# Laurel Wilt: A New and Devastating Disease of Redbay Caused by a Fungal Symbiont of the Exotic Redbay Ambrosia Beetle

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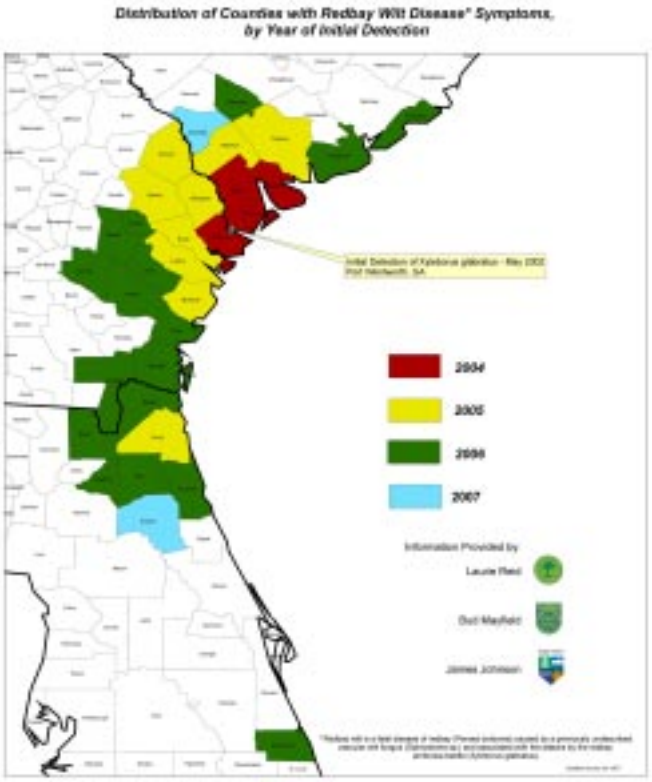
The mysterious death of redbay (*Persea borbonia* (L.) Spreng.) trees on Hilton Head Island, South Carolina, and surrounding areas was first reported in local newspapers in 2003. Thousands of redbays were dying in the low country of South Carolina, and by the end of 2004 officials on Hilton Head were estimating that they had lost 75-80% of the island's redbays. Many theories were initially advanced for the mortality including the role of beetles and the influence of drought followed by above average rainfall during the late 1990s and early 2000s.




**Distribution of laurel wilt by county in South Carolina, Georgia and Florida. Counties are color coded by year of initial disease detection. (Information compiled and graph produced by James Johnson (Georgia Forestry Commission) Laurie Reid (South Carolina Forestry Commission) and Albert "Bud" Mayfield (Florida Division of Forestry).**

A site visit was made to Hilton Head Island in November 2004, and redbays were found in various stages of decline. Many trees were dead while others exhibited dieback of individual branches or portions of tree crowns. Leaves on affected trees developed a reddish to purplish brown discoloration and persisted on the branches long after trees had died. The sapwood of affected trees exhibited a black discoloration in the outer sapwood. Small entrance holes and tunnels of an ambrosia beetle (Coleoptera: Curculionidae, Scolytinae) were often associated with the discolored sapwood, although these holes were often infrequent and difficult to find on some trees. Ambrosia beetles from tunnels in branch and stem samples were subsequently identified as *Xyleborus glabratus* Eichhoff, the redbay ambrosia beetle. This non-native beetle was first trapped in the United States in 2002 near Savannah, Georgia as part of the Early Detection and Monitoring Project sponsored by the USDA Forest Service (Haack 2006, Rabaglia 2003). The association of *X. glabratus* with redbays on Hilton Head Island was the first indication that this beetle was established in a forest ecosystem within the United States. *Xyleborus glabratus* is native to Asia (e.g., India, Japan, Taiwan) where it is often associated with aromatic plant species in the family Lauraceae (e.g., *Lindera latifolia* and *Litsea elongata*) and other families (Wood and Bright, 1992; Rabaglia, 2006). It is presumed that the beetle was introduced to the USA on solid wood packing material.

**Lateral view of *Xyleborus glabratus***

Samples of the discolored sapwood were plated on various agar media and an unknown fungus was consistently isolated. The fungus produces terminal conidia on conidiophores as well as a yeast-like phase similar to species found in the genus *Raffaelea*. Subsequent analyses of the ribosomal DNA sequences determined that the fungus was related to *Ophiostoma* spp., and particularly to species known to be associated with ambrosia beetles. Many of the fungal symbionts of ambrosia beetles are assigned to the anamorphic genera *Ambrosiella* or *Raffaelea* (Batra, 1967; Cassar and Blackwell, 1996; Harrington, 2005; Jones and Blackwell,

**Wilted redbay on Jekyll Island, Georgia (October 2006).**

1998). The genus *Raffaelea* appears to be the best generic placement of the new fungal species. A series of field and laboratory studies have confirmed that this *Raffaelea* sp. is pathogenic to redbay. The fungus is consistently isolated from *X. glabratus*, and the beetle is capable of introducing the pathogen into healthy redbay seedlings when challenged with the beetle.

Since our initial evaluations on Hilton Head Island in 2004, surveys by state forest health specialists have found the wilt in 30 counties in the coastal plains of Georgia, Florida and South Carolina. *Xyleborus glabratus* and the *Raffaelea* sp. have been consistently associated with dead and dying trees throughout the range of the problem. In addition, sassafras (*Sassafras albidum* (Nuttall) Nees) mortality has been observed in several coastal counties of Georgia, and *X. glabratus* and the *Raffaelea* sp. were associated with these dead and dying trees. Additional laboratory studies have determined that the *Raffaelea* sp. is pathogenic to sassafras and other members of the Lauraceae found in the southeastern USA.

Redbay (*Persea borbonia* (L.) Spreng.) is an attractive, aromatic, evergreen tree of small-to-medium size that is common in forests of the Atlantic and Gulf coastal plains of the southern USA (Brendemuehl, 1990). Fruit of redbay is an important food source for songbirds, wild turkey and other animals, and deer browse upon foliage (Brendemuehl, 1990). Redbay also serves as a primary larval host for the Palamedes swallowtail (*Papilio palamedes* Drury) (Scott, 1986). In the Southeast, laurel wilt poses a threat to redbay and sassafras as well as other species such as pondberry (*Lindera melissaefolia* (Walter) Blume), and pondspice (*Litsea aestivalis* L. Fernald), which are endangered or threatened plant species. Worldwide, many important species of plants are found in the Lauraceae, and there is great diversification of this family in Central and South America. At this time it is uncertain if "laurel wilt" poses a threat to plants in other areas of the Americas, but the potential for spread of this new disease is a concern.

There is much to be learned about this new pathogen and its vector relationships. We assume that the fungus is native to Asia and that it was introduced to the USA with the redbay ambrosia beetle. Thus far, it appears that the redbay ambrosia beetle is the only vector, and the incidence of the disease in the USA coincides with the presence of this beetle, which is spreading rapidly.

**Wilted redbays at Hunting Island State Park, South Carolina (November, 2006)**

**Sapwood discoloration in wilted redbay on Jekyl Island, Georgia (December 2006)**

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