

# SEED SOURCE STUDY OF NORTH CAROLINA AND SOUTH CAROLINA ATLANTIC COASTAL PLAIN LOBLOLLY PINE IN VIRGINIA

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As cooperators in the NCSU Tree Improvement Program in the northeastern corner of the loblolly pine range are beginning to establish 3<sup>rd</sup>-cycle seed orchards, there is a large number of potential clones available from the local breeding region of Coastal and Piedmont Virginia as well as from the northern half of North Carolina. In addition to this large pool of genetic resources at the northern end of the range, many more potential clones exist from further south. The intriguing question is how far south can cooperators reach to take advantage of well-documented seed source effects without incurring undue risks in long-term adaptability and stability (e.g. Schmidting 1994)?

It is generally accepted that seed source movements of 200 miles or less in a northerly direction in the Coastal Plain of the Southeast do not present significant risks. Indeed, most 1.5- and 2.0-generation Coastal loblolly orchards in VA include many clones from the northern half of North Carolina (for example, 33% of the clones in Chesapeake's orchards are from NC). The growth performance of the NC checklots in most progeny tests (unpublished data) has also been exceptional and dramatically demonstrates the potential genetic gains achievable from use of southerly seed sources.

Moreover, results from other trials have demonstrated that selected families of loblolly pine from coastal South Carolina and northeast coastal Georgia perform very well in many areas of the South (McKeand et al. 1989, 1990). So, it is possible that another source or sources will do as well or better than the local VA source. The potential for increased genetic gains would be expanded with each clone found to be suitable for use in the region, since the selection intensity for the new orchards would be increased.

In 1992, Chesapeake Forest Products Company began a series of seed source trials with the following objectives:

- 1) compare growth and wood properties (not yet assessed) of South Carolina and North Carolina Coastal Plain loblolly pine against local material from Coastal Virginia in side-by-side comparisons in the Virginia Coastal Plain and Piedmont.
- 2) examine the stability of families within seed sources.

## METHODS

Sixteen open-pollinated seedlots were used for each seed source: South Carolina Coastal, North Carolina Coastal, and Virginia Coastal. Clonal lots were collected from 2<sup>nd</sup>-generation orchards within each of these geographical provenances. Containerized seedlings were planted in three trials, two in 1992 (Piedmont and Coastal Plain) and one in 1994 (Eastern Shore). The field design was a randomized complete block with 10 replications per trial. Each replication was a split plot with each of the three sources planted in 100 trees block plots (main plots), and the 16 families as sub-plots, at a spacing of 8' x 8'. The measurement plot consisted of the interior 64 seedlings with four individuals from each family randomly located within the measurement plot. The two 1992 tests were measured for height, diameter, and straightness in 1998, and results are presented here.

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## RESULTS AND DISCUSSION

Surprisingly, at age six years, there were no seed source effects for any trait when data were combined across the two sites. The average growth (height=16.4'), survival (94% ), and uniformity (average RxF CV for height = 6.6%) of the trials was superb, so poor tests were not the reason for the lack of ability to detect genetic differences. Substantial provenance by location (GxE) interaction was the reason that no overall seed source effect was found; what's best in the Coastal Plain was not best in the Piedmont (Figure 1). The poor performance of the SC Coastal source in the Piedmont is not surprising; we have exceeded the limit of safe northerly movement. However, the lack of provenance variation at the Coastal Plain site is surprising; all three provenances were essentially equal for growth, and there was a very slight advantage for straightness in the VA source (data not shown).

For families within provenance, there were large differences for height and straightness, but not for volume across the two sites. Again, the results are a bit surprising when families from specific provenances were compared across the sites. For the VA families, there was substantial GxE for volume. There was essentially no correlation between family performance in the Piedmont and Coastal Plain ( $r_{Gb}=0.02$ ). The GxE was less for the NC and SC families, but the SC families generally performed poorly in the Piedmont (Figure 1) These results are very unusual in that provenance effects are typically very large in most trials, and GxE for open-pollinated families is not normally very important (e.g. McKeand et al. 1997). Could it be that this more rigorous test of seed source and family variation in this more northern portion of the natural range of loblolly pine is indicative of potential problems? These trials will be followed through at least half rotation to see if these early trends in growth and form are maintain.

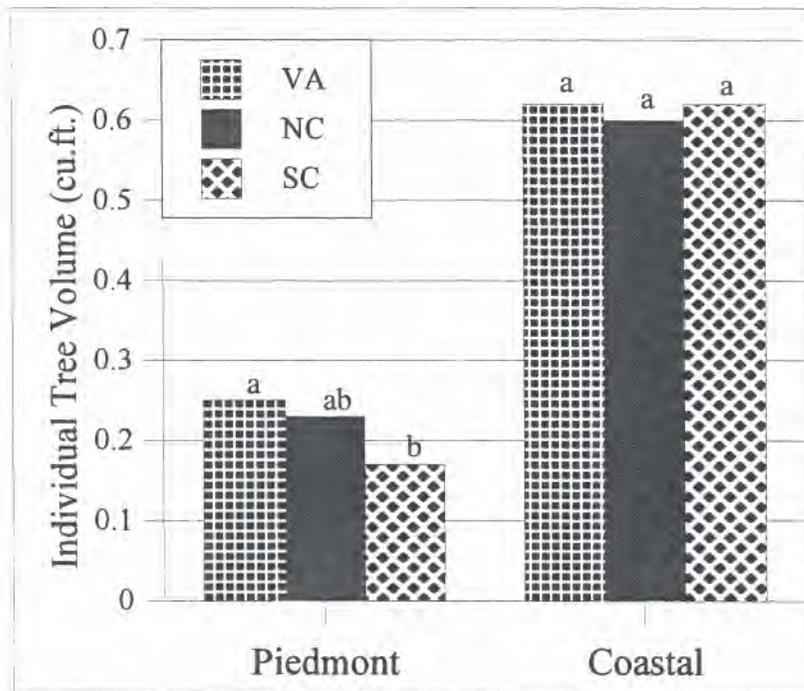


Figure 1. Provenance means for volume at age 6 years in Chesapeake's seed source trials in the Piedmont and Coastal Plain of Virginia. Provenance means with the same letter within a test site are not significantly different at  $p < .05$ .

## ACKNOWLEDGMENTS

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