DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA5033

Laurel Wilt: An Invasive Pest of Sassafras in Arkansas

Kyle Cunningham
Associate Professor
of Forestry

Laurel wilt is an invasive disease recently found for the first time in Arkansas. The disease is caused by a pathogenic fungus (*Raffaelea lauricola*) spread only by the nonnative redbay ambrosia beetle (*Xyleborus glabratus* Eichhoff (Coleoptera: Curculionidae: Scolytinae)) that primarily affects sassafras (Figure 1) in Arkansas. The beetle, originally from southern Asia, was first identified near Savannah, Georgia, in 2002. Soon after, the disease was found in declining redbay trees. The disease has killed many redbay in South Carolina, Georgia and Florida and has been moving steadily westward along the Gulf Coast (Figure 2).

Figure 1. Sassafras is a scattered tree in forests throughout Arkansas. *Photo courtesy of Vern Wilkins, Indiana University, Bugwood.org.*

Distribution of Counties With Laurel Wilt Disease* by Year of Initial Detection

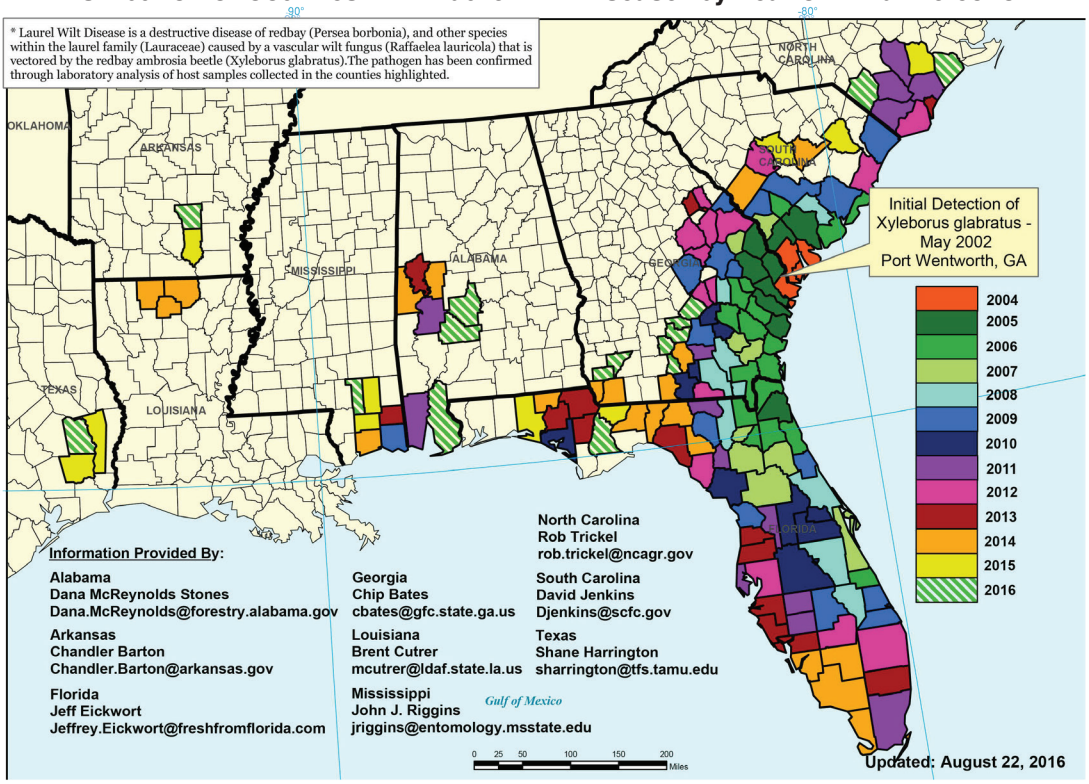

Figure 2. Distribution of laurel wilt in the southeastern U.S. *Map developed by Chip Bates, Georgia Forestry Commission.*

Arkansas Is Our Campus

Visit our web site at:
https://www.uaex.uada.edu

Laurel wilt and the beetle were first positively identified in Arkansas in late 2015. As of August 2016, the disease has been confirmed on sassafras in two southern Arkansas counties and three nearby Louisiana parishes. We expect that the number of infested counties in Arkansas will increase as officials continue searching for the disease.

