PROGRESS IN TREE IMPROVEMENT RESEARCH AT THE SOUTHERN FOREST EXPERIMENT STATION

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The territory of the Southern Forest Experiment Station extends from Tennessee, Alabama, and the 10 westernmost counties of Florida through the western limits of the southern pine types in Oklahoma and Texas. Throughout most of this territory timber production is, potentially or actually, the dominant land use.

Throughout most of it, also, the potential benefits of applying the findings of forest genetics research are enormous. These potential benefits include increased quantities and quality of products from good to excellent sites in many pine types, and in the bottomland hardwood types of Mississippi, Arkansas, and Louisiana. They include also the partial or complete solution of many local or special problems, of geographic sources of seed for an annual planting program of a quarter of a billion trees, of the delayed initial height growth of longleaf pine, of brown spot needle blight of longleaf pine, of the fusiform rust of slash and loblolly pines, of such insects as bark beetles and Nantucket tip moth, and of special stock for poorly drained areas, deep, excessively drained sands, and areas of frequent, severe droughts.

Opportunities both for genetic research and for application of results could hardly be excelled.

Eight species of hard pines are native to the territory. They exhibit a high degree of individual variation--much more than red pine seems to, for example. At least three exhibit great racial variation as well. Considerable hybridization among them has proved possible through artificial crossing. Among hardwoods, yellow-poplar is of interest because of its high value and very wide occurrence, and cottonwood because of its fast growth, high value, and easy vegetative propagation. The breeding potentialities of the oaks, both bottomland and upland, and of many other hardwoods, are anybody's guess.

A pine planting program which, despite its annual expansion since World War II, still has many millions of acres to cover, offers an ideal outlet for almost all positive findings of genetics research on pines, Intensive management of natural stands, particularly by the pulp industry,

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offers an even wider outlet for findings applicable through natural reproduction.

The progress in tree improvement made by the Southern Forest Experiment Station in the midst of these obvious opportunities is hard to evaluate objectively. Our current program was launched in 1950, but remained on a very limited basis until 12 months ago Nevertheless we feel that we have been successful in certain essential steps. Also, we have a legacy of test plantations, individual trees, records, and experience going back to the period 1925-1937, which promises to save us at least 20 to 30 years in some of our most important current studies, particularly at the recently created Southern Institute of Forest Genetics,

SCOPE AND OBJECTIVES OF THE PRESENT PROGRAM

At its Research Centers, and in cooperation with other federal, state, and private agencies, the Station is studying racial variation in southern pines, selection and breeding of pines and cottonwood, and interspecific and interracial hybridization of pines, together with pollination and other techniques essential to these studies.

Three main concepts have guided the Station in planning its forest genetics research:

First, for best results, both selection and hybridization must be done within the framework of existing geographic races. Improved trees for the deep sands of western. Florida or the low-rainfall belt of eastern Texas must be produced from locally adapted parent stocks, rather than from some single convenient sources such as eastern Louisiana.

Second, the Station does not aim primarily at the discovery, designation, multiplication, and distribution of genetically improved plant material. Rather, it seeks to acquire and make available the soundest possible knowledge of the mechanism of inheritance in the species concerned, and of how to manipulate it, so that not only the Station, but others also, may improve trees for the widest possible variety of conditions and uses .

Third, results applicable through natural reproduction are sought equally with those applicable only through planting. The maximum possible benefit per acre attainable through natural reproduction may be less, but, because of the vastly greater acreage likely to be regenerated naturally, the total gain may be as great or greater.

