

Beyond redbay: Monitoring spread and impact of laurel wilt in sassafras beyond the Gulf-Atlantic Coastal Plain

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INTRODUCTION

- Laurel wilt is a vascular disease caused by a fungus (*Raffaelea lauricola*) and spread by an insect vector, the redbay ambrosia beetle (*Xyleborus glabratus*). The disease has killed hundreds of millions of redbay (*Persea borbonia*) trees and other lauraceous species in the Gulf-Atlantic Coastal Plain.
- In recent years, the laurel wilt vector and pathogen have begun spreading into the Piedmont and Mountain regions of the southeastern U.S. (where redbay is absent) using sassafras (*Sassafras albidum*) as a host (Fig. 1).
- Diseased sassafras trees exhibit wilted foliage and vascular discoloration, but unlike redbay, they shed their wilted leaves quickly, making visual detection difficult (Fig. 2).

OBJECTIVES

- Establish a sentinel plot network by which spread of laurel wilt in sassafras can be detected, monitored & characterized.
- Monitor plots for sassafras crown health, mortality, and pathogen presence, and a subset of plots for *Xyleborus glabratus* flight phenology.
- Provide managers with data and information to supplement the laurel wilt range map, and researchers with locations to potentially locate disease-resistant sassafras in the future.

METHODS

- Identify stands with sassafras in the Coastal Plain, Piedmont/Sandhills, and Mountains regions, targeting 3-8 sites per state in 9 states (46 sites total as of 2019) (Fig. 3).
- Choose sites within 1-5 mi. of a *Xyleborus glabratus* risk-of-entry point (campground, hardwood mill, known infestation).
- Tag and monitor 20-30 live sassafras trees (≥2" dbh) per site for crown health and survival. Sample sapwood of suspect trees for pathogen confirmation in the lab.
- At a subset of sites, monitor for *Xyleborus glabratus* using 2 flight traps baited with alpha-copaene lures, checked bi-weekly for 8 weeks (July-Oct window). Conduct year-round trapping at selected sites.

Fig. 1. Distribution of laurel wilt (colored counties) and sassafras (green shading).

