

Plantation Management Research Cooperative

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SLASH PINE GROWTH AND YIELD

In 1975, faculty at the School of Forest Resources of the University of Georgia launched an effort to provide management information on the slash pine (*Pinus elliottii* Engelm.) plantation resource. Funding was provided by the school from McIntire-Stennis funds, and since 1976, also by a changing number of timber companies who agreed to participate in the University of Georgia Plantation Management Research Cooperative (PMRC). Growth and yield plots were established in stands 10 years old and older in 1976 with some plots re-measured in 1980, 1984, and 1989. In addition, plots with more intensive silviculture and genetics were established in the mid to late 1990's and re-measured in 2004. A total of 1565 distinct growth and yield sample plots with 1-3 measurements result in a total of 2419 plot-age pairs for modeling purposes. These plots contained 60 to 64 planting spaces and were variable sized depending on stand density. They averaged about 0.1 acre each. Three PMRC designed studies were also used for models. The slash pine site preparation study had 79 plots with re-measurements every 3 years between ages 5 and 23. The slash pine improved planting stock-vegetation control study had 76 plots with re-measurements every 3 years between ages 6 and 15. The slash competing vegetation control study had 37 plots with 7 re-measurements every other year. Altogether, the total number of measurements available for fitting the slash pine growth and yield model in 2004 was 3358. In addition, data from 114 locations of a spacing and thinning study have been used in slash pine growth and yield model development. Measurement plots with 25 trees varied in size depending on density in the spacing portion of the experiment. Thinned plots were 0.25 acres in size with 0.1 acre measurement plots. The last measurement was made 15 years after thinning. Average site index (base age 25) of these installations was 60 ft and ranged from 50 to 72.

Status

- **This is an ongoing project. The 2005 technical report 2005-3 is the latest slash pine growth and yield model.**
- **Previous models were published in PMRC Technical Report 1996-3 by Pienaar et al. and that report contains the last individual tree volume, weight, and taper functions.**

Key Research Results

- **Individual tree cubic foot volume, green and dry weight, and taper equations.**
- **Height growth models and site index curves.**
- **Survival prediction equations for thinned and unthinned stands and also different survival depending on percent fusiform rust infection.**
- **Basal area and volume prediction equations for thinned and unthinned stands.**
- **Diameter distribution based yield prediction system.**

- **A generalized stand table projection system to allow updates of inventory data compatible with a whole stand basal area prediction.**

Fertilized Stand Models

All of the plots in the PMRC slash pine growth and yield dataset are unfertilized. A cooperative effort utilizing the CRIFF (Cooperative Research in Forest Fertilization) mid-rotation fertilization dataset (B400) resulted in development of growth and yield models for mid-rotation fertilized slash pine stands. The reference for this article is as follows:

Martin, S. W., R. L. Bailey, and E. J. Jokela. 1999. Growth and yield predictions for lower coastal plain slash pine plantations fertilized at mid-rotation. *South. J. Appl. For.* 23(1):39-45.

Key Research Results:

- **A dominant height response equation as a function of N only or N+P fertilization**
- **A dominant height projection equation**
- **A survival function incorporating CRIFF soil group**
- **A basal area per acre response function incorporating type of fertilization (N or N+P) and CRIFF soil group.**
- **A basal area prediction equation**
- **A basal area projection equation**
- **A stand table projection algorithm using either a tree list from an inventory or a generated tree list using equations developed to predict Weibull percentiles.**

Economic Analysis of Mid-Rotation Fertilization

- **Using slash pine models developed from the CRIFF B400 data, the economic feasibility of mid-rotation fertilization was evaluated.**
- **The maximum IRR was determined for several different projected stand scenarios.**
- **Results indicate that fertilization with N and P consistently increases the maximum IRR and decreases the optimum economic rotation over all site indices and densities.**
- **The report is PMRC Technical Report 1999-1 by Martin et al.**