Progression of Laurel Wilt Disease in Georgia 2009-2011

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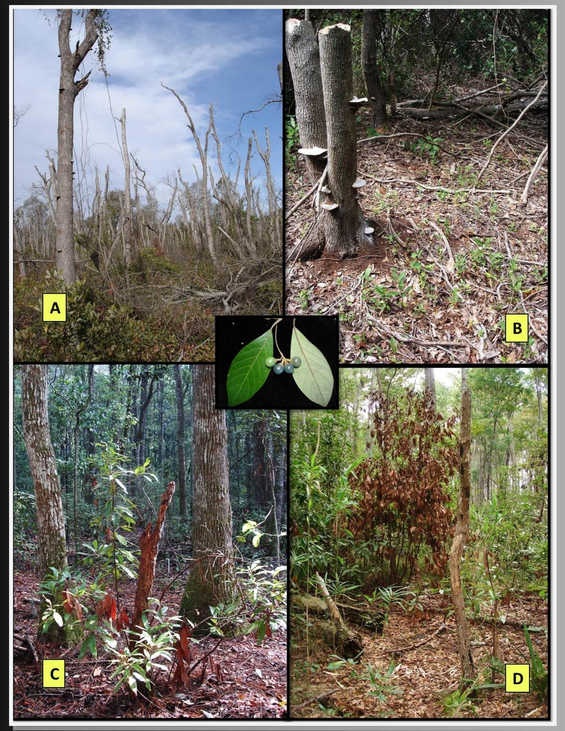
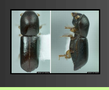
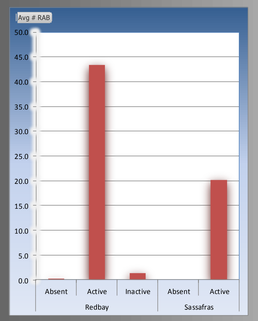


Laurel wilt in redbay: *A) Total mortality and collapse in a dense stand of large redbay, B) regeneration after breakup, C) sprouts around stump, D) stump sprouts killed by laurel wilt after first wave.*

Leaf symptoms: Healthy to faded chocolate brown



Redbay ambrosia beetle (RAB), Xyleborus glabratus



Mean # RAB trapped by disease stage & host, Aug 2009 & 2010

Background

Laurel wilt disease (LWD), caused by the fungus *Raffaelea lauricola* and vectored by the redbay ambrosia beetle (RAB), *Xyleborus glabratus*, has spread rapidly throughout the coastal maritime forests in Georgia, killing nearly all large redbay (*Persea borbonia*) trees in its path. As this disease spreads inland, it is moving into more diverse habitats, often with scattered and smaller redbay and sassafras. Past surveys and research have revealed much about LWD, but much remains to be learned about the disease process in redbay and especially sassafras, extent of spread, and impacts on host plants.

Objectives

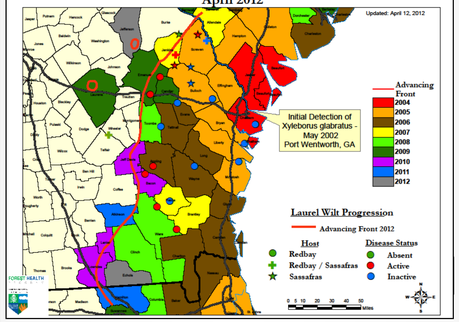
The goals of the 2009 GA laurel wilt disease evaluation project were to:

- Document the advancing front of LWD in GA,
- Establish a methodology to document the disease process and long term effects on hosts and other vegetation,
- Document the rate of local spread in redbay and sassafras on diverse sites,
- Learn the fate of redbay after the initial epidemic, and
- Monitor abundance of RAB in varying disease stages.

Methods

- The LWD advancing front and host species affected were documented through forester observations, landowner contacts, and directed road surveys.
- Standardized permanent plots were installed in redbay and sassafras habitats to document the disease process, vegetation changes, and host regeneration status.
- Seventeen redbay plots with four 10 m x 10 m modules and seven smaller sassafras plots were established in the spring of 2009 and revisited 6 times through spring 2012.
- Redbay plots were established in three disease-status categories: LWD "absent," "active," and "inactive" at initiation. Sassafras plots were established on absent and active sites.
- Lindgren funnel traps baited with manuka oil were deployed during August 2009 and 2010 to monitor relative abundance of RAB adjacent to redbay and sassafras plots with varying stages of disease development.