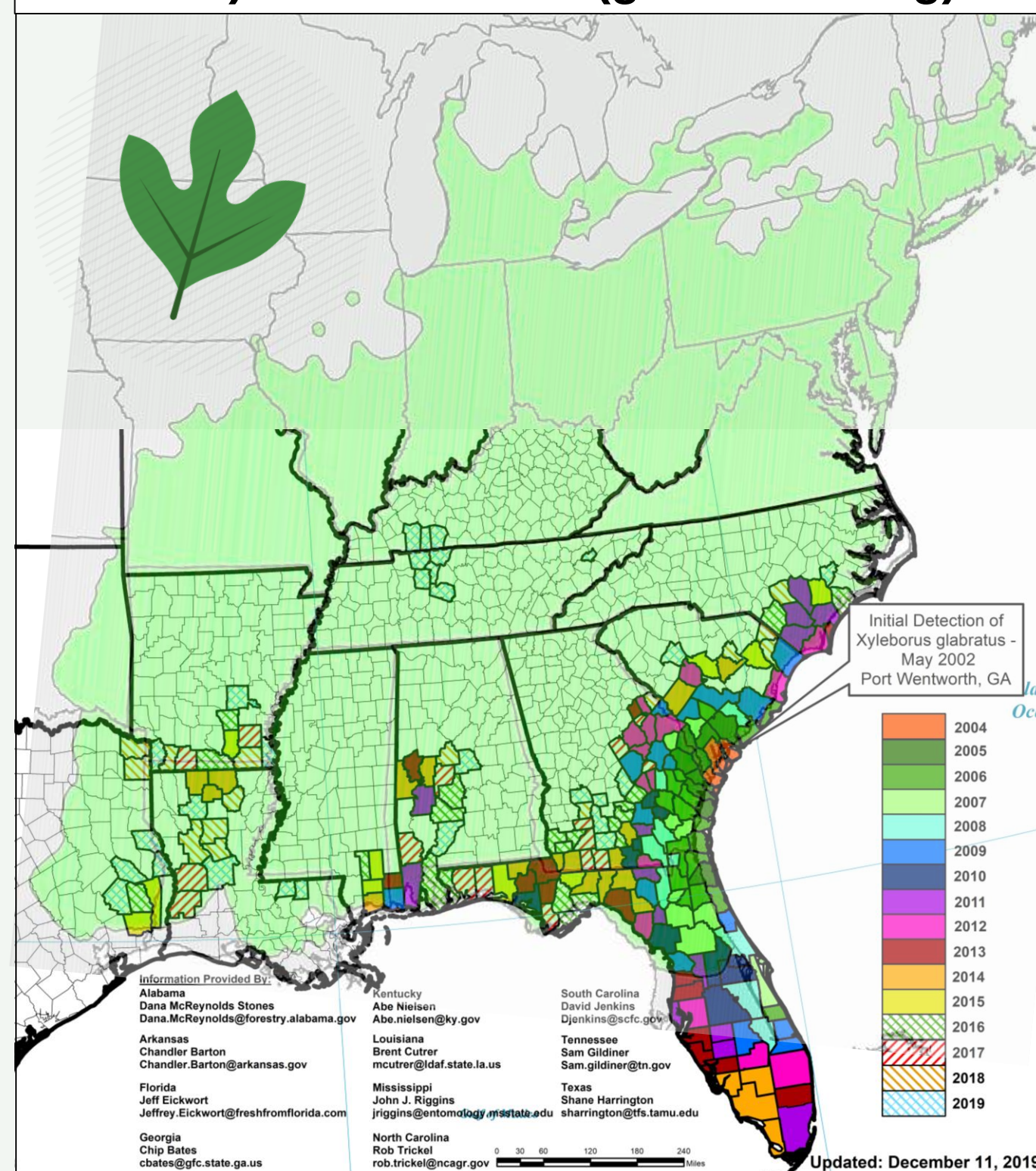


Fig. 2. Laurel wilt symptoms include wilted foliage (a), discolored sapwood (b), and rapid leaf drop (c).



Fig 3. Locations of 46 sassafras sites for monitoring laurel wilt.

