THE TREE IMPROVEMENT PROGRAM

of the

TEXAS FOREST SERVICE

(A part of the Texas Agricultural Mechanical College System)

Bruce Zobel, Associate Silviculturist

The Texas Forest Service has in operation a comprehensive program of tree improvement which was officialy initiated in 1951. Workplans have been completed and active research is underway on several major projects, as well as on several smaller ones.

The genetic research work of the service is being conducted on the western edge of the southern pine region, and is representative of most of the area lying west of the Mississippi River. Much of this area has low fluctuatng rainfall, extreme temperature changes and great variability in soils. Such conditions produce some special problems peculiar to our area. In addition, we also share in the majority of problems common to the rest of the Southern Pine Region.

During the course of this meeting, you have heard and will hear more about what a well rounded forest genetics research program should encompass. We have tried to make the program of the Texas Forest Service fulfill these requirements. Research underway is attempting to attack the most pressing problems by a combination of selection and breeding. When organizing a forest genetics research program one runs into two types of problems, i.e., those that are of a strictly local nature in which the findings will be of particular interest only in a limited, localized area and those whose findings will be of interest region wide, or in fact, nation wide and world wide.

Because of the limitation of time I will not have a chance to discuss with you all of the Texas Forest Service operating projects. These are outlined for your information on the attached summary. However, I would like to describe to you in some detail, two of our seven projects. The first of these deals with a problem restricted mostly to the western border of the pine region, while the second is of interest to all silviculturists, wood technologists and forest geneticists no matter where they are working.

To the west of the southern pine region is an area of approximately twelve million acres locally called the Post Oak Region, in which pines usually are not found growing naturally. Much of this area has at one time been under cultivation but a great deal of it, expecially in the characteristically deep sand portion, has since reverted to abandoned fields. For years local farmers have planted pine seedlings obtained

from nurseries in the pine region and year after year have watched their plantations fail. To say the least, they have been very presistent in their attempt to establish pine stands. To alleviate this situation and extend the commercial range of pine the Texas Forest Service is attempting to produce a hardy strain of pine that will be suitable for planting in this region. Nature has given us a boost along this line in the form of the "Lost Pines" -- islands of pine and isolated pines growing from 50 to 100 air-line miles west of the pine belt, with 15 to 25 inches lower rainfall. We are using these "Lost Pines" as a basis for selection, of hardy strains. In addition, we are testing a number of exotics that might be suitable for the Post Oak Region and are working with various theoretically promising hybrids. I personally feel the hybrid with best potentialities is the shortleaf -- slash hybrid. If this tree will inherit the quick takeoff and resistance to tip moth of the slash pine parent and the drought hardiness, ice resistance, rust resistance, and limb form of the shortleaf pine parent we will have a tree ideally suited for our purpose. However, tests are not far enough along to draw any conclusions.

The other project I wish to discuss is exceedingly complex but is of a great deal of importance to anyone interested in wood products. In this study we are attempting to find how strictly the density of a tree is determined by its genetic makeup, and if it will be possible to develop strains of loblolly pine which produce wood of exceptionally high or low densitites.

For a number of years the problem of wood density control has been "studied" -- I put studied in quotes on purpose -- with the result that several ideas have been published as to how wood density of the southern pines can be controlled. I shall now make a statement which as yet cannot be backed up by statistically proven data but can be backed up only by extensive observation. The statement is this, "For any species as a whole, many of the published ideas are partly or wholly incorrect." Often, ideas on controlling wood density were formulated by sampling 4, 6, 8, 10 or some other ridiculously small number of trees. Too often, results were implied to be true for a species in general or in a few cases, for all southern pines. I personally cannot see how anyone who recognizes the amount of variation existing from region to region and tree to tree in what the taxonomist defines as a species, can accept results based on these restricted samples. Furthermore, in most cases, no recognition was made of the parentage of the tree studied, which seems a most serious oversight to one interested in genetics. In fact, I fear that more than once, exceptions to the general findings were encountered which were probably discarded or disregarded as not being typical and which would be of the greatest interest to the geneticists.

Now to get back to the project under discussion. We recently completed the determination of the specific gravities of some 6,000 loblolly pines throughout East Texas, representing all sites, in an attempt to find trees with the highest and lowest densitites. These

trees with extremes of specific gravity will serve as a source of research material for our project and will supply scions, seed and pollen needed in carrying it out.

Several approaches will be made since in most cases techniques to be used must be perfected while working on the project. In whatever approach used, however, one prime consideration is to make the tests under conditions where the environment is as uniform as possible so that results are a measure of the genetic potential of the tree, not merely of two different environments. The first step in obtaining this uniformity has been achieved by locating a homogeneous area for "uniform test garden" where all genetic research material is to be tested.

One method to be used in determining how density is inherited is to graft scions of dense and non-dense trees onto a uniform root stock, and see what density wood the scions produce. But in this case there is a chance for variations in the stock influencing the results since we do not at present have any genetically uniform loblolly pines. To overcome this we are making twin grafts -- i.e., graft a scion from a dense tree and a scion from a non-dense tree both to the same stock, producing a forked tree, one fork of which is from a dense scion, the other from a non-dense scion. This eliminates environmental differences as completely as possible. If the dense and non-dense scions grow to have densitites similar to that of their parent trees a strong genetic control will be indicated -- if they both grow up to have similar densities, it would then indicate the approach for wood density control must be from the silvicultural viewpoint.

As soon as methods for rooting cuttings of loblolly pine have been worked out, cuttings will be taken from the same dense and non-dense trees as were used for the grafts. Further study of density inheritance will be made by determining the specific gravity of trees grown from seed obtained by controlled pollination between the trees with dense and non-dense wood.

In conclusion, let me state that the Texas Forest Service has what we believe to be a well rounded program underway. Through the medium of the Committee on Southern Forest Tree Improvement and in cooperation with others working on similar programs, we are coordinating our work with other agencies in the south to avoid unnecessary duplication of effort. The major forest industries in Texas and Western Louisiana have shown a great deal of interest in genetics research, and have actively backed the work. With such fine cooperation between research agencies, and with industry, the future looks bright for genetics research in our part of the Southern Pine Region.