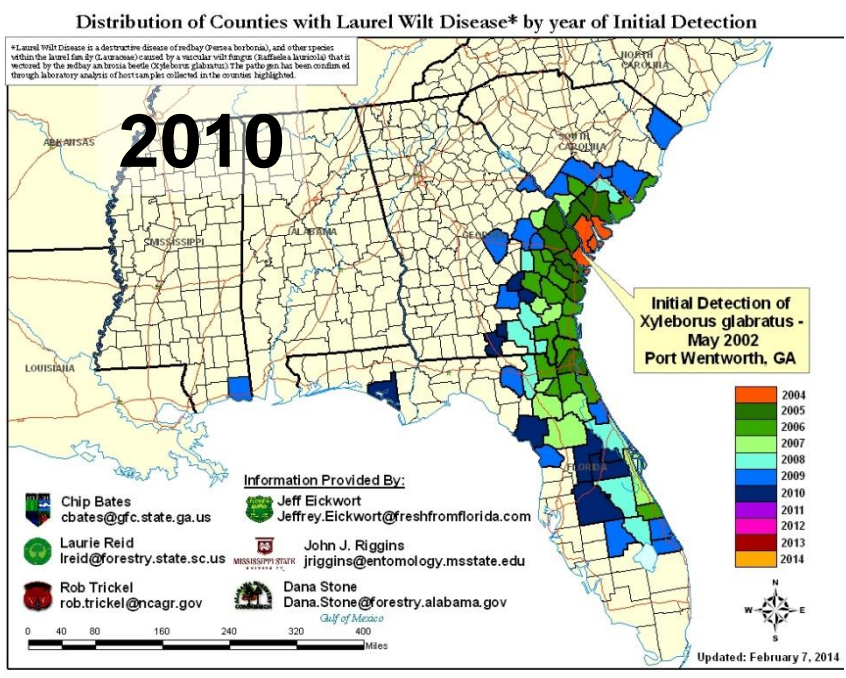
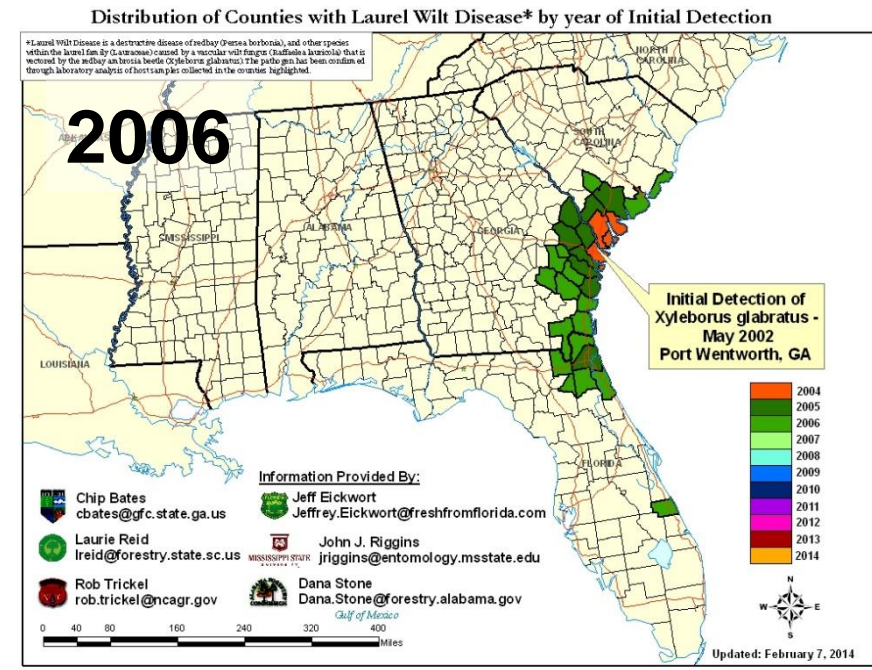
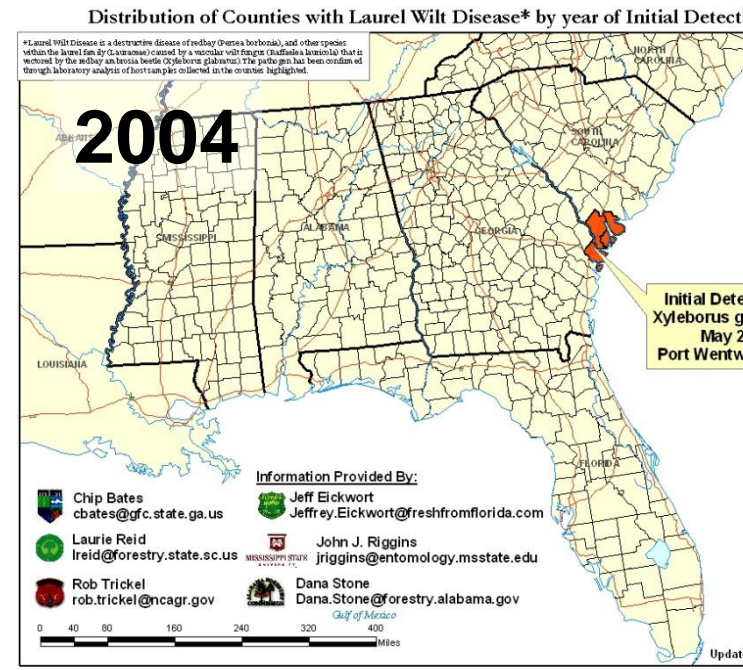
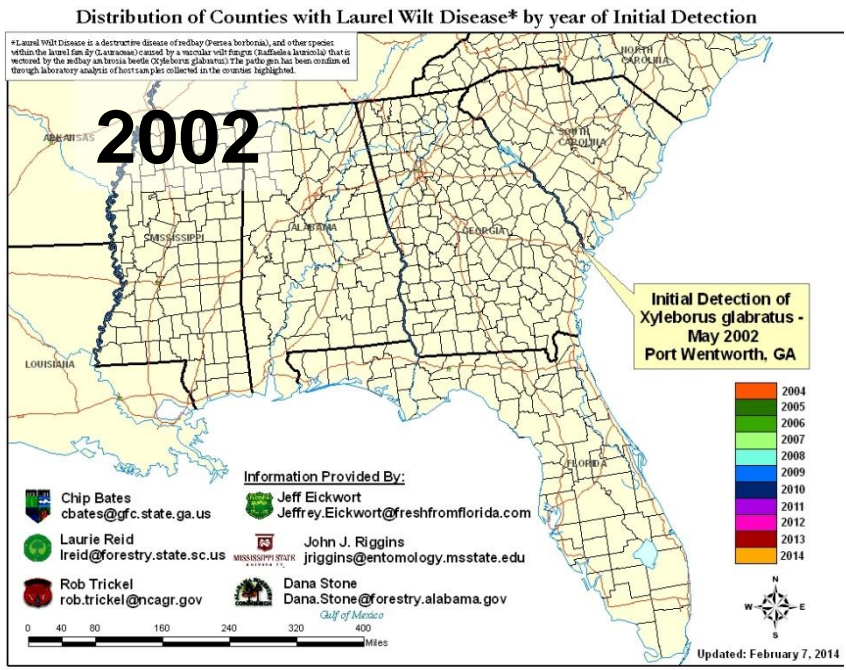
- **2002:** *Xyleborus glabratus* beetles detected in a survey trap. New to N. Amer. No known association with local trees or tree mortality.
- **2003-2004:** Unusual redbay mortality in coastal SC, GA and GA
- **2004:** Steve Fraedrich (USFS-SRS) investigates Hilton Head, SC in Dec 2004.
  - *X. glabratus* recovered from the redbay wood
  - *Ophiostoma*-like fungus isolated from wood
    - *Raffaelea lauricola* → *Harringtonia lauricola*
- **2005 – present:** Geographic spread and colonization of new hosts



**Bob  
Rabaglia**



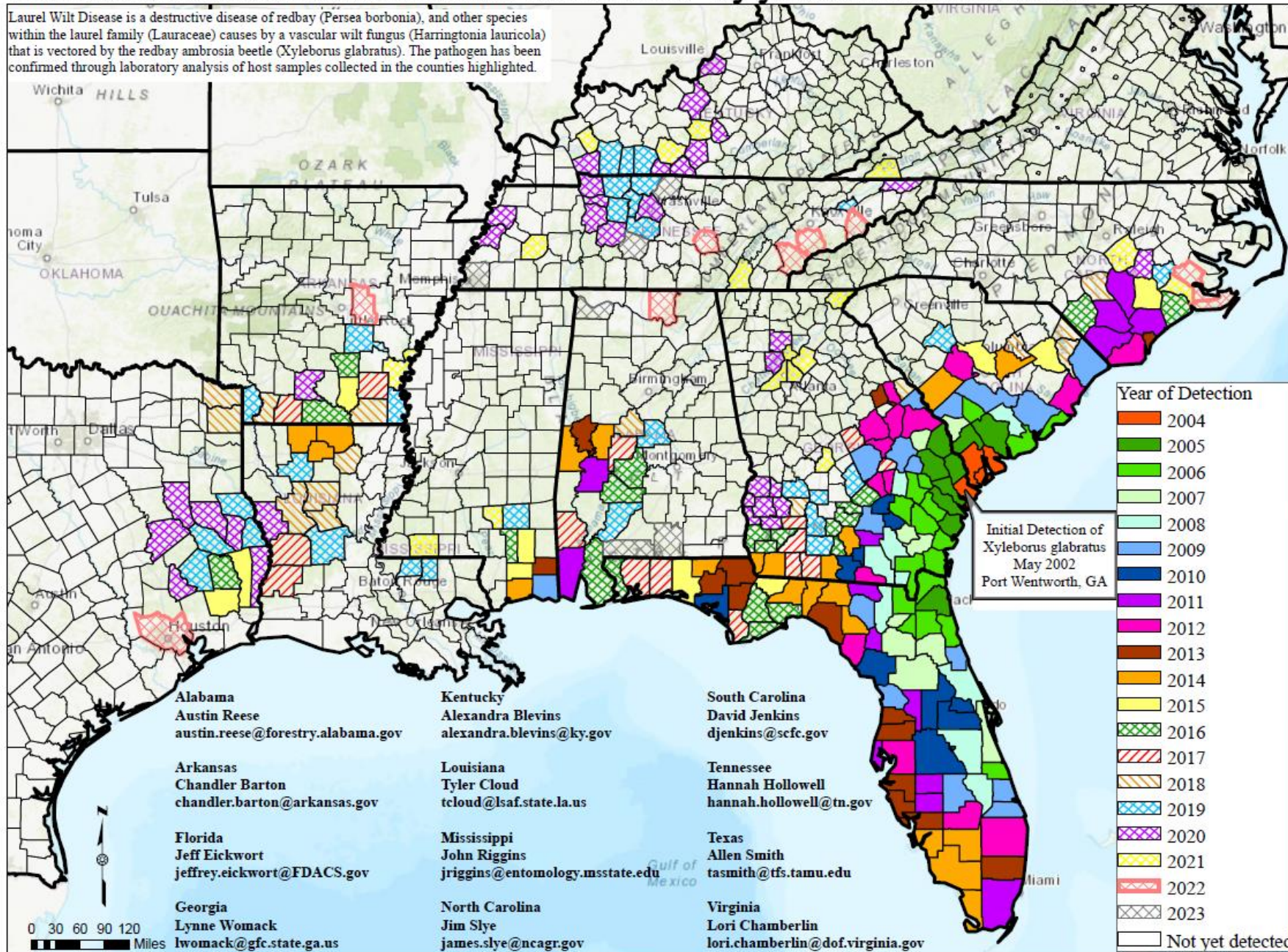
**Steve  
Fraedrich**



# Distribution of Counties with Laurel Wilt Disease\* by year of Initial Detection

October 16, 2023

Laurel Wilt Disease is a destructive disease of redbay (*Persea borbonia*), and other species within the laurel family (*Lauraceae*) caused by a vascular wilt fungus (*Harringtonia lauricola*) that is vectored by the redbay ambrosia beetle (*Xyleborus glabratus*). The pathogen has been confirmed through laboratory analysis of host samples collected in the counties highlighted.



