

Plantation Management Research Cooperative

Daniel B. Warnell School of Forestry and Natural Resources

The University of Georgia

Athens, Georgia 31204-2152

IMPROVED PLANTING STOCK/ VEGETATION CONTROL STUDIES

Forest tree improvement cooperatives have been at work for several decades and by the mid-1980's first generation improved stock was available for both slash and loblolly pine. Genetically improved stock is expected to be disease resistant and to grow faster, straighter, have higher specific gravity, and other good qualities. Research at the PMRC and elsewhere in the South has demonstrated the benefits of cultural practices, particularly weed control, on growth rates. Studies were established for loblolly pine in 1986 and for slash pine in 1987 with the objective of evaluating growth of unimproved trees and genetically improved trees with and without weed control. A second objective of the studies was to obtain information on yield and stand structure with which to modify existing growth and yield models when genetically improved seedlings were planted. There were actually two loblolly studies since the tree improvement cooperative at North Carolina State University selects improved trees separately for coastal plain (16 locations) and piedmont (15 locations). The slash pine study (19 locations) was established a year later and used material collected and evaluated at the University of Florida. Each location of the study contains 4 treatments (genetically improved and unimproved stock, each with and without complete vegetation control) plus 2 treatments (a single family planting with and without complete vegetation control). Genetically improved stock means that the seed came from a genetically improved tree, but the seed is open pollinated so the source of pollen is not known. For both groups of treatments one of the treatments is replicated on the location. A total of nine plots, each 0.4 acres, comprise each installation. The studies have been measured every three years beginning at age 3.

Status

- **The study is ongoing with loblolly measurements at age 18 being made during the dormant season of 2004-2005 and analyses detailed in PMRC Technical Report 2005-1.**
- **A Southern Journal of Applied Forestry article was written after the 12 year results were distributed to PMRC members. The citation for it is**

Martin, S. W. and B. D. Shiver. 2002. Impacts of vegetation control, genetic improvement and their interaction on loblolly pine growth in the Southern United States - Age 12 Results. South. J. Appl. For. 26(1):37-42.

Key Research Results

- **For loblolly through age 18 the largest gains in average tree size and in per acre basal area and volume are due to the complete weed control treatment.**

- For loblolly, gains in average tree size and in basal area and volume per acre due to genetic improvement alone are statistically significant and appear to be very near estimates made from progeny tests.
- Gains from genetic improvement and weed control are additive. This means that forest managers can expect to get growth responses from weed control plus the expected growth response from genetic improvement without one taking away from the other.
- For slash pine through age 15, there was not a significant response from genetic improvement for average dbh or basal area per acre, but there was a response for dominant height and total and merchantable volume, and as with loblolly, the responses for genetic improvement and vegetation control were additive through age 15.
- Periodic growth evaluations for loblolly indicate that the no competition control plots had significantly larger 3-yr growth in mean dbh in both the Piedmont and Coastal Plain regions than complete vegetation control plots for ages 12-15 and 15-18. In terms of mean dominant height, improved genetic stock continued to outgrow the unimproved stock in the Piedmont. In both the Coastal Plain and Piedmont, basal area growth was significantly higher on plots without competition control than plots with competition control. Neither improved genetics nor competition control significantly affected volume or weight growth during the 12 to 15 year or 15-18 year periods in the Coastal Plain.
- Periodic growth analyses for slash pine indicated that there were no significant differences in Dbh growth from 12 to 15 due to competition control. Therefore, the early gains from competition control are still being maintained through age 15. For total volume per acre, competition control continues to significantly increase growth.
- For loblolly pine the genetically improved trees had about 1/2 the fusiform rust incidence of unimproved trees. For slash pine the decrease about 1/3 from about 21% to about 14% with no difference between bulk lot and single family.
- For loblolly, improved genetics significantly decreased the percent of trees with major defects, while competition control had no impact. In both the Coastal Plain and Piedmont competition control significantly increased the percentage of forked trees versus no competition control. Improved genetics significantly decreased the percentage of forked trees in the Coastal Plain, but had no impact in the Piedmont. The percentage of trees with sweep was significantly reduced by improved genetics in both the Coastal Plain and Piedmont, but competition control had no significant effect in either physiographic region. For slash pine, none of the tree quality variables were significantly impacted by genetic improvement.
- These single-family plantings were not more uniform than bulk lot improved plantings nor were bulk lot improved plantings more uniform than unimproved plantings. The only variable, which consistently lowered coefficient of variation (a measure of uniformity), was weed control.