

Title: **Evaluation of Mortality in Redbay, Sassafras and Related Plants in Georgia**

**LOCATION:** This project will be conducted in selected areas in GA from the coast to about 125 miles inland. A low intensity redbay mortality delineation survey will be conducted in western counties along the edge of the known range of laurel wilt disease. More intensive evaluation monitoring will be conducted in selected areas to document the rate of mortality and impact of laurel wilt disease on redbay, sassafras and other members of the Lauraceae family as the disease advances through the region.

**DURATION:** 2 years

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**PROJECT OBJECTIVES:** Using information obtained from intensive ground detection surveys conducted from 2006 through early 2008 and recent research findings as a basis, this project will document the rates, extent, and causes of mortality in redbay, sassafras and other plants in the laurel family through several targeted evaluation monitoring projects.

The specific objectives of these projects are to:

1. Document the spread of laurel wilt disease into new areas in GA.
2. Ascertain how redbay ambrosia beetles and laurel wilt disease transition as redbay is eliminated from the coastal and inland forests.
3. Document how laurel wilt impacts sassafras and other plants in the laurel family.
4. Determine if redbay will be permanently eliminated from coastal and inland forest ecosystems or regenerate through remnant specimens, sprouts, and/or seedlings after laurel wilt disease has moved through an area.

**CRITERIA:**

- The laurel wilt disease problem has been monitored since 2004, and is causing significant detriment to the maritime forests of Georgia (and other states).
- Laurel wilt disease has spread from one county in 2004 (Chatham – Savannah) to 16 counties as of September 2007 and is currently impacting 7,500+ square miles of Georgia’s coastal forests. All Georgia barrier islands are now impacted.
- Laurel wilt disease appears to be completely eliminating native redbay populations and evidence is clear that other species will be impacted at some level: avocado, sassafras, pondspice and pondberry.
- Georgia Forestry Commission has conducted 2 laurel wilt surveys and this problem continues to be one of the key issues for the Forest Health section.

**JUSTIFICATION:** Ambrosia beetles are generally considered secondary pests of relatively minor importance, using the wood in weakened, dying, or recently killed trees for cultivating fungi that serve as their primary source of food. Thus, it was totally unexpected when it was discovered that *Xyleborus glabratus*, an ambrosia beetle introduced from Asia into the Savannah area, carries a virulent pathogenic fungus (*Raffaelea* sp.) that is eliminating redbay from maritime and inland forest ecosystems in the southeastern U. S. (Fraedrich et al., in press). It is of prime importance to track the progress of this disease episode and understand the epidemiology of this unusual insect/fungal disease system, especially since this is an insect that was not

considered to be a high risk prior to its introduction into the United States.

Redbay is a species that has important ecological value as a significant component of many coastal and some inland forest ecosystems. This native tree species also has ornamental and urban value and is present in yards and landscapes throughout its native range. Laurel wilt disease has almost completely eliminated redbay in areas around Savannah and this disease is advancing at an alarming rate throughout the south-Atlantic coast region.

Laboratory and field studies have demonstrated that many other native plants in the laurel family are susceptible to the laurel wilt fungus, including sassafras (*Sassafras albidum*), the federally endangered pondberry (*Lindera melissifolia*), the state threatened pondspice (*Litsea aestivalis*), and avocado (*Persea americana*) (Fraedrich et al., in press). The laurel family (Lauraceae) contains about 55 genera and over 2000 species world-wide, mostly from warm or tropical regions, especially Southeast Asia and Brazil. There are three main economical uses in this family: 1) ethereal oils are used in spices and perfumes; 2) avocados are widely planted for their important oil-rich fruit; and 3) the hard wood of several species is an important source of timber. Thus, laurel wilt disease could have an enormous economic and ecological impact if it continues to spread in redbay and other species throughout the U. S. and into other parts of the world.

Detailed ground-based surveys conducted in 2006/2007 and 2007/2008, supported by USDA Forest Service, Forest Health Protection, have effectively documented the distribution, incidence, and spread of the laurel wilt disease in GA and SC. Mortality of sassafras, spicebush, and pondspice also has been documented in scattered locations, but these species are more difficult than redbay to locate and monitor for mortality in detection surveys due to their more spotty distribution and rapid loss of leaves when they die. The impact of this disease on sassafras, spicebush, and pondspice is still unknown. The evaluation monitoring project outlined in this proposal is designed to track where this disease is moving and more effectively document mortality rates, impact, and the fate of redbay and other laurel species as the disease moves through an area.