Hosts

The laurel wilt fungus is capable of attacking all trees and shrubs in the laurel family. Arkansas has only one common tree in the laurel family, sassafras (*Sassafras albidum* (Nutt.) Nees, which occurs throughout the state. Research in Georgia has found that sassafras has greater tolerance to laurel wilt than redbay (*Persea borbonia* (L.) Spreng) (Mayfield and others 2009). Some sassafras escape infection, and others continue producing sapwood after infection. While sassafras is not a commercially important tree in Arkansas, it is ecologically important. Whitetailed deer browse sassafras, many animals eat the fruits and many insects, including the caterpillars of several butterflies, feed on the leaves. Redbay is also documented in Arkansas but only in Miller County in southwest Arkansas. Redbay is highly susceptible to laurel wilt and usually dies within six to eight weeks of infection.

Sassafras and redbay are Arkansas' only native trees in the laurel family, but Arkansas also has two shrubs in the laurel family. Spicebush (*Lindera benzoin* (L.) Blume) is a common understory shrub on moist soils. It occurs essentially throughout Arkansas. Even though it is not economically important, it has ecological values similar to sassafras. Pondberry (*Lindera melissifolia* (Walter) Blume), an endangered shrub that occurs in five counties in northeast Arkansas, is also in the laurel family. All four of these species are imperiled by laurel wilt. There are several additional tree families attacked by redbay ambrosia beetle in its native range, but the beetle is not associated with wilt diseases there.

Laurel wilt has been observed only in plants in the laurel family in the United States. Several additional plants have "bay" in the name, for example sweetbay (*Magnolia virginiana* L.), but they are not affected by laurel wilt.

In some parts of the United States, laurel wilt will be a substantial threat to avocado (P*ersea americana* Mill.). The disease also will affect bay laurel (*Laurus nobilis* L.), the source of bay leaves and other herbs. Neither of these trees is present in Arkansas. Some ornamental plants may be threatened, but these potential threats have not been explored in Arkansas.

Symptoms

Symptoms of laurel wilt are easy to recognize. Symptoms start in the upper crown of the tree with the leaves drooping and turning reddish or purplish (Figure 3). Eventually the entire crown will wilt. One can often find stiff strings of "sawdust" (Figure 4) protruding from the bark of the tree. With severe infestations, the tree can almost look furry, but the sawdust strings may be scattered and difficult to locate with light infestations. If you notice these two symptoms, peel some of the bark from the

Figure 4. Stiff strands of "sawdust" may indicate the presence of redbay ambrosia beetle. *Photo courtesy of Jon Barry, University of Arkansas System Division of Agriculture Cooperative Extension Service.*

Figure 3. Wilted leaves in the tree crown are one of the earliest symptoms of laurel wilt disease. *Photo courtesy of Albert (Bud) Mayfield, USDA Forest Service, Bugwood.org.*

Figure 5. Redbay ambrosia beetles cut galleries into the sapwood of the tree. *Photo courtesy of James Johnson, Georgia Forestry Commission, Bugwood.org.*

tree. You may be able to identify small galleries cut in the sapwood by the beetles (Figure 5) and sapwood stained by the fungal infection (Figure 6). When an infected tree is cut, examination of the cut surfaces will often show a dark ring of wood that has been infected by the fungus.

Figure 6. The laurel wilt fungus produces a recognizable stain in the sapwood of the infected tree. *Photos courtesy of Albert (Bud) Mayfield, USDA Forest Service, Bugwood.org.*

Redbay Ambrosia Beetle

The redbay ambrosia beetle (Figure 7) is native to southern Asia. Like many of our invasive insects, this pest is thought to have been introduced to the United States on infested solid wood packing materials (Figure 8). It is suspected that the initial introduction into Georgia occurred before 2002, the year it was identified.

The redbay ambrosia beetle is a dark brown to nearly black beetle about 2 millimeters long. The slightly smaller males are flightless and don't spread from tree to tree. The females are larger and fly well. They spread the fungus from tree to tree as they move.

