Research Project Proposal #1

TITLE: Delineating of Loblolly Pine Decline in the Southeast using county survey and FHM/FIA Data

LOCATION: Southeast US - US Forest Service Region 8 (Texas, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, South Carolina)

DURATION: 2-year project

PROJECT LEADER: Dr. Lori Eckhardt, School of Forestry and Wildlife Sciences, Auburn University, 334-844-2720, eckhalg@auburn.edu

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PROJECT OBJECTIVES:
Using P3 data the detection-monitoring phase of the Forest Health Monitoring program (FHM), the proposed study will address the following three questions: (1) what percentage of loblolly acres are associated with ranges of aspect and slope that have been associated with loblolly pine decline? (2) what percentage of loblolly and longleaf acres are associated with crown condition and growth factors that are associated with pine decline? (3) what is the extent of loblolly pine decline based on these associations predisposing a risk of decline or mortality? (4) what is the county distribution of pine decline across the southeast US?

JUSTIFICATION:
This project will address forest health indicators for loblolly pine decline and mortality based on crown conditions and site parameters. These will be addressed by mining FHM/FIA database and comparing these results to a hazard and impact rating system. The results will continue to be ground-truthed on permanent non FHM/FIA study plots located on federal, state and industry land to confirm the regional impacts of loblolly pine decline. Surveys will be conducted with extension and industry personnel of impacted areas. The parameters determined to be correlative to decline were determined from data collected on a published loblolly pine decline study with permanent plots established using FIA plots design. Since the data mirrors the protocol used by FHM and FIA it can be comparatively analyzed to determine similar parameters located in the data set. Identification of the similarities in the data will provide information to the FHM program to determine the geographic extent of pine decline and mortality. The data correlations will also be relative to growth reductions, reduced vigor conditions, and susceptibility to insect and disease within established FHM and FIA plots.

DESCRIPTION:
a. Background:
Forest decline and mortality syndromes have been increasingly reported in the past twenty years in many areas in the southeastern US. Forest tree declines have been

described as resulting from complex interactions of biotic and abiotic stressors. Recent studies and observations have noted reduced growth parameters, poor crown conditions, and abnormal mortality in loblolly pine across the southeastern US. Several studies have shown data supporting a complex of abiotic and biotic factors that are associated with the decline in loblolly pine. The abiotic factors of site were strongly correlated to a range of aspect and slope that stress and predispose loblolly pine to the influence of other disturbance factors i.e. drought, wind, fire, or management. The effects of the disturbances on loblolly pine are manifested in measurable crown condition data and the severity of the stressing factors related to a measured condition in the crown. These provide parameters that can be mined from existing FHM and FIA data sets and provide a basis for comparison.

b. Methods:

This project is proposed to consist of three main activities:

1. First, a comparative analysis of non FHM data, the specific crown conditions and site parameters associated with loblolly pine (*Pinus taeda)* decline and mortality, to P3 FHM and FIA survey plot data for Forest Service Region 8.
2. The second activity will involve determining the extent of loblolly in decline and at risk of mortality in Region 8.
3. The last activity will consist of developing a risk rating system for loblolly pine decline using P3 data.

P3 data will be analyzed statistically to determine the extent of the data matching specific loblolly pine decline parameters that can be attributed to crown condition and site factors thought to be important to disease development, such as the database allows. All non FHM data will also be entered into a GIS system for production of maps to graphically illustrate current loblolly pine stands in decline, hazard rating and impact rating of loblolly pine decline, and predicted future of loblolly pine decline. P3 data found to be relative will be provided to FHM program for a comparative geographical analysis.

c. Products:

Range and hazard map will be created. One MS degree will be granted. Several manuscripts will be submitted for publication in refereed journals, a summary of research findings will be published on the website, and a USDA Forest Service technical report will be generated. Also a poster to be presented at the following national FHM meeting updated information for following Summary Report: Forest Health Monitoring in the South, yearly report and technology transfer through presentations at meetings/training sessions such as the Southwide Forest Pathology Workshop.

d. Schedule of Activities:

The proposed project is for two years starting in May 2009 and ending May 2011. Each major activity and its starting date are listed below:

05/2009	Acquiring plot data	08/2009	Compiling study dataset
12/2009	Generating decline risk	03/2010	Analyzing data
06/2010	Writing Thesis	01/2011	Writing manuscripts

e. Progress/Accomplishments:
To date, we have 32 permanent loblolly rating plots in Alabama that were rated for crown health in 2001 and 2002 to revisit to assess long-term survival to be rated for crown health. There are also 39 permanent plots in Georgia, 12 permanent plots in Mississippi, 12 permanent plots in Alabama, and 13 permanent plots in Texas that were establish using FHM plot protocols and data taken 2003-2007. There are also 62 permanent plots in Alabama that were established in 2007-2008.

f. Budget: The *Forest Health Cooperative* will provide graduate student, supplies and travel. *School of Forestry and Wildlife Sciences* at AU will provide GIS facility. *Forest Health Protection* will assist in obtaining the FHM data set from FIA and other Forest Service entities.