RESEARCH ARTICLE

# Drivers of invasion by laurel wilt of redbay and sassafras in the southeastern US

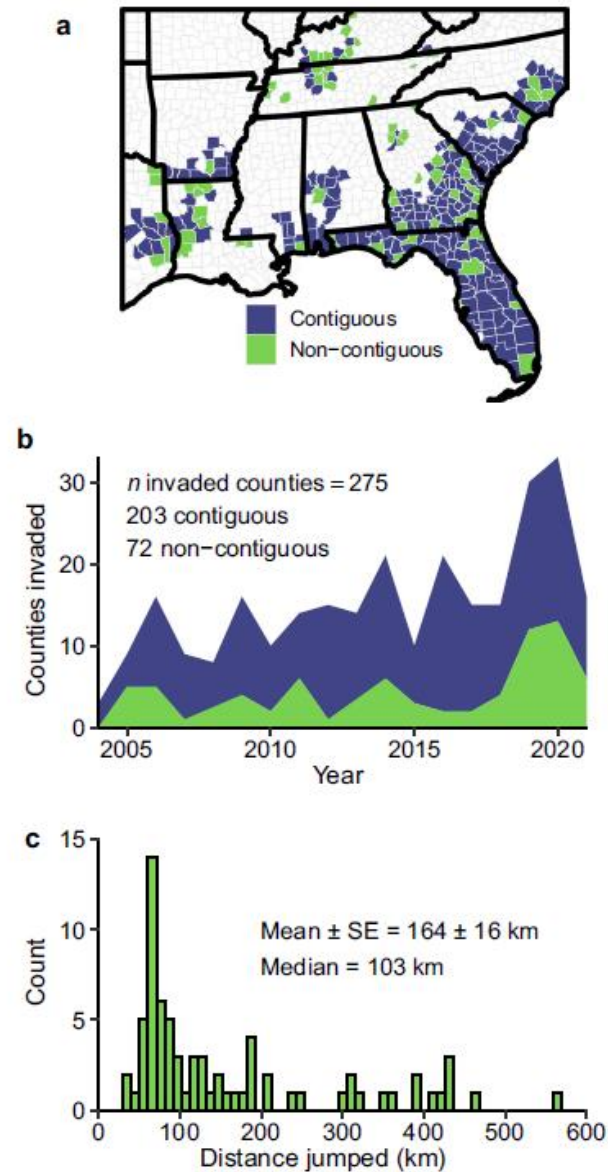
Samuel F. Ward  · John J. Riggins 

## 2004 - 2021:

- Detected in 275 counties
- 72 discrete “jumps” into non-contiguous counties
- Average jump distance = 102 mi (164 km)
- Decelerating rate of spread after first 5 yrs (25 to 15 mi/yr)
- Recent decline in no. of newly-reported counties

- 2020: 33
- 2021: 16
- 2022: 9
- 2023: 4

} *Patchier host distribution?*  
*Colder climate?*  
*Less monitoring in rural areas?*  
*COVID???*



**Fig. 4** County-level invasion by laurel wilt in the southeastern US. **a** Categorized by contiguous and non-contiguous invasions. **b** Annual number of contiguous and non-contiguous counties invaded. **c** Distance of long-distance jumps into non-contiguous counties

What host plants are affected by  
laurel wilt?

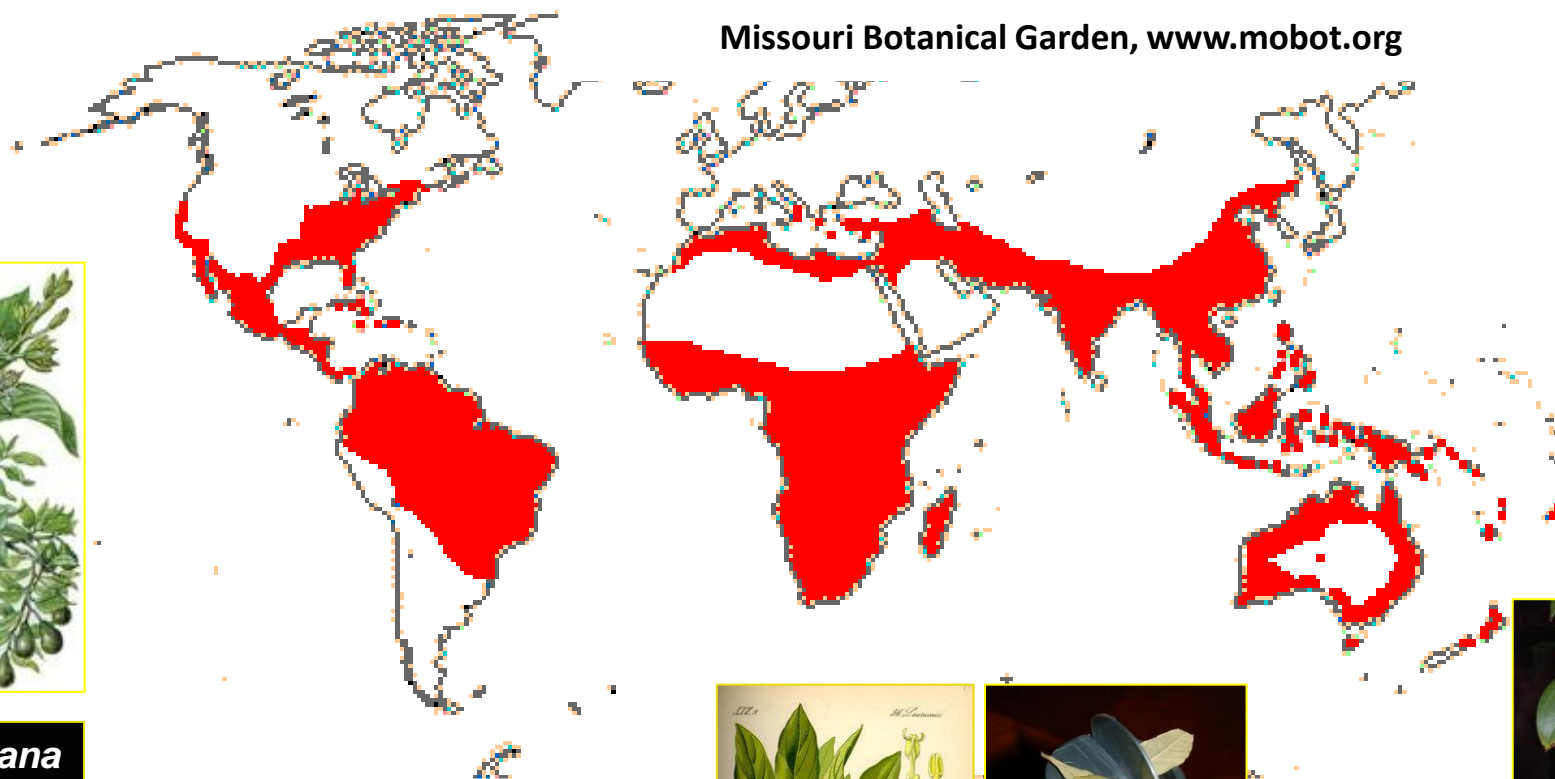
# Laurel Family: Lauraceae

Missouri Botanical Garden, [www.mobot.org](http://www.mobot.org)



*Persea americana*

- 55 genera, >2000 species worldwide
- Aromatic oils
- Economic, cultural, medicinal, and ecological importance



Laurel wreath



*Laurus nobilis*



*Cinnamomum verum*



# *Sassafras albidum*



A. Mayfield



Dow Gardens

UGA5143025



PA-DCNR

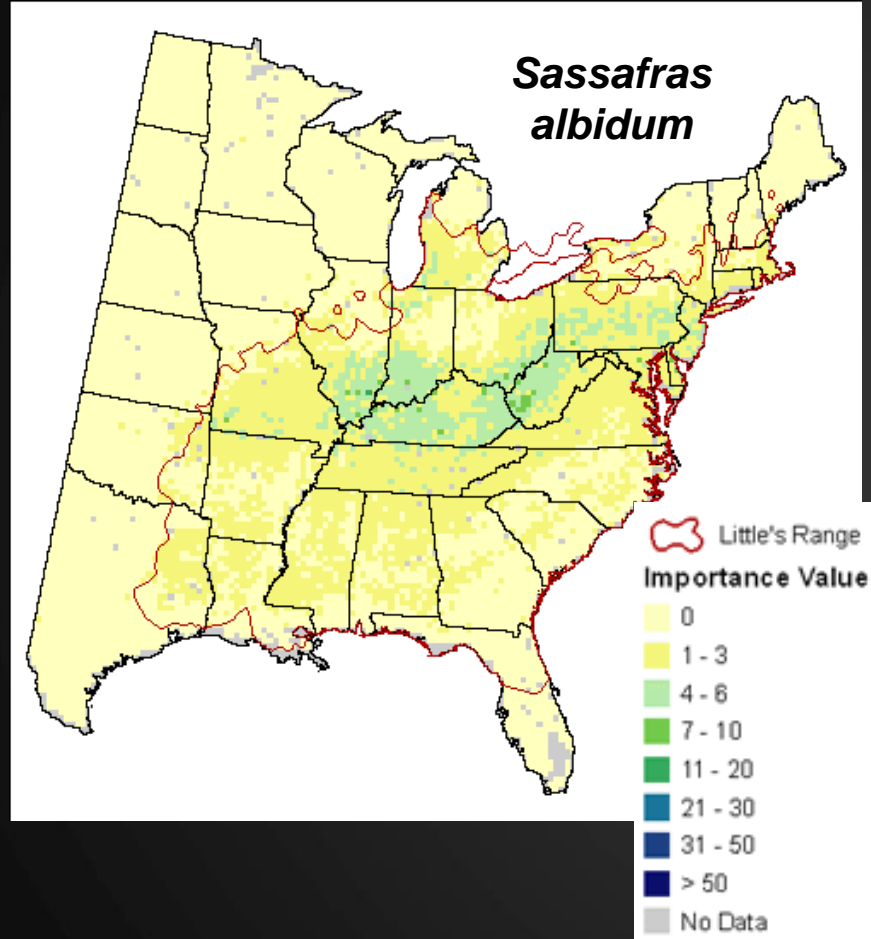


A. Mayfield



A. Mayfield

# Sassafras albidum



USDA Forest Service NRS Climate Change Tree Atlas

<https://www.fs.fed.us/nrs/atlas/>



It makes me hungry just to smell  
The nice hot sass'fras tea,  
And that's one thing I really like  
That they say's good for me."