## **DESCRIPTION:**

**a. Background:** To document where laurel wilt is moving in GA, this project will include a low intensity ground survey based upon vegetation damage along the leading edge of the laurel wilt distribution as documented in prior more intensive surveys. However, the main focus of this evaluation monitoring project will be to determine mortality rates, impact, and causes of mortality in redbay, sassafras, pondspice, and spicebush and the fate of redbay in areas heavily impacted by laurel wilt. This will be accomplished through the installation and periodic inspection of a series of plots established in areas specifically selected to accomplish these objectives. Georgia is well situated for conducting this project since the epicenter and the westward leading edge of the disease episode are within its boundaries and redbay and other plants in the laurel family are distributed across a wide range of latitude, longitude and physiographic regions, providing a potential corridor for spread to other parts of the country.

The GFC is uniquely positioned to conduct this project. The agency has been instrumental in the detection of *X. glabratus*, setting up a Redbay Task Force, and documenting the spread of this disease, and GFC forest health foresters can assist with the implementation of this project. GFC has close ties with Dr. Stephen Fraedrich and Dr. James Hanula, USDA Forest Service Research Scientists located in Athens, GA, who have taken the lead role in research investigations related to the laurel wilt disease. When the causal agent of mortality is unclear, samples from dead and dying plants will be sent to Dr. Fraedrich for verification of the causal agent. The GFC has employed Dr. Scott Cameron, a well known forest health expert, who will be the lead person for the work detailed within this project. Finally, the GA Department of Natural Resources has documented the locations of pondspice and spicebush sites in GA, and botanists, Tom Patrick and Mincy Moffett, have expressed interest in cooperating with GFC on plant health related projects.

Recent advances using attractants (Hanula, personal communication) may make trapping a practical means of

detecting *X. glabratus* at the advancing disease front and for determining if resident populations remain after the disease has eliminated most host trees in an area.

**b. Methods:** Using information obtained from the 2006-07 and 2007-08 ground surveys, a more limited ground survey will be conducted to determine the presence or absence of the laurel wilt disease along the advancing disease front. Plots will be established in distinct disease episode conditions (before, during, after) and periodically revisited to document the rate and impact of mortality in redbay and other plants in the laurel family. Implementation steps include:

1. Establish evaluation monitoring procedures designed to address the stated objectives.
2. Conduct a low-intensity ground survey in areas where redbay occurs along major transportation routes at the advancing disease front to document the spread of laurel wilt disease into new areas in GA. GPS equipment will be used to collect field data, which will be assemble into regional maps.
3. Establish evaluation monitoring plots with redbay, sassafras, spicebush, and/or pondspice to document causes and rates of mortality in selected areas where laurel wilt disease is well established and where the disease is absent or has only recently been detected.
4. Establish plots in areas where most or all large redbay trees have been killed to determine if initial redbay sprouts and seedlings later succumb to the disease and to see if new redbay regeneration becomes established.

**c. Products:** Upon project completion, new areas of disease incidence will be included by county on maps generated from previous surveys and distributed to natural resource managers throughout the region. Species, numbers, conditions of plants in monitoring plots will be used to document mortality causes, rates and impact and summarized in annual technical reports.

**d. Schedule of Activities:**

Fall - winter 2008–09 (& 2009-10): Develop methods for evaluating mortality rates and impact of laurel wilt among redbay and other Lauraceae plant populations; establish initial monitoring plots, and conduct the redbay mortality survey along the western edge of the disease episode.

Winter 2009 (&2010): Assemble data and prepare annual report.

Spring - summer 2009 (& 2010): Collect data in established monitoring plots and set up new plots.

Fall – winter 2009 (& 2010): Repeat the activities for the previous year until the project is completed.

**COSTS:**

Item	Requested FHM EM Funding	GFC Funding	Total Funding
Salary	\$ 40,000		\$ 40,000
Overhead		\$ 10,000	\$ 10,000
Travel	\$ 10,000		\$ 10,000
Equipment		\$ 10,000	\$ 10,000
Supplies		\$ 5,000	\$ 5,000
Support		\$ 25,000	\$ 25,000
<b>TOTAL</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>	<b>\$ 100,000</b>

Salary - one field evaluation person is requested

Overhead – administrative and supervisory for position

Travel - primarily mileage reimbursement

Equipment - GPS and computer equipment

Supplies - office supplies, telephone and internet service

Support – GFC foresters and county unit personnel assistance with survey