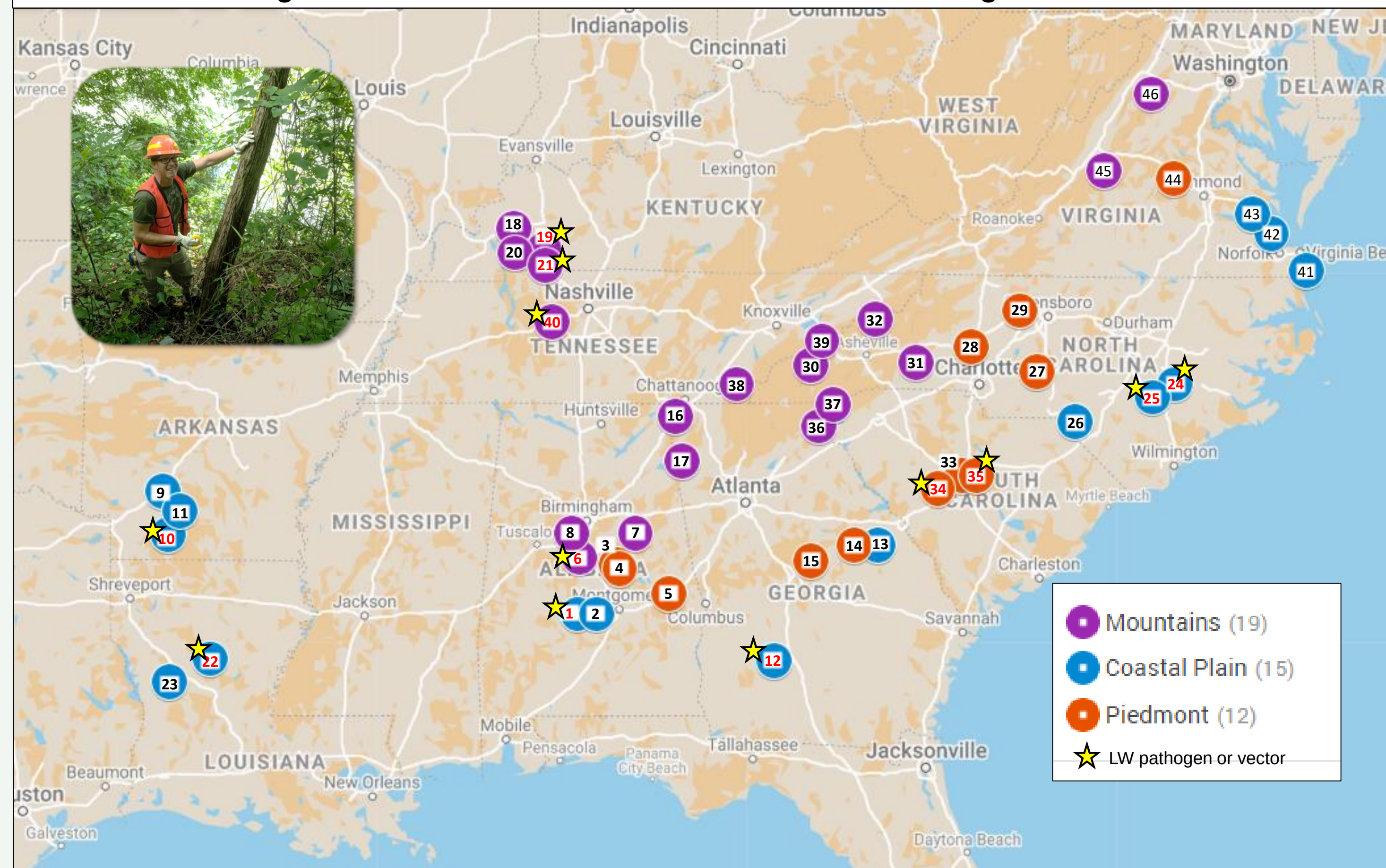
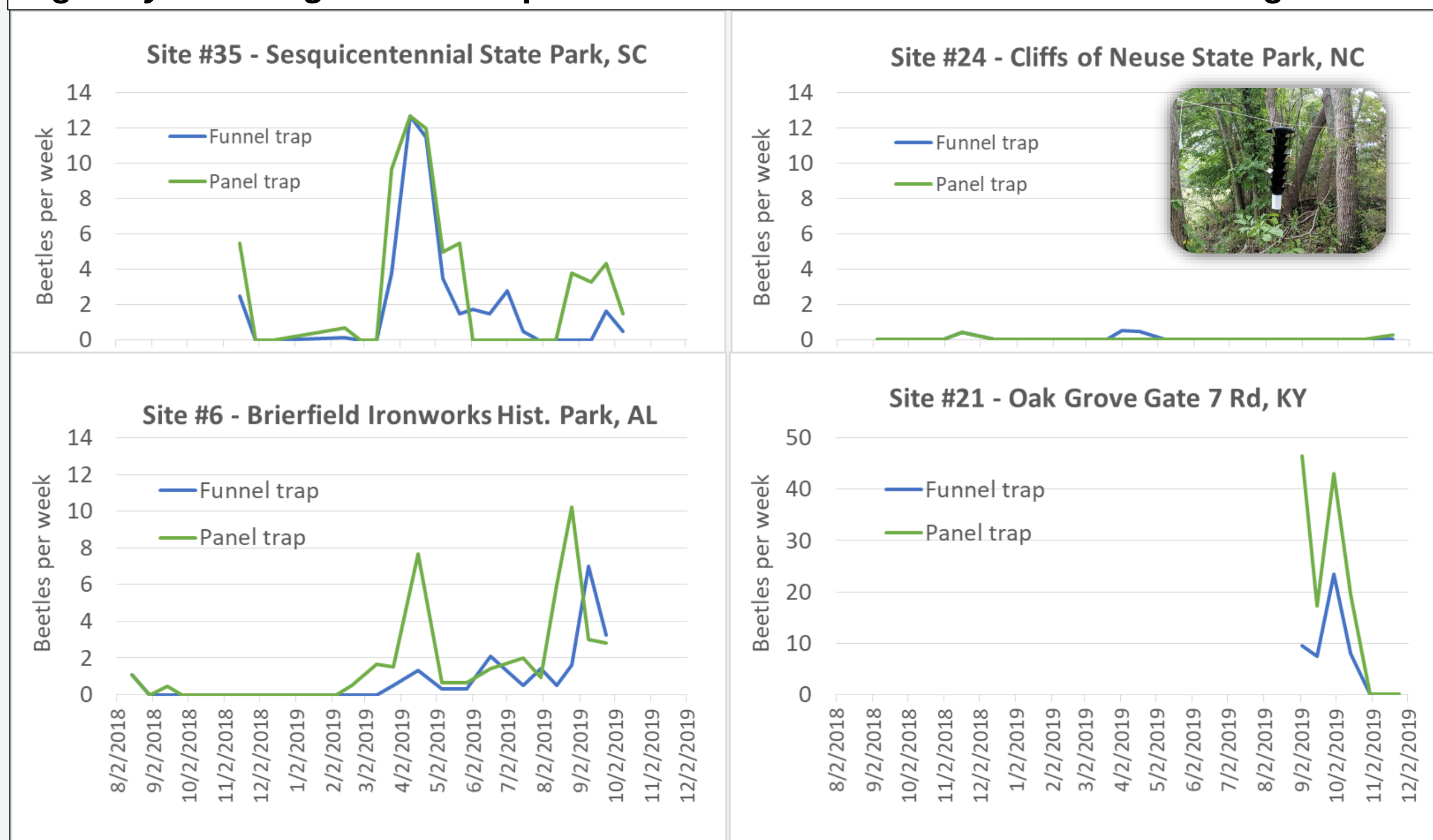