THE SOUTHWIDE PINE SEED SOURCE STUDY

The Southern Station is the Chairman organization of the Subcommittee on Geographic Source of Seed, of the Committee on. Southern Forest Tree Improvement. In this capacity it launched in 1951 a cooperative study designed to map the zones within which seed of loblolly, slash, longleaf, and shortleaf pines, respectively, might safely be moved from collecting ground to planting site, but across the boundaries of which seed should

not be moved. Through the subcommittee's offices as coordinator, cooperators in 16 states have planted stock from 61 seed sources in 66 test plantations totaling 1,824 individual plots, or more than 220,000 trees. The loblolly and slash pine plantations have survived well enough to meet the needs of the study. Deficiencies in the longleaf and shortleaf phases of the study, resulting mainly from the 1953 and 1954 droughts, are scheduled for correction by further plantings with stock from 1955 seed.

THE SOUTHERN INSTITUTE OF FOREST GENETICS

About a year ago, the Southern Institute of Forest Genetics, an integral part of the Southern Forest Experiment Station, was established at Gulfport, Mississippi. It replaces the former Gulfcoast Branch of the Southern Station.

The staff consists of six technical men, including a pathologist and an entomologist, and their assistants.

Along with selected studies inherited from the previous establishments in forest management and forest pathology, the Institute is conducting both basic and applied research aimed at improving the quality and quantity of forest trees of the South. The emphasis is now on the southern pines,

Current work includes studies on variation among individuals of a race, among races of a species, and among species of southern pines, and the extent to which certain desired characters , including resistance to the fusiform rust and brown spot diseases, are inherited; studies on the interspecific compatibility of the southern pines; studies on flower production and on pollen extraction, germination, and storage; morphological studies on the life cycle of longleaf pine, and the pathological anatomy of the fusiform rust on slash pine; and the effects of nursery practices on survival and growth of outplanted stock. Of necessity, the entomological work at present is aimed largely at control of cone insects and plantation insects; resistance studies are planned for later.

STATION RESEARCH OTHER THAN AT THE INSTITUTE

The main genetics research effort, other than at the Institute, has been at the Crossett, Arkansas, Research Center, where one man has been maintained, full time, on cooperative funds, since the fall of 1952. Studies at Crossett, in addition to two test plantations of the Southwide Pine Seed Source Study, include selection of and breeding on loblolly plus trees, nursery selection of loblolly and shortleaf seedlings, a unique local seed source study, considerable interspecific and some interracial hybridization, and preliminary work on development of seed orchards.

The Alexandria, Louisiana, Research Center did some effective hybridizing in 1951, and has cones coming from new crosses made in 1954 and 1955.

It has valuable breeding stocks of 44 seed sources of 4 species of southern pines, now 19 years in plantation, and 1 very promising brown-spot-resistant longleaf pine discovered in an abandoned nursery in 1937 and now bearing seed.

First attempts to breed pines especially adapted to the deep sands of western Florida were made at the East Gulfcoast Research Center, Marianna, Florida, in 1955. Longleaf and sand pine seed sources are also under test at this Center,

The Delta Research Center at Stoneville, Mississippi, began selection studies of cottonwood in 1954, and three other Centers situated in pine-hardwoods types have various tests of hybrids, of geographic sources of seed, or both.

The Station has enjoyed productive cooperation in hybridizing, selection, and development of pollination techniques with A. Jo Hodges Industries, Inc., at Many, Louisiana, where the company is developing a private institute for game management and forest genetics research, with a full-time technical man, an assistant, plenty of labor, and excellent physical facilities, The Station is also cooperating with the Biophysics Laboratory of Tulane University and the Botany Department of Newcomb College (both in New Orleans) in irradiation of seed and in anotomical studies of the development of longleaf "flower" primordia, respectively,

RESULTS TO DATE

The program just described has been under way too short a time to yield many definite results. The following releases and publications, however, may be of interest as a sample of what may be expected in the future.

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1951. Standardized working plan for local tests of seed source. South. Forest Exp. Sta. 11 pp,, illus. (Processed.)

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1953. Progress in study of pine races. South. Lumberman 187(2345): 137-140, illus.

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1954. Some new pine pollination techniques. South. Forest Exp. Sta. Occas. Paper 136, 13 pp., illus. (Processed.)