From *Sassafras Tea*  
by Effie Lee Newsome

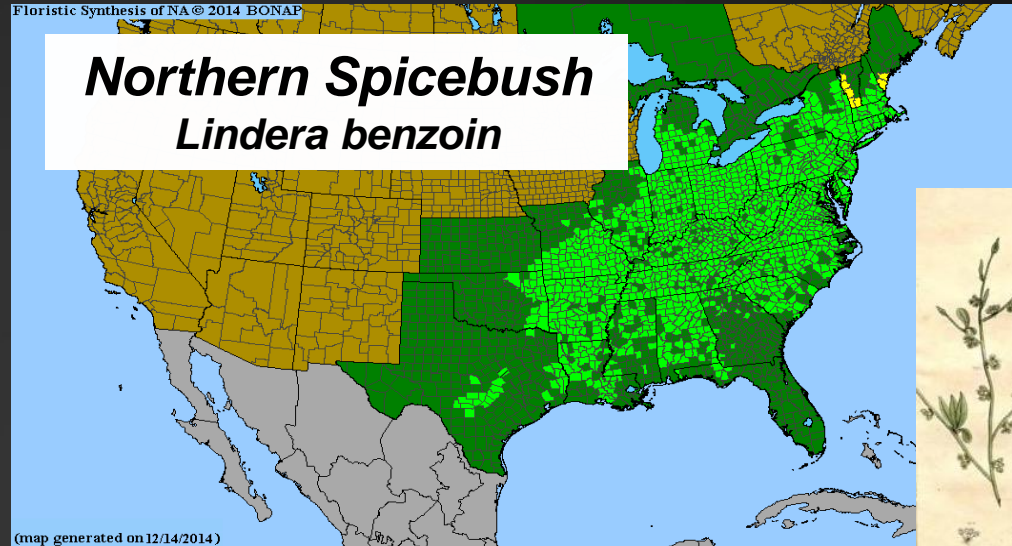


# Major species of Lauraceae in North America

**Sassafras**  
*Sassafras albidum*



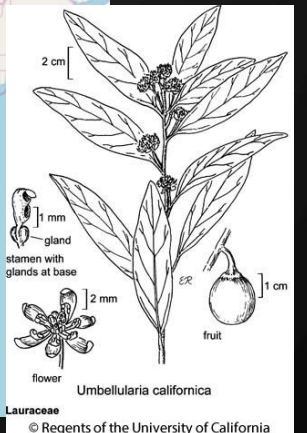
**Northern Spicebush**  
*Lindera benzoin*



**Redbay**  
*Persea americana*



**California Bay Laurel**  
*Umbellularia californica*



Lauraceae  
*Umbellularia californica*  
© Regents of the University of California

## Recovery Plan for Laurel Wilt on Redbay and Other Forest Species Caused by *Raffaelea lauricola* and Disseminated by *Xyleborus glabratus*

Updated May 2015

Hughes, M. A., Smith, J. A., Ploetz, R. C., Kendra, P. E., Mayfield A. E., III, Hanula, J. L., Hulcr, J., Stelinski, L. L., Cameron, S., Riggins, J. J., Carrillo, D., Rabaglia, R., Eickwort, J., and Pernas, T. 2015. Recovery plan for laurel wilt on redbay and other forest species caused by *Raffaelea lauricola* and disseminated by *Xyleborus glabratus*. Plant Health Progress doi:10.1094/PHP-RP-15-0017.

**TABLE 1**  
Forest tree species with laurel wilt due to natural infections, with Koch's postulates completed.

Host <sup>a</sup>	Reference
<i>Persea borbonia</i> (L.) Spreng. (Redbay)	Fraedrich et al. 2008
<i>Persea palustris</i> (Raf.) Sarg (Swamp bay)	Fraedrich et al. 2008
<i>Sassafras albidum</i> (Nutt.) Nees (Sassafras)	Fraedrich et al. 2008
<i>Persea americana</i> Mill. (Avocado) <sup>b</sup>	Mayfield et al. 2008a
<i>Litsea aestivalis</i> (L.) Fernald (Pondspice) <sup>c</sup>	Hughes et al. 2011
<i>Lindera melissifolia</i> (Walter) Blume (Pondberry) <sup>c</sup>	Fraedrich et al. 2011
<i>Persea humilis</i> Nash (Silk bay)	Hughes et al. 2012
<i>Laurus nobilis</i> (L.) (Bay laurel) <sup>b</sup>	Hughes et al. 2014
<i>Cinnamomum camphora</i> (L.) J. Presl (Camphortree) <sup>b</sup>	Fraedrich et al. 2015

<sup>a</sup>Plant names derived from The PLANTS Database (<http://plants.usda.gov>) and Plant List (2013), Version 1.1. (<http://www.theplantlist.org>).

<sup>b</sup>Non-native, landscape or agricultural species.

<sup>c</sup>Indicates threatened or endangered status (state or federally).

**TABLE 2**  
Tree species displaying laurel wilt symptoms after artificial inoculation with *R. lauricola*, yet lacking documented cases of laurel wilt in the wild.

Host <sup>a</sup>	Reference
<i>Umbellularia californica</i> (Hook. & Arn.) Nutt. (California laurel)	Fraedrich 2008
<i>Lindera benzoin</i> (L.) Blume (Northern spicebush)	Fraedrich et al. 2008
<i>Licaria triandra</i> (Sw.) Kosterm. (Pepperleaf sweetwood) <sup>c</sup>	Ploetz and Konkol 2013
<i>Persea indica</i> (L.) Spreng. (Viñátigo [Spanish]) <sup>b</sup>	Hughes et al. 2013
<i>Nectandra coriacea</i> (Sw.) Griseb. (Lancewood)	Hughes & Ploetz, <i>unpublished</i>

<sup>a</sup>Plant names derived from The PLANTS Database (<http://plants.usda.gov>) and The Plant List (2013), Version 1.1. (<http://www.theplantlist.org>).




<sup>b</sup>Non-native, landscape or agricultural species.

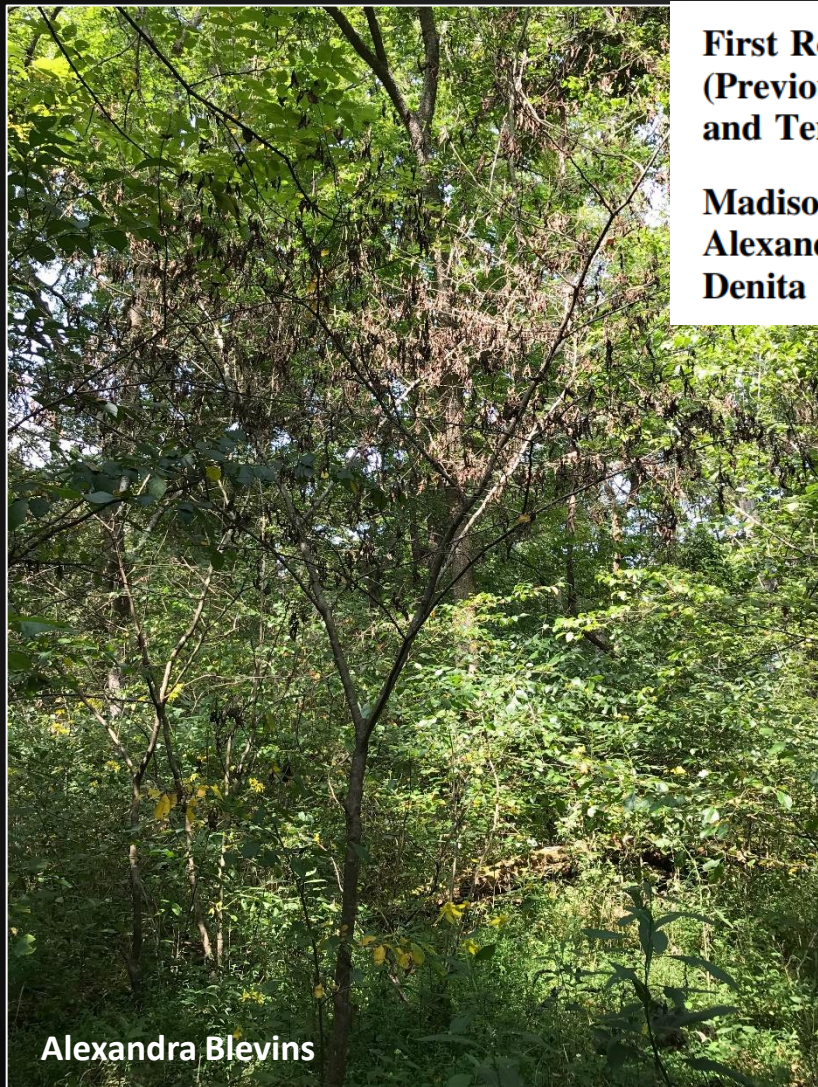
<sup>c</sup>Indicates threatened or endangered status (state or federally).

All North American species in the Lauraceae are susceptible to the disease pathogen

# Laurel Wilt in Northern Spicebush (*Lindera benzoin*)

First Report of Laurel Wilt Caused by *Harringtonia lauricola*  
(Previously *Raffaelea lauricola*) on Northern Spicebush in Kentucky  
and Tennessee

Madison J. Eaton,<sup>1</sup>  Julie Beale,<sup>2</sup> Sara Long,<sup>2</sup> Tyler J. Dreaden,<sup>2,3,4</sup>  
Alexandra Blevins,<sup>5</sup> Albert Mayfield,<sup>3</sup> Megan Buland,<sup>1</sup>  
Denita Hadziabdic,<sup>6</sup>  and Ellen V. Crocker<sup>1,4,†</sup> 



Alexandra Blevins



Alexandra Blevins



Alexandra Blevins

Photos by Alexandra Blevins KY-DOF, Fort Campbell, KY September 2020

# Plants that are NOT laurel wilt hosts, despite their names (not in the Lauraceae)



- Mountain laurel (*Kalmia latifolia*)
- *Rhododendron* spp.
- Laurel oak (*Quercus laurifolia*)
- Sweetbay magnolia (*Magnolia virginiana*)
- Loblolly bay (*Gordonia lasianthus*)

What are the symptoms of laurel wilt?