Figure 7. The redbay ambrosia beetle is the only known vector for the fungus that causes laurel wilt disease. *Photo courtesy of Joseph Benzel, Screening Aids, USDA APHIS ITP, Bugwood.org.*

Figure 8. The redbay ambrosia beetle probably arrived in the U.S. in solid wood packing material from Asia. *Photo courtesy of USDA APHIS PPQ, Bugwood.org.*

Redbay Ambrosia Beetle Life Cycle

The life cycle of redbay ambrosia beetle has not been extensively studied, but it is presumed to be similar to that of other ambrosia beetles. The beetles occupy galleries cut by the female beetles in the sapwood of the host tree. About nine days after starting the galleries, the beetles lay eggs (Figure 9), which then hatch about a week later.

Larvae (Figure 10) feed on the introduced fungus and form pupae in the gallery about 10 days after hatching and then emerge as adults four to seven

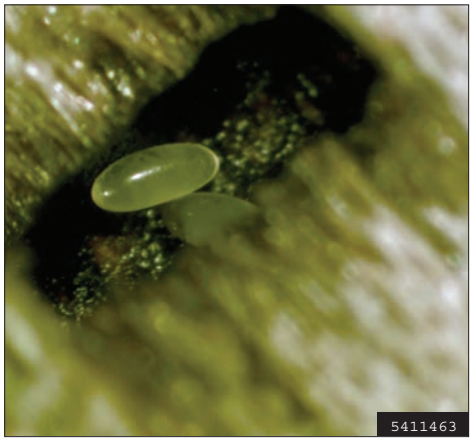

Figure 9. Female redbay ambrosia beetles lay eggs in galleries cut in the wood. *Photo courtesy of Karolynne Griffiths, USDA APHIS PPQ, Bugwood.org.*

Figure 10. Redbay ambrosia beetle larvae feed in the galleries for about 10 days before pupating. *Photo courtesy of Andrew Derksen, USDA APHIS, Bugwood.org.*

days later. After the initial infestation, redbay ambrosia beetles of all life stages are typically found in the host tree.

Most ambrosia beetles attack trees that are already stressed and in decline. However, the redbay ambrosia beetle has proven to be a primary invader in the U.S. It is capable of attacking otherwise healthy trees. As a primary invader, it poses a serious threat to our native forests and, in some parts of the United States, to agriculture.

The Fungus

Laurel wilt is caused by a fungus, *Raeffaelea lauricola* (Figure 11), that is carried by the redbay ambrosia beetle. The beetle has pouches located under its mouth, known as mycangia, specialized for the transport of fungal spores. Transmission of the fungus is important because it serves as the main food source for the beetles' young. Since the beetle and fungus are closely associated, there is no evidence that any other ambrosia beetle carries the fungus. The origin of the fungus is unknown, though it is presumed to have arrived with the beetle. During the process of excavating galleries, the beetles inoculate the tree with fungal spores carried from the previous host that then colonize the sapwood of the new host tree. As the fungal hyphae spread through the sapwood, they clog the transport vessels and block water and nutrients from moving between leaves and roots. Blocking water flow eventually causes the tree crown to wilt.

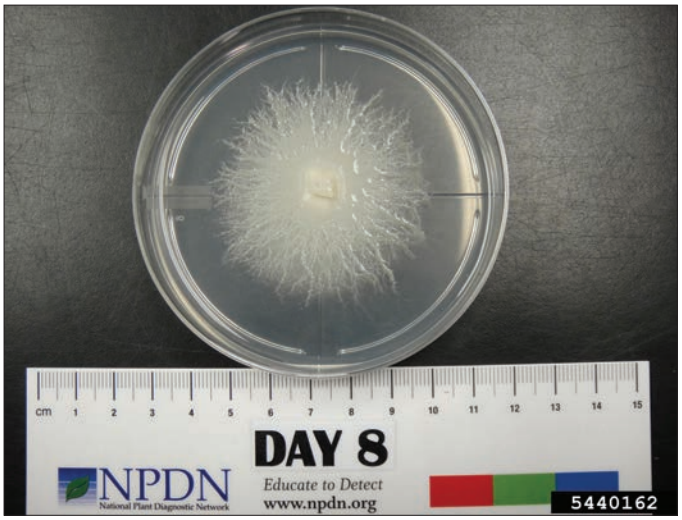

Figure 11. The causal agent of laurel wilt, *Raffaelea lauricola*, cultured on an agar. *Photo courtesy of Samuel Glucksman, Bugwood.org.*

Treatment for Laurel Wilt

It is impractical to treat wild trees to prevent laurel wilt because those trees are spread through the forest and would need to be treated individually. Since the redbay ambrosia beetles live under the bark of the trunk and branches, aerial sprays are unlikely to reach and eliminate the pest.

