Research Project Proposal #2

Title: Hylastes population dynamics and forest health evaluation in association with thinning and harvesting

Project Lead Investigator: Dr. Lori Eckhardt, Forest Health Cooperative, AL

Project Period: FY2009-2012

Justification: Trapping of pine bark beetles is a well established method for predicting potential activity. Spring trapping surveys are used to predict subsequent SPB population trends. A ten year data set of year round trapping suggests that populations of *Hylastes* species become very high and then crash just before an increase in southern pine beetle (SPB) numbers and outbreaks (J. Foltz, U. of Florida, unpublished). High numbers of root-feeding *Hylastes* spp. increase root disease, significantly reduce host vigor, and may predispose trees to pine bark beetle attack. These root-feeding beetles are attracted to trees that are under stress from natural or anthropogenic causes (Eckhardt *et al.*, 2007). Otrosina *et al.* (2002) reported longleaf pine decline associated with *Leptographium terebrantis* and *L. procerum,* and Eckhardt and Menard (2005) reported loblolly and shortleaf pine decline is associated with *Hylastes salebrosus* and *H. tenuis* as insect vectors of *L. terebrantis, L. procerum and L. serpens*. Zanzot and Eckhardt (unpublished) have also found that *L. huntii* associated with longleaf pine and the insect vectors *H. salebrosus* and *H. tenuis.* *Leptographium serpens* and *L. huntii* are newly reported to the U.S., are pathogenic, and it is unknown whether or not they may be exotic but *L. serpens* has been added as a candidate for the Southern Region Priority Invasive Species list. In the southeastern U.S., declining loblolly pines appear to be more vulnerable to attack by southern pine beetle than are apparently healthy trees (Otrosina *et al*. 1997, Hess *et al*.1999). Similar associations to pine root disease and decline complexes described cause significant negative ecological and economic impact at a regional, national, and international level. This project is important as SPB have caused unprecedented losses in recent years, and have the potential to do so again. In addition, there is an increase in natural and anthropological disturbances to southeastern pines, and preliminary data which suggests root-feeding scolytid numbers are also on the increase. An understanding of ecological patterns and biological relationships that predispose pine stands to reduced vigor and potential root-feeding beetle outbreaks are essential to preventative management objectives.

Objectives: This proposal will (1) quantify the populations of root and lower stem colonizing beetles (*Hylastes* spp.) and other pine bark beetles, in stressed and healthy pine stands through three different seasonal periods spring, summer and fall; (2) compare populations among stands under various management regimes (thinning and clearcut) during the three seasonal periods; (3) determine tree vigor under various management regimes during the three seasonal periods; (4) relate all management and site characteristics to changes in populations of root and lower stem colonizing insects while monitoring for changes in forest health condition.

Methods:

Study Sites: Plots (5 thin, 5 clearcut, 5 control) would be installed as per Forest Health Monitoring standards on the Coop Member property. One central plot and three sub-plots identical to it will be established at each selected site. The subplots will be located 120 m

away from the central plot at bearings of 120, 240, and 360 degrees (Dunn, 1999). Pines on plots will be rated based on FHM standards to determine crown condition as a vigor and disease indication. Five- and ten-year radial growth will be assessed along with the growth parameters of DBH and height. Resin sampling will be conducted to establish host vigor. Stand conditions such as basal area, vegetation density and duff will also be explored. Soil and foliar samples will be taken to determine nutrient availability and uptake. Plots will be monitored bi-weekly for 2 consecutive years (minimum for change over time and population fluctuations) for root-feeding bark beetles.

Insect Sampling: Four types of insect traps (panel, flight intercept (FIT), and pitfall) would be installed on each subplot to sample bark beetles and their predators, root and lower stem colonizing beetles and adult root colonizing insects. Each plot would have a total of 9 traps, one of each type per subplot. Traps would be monitored every two weeks year-round for two consecutive years.

Stump Sampling: Stumps will be sampled in treatment areas quarterly to determine insect gallery formation, brood levels, and fungal populations and viability.

Analyses: Beetle catches will be related to forest health condition and silivicultural management actions over key seasonal periods. Results will be used to identify how and when management activities may affect forest health condition and what response bark beetle activity may be based on management activities.

Budget Request Explanation: Stipend, supplies, laboratory work, and travel will be paid by FHC and land base and stand management will be provided by FHC member.

Literature Cited

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Eckhardt, L.G., Weber, A.M., Menard, R.D., Jones, J.P., and Hess, N.J. 2007. Association of an insect-fungal complex with loblolly pine decline in central Alabama. For. Sci. 53:000-000. (In Press)

Hess, N.J., W.J. Otrosina, J.P. Jones, A.J. Goddard, and C.H. Walkinshaw. 1999. Reassessment of loblolly pine decline on the Oakmulgee District, Talladega National Forest, Alabama. Report No. 99-2-03. Pineville, LA: USDA, For. Ser., Forest Health Protection. 12 p.

Otrosina, W.J., N.J. Hess, S.J. Zarnoch, T.J. Perry, and J.P. Jones. 1997. Blue-stain fungi associated with roots of southern pine trees attacked by the southern pine beetle, *Dendroctonus frontalis*. Plant Dis. 81:942-945.

Otrosina, W.J., C.H. Walkinshaw, S.J. Zarnoch, S.S. Sung, and B.T. Sullivan. 2002. Root disease, longleaf pine mortality, and prescribed burning *in* Proc. of Eleventh Biennial Southern Silvicultural Research Conference. Gen. Tech. Rep. SRS-48. Asheville, NC: USDA, For. Ser., Southern Research Station. 551-557 pp.