Georgia Laurel Wilt Disease Monitoring Plots and Disease Front
April 2012



Progression of Disease Status in Laurel Wilt Monitoring Plots*

Plot ID#	Establish Wint/Spr 2009	Summer 2009	Spring 2010	Summr/Fall 2010	Spring 2011	Fall 2011	Wint/Spring 2012	Rb	Sas	County
111	1/30/09	8/11/09	2/6/10	9/21/10	3/29/11	9/27/11	2/17/12	x		Emanuel
112	2/10/09	8/11/09	4/14/10	9/21/10	4/20/11	9/27/11	2/17/12	x	x	Jenkins
113	2/12/09	8/9/09	3/14/10	9/19/10	3/27/11	9/26/11	2/15/12	x		Bacon
114	4/6/09	8/12/09	2/6/10	9/21/10	3/28/11	9/27/11	2/17/12	x		Emanuel
115	6/23/09	8/8/10	2/4/10	9/18/10	3/27/11	9/25/11	2/12/12	x		Ware
121	2/3/09	8/11/09	4/14/10	9/23/10	4/14/2011	9/23/11	3/29/12	x	x	Screven
122	2/4/09	8/13/09	3/16/10	9/19/10	3/28/11	9/26/11	2/15/12	x		Bulloch
123	2/4/09	8/9/09	3/16/10	9/21/10	3/28/11	9/26/11	2/15/12#	x		Tattnall
124	2/12/09	8/12/09	3/14/10	9/19/10	3/28/11	9/26/11	2/15/12	x		Appling
125	3/24/09	8/8/09	2/4/10	9/18/10	3/27/11	9/25/11	2/12/12#	x		Brantley
126	3/25/09	8/8/09	2/4/10	9/18/10	3/27/11	9/25/11	2/12/12	x		Pierce
131	2/7/09	8/14/09	2/3/10	9/16/10	3/26/11	9/24/11	2/13/12	x		Bryan
132	2/8/09	8/9/09	2/3/2010#	9/16/2010#	3/26/2011#	9/24/2011#	2/11/2012#	x		Chatham
133	2/22/09	8/14/09	2/3/10	9/16/10	3/26/11	9/24/11	2/13/12	x		McIntosh
134	2/13/09	8/9/09	2/6/10	9/16/10	3/26/11	9/27/11	2/17/12	x		Bulloch
136	4/30/09	8/8/09	3/14/10	9/18/10	3/27/11	9/25/11	2/12/12	x		Wayne
211a	5/14/09	8/11/09	4/14/10	9/21/10	4/20/11	9/27/11	3/27/12	x	x	Jenkins
211b	5/14/09	8/11/09	4/14/10	9/21/10	4/20/11	9/27/11	3/27/12	x	x	Jenkins
212a	5/1/09	8/10/09	4/15/10	9/23/10	4/15/11	9/28/11	3/31/12		x	Jenkins
212b	5/1/09	8/10/09	4/15/10	9/23/10	4/16/11	9/28/11	3/31/12		x	Jenkins
213	5/14/09	8/11/09	4/19/10	9/23/10	4/19/11	9/29/11	3/31/12		x	Jenkins
221	5/13/09	8/10/09	4/15/10	9/23/10	4/15/11	9/28/11	3/29/12		x	Bulloch
222	5/13/09	8/10/09	4/17/10	9/23/2010#	4/20/2011#	9/29/2011#	2/29/2012#		x	Screven
223	5/13/09	8/11/09	4/14/10	9/23/10	4/19/11	9/29/11	3/29/12	x	x	Screven
224	5/2/09	8/6/09	xx	9/23/10	xx	xx	xx		x	Bulloch
311a	5/27/09	8/12/09	5/10/10	xx	xx	xx	xx	x	x	Wheeler
311b	5/27/09	8/12/09	5/10/10	xx	xx	xx	xx			Wheeler

Key						
*	Absent	Adjacent	1st Sympt	Active	Inactive	Sas added	Sas added
	# Inactive plots with live host >1" DBH still present					

