AND THEY'RE OFF! – FOURTH CYCLE OF LOBLOLLY PINE BREEDING HAS BEGUN IN THE NCSU COOPERATIVE TREE IMPROVEMENT PROGRAM

Steve McKeand[1], Josh Steiger, Jadie Andrews, David Barker, Ross Whetten, Tori Brooks, and Fikret Isik

[1]NC State University Cooperative Tree Improvement Program, Department of Forestry and Environmental Resources, NC State University, Raleigh, NC

Members and staff of the North Carolina State University Cooperative Tree Improvement Program commenced the fourth-cycle breeding program in 2012. A Differential Evolution (DE) algorithm used in animal breeding programs was implemented to evolve an optimal solution (i.e., selection of mates). The objective was to increase genetic gain for the financial benefit of members while maintaining long-term genetic diversity so that gain can continue for multiple generations. Pedigree analysis tools were used to provide insights for our population management options. Our pedigree analysis shows that there is minimal inbreeding in any of the third-cycle populations. The numbers of selections being mated to date for the fourth cycle are 397 (759 crosses) in the large Coastal population, 281 (475 crosses) in the Piedmont, and 209 (304 crosses) in the Northern population. The Cooperative is using an alpha cyclic incomplete block design and rolling front progeny test approach to field test large numbers of trees. Such a strategy will allow better connection between progeny tests across years but also reduces the testing effort. The Cooperative aims to finish crossing for the fourth breeding cycle by 2015. We are also developing strategies to incorporate DNA markers for genomic selection. A high-throughput genotyping platform called genotyping by sequencing has been explored. These approaches will serve to increase genetic gains by reducing the time and effort required for progeny testing. Historical weather records and provenance growth data are also being analyzed to determine the universal response functions of different seed sources and genotypes for adaptive traits such as cold hardiness, heat tolerance, and drought stress, for incorporation into deployment strategies based on scenarios of future climate alternatives.