# Laurel Wilt Symptoms & Signs in sassafras and redbay

Ambrosia beetle  
“Frass noodles”



Sapwood discoloration



Stunted foliage



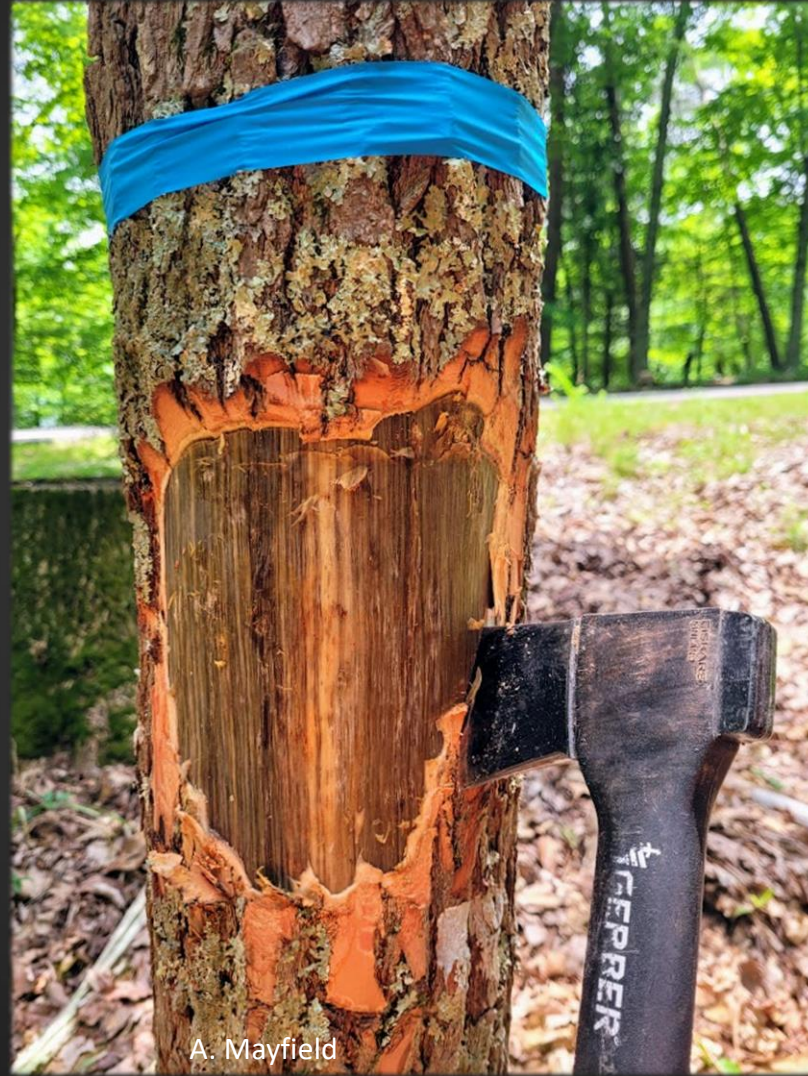
Wilted, discolored, and missing foliage



# Laurel Wilt in Sassafras



A. Mayfield

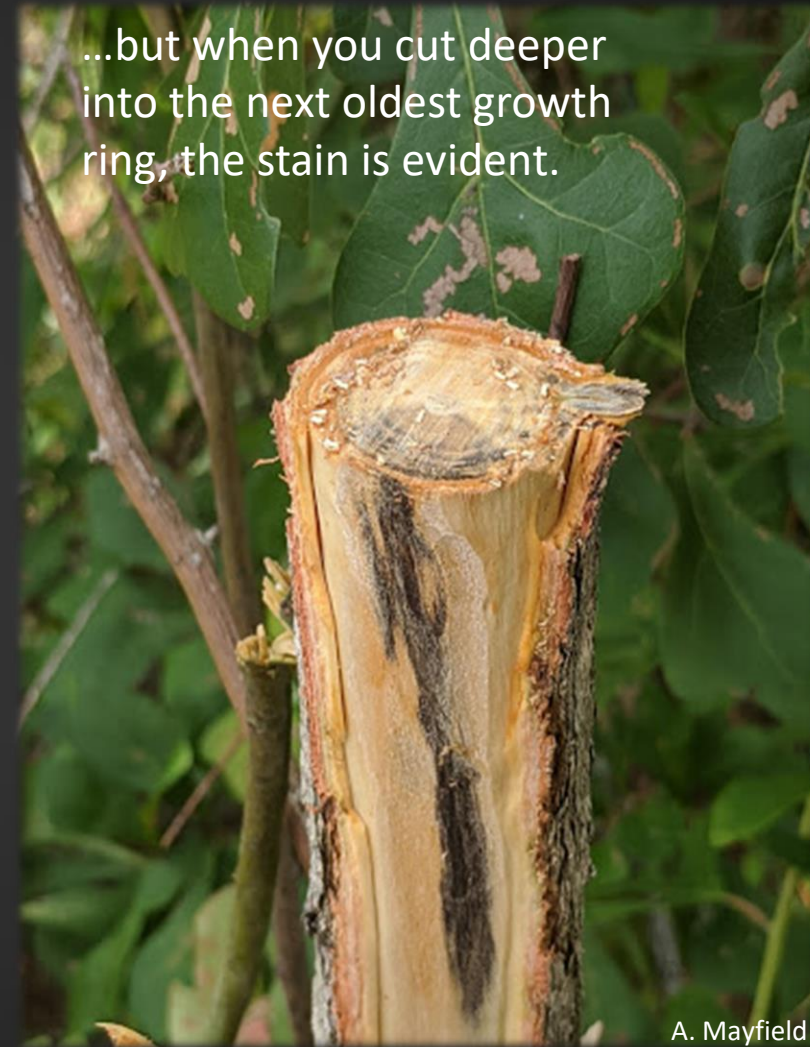


A. Mayfield



A. Mayfield

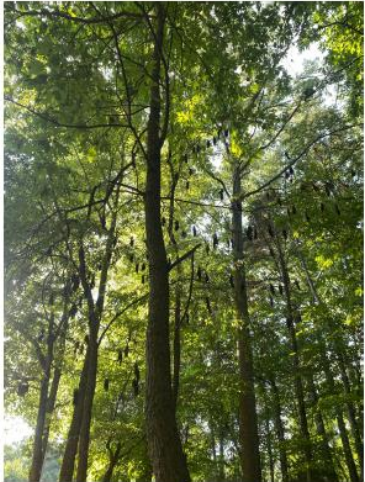
# Checking for vascular stain in sassafras: Go deeper than the outer ring.



# Emerging wilt of sassafras and spicebush in the central hardwood forest region

Olivia Bigham<sup>1</sup>, Tyler Dreaden<sup>2</sup>, James Jacobs<sup>3</sup>, Joshua Wigal<sup>4</sup>, Mikayla Watts<sup>4</sup>, Matthew Ginzel<sup>1,5</sup>, and Anna Conrad<sup>4</sup>  
<sup>1</sup>Dept. of Forestry and Natural Resources, Purdue University; <sup>2</sup>USDA-FS-SRS; <sup>3</sup>USDA-FS-R9-FHP; <sup>4</sup>USDA-FS-NRS; <sup>5</sup>Dept. of Entomology, Purdue University

Wilting sassafras  
NOT caused by the  
laurel wilt pathogen  
(IN, MO, OH)



Leaves brown, wilted, and drooped



Wilting symptoms start in mid-late summer

- Total of 17 counties
- 8 counties of observed wilt, 9 counties of landowner reported wilt
- Reports of wilting sassafras in Missouri
- In Ohio, spicebush, a tree related to sassafras, has been reported to wilt in a similar manner

## HOW YOU CAN HELP

We need help finding wilting trees so we can better understand and manage this problem

If you find any wilting sassafras trees, report by scanning the QR code below or send an email to [sassafras.wilt@gmail.com](mailto:sassafras.wilt@gmail.com)

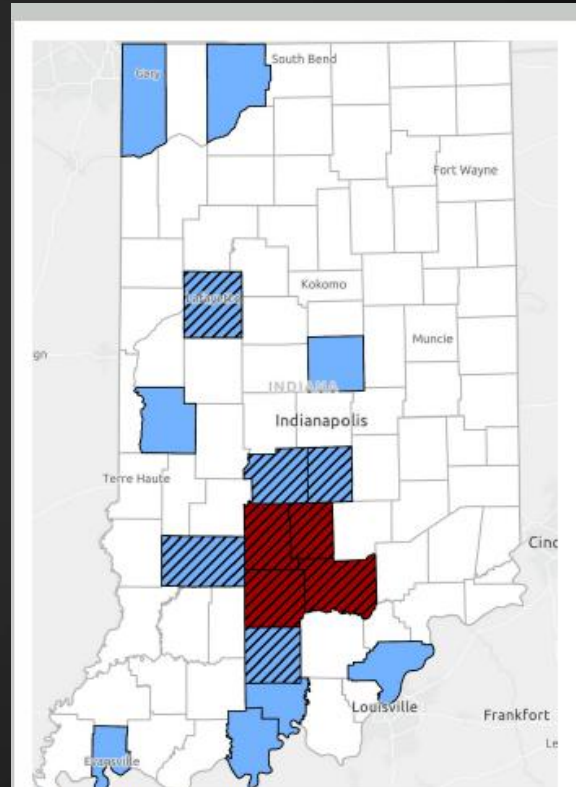
SCAN QR CODE TO REPORT



## Conclusions

- We continue to track the locations of wilting sassafras and spicebush. Continued monitoring is needed to determine whether the severity or distribution of the wilt is changing.
- Three invasive beetles and an *Ophiostoma*-like fungus are associated with wilting trees. In 2024, we plan to use Koch's postulates to determine whether the fungus can cause the observed symptoms.

**Acknowledgements** Funding was provided by USDA-FS-R9-FHP.



Years observed

■ 2019-2022

■ 2022-2024

▨ Observed wilt

\*unhatched counties are landowner reported sassafras wilt

**Olivia Bigham**

Purdue University  
Forestry and Natural Resources  
Graduate Student

Email: [sassafras.wilt@gmail.com](mailto:sassafras.wilt@gmail.com)



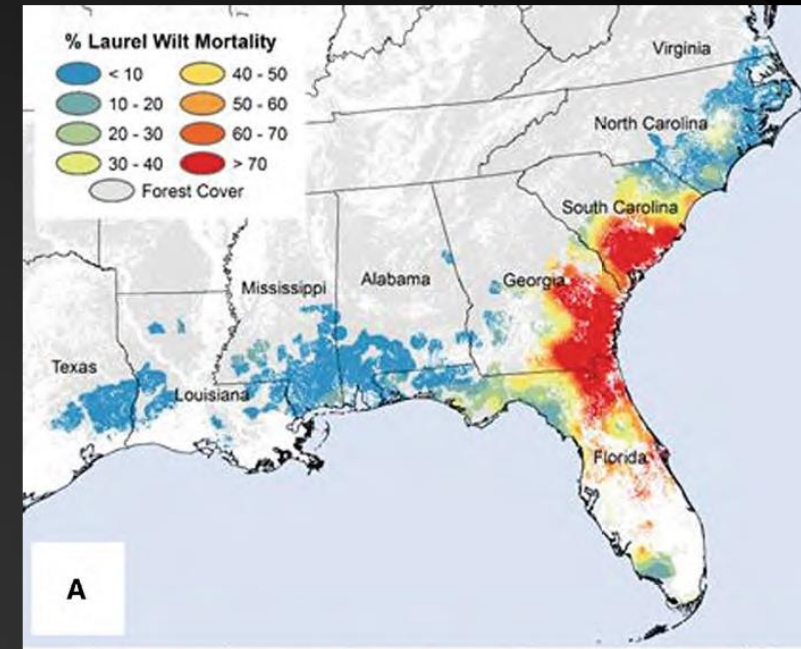
Extension - Forestry  
and Natural Resources

What are some of the impacts of laurel wilt?