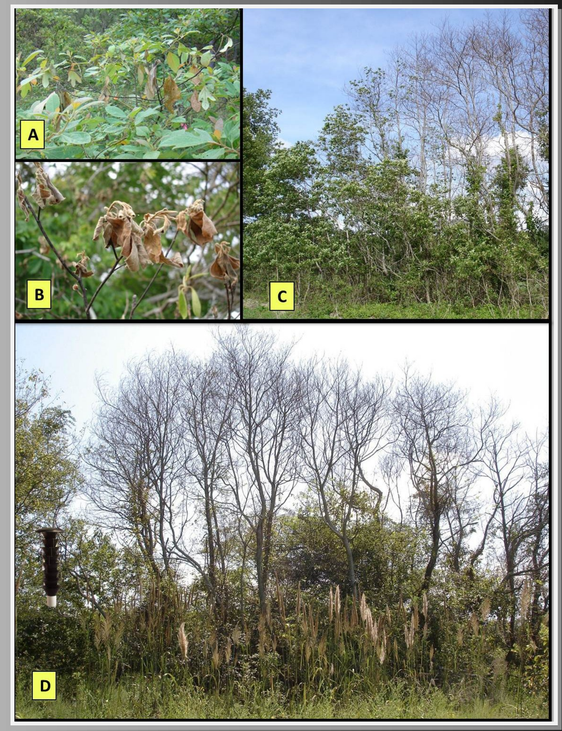
Absent=no known LW near, **Adjacent**=disease near, but not in plot, **1st Sympt**= first few LW symptomatic trees observed in plot, **Active**=multiple trees with LW symptoms, ambrosia beetles active, **Inactive**=disease moved through area, RAB emerged, host trees have fallen apart. **Sas added**=extra module installed to include more Sas; color indicates redbay/Sas plot association. **Rb**=redbay, **Sas**=sassafras. **#**=plots still have host >1" DBH. **x**=host species in plot. **xx**=not monitored.

Results

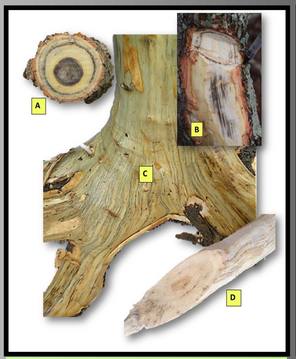
- LWD moved more slowly north-westward 2009-11, but killed large numbers of redbay trees behind the front.
- Numerous sassafras thickets and scattered trees have been killed by LWD, in areas with and without redbay.
- LWD was discovered in several isolated areas, each about 40 miles ahead of the known disease front.
- Vegetation change is greatest on sites with dense, mature redbay in the canopy.
- When large redbay trees died and fell apart, opening the canopy, abundant regeneration often resulted.
- LWD usually starts in larger sassafras trees and moves rapidly in dense thickets, apparently through interconnected lateral roots, but smaller trees remain alive at the perimeter.
- Epicormic shoots develop on some diseased sassafras.
- Ambrosia beetle frass is most often observed at the base of sassafras trees infected with LWD.
- Few RAB were caught in absence of active LWD; greatest numbers were caught on sites with many recently killed trees; a few were caught on inactive sites.
- In 2010, many RAB were trapped beside a thicket of large sassafras, in the absence of redbay.

Conclusions

- LWD progression has slowed in areas of sparse host and is transitioning to sassafras along the NW front.
- Additional heavy redbay mortality is likely in south GA.
- LWD is generally initiated in isolated trees and does not expand rapidly until a couple years later.
- Disease progress is most rapid on sites with large, dense host and slower on sites with small, sparse host.
- RAB can infect and produce brood in sassafras.
- LWD and RAB are present at low levels in redbay regeneration many years after the initial epidemic passes.
- Long distance spread of LWD continues to occur, emphasizing a need for more effective education aimed at limiting the movement of host material harboring RAB.
- This project has provided important details on LW disease development in redbay and sassafras.



Laurel wilt in sassafras: *A) Initial leaf symptoms, B) short-lived dead leaves, C) rapid spread through thicket, D) one year following rapid mortality and RAB trap position.*



Black staining in sassafras: *A&B) Stem, C) root flare D) root.*

RAB in sassafras: *A) Frass at base, B) galleries, C) emergence.*