

A Decade of Progress in Tree Improvement

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Tree improvement research has been a part of the scene in American forestry for over half a century. Only in the last decade, however, has major attention been directed to it. A careful examination of the historical record probably would reveal a number of factors that contributed to the awakened interest. Two, I think, are significant. First is the influence of a number of prominent foresters who attended the Third World Forestry Congress in Helsinki, Finland, in 1949. These men, among whom can be named Dr. I. T. Haig and J. Herbert Stone, had the background to understand the significance of the advances in tree improvement that were being made in Northern European countries. Their recognition of this significance permeated their associates. I recall that the Appalachian Section of the Society of American Foresters devoted its annual meeting in January, 1950, to tree improvement at the suggestion of Dr. Haig, who helped set up the program. The second factor was an exchange of correspondence, beginning in the fall of 1949, between the Forestry Relations Division of the Tennessee Valley Authority and the Southern Forest Experiment Station on the possibility of a regional seed source research program. As an outgrowth of this correspondence the two regional forest experiment stations and the regional office organized the First Southern Conference on Forest Tree Improvement, held in Atlanta on January 9 and 10, 1951.

Somewhat unexpectedly, about 80 people attended the conference. As a result of the deliberations, Dr. Haig and C. A. Connaughton were instructed to appoint a standing committee to coordinate forest tree improvement research and to prepare information on the subject. A twelve-member committee was appointed to include representation from research and regional federal forestry activities, state forestry agencies, the Tennessee Valley Authority, schools and industry.

At its first meeting this group assumed the name Committee on Southern Forest Tree Improvement. Early in its existence it adopted a four-point program of purposes and objectives:

1. To advise and assist those interested in the improvement of southern forest trees in arranging and conducting research and development programs.

2. To provide a clearing house for information on forest tree improvement.
3. To provide for or assist in coordination in the conduct of a South-wide program of tree improvement research and development.
4. To foster and encourage the advancement of knowledge of southern tree genetics.

In this Sixth Conference on Southern Forest Tree Improvement, advances in the tree improvement knowledge and practice will be presented. I shall summarize developments of the past ten years and point out the possible function of the Committee on Southern Forest Tree Improvement in these advances. Many people in public agencies and private industry have provided me with information. I am particularly indebted to Philip Wakeley and Dr. Keith Dorman for their accounts of happenings prior to 1951 and of the work of the Southern and Southeastern Forest Experiment Stations.

Early Studies

Wakeley points out that forest genetics work began in this country with studies of racial variation as related to geographic seed source. Tests were started with ponderosa pine in northern Idaho and in Colorado in 1916. Seed collection began in 1912 for an extensive study of Douglas-fir. Wakeley's 4-source loblolly study was established at Bogalusa, Louisiana, in 1925, Ernest Schreiner and others started an extensive poplar hybridization program in Maine in 1924. And in 1925, James G. Eddy started the Eddy Tree Breeding Station, now known throughout the world as the Institute of Forest Genetics, at Placerville, California.

The South

With this very brief resume, let us direct our attention to the South where extensive beginnings in tree improvement research had been made prior to 1951. Almost exclusively the activity was limited to the Southern and Southeastern Forest Experiment Stations and to T.V.A.

I have cited Wakeley's early study. He also did some crossing of pine species, The early work at the Lake City Research Center was done at a time when that center was still a part of the Southern Station. Most notable was the selection of high gum yielding slash and longleaf pine started in 1941 by Mitchell, Dorman and Schopmeyer. Rooted cuttings of nine high gum yielding clones and six average yielders were produced. By controlled and wind pollination of 12 high yielding and average trees a progeny plantation

of 629 trees was established. From this study have come a number of important publications on forest tree improvement.

At the Southeastern Station, the Appalachian Station at that time, a large study with open pollinated loblolly pine was started in 1934 by A. L. McKinney and L.E. Chaiken. From the seed of each of 105 mother trees, 100 plantable seedlings were obtained and planted in four replications with 25 trees per plot. Early results of this study gave strong indications of rather wide inherent variation in loblolly pine. Flooding of the plantation by the Santee-Cooper power project terminated the study.

Leon Minckler established a pitch pine x loblolly pine hybrid plantation on the Lee Experimental Forest in Virginia in 1945. Also in that year he put in a racial variation study of loblolly pine from four geographic sources and shortleaf pine from five sources.

Under Dorman's supervision a cooperative program was started with the Ida Cason Callaway Foundation at Hamilton, Georgia, in 1949.

As a result of selection among wilt-resistant strains of mimosa in North Carolina, George Hepting and Richard Toole had 28 resistant clones by 1948. Several of these were given to the nursery trade and have carried forward the immunity to wilt. Hepting, Bratislav Zak, and others, in 1950 began making selections in shortleaf pine for resistance to littleleaf disease.