# Redbay Mortality in the Coastal Plain

Over 300 million trees killed (Hughes et al. 2017)

- Altered stand structure
- Coarse woody debris
- Hazard trees
- Threatened cultural uses



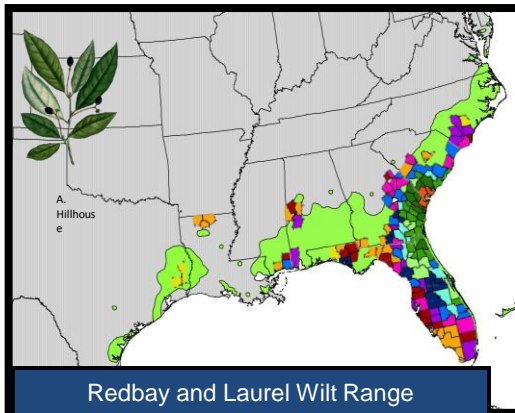
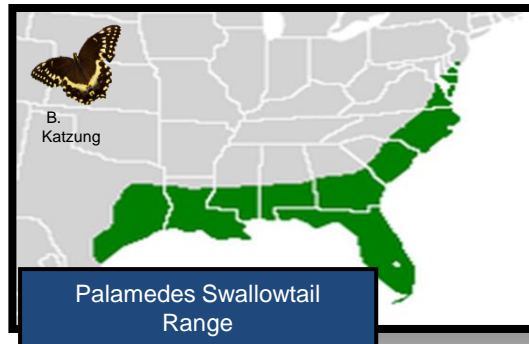
Hughes et al. 2017 Biol Invasions 19: 2143



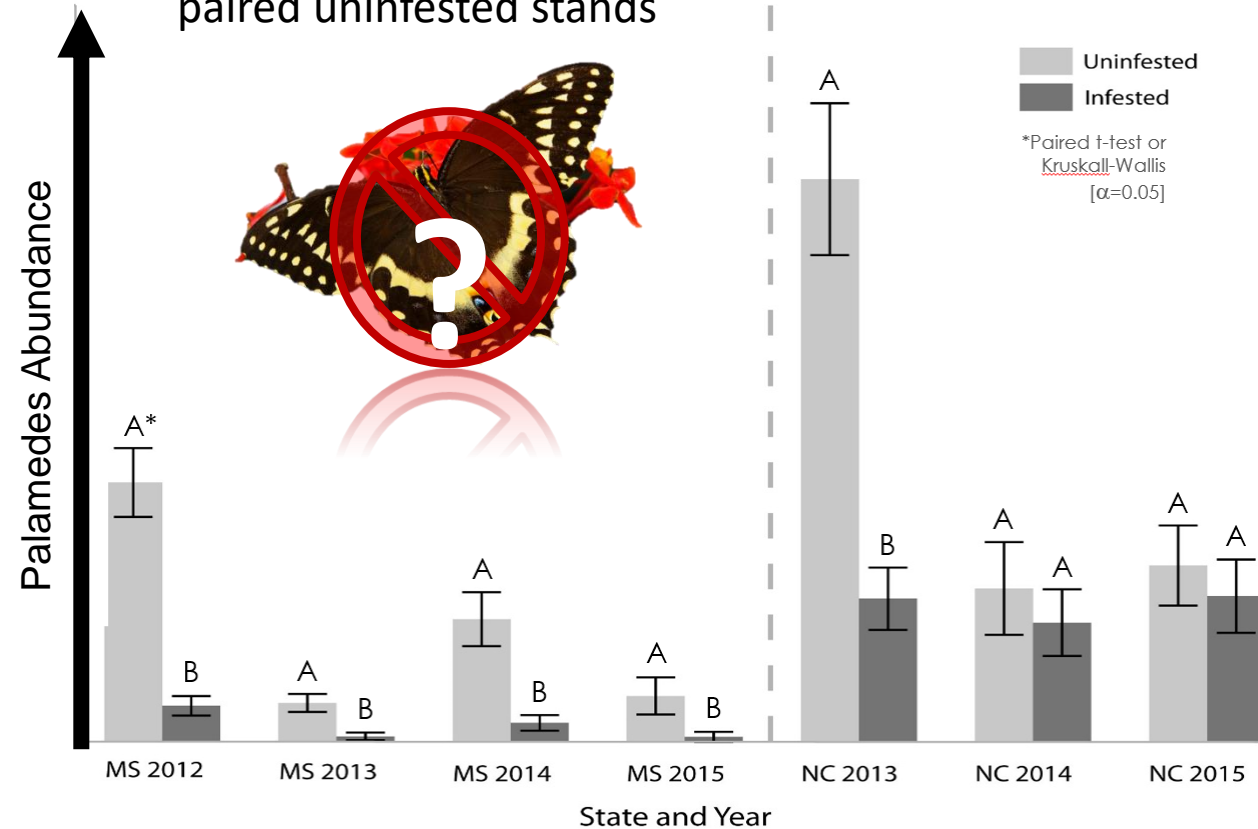
# Examples of At-Risk Species: Palamedes swallowtail

Riggins et al. (2019)  
Biol Invasions 21:493

■ “Pollard transects”

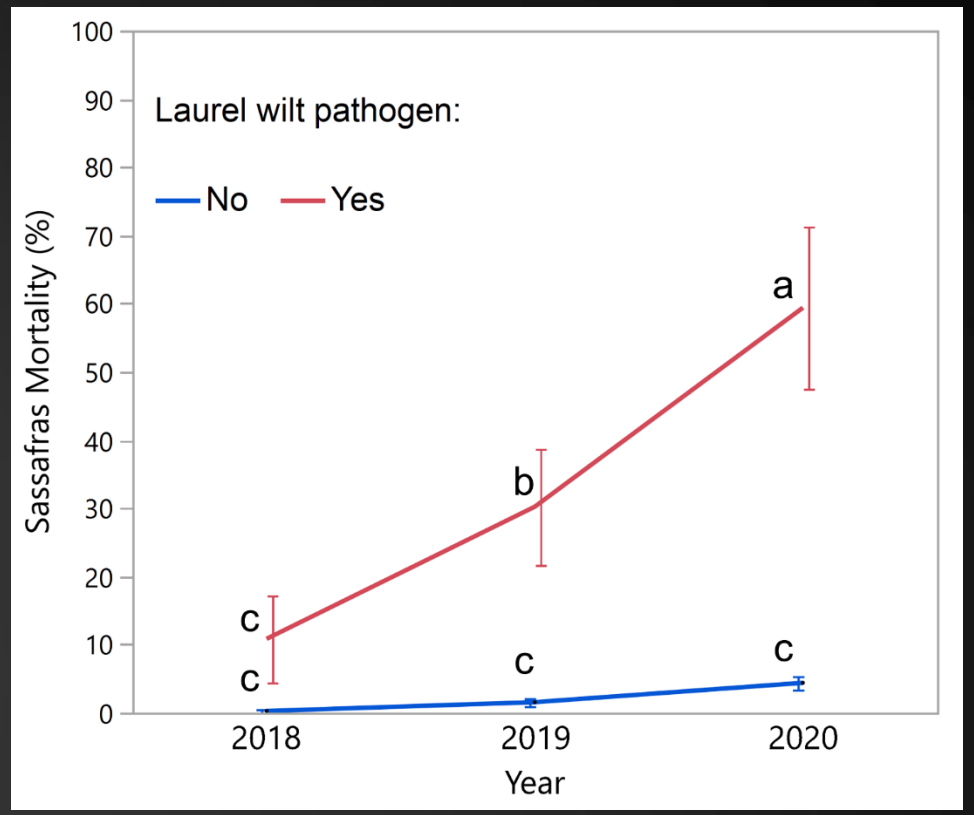
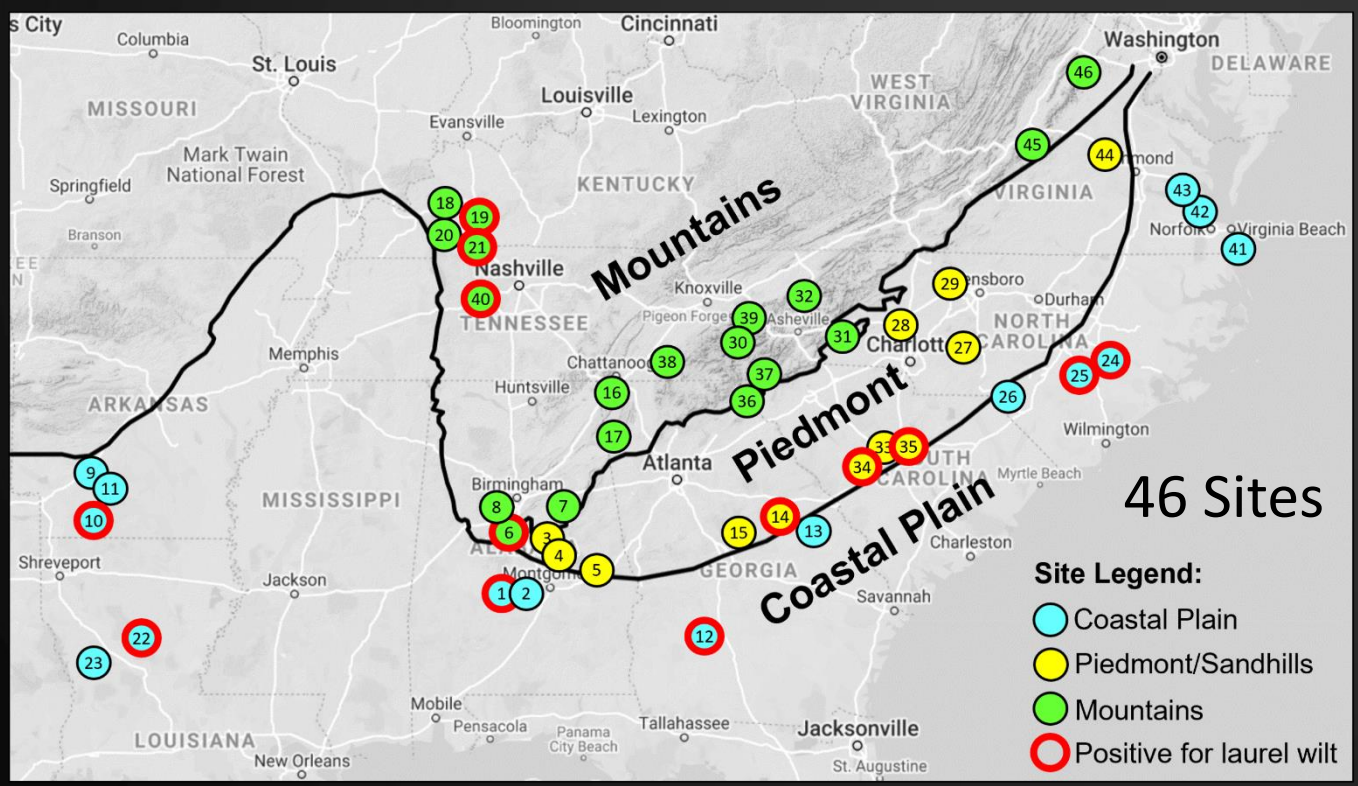