Table 1. Summary data for tree counts, crown health, vector trapping, and laurel wilt pathogen confirmation at 46 sites with sassafras in the southeastern U.S.

Map Code	State	Site	No. tagged trees monitored	2018	2019	Proportion of trees with <50% healthy foliage	2018	2019	Trapping site	2018	2019	Xyleborus glabratus trapped	2018	2019	Laurel wilt pathogen confirm.
1	AL	Chilton County	14	12	0.0%	50.0%									X
2	AL	Lowndes County WMA	26	26	0.0%	3.8%			X	X					
3	AL	Coosa Co - Private	19	19	0.0%	0.0%									
4	AL	Coosa Co - WMA Forever Wild	12	12	0.0%	0.0%									
5	AL	Kiesel Park	21	21	0.0%	14.3%									
6	AL	Brierfield Ironworks Hist. Park	12	12	75.0%	100.0%			X	X		X	X		X
7	AL	Talladega National Forest	20	20	0.0%	5.0%									
8	AL	Tannehill State Park	30	30	6.7%	0.0%									
9	AR	Clark/Ross Found.	20	20	0.0%	0.0%				X					
10	AR	Logoly State Park	20	20	0.0%	30.0%			X	X					X
11	AR	Poison Springs State Park	20	20	0.0%	0.0%			X	X					
12	GA	Highway 300-Red Oaks	25	25	0.0%	16.0%			X	X					X
13	GA	Jefferson County Quaker Road	16	-	25.0%	-									
14	GA	Hamburg State Park	17	17	0.0%	17.6%			X	X					
15	GA	Sassafras Hill	26	26	11.5%	11.5%									
16	GA	Cloudland Canyon State Park	20	25	0.0%	0.0%									
17	GA	Friday Road	20	20	0.0%	5.0%									
18	KY	CR 128 Hedgerow	-	20	-	15.0%				X					
19	KY	Jeffers Bend	-	22	-	4.5%			X			X			X
20	KY	Lake Barkley	-	24	-	0.0%									
21	KY	Oak Grove Gate 7 Road	-	20	-	25.0%			X			X	X		X
22	LA	Catahoula District KNF	6	6	0.0%	50.0%			X	X		X	X		X
23	LA	Kisatchie District KNF	9	4	0.0%	0.0%			X	X					
24	NC	Cliffs of Neuse SP	23	23	0.0%	13.0%			X	X		X	X		
25	NC	Lake Artesia Site	22	-	18.2%	-			X			X			X
26	NC	Nichols Brothers	25	25	0.0%	8.0%									
27	NC	Hunters Glen	22	22	0.0%	13.6%									
28	NC	Sasha's	24	24	0.0%	0.0%									
29	NC	Winston	27	22	0.0%	13.6%									
30	NC	Deep Creek GSMNP	20	20	0.0%	0.0%			X	X					
31	NC	Fire Tower	25	25	0.0%	0.0%									
32	NC	Flat Top Mountain	20	32	0.0%	6.3%									
33	SC	Harbison	-	10	-	0.0%				X					
34	SC	Leesville	9	22	88.9%	68.2%			X			X	X		X
35	SC	Sesquicentennial Park	10	22	20.0%	77.3%			X	X		X	X		X
36	SC	Pine Mountain, Sumter NF	-	16	-	6.3%									
37	SC	Walhalla Fish Hatchery	-	15	-	0.0%									
38	TN	Gee Creek Campground	-	25	-	0.0%									
39	TN	Laurel Springs Road - Cosby	19	-	0.0%	-			X	X					
40	TN	Tall Tree Farms	-	19	-	57.9%				X			X		X
41	VA	False Cape State Park	11	11	0.0%	9.1%			X	X					
42	VA	Sandy Bottom Nature Park	20	20	0.0%	20.0%			X	X					
43	VA	Waller Mill Park	10	10	0.0%	20.0%									
44	VA	Lewis Farm	-	10	-	0.0%				X					
45	VA	Lesene State Forest	20	20	0.0%	5.0%									
46	VA	Shenandoah NP- Harris Hollow	20	20	0.0%	10.0%									
Total trees or sites			680	834					15	23		5	8		11

