

## **Loblolly Pine Stand Fertilization at Mid-rotation to Increase Small and Large Sawtimber Volume**

2006 Summary Report

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### **Case Study**

The UGA Warnell School of Forestry and Natural Resources (WSFNR) installed a replicated fertilizer study on Chuck Leavell's Charlene Plantation, located in Twiggs County, Georgia (45 minutes South of Macon). Seven of nine thinned loblolly pine stands on Chuck's property show NP, NPK, NPKS, or NPKSCu deficiencies based on soil and foliar sampling on 27 February 2004. Leaf area index (LAI) estimation taken in July 2004 showed that these nutrient deficient stands had LAIs below optimal levels indicating a good probability of response to N.

### **Objectives**

The WSNR (David Dickens and Bryan McElvany) and Cooperative Extension Service county agent installed two fertilizer trials using fertilizer treatments and an untreated control (planted in 1978, thinned in 2002-03). These marginal fertility stands are the Bullard Bluff East tract (8 plots; 2 replications of 3 fertilizer treatments and a control) and the Bullard Bluff West tract (15 plots; 3 replications of 4 fertilizer treatments and a control). The major objectives: (1) quantify the magnitude and duration of wood volume response to the fertilizer combinations, (2) determine changes in product class distribution and (3) the cash flow and rate of return for each fertilizer combination compared to unfertilized control plots, and (4) discern when fertilizers are to be re-applied to maintain wood volume gain.

### **Project Layout and Experimental Design**

Gross treated plots (147.6 x 147.6 feet, or 0.5 acres) and internal permanent measurement plots (104.5 x 104.5 feet or 0.25 acres) were installed between July and December 2004. Soil characteristics were estimated during this period. Forty feet of untreated buffer is between each gross treated plot. Replications (blocks) were laid out on the basis of contour to minimize soil moisture differences and basal area to balance stocking/size differences. Baseline soil (10 core samples to make a composite sample, with one composite sample /plot @ 0-6") were taken in each plot prior to treatment and annually post-treatment. All living crop trees in each plot were aluminum tagged, numbered and measured for dbh, total height, live crown length, and defect(s) prior to treatment (January 2005), two and four years post treatment.

Randomly assigned to each plot was NP, NPK, NPKSCu (Bullard Bluff East,; BBE) or NP, NPCu, NPKCu, NPKSCu (Bullard Bluff West; BBW) fertilizer treatments. Untreated control plots will serve reference plots. The one-time fertilizer application levels in the thinned loblolly pine stand were applied on 15-16 February 2005. Fertilizer levels were: 200 lbs N/acre + 50 lbs elemental-P + 80 lbs elemental-K + 60 lbs S and 5 lbs Cu/acre. Rainfall patterns have been excellent since fertilizer

application. The first post application rain occurred on 18 February and was 1 ½ inch and 1 inch on 24 February 2005. A low-cost (\$15/ac for product) foliar active herbicide, Glyphosate with a surfactant, was applied at a rate of 3 qts/ac with an ATV and boomless sprayer @ 15 gpa in August 2004 on BBE (pre-fertilization) and in August 2005 on BBW (post-fertilization).

Plot leaf area index (LAI) is being estimated annually using the NCSU protocol starting in July 2005. Foliage samples are being taken each dormant season starting in December 2005. Soil and foliage analysis include N (foliage only), P, K, Ca, Mg, S, Cu, Mn, Zn, and B. Soil pH for each plot is also being determined.

### **Outcome - Goals**

A field day is being planned for the fall of 2007 to share two year post fertilization findings. Private non-industrial forest landowners, Extension agents, forestry consultants, Georgia, Alabama, Florida, and South Carolina State Commission foresters, NRCS, and other interested individuals will be invited. Increases in diameter growth, crown and leaf area, volume/acre, and product class and cash flow changes will be addressed at these field days. Workshops, seminars, extension publications and other publications will also be generated from these demonstration sites and distributed to the same and made available on the WEB. Also addressed will be various ways for fertilizers to be applied to forest stands with tractor-spreader combinations (cyclone or pull behind), spreader calibration, how much urea, DAP, muriate of potash, S and Cu to apply per acre, and when to apply fertilizers for maximum benefit and minimum losses. It is anticipated that many forest landowners will be able to make educated and informed fertilization decisions in thinned loblolly pine plantations from this project.