- 3-7 fold decrease in palamedes abundance versus paired uninfested stands



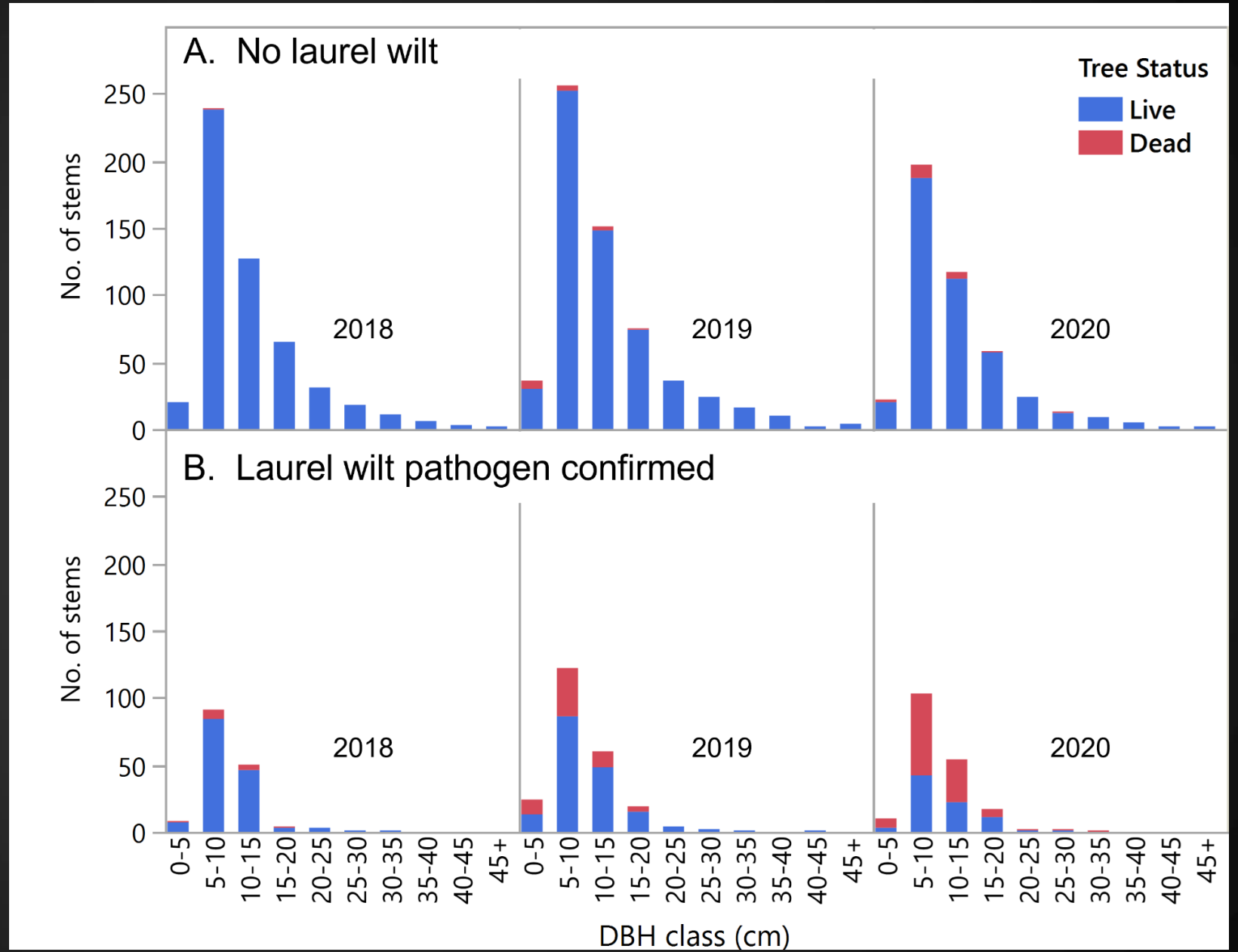
# Spread, Vector Flight Behavior, and Impact of Laurel Wilt in Sassafras Beyond the Gulf-Atlantic Coastal Plain

Albert E. Mayfield III<sup>1\*</sup>, Rabi O. Olatinwo<sup>2</sup>, Jaesoon Hwang<sup>3</sup>, Bryan T. Mudder<sup>1</sup>, Alexandra Blevins<sup>4</sup>, and Stephen W. Fraedrich<sup>5</sup>



- Mean percent mortality of monitored sassafras at diseased sites (n=13) increased from 11% to 60% from 2018-2020
- 100% mortality at 4 sites
- Stands in which laurel wilt not detected: < 5% mortality

# Elevated sassafras mortality evident in all diam. classes



# Found in Leaf Shelters on Spicebush:

## Lepidoptera

- *Papilio troilus*
- 1-2 Tortricidae spp.

## Orthoptera

- *Camptonotus carolinensis*

## Coleoptera

- 1 Elateridae sp.

## Dermaptera

- 1 Forficulidae sp.

## Arachnida

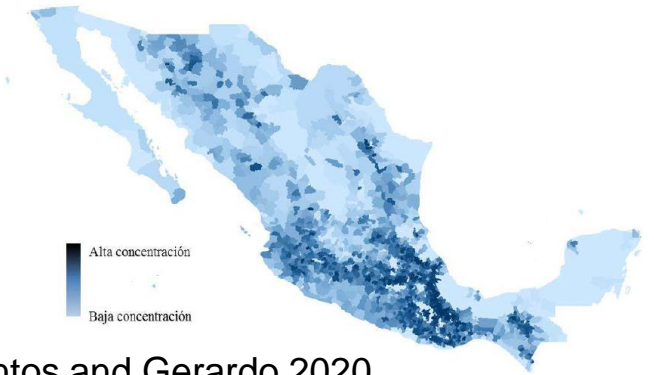
- 2-3 spp.



# Potential Impacts Beyond the US

- Laurel family diversity, abundance much higher (Olatinwo et al 2021)
  - Numerous w/ commercial value for timber, essential oils
- **Central and South America:** 750 species in 26 genera
  - 80 neotropical *Persea spp...* are they susceptible?
- **Asia:** 440 species in 25 genera in China alone
  - Several Asian species exhibit resistance to LW (Shih et al 2018)
- **Australia:** 125 species in 8 genera
- **Africa (Madagascar):** 135 species in 6 genera
- **Europe:**
  - Laurasilva forests of Macaronesian Islands
    - UNESCO World Heritage Site, unique mix of numerous Lauraceae

Figura 1.3: Concentración de ecosistemas vulnerables por municipio



Barrientos and Gerardo 2020



<https://whc.unesco.org/en/list/934/gallery/> © Patrick Werkin



<http://www.discoveringmadeira.com/discover-madeira-laurissilva>

Can you trap the redbay ambrosia beetle?  
When does it fly?

# RAB Flight Traps

- Funnel, panel, sticky
  - Mimic host silhouette
  - Bait with host volatiles
    - Commercial essential oil lures
      - Alpha-copaene is a primary attractant
    - Fresh bolts of host trees
    - Short-range attraction
- See Hanula et al (2016) J. Econ. Entomol. 109: 1196
- No pheromone lures
  - ***Not very effective at early detection of low populations***

Mayfield et al. Journal of Forestry, 2022, 633–645



# RAB Flight Phenology

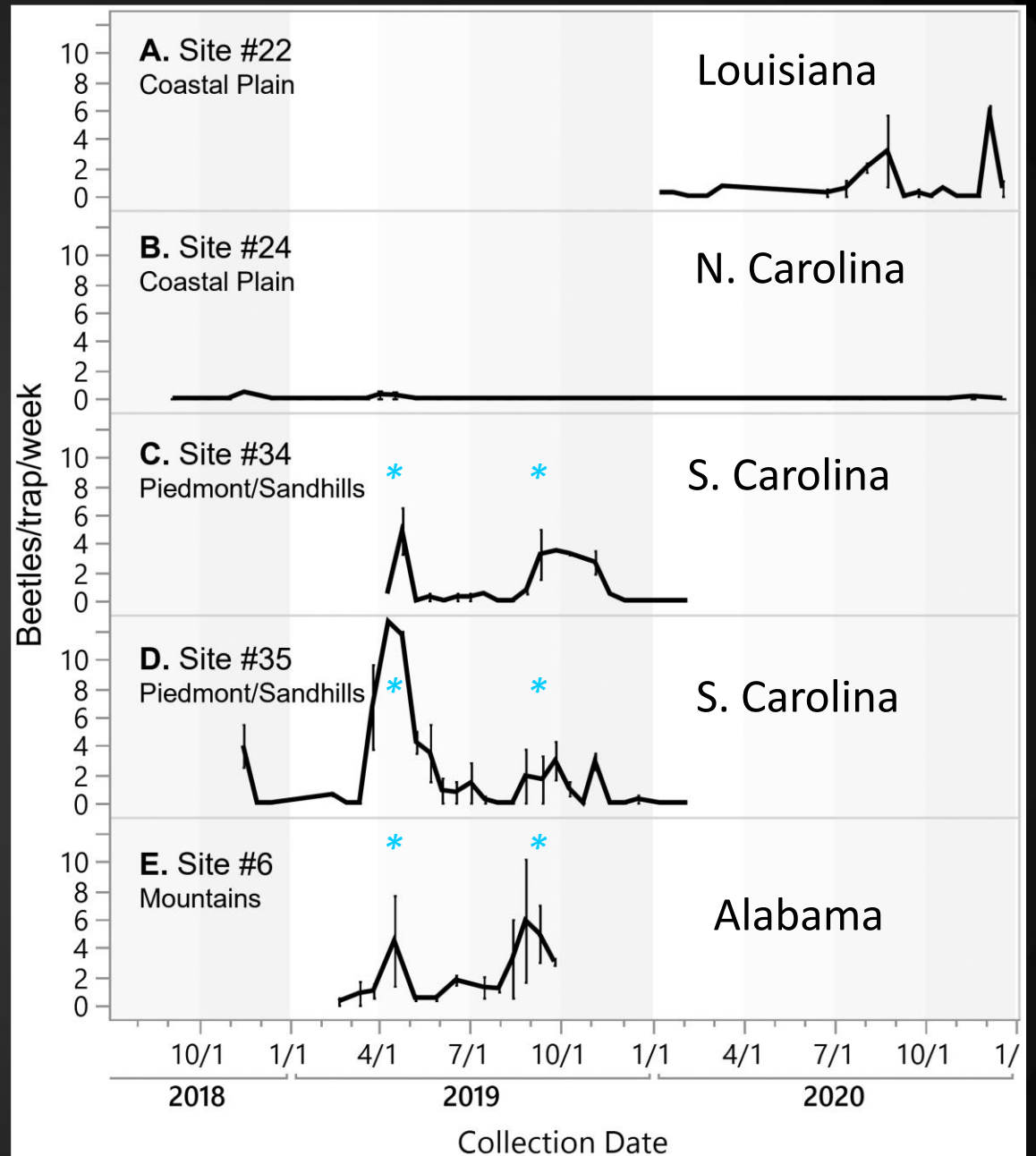
In stands with sassafras

## Coastal Plain

- Occurs nearly year-round
- Minimal Nov - Feb

## Piedmont/Sandhills (SC) and extreme southern Mountains (AL)

- Initial flight as early as Feb
- Two periods of peak catch:
  - April
  - Aug → fall
- \* *Suggestive of 2 generations/yr*



