FOREST HEALTH COOPERATIVE
Proposal for Preliminary Data

Title: Impact on Plant Composition/Quality on Genetically Superior *Pinus taeda* Infected by Pathogenic Ophiostomatoid Fungi

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Rationale: Loblolly pine (*Pinus taeda*) is the dominant crop tree species utilized for forest products in the U.S. These trees are managed by private and industrial landowners who optimize site conditions for productivity and quality. But land managers are currently facing a new crisis because in addition to rising demand of conventional forest products, new markets such as bioenergy are emerging. In response to demand, managers are pushing crop productivity to new limits through optimal spacing, thinning, increased fertilization, and genetic selection. However, under the right conditions, increased productivity can be at odds with tree health and crop value. Crop value will decrease due to lower mechanical properties in the product after conversion.

The ***mechanism*** of poor tree health (pine decline) can be traced back to ophiostomatoid fungi which obstruct the xylem resulting in decreased water and nutrient uptake and photosynthate flow back to roots. As the tree becomes less vigorous, it begins to interact with other environmental stresses such as drought and poor genetics which can increase susceptibility to pest and pathogens and lead to premature mortality. As the tree becomes stressed, productivity decreases resulting in a reduction in mechanical properties. An understanding of the ***mechanism of plant response*** to bark beetle and ophiostomatoid fungi are thus necessary to maintain a profitable industry.

Overall Hypothesis: Infection by ophiostomatoid fungi will cause stress on loblolly pine reducing water and nutrient uptake in turn reducing growth, and thereby decreasing wood quality.

Specific Objectives: The main objectives are to (1) determine whether or not root infection by ophiostomitoid fungi will reduce moisture content and decrease growth and (2) determine the effect of ophiostomatoid fungi (pine decline) on wood quality.

Approach: A completely healthy site of superior genetic stock (increased productivity) will be found for testing. Twenty trees will be selected for testing (10 as a control and 10 for inoculation). Trees would be paired into 10 pairs and pairs will be near one another and as close as possible to identical (DBH, Height, Age, etc) such that a paired t-test can be utilized to detect for subtle differences in moisture response. For the inoculation treatment, Isolates of *Leptographium* will be inoculated into 4 roots of each tree with a punch to the epidermis. Moisture content probes will be installed in the trees at time of inoculation and variation in moisture content following inoculation will collected. The trees will be monitored for external and internal signs of vigor (decline) by crown rating and resin sampling, data will be recorded for 2 years or less (if decline is quicker). Increment cores will be taken from the stem at breast height. The cores will be processed and spectra will be collected in the near and infrared region. The infrared region will be used to monitor functional groups attributable to wood chemistry

(lignin and cellulose). NIR models developed at the ***University of Georgia*** will be used to predict wood strength, stiffness, and microfibril (cellulose polymer) angle.

Budget:

Travel to inoculate trees and crown rate: Hotel and perdiem for 2 people plus mileage ($1000)
Supplies (growing fungi and inoculations) $500

Costs for work at UGA ($2,500) will be covered by the Wood Quality Consortium (Dr. Laurie Schimleck).

Potential impact & expected outcomes: Through better understanding of the interaction of tree response to root pathogens and infection, the yield per acre can be optimized. The expected outcome will be a prescription for managing a loblolly stand for productivity and increased wood quality while minimizing the instance of disease and pine decline.