Ornamental trees in the laurel family may be treatable with soil drench insecticides, but these are unlikely to effectively prevent a tree from becoming infected with laurel wilt. The beetle must bore into the tree to contact the insecticide. The insecticide will kill the beetle at that point, but by the time the beetle contacts the insecticide, the tree has already been inoculated with the fungus the beetle was carrying.

There are systemic fungicides that can be injected into trees to protect the tree from laurel wilt as well as other fungal diseases. The active ingredient propiconazole, available under several trade names, is known to effectively prevent laurel wilt infection. However, stem injections are the preferred application method and, therefore, the treatments can be expensive, require specialized equipment for application and must be repeated every twelve to fourteen months. These treatments may be practical for high value ornamental or historical trees, but they are unlikely to be practical for most landscape trees. This treatment is in no way practical for trees in forest settings.

Outlook

Laurel wilt has devastated redbay along the coastal states, but at this point, little is known about the effect laurel wilt disease and the redbay ambrosia beetle will have on other hosts. All current research indicates that sassafras is a susceptible host and the beetle is capable of surviving Arkansas' climate.

By moving infested wood, humans have likely assisted the movement of this beetle across long distances. A tree killed by laurel wilt will produce a surprising number of beetles. Cutting a tree down and either chipping or burning it on location are the only ways to ensure that the beetles do not spread. The public is encouraged to dispose of dead sassafras on-site and to prevent the movement of unprocessed wood.

If you observe sassafras trees displaying crown wilt, please immediately contact your county Cooperative Extension Service agent or your Arkansas Forestry Commission county forester and report your observation.

Literature Cited

Brar, Gurpreet S., John L. Capinera, Paul E. Kendra, Stephen McLean and Jorge E. Peña. 2013. Life Cycle, Development and Culture of *Xyleborus glabratus* (Coleoptera: Curculionidae: Scolytinae). *Florida Entomologist* 93(3):1158-1167.

Crane, Jonathan H., Jorgé Peña and J. L. Osborne. 2008. Redbay Ambrosia Beetle-Laurel Wilt Pathogen: A Potential Major Problem for the Florida Avocado Industry. HS1136. University of Florida, IFAS.

Hughes, Marc A., J. A. Smith, R. C. Ploetz, P. E. Kendra, James Hanula, Jiri Huler, L. L. Stelinski, S. Cameron, John J. Riggins, D. Carrillo, Robert Rabaglia and Jeff Eickwort. 2015. Recovery Plan for Laurel Wilt on Redbay and Other Forest Species Caused by *Raffaelea lauricola* and Disseminated by *Xyleborus glabratus*. *Plant Health Progress* 16(4):174-210.

Mayfield, Albert, Edward Barnard, Thomas Harrington, Stephen Fraedrich, James Hanula, Victor Vankus, Bob Rabaglia, Don Duerr, Russ Bulluck, James Johnson, Chip Bates, Scott Cameron, Jason Smith, Jorge Peña, Faith Campbell and Andy Boone. 2009. Recovery Plan for Laurel Wilt on Redbay and Other Forest Species Caused by *Raffaelea lauricola*, vector *Xyleborus glabratus*. Contributors: Florida Department of Agriculture and Consumer Service, Division of Forestry; Iowa State University; USDA Forest Service; USDA APHIS; Georgia Forestry Commission; University of Florida; The Nature Conservancy; and DendroDiagnostics, Inc.

Spence, Don, Jason Smith, Albert Mayfield III, Jiri Huler, Randy Ploetz and Lukasz Stelinski. 2011. Assessing the Survival of the Redbay Ambrosia Beetle and Laurel Wilt Pathogen in Wood Chips. School of Forest Resources and Conservation Department, Florida Cooperative Extension Service. FOR289. University of Florida. IFAS.

Acknowledgements: Gratitude is due to **Dr. Jon Barry, Chandler Barton, and Dr. Tamara Walkingstick,** contributing authors on the orginial publication of this fact sheet.

KYLE CUNNINGHAM is Extension associate professor of forestry, University of Arkansas Division of Agriculture, Cooperative Extension Service, Little Rock.

FSA5033-PD-8-22R