Fig 4. *Xyleborus glabratus* trap catches at 4 selected sassafras monitoring sites.



RESULTS and OBSERVATIONS

- Laurel wilt disease was confirmed in sassafras at 11 of the 46 sites, including five sites in the Coastal Plain (#1, 10, 12, 22, 25), two in the Piedmont/Sandhills (#34, 35), and four in the Mountains (#6, 19, 21, 40) (Table 1, Fig. 3). Four of these detections (sites #1, 6, 10, 12) were previously unreported county records of laurel wilt that generated updates to the regional Laurel Wilt Distribution Map.
- The laurel wilt vector *Xyleborus glabratus* was trapped at 8 of 11 sites where laurel wilt was confirmed, and at one site (#24) where the pathogen had not yet been confirmed (Table 1).
- At sites with laurel wilt or *Xyleborus glabratus*, the percentage of tagged trees with notably unhealthy crowns (≥50% of foliage volume wilted or missing) was usually ≥30% or higher (Table 1). Exceptions were likely associated with more recent infections. Sassafras mortality is progressing rapidly at several sites, such as Site #6 where mortality increased from 33% to 100% within one year.
- Xyleborus glabratus* flight at sassafras sites in the Piedmont/Sandhills of SC (#35) and the Mountains of AL (#6) peaked in Apr and Aug/Sep, but was rare in Nov-Feb (Fig. 4). *Xyleborus glabratus* flight continued unto mid-Oct even as far north as KY (#21) (Fig. 4).
- During two months (8/23/2019 – 10/31/2019) of late-season trapping in KY (site #21), traps baited with only alpha-copaene (a host plant volatile attractant) captured at least 12 different species of ambrosia beetles (Table 2). *Xyleborus glabratus* accounted for 17% of the specimens, and 96% of the specimens were comprised of 5 species (Table 2).

Table 2. Ambrosia beetle species collected in 2 traps at Site #21 (KY) from 23 Aug 2019 to 31 Oct 2019.

Ambrosia beetle species	Count	Percent
<i>Xylosandrus crassiusculus</i>	1050	55.6%
<i>Xyleborus glabratus</i>	322	17.0%
<i>Xyleborinus saxeseni</i>	298	15.8%
<i>Xylosandrus germanus</i>	109	5.8%
<i>Dryoxylon onoharaensis</i>	39	2.1%
<i>Euwallacea validus/interjectus</i>	9	0.5%
<i>Monarthrum mali</i>	6	0.3%
<i>Cnestus mutilatus</i>	5	0.3%
<i>Xyleborus affinis</i>	4	0.2%
<i>Monarthrum fasciatum</i>	3	0.2%
<i>Xyleborus ferrugineus</i>	2	0.1%
Unidentified	43	2.3%
Total	1890	100.0%



- In KY, observation of a root sprout ~1 cm basal diameter (shown below), without beetle entrance holes and infected with the laurel wilt pathogen, suggests root transmission of the pathogen from adjacent larger stems.



CONCLUSIONS

Laurel wilt is spreading in sassafras well beyond the Gulf-Atlantic Coastal Plain. Sassafras mortality in sites observed in the Piedmont/Sandhills and Mountains can progress rapidly. Beetle vector flight persists well into autumn and the pathogen likely moves underground in clonal sassafras clumps. Sites in this project will be monitored for a third year in 2020. Additional detections and impact of laurel wilt in the central and northern parts of the sassafras range appear likely.

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