# RAB Flight Phenology

## In western Kentucky

### 1. RAB (2020)\*

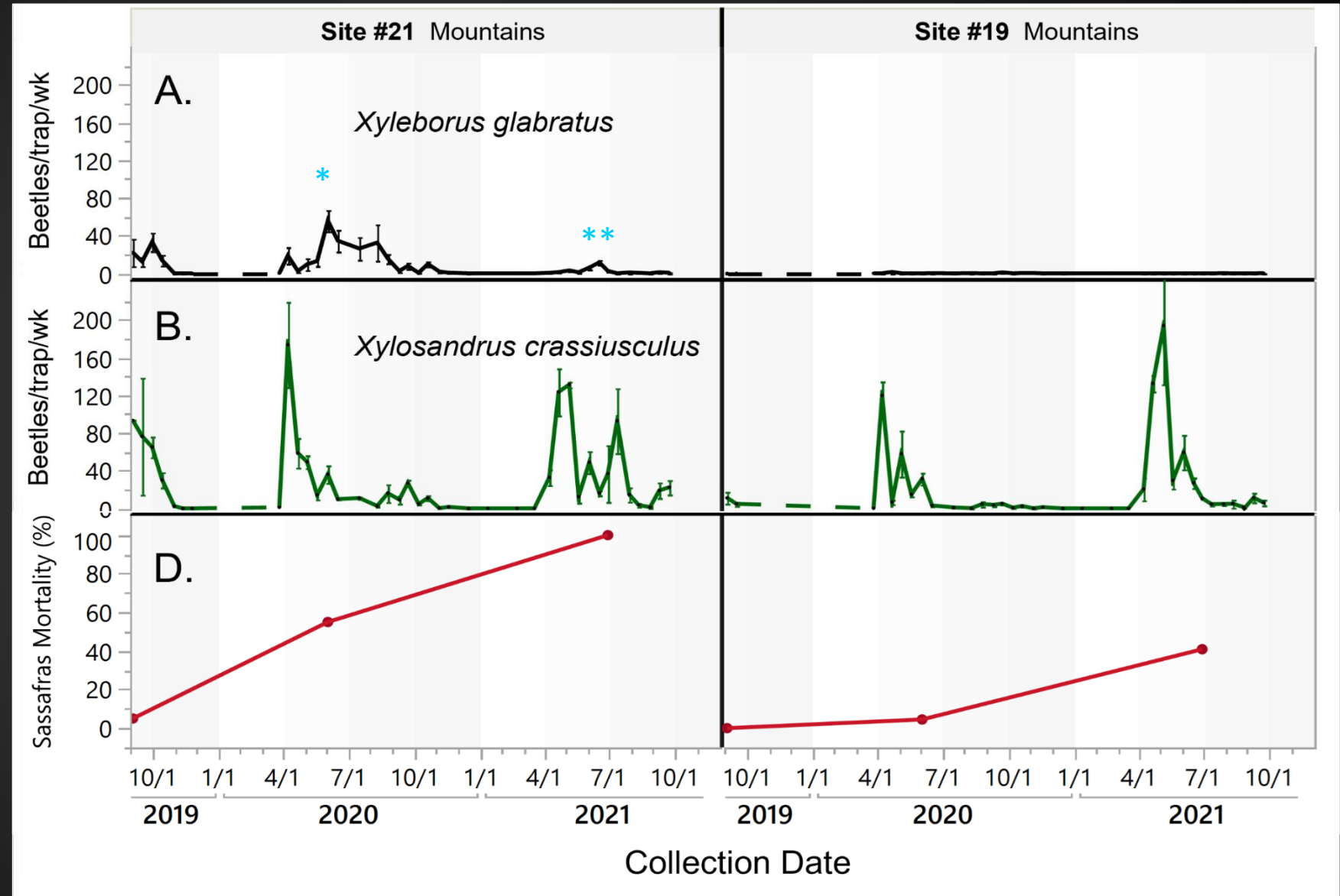
- Began: April
- Peaked: June
- Ended: Nov

### 2. RAB (2021)\*\*

- 10x reduction in catch as sassafras mortality ↑100%

### *Xylosandrus crassiusculus*

- More abundant and persistent



**Table 4.** Total numbers (and percentage) of specimens of ambrosia beetle species captured in  $\alpha$ -copaene-baited flight traps at two sites (19 and 21) in western Kentucky, September 2019–September 2021, with species nonnative to North America (per Gomez et al. 2018) noted.

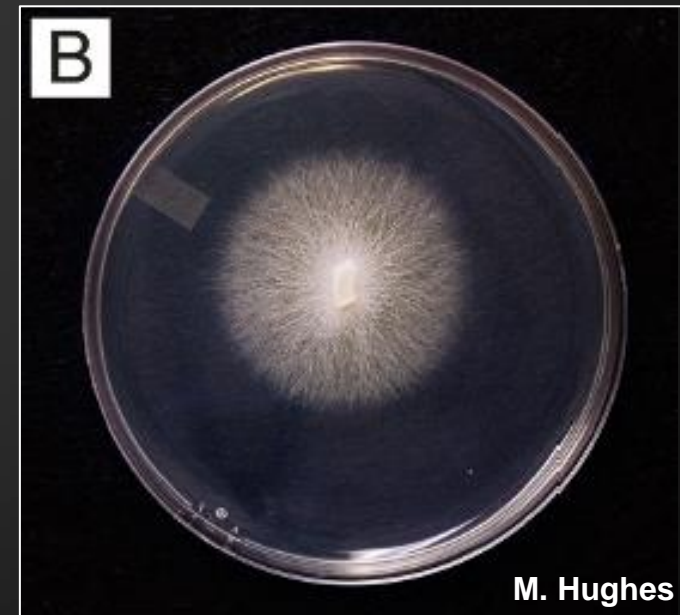
Species	Count	Percent	Nonnative to North America
<i>Ambrosiodmus rubricollis</i> (Eichhoff)	27	0.1	X
<i>Ambrosiodmus tachygraphus</i> (Zimmermann)	6	< 0.1	
<i>Ambrosiophilus atratus</i> (Eichhoff)	24	0.1	X
<i>Cnestus mutilatus</i> (Blandford)	633	2.3	X
<i>Corthylus punctatissimus</i> (Zimmermann)	3	< 0.1	
<i>Cyclorhipidion bodoanum</i> (Reitter)	11	< 0.1	X
<i>Cyclorhipidion pelliculosum</i> (Eichhoff)	151	0.5	X
<i>Dryoxylon onoharaense</i> (Murayama)	179	0.6	X
<i>Euwallacea validus</i> (Eichhoff) or <i>E. interjectus</i> (Blandford)	465	1.7	X
<i>Hylocurus rudis</i> (LeConte, 1876)	68	0.2	
<i>Hylocurus spadix</i> Blackman	6	< 0.1	
<i>Hypothenemus</i> sp. Westwood	94	0.3	
<i>Monarthrum fasciatum</i> (Say)	66	0.2	
<i>Monarthrum mali</i> (Fitch)	46	0.2	
<i>Pityophthorus</i> sp. Eichhoff	16	0.1	
<i>Xyleborinus saxesenii</i> (Ratzeburg)	6,089	21.7	X
<i>Xyleborus affinis</i> Eichhoff	27	0.1	
<i>Xyleborus ferrugineus</i> (Fabricius)	41	0.1	
<i>Xyleborus glabratus</i> Eichhoff	2,489	8.9	X
<i>Xylosandrus crassiusculus</i> (Motschulsky)	14,905	53.2	X
<i>Xylosandrus germanus</i> (Blandford)	2,598	9.3	X
Unidentified	79	0.3	
Total	28,023	100.0	

**RAB comprised < 9% of all amb. beetle spec.**



# Laurel wilt pathogen confirmation

- Field collection of moist sapwood with xylem discoloration
- Isolate fungus on selective media
- Morphological ID (Harrington et al 2008 Mycotaxon 104:399)
- DNA extraction and PCR amplification (Dreaden et al 2014 Plant Dis 98:379)
- LAMP assay for DNA-based field confirmation (Caterina Villari, UGA)
- NPDN network has a protocol for diagnostic labs (Harmon et al 2014 NPDN)



Are there management options  
for Laurel Wilt?

# Potential Management Tactics

- Don't transport firewood
- Don't sell/transport symptomatic plants
- Sanitation: chip, cover, burn (Spence et al. 2013)
  - May not kill all beetles, but could help reduce local populations if coordinated area-wide
  - Trench to sever root connections
- Chemical control
  - Insecticide options of limited/no efficacy
  - Fungicide infusion demonstrated in redbay (Mayfield et al 2008) and sassafras (Johnson et al. 2023)
- Semiochemicals
  - SPLAT verbenone reduces attacks on redbay trees (Martini et al. 2020)
- Host Resistance
  - Propagation of resistant redbay (Hughes and Smith 2014)
  - “Lingering Sassafras” STDP project (Dreaden et al. 2020)



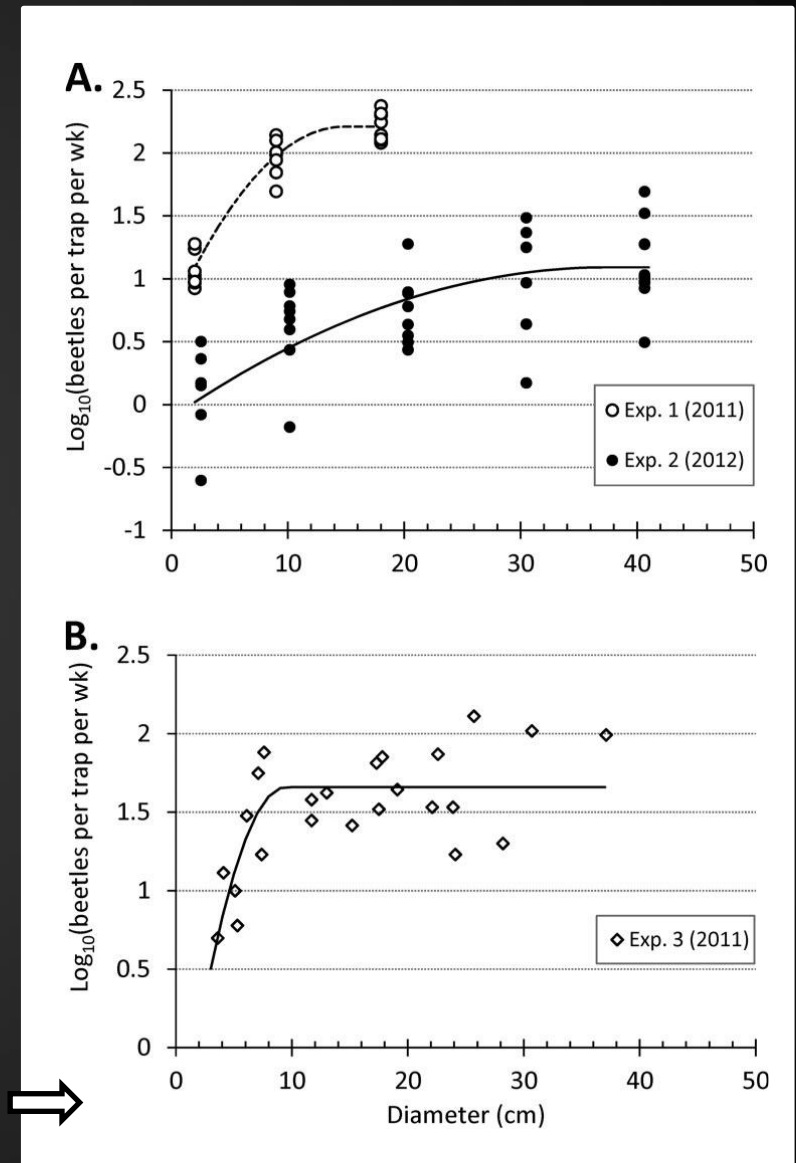
# Lingering Sasafras Survey, Statesboro, GA, Aug 2020



Trees over 3" DBH are rare in areas with 10+ years of laurel wilt.