The Tennessee Valley Authority started tree improvement studies in 1933 with the establishment of an experimental tree crop nursery at Norris Dam. Until 1949, the research was devoted mostly to selection and testing of improved nut trees and other crop trees suitable for planting on open land. Some limited attention was given to hardwood species suitable for timber production. Since 1944, collections have been made of trees with unusual and attractively figured wood, including yellow poplar, red maple, walnut, hybrid poplar, and birch. In 1950, studies on pine tree improvement were started in which vegetative propagation and seed source tests were stressed. Attention has also been given to blight resistant chestnut of which seven selections have been propagated.

Developments Since 1951

T.V.A.

By 1960, T.V.A.'s selection and testing of crop trees had resulted in the planting of 140 black walnut, 184 chinese chestnut, 115 filbert and 31 pecan plantations on the lands

pine; physiological studies on growth, photosynthetic efficiency, and respiration; characteristics of trachieds; seed orchard studies; hybridization; and including a number of studies on variation and heritability with hardwoods, particularly yellow poplar and sweet gum. These studies in an extensive graduate teaching program are a real factor in extending the breadth of the research.

The University of Georgia Initiated her program in 1954, It now includes work on heritability of southern pines, vegetative propagation, graft survival, and factors significant in the selection of breeding stock. Plans for more extensive physiological studies are being made.

Auburn University has given some attention to tree improvement since 1953, beginning with geographic seed source studies. Increasing emphasis is being given to physiological studies on characteristics of seedlings of selected pines.

Louisiana Polytechnic Institute, Mississippi State University, Louisiana State University and the University of Arkansas have limited studies emphasizing geographic variation.

The University of Tennessee started a program in 1959 that now includes studies on variation and heritability of yellow poplar and breeding studies with yellow poplar, chestnut, and a number of other hardwoods.

In 1953 the University of Florida, with the help of the Texas Forest Service and the Southern Station, held a short course on tree improvement. Succeeding courses were held at Lufkin, Texas; Florida; Athens, Ga.; and Raleigh, N. C. These courses provided basic training for a large number of the foresters now involved in one fashion or another in southern forest tree improvement.

Professional Manpower in Tree Improvement

Among the state agencies, Georgia has four foresters devoting most of their time to seed orchard and tree improvement work. Alabama has two part-time; Florida one full -time. Louisiana has one man who spends much of his time in the work. Virginia has two men full -time, Texas, more concerned with research, has a geneticist with the Ph. D, a second man with an M. S. and has plans for the employment of a physiologist.

Within industry some 10 or 12 men appear to be devoting full time to tree improvement. However, many foresters possibly 40 to 60, or more, have some direct responsibility in

tree improvement other than that of administration or general supervision. In many companies the identification of outstanding trees that might possibly serve as superior mother trees is a permanent assignment of all foresters who work in company forests,

The Southern Forest Experiment Station at the Southern Institute has six people assigned full time to tree improvement. Wakeley devotes some time to this work, There is one man at Crossett as previously pointed out, two part-time at Stoneville, Mississippi, and one part-time at Alexandria, To sum up, there are 13 researchers of whom 6 are full-time and at least two others better than half-time.

Four men devote full time to tree improvement for the Southeastern Station - two at Lake City and two at Macon. In addition, tree improvement is carried on part-time by one man at Cordele, Georgia; two at Charleston, S. C.; one at Franklin, Virginia; two at Charlottesville, Virginia; one at Asheville, North Carolina; two at Athens, Georgia; and one at Lake City.

T.V.A. has one full-time worker in tree improvement.

Among the schools, Florida has three full-time staff members on tree improvement research. North Carolina State has four. Georgia has two and two others part-time. Auburn has the equivalent of about three full-time. Tennessee has one full-time and two part-time. Louisiana Polytechnique Institute, Louisiana State University, and Arkansas, have one or more staff members who are doing some work in tree improvement.

In the aggregate this becomes at least 48 full-time workers in some phase of tree improvement research or development and development.

Summary of Activity

The basic effort thus far has been in the development of seed orchards and in related supplementary research. Species variation, heritability, breeding, and hybridization are all receiving attention. A most encouraging aspect of the developing research program is the increasing emphasis that is being given to the fundamental physiology-biochemistry of tree growth, including aspects particularly pertinent to forest tree genetics, by the Southern and Southeastern Forest Experiment Stations, N. C. State College, Auburn University and Georgia.

The Committee on Southern Forest Tree Improvement has expanded its membership from the original 12 to 18, and has been active in the assignments to which it set itself, At