- RABs are more likely to land on larger trees than smaller ones
- Use stem silhouette as a visual host-finding cue

Mayfield and Brownie 2013 Env. Entomol. 42(4): 743-750



# Efficacy of Propiconazole for Prevention of Sassafras Mortality from Laurel Wilt Disease Using a Tree Micro-Injection and Micro-Infusion Delivery System

By C.W. Johnson, R.O. Olatinwo, J. Hwang, and C. Brownie

## QUIK-jet Kit



## TREE IV Systems in Use



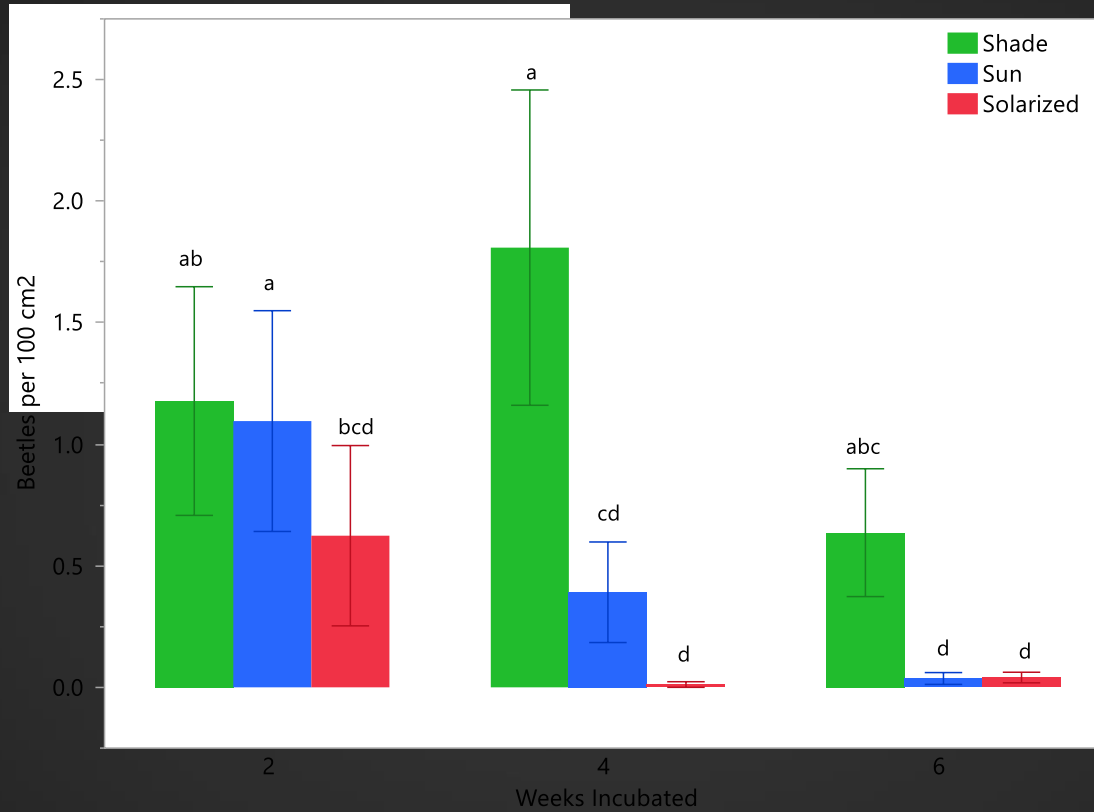
- Results indicate that propiconazole provides adequate protection against laurel wilt in healthy sassafras for at least one growing season using either system
- TREE I.V. infusion slower (avg 30 min) than QUIK-jet (estimated as <5 min), but watch for heart rot with QUIK-Jet (deeper application)



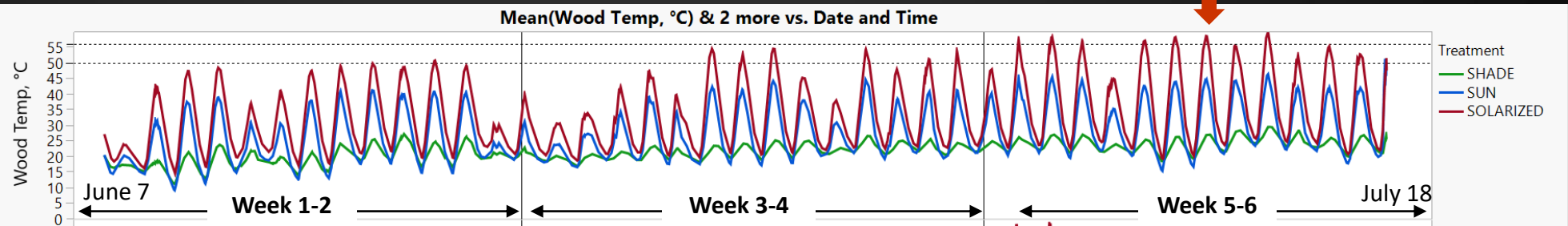
Proportion of trees by crown health category at the conclusion of the first growing season (2020)

# Solarization to reduce potential vector emergence?

A. Mayfield, R. Woodbridge, R. Olatinwo, B. Mudder, B. Girgenti (unpublished)








- Ambrosia beetle emergence (all spp.) significantly reduced after 4- 6 weeks in both SUN and SOLARIZED treatments
- Wood temp exceeded 56°C in July 2023 in east TN under SOLARIZED (clear plastic)



# Continuing Education Credits, anyone?

## True or False:

-  Laurel wilt is a canker disease that affects mountain laurel and Rhododendron. **False**
-  2. Numerous tree and shrub species in the laurel family (Lauraceae) native to North America are susceptible to damage by the laurel wilt pathogen. **True**
-  3. In general, ambrosia beetles are insects that bore into wood, inoculate the walls of their tunnels with fungal spores, and grow those fungi as a food source. **True**
-  4. The geographic distribution of laurel wilt disease is currently limited to the natural range of redbay in the US southeastern Coastal Plain. **False**
-  5. The laurel wilt pathogen can be carried by insects other than the redbay ambrosia beetle, but the status of these insects as disease vectors in natural forests is uncertain. **True**



# THANKS!

## Bud Mayfield

### USDA Forest Service SRS

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*Harringtonia lauricola*
- Littleleaf Disease
- Oak Wilt  
*Bretziella fagacearum*
- Phytoplasmas (aka Yellows)
- Thousand Cankers Disease  
*Geosmithia morbida*

**Laurel Wilt**  
*Harringtonia lauricola*

Laurel wilt is caused by *Harringtonia lauricola*, a fungal pathogen transmitted by the ambrosia beetle *Xyleborus glabratus*. This beetle and fungus are native to southern Asia, and the beetle was first detected in Georgia in 2002. This disease impacts several trees in the family Lauraceae, including redbay, sassafras, pondspice, bay laurel, and avocado. Extensive mortality to redbay has occurred in coastal areas from North Carolina to Mississippi, with detections also occurring inland in Alabama, Louisiana, Kentucky, Tennessee, Texas, Georgia, and Arkansas. Infected trees generally die within months, often showing a full crown of dead, brown leaves. There is no cure once a tree has this disease. Preventing the spread of this disease by transporting firewood is of the utmost importance, as management options are limited. Current management involves sanitation (chipping, burning) of infested material, and chemical treatments may be effective for high value trees.

Ronald Billings, Texas Forest Service, Bugwood.org

Publications | Webinars | Resources

- Biology, ecology, and management of laurel wilt and the redbay ambrosia beetle  
*University of Florida and Southern Regional Extension Forestry, 2016*
- Homeowner Detection of and Recommendations for Mitigating Redbay Ambrosia Beetle – Laurel Wilt Disease on Redbay and Avocado Trees in the Home Landscape  
*University of Florida, 2010*
- New disease epidemic threatens redbay and other related species  
*Georgia Forestry Commission, SC Forestry Commission, Florida Dept. of Agriculture, South Carolina Dept. of Forestry, USDA Forest Service*

USDA | Southern Regional Extension Forestry

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# Pest Alert

United States  
Department of Agriculture  
Forest Service  
Southern Region  
State and Private Forestry  
RS-PR-01-19  
October 2019

## Laurel Wilt

Laurel wilt is a disease of woody plants in the laurel family (Lauraceae). Hundreds of millions of redbay (*Persea borbonia*) trees have been killed by laurel wilt in the southeastern Atlantic Coastal Plain region of the United States (US). The disease has also killed large numbers of sassafras (*Sassafras albidum*) trees in forests and landscapes, and avocado (*Persea americana*) trees in commercial production. As of October 2019, laurel wilt was known to occur from Texas to North Carolina, south through Florida and north to Kentucky. Laurel wilt is expected to continue spreading through sassafras in the eastern US, and is a potential threat to California bay laurel (*Umbellularia californica*) in the western US and to Lauraceae species elsewhere in the world.

Laurel wilt is caused by a fungus (*Raffaella lauricola*) that is carried by an insect, the redbay ambrosia beetle (*Xyleborus glabratus*). These organisms are native to Asia, are invasive pests in North America, and can be easily transported to new areas by movement of infested wood products and firewood.

### Symptoms

In early stages of laurel wilt, trees exhibit drooping, discolored leaves (Fig. 1A). In deciduous hosts like sassafras, leaves soon fall from the tree leaving branches bare (Fig. 1B). In contrast, evergreen hosts like redbay will retain reddish or brownish leaves for many months. Diseased trees typically exhibit a dark discoloration in the outer sapwood that runs with the direction of the grain (Fig. 1C). In sassafras, some trees may produce sparse, stunted leaves in the spring following the initial year of infection (Fig. 2).

Redbay ambrosia beetles (Fig. 3) are extremely small (~2 mm long), spend most of their life cycle inside the tree, and are not easily seen in the field. Entrance holes (<1 mm diameter) may be seen on smooth bark or on the wood surface when bark is removed. Many ambrosia beetle species produce fine, light-colored sawdust that may be seen at the bark surface, but neither sawdust nor beetle holes are signs specific to laurel wilt.

### Disease Process

Spores of the laurel wilt fungus are carried in the mouthparts of the redbay ambrosia beetle. Host trees typically become infected when a female beetle lands on a stem or branch and bores into the wood. The fungal spores enter the water-conducting cells and spread through trees, causing a reaction that restricts water flow. Trees can die within a few weeks or months after infection. The redbay ambrosia beetle will attack



Fig. 1. Laurel wilt symptoms in sassafras. A) Drooping leaves in the early stages of the disease. B) Diseased trees that have recently dropped their leaves. C) Bark removed to show dark discoloration on the surface of the sapwood.

<http://southernforesthealth.net/diseases/laurel-wilt>