REPORT OF TECHNICAL COMMITTEE VII.
INHERITANCE OF DISEASE RESISTANCE

It is the feeling of the committee that there should be a careful consideration of various problems before any one is selected for the preparation of a working plan. This report, therefore, merely suggests some of the thinking that has been done before such a selection is made. If it stimulates your thinking and calls forth additional ideas, it will have served its purpose.

There is abundant evidence of variation in susceptibility to diseases in forest trees and research programs are already in progress on resistance to blister rust in white pine, to blight in chestnut, to Dutch elm disease and phloem necrosis in elm, to Septoria and Dothichiza cankers in hybrid poplars, and to littleleaf in shortleaf pine. General observations indicate that there is equal opportunity to find resistance to specific diseases in many other forest trees.

In discussing this subject with Dr. Carl Hartley of the U. S. Forest Service, he made the following pertinent observations. In choosing hosts and pathogens for detailed investigations of resistance, there are several points to consider.

1) The host should be commercially important.

2) The host should be one for which planting would be sufficiently practicable to establish widely any superior varieties developed.

Ease of vegetative propagation is a tremendous advantage in this respect.

3) The host should be one whose management or utilization is now limited by disease or decay, but it should not have pathogens so numerous or severe as to make it appear hopeless to unite in a single strain free dom from all of them.

4) The causes of the important diseases of the host should be definitely known, their symptoms readily recognizable, and their natural incidence or artificial infection so simple that supposedly resistant stock can be given a severe test.

5) The diseases should attack the host in its juvenile stages or at most in its middle age, to give a chance for results in a reasonable time.

6) There should be observational or other preliminary evidence that them are very considerable genetic differences in disease susceptibility in the host species or genus.

If a forest disease meets with these various specifications, then ways and means of developing resistant varieties or selections may be considered. The committee submits two subjects for your consideration; the inheritance of resistance to heartwood decay in various species and the inheritance of resistance to oak wilt in oaks. Both diseases are extremely important and offer an opportunity for tremendous savings in forest production and utilization.

I. The Inheritance of Resistance to Heartwood Decay. The Timber Resources Review, now in preparation, strongly emphasizes the importance of heartrots in forest trees as a part of the total drain from diseases. Here in the Middle Atlantic States, almost nine-tenths of the total annual loss in board foot volume from diseases in forest stands is attributed to heartrot in merchantable and decay cull trees. This indicates the need for reducing such losses if we are to markedly improve the disease drain situation.

Previous studies have shown that there is large variation within species in decay susceptibility of the heartwood of Douglas fir, black locust, and white and red oaks. What is not known is whether or not such variation results from genetic differences or whether it is due to other factors, such as site, growth rate, soil nutrients, etc. Here in the Northeast, we have two important forest tree species that are highly susceptible to heartrot at an early age, black locust and balsam fir. Either or both of them would be suitable for investigations of genetic resistance to decay. Balsam fir fails to meet one of the specifications suggested by Hartley, in that it might be difficult to establish large plantations of it on sites now occupied by rot-susceptible trees and it cannot easily be reproduced vegetatively. Black locust meets all specifications. Both species have serious insect pests that would have to be considered.

Working plans for such a study would include the following items: selection of individual trees in forest stands without heartrot in the older age classes; maintaining through rooting and grafting techniques the original germ

plasm; testing the decay susceptibility of the heartwood from the selected trees; and attempting to determine the basis for genetic variation, if present, and how it is inherited. Seed progeny tests would eventually be required.

II. The Inheritance of Resistance to Oak Wilt. Oak wilt is the most serious menace to oak production in the United States today. Annual losses in some areas in Wisconsin amount to or exceed one percent of the volume over large areas, a rate that can ruin a stand over its rotation. One black oak in Missouri has shown evidence of resistance to wilt and many white oaks can survive for indeterminate periods after infection. In addition, there may be nary cases of natural infections in other oaks that have been unsuccessful or in which the trees have completely recovered. A working plan to investigate the possibilities of controlling oak wilt through selection and breeding for resistance should be formulated. It should include the search for resistance in North American oaks and in exotic oaks as well. Here again, the prime requirements are to find resistant individuals, to propagate them by grafts or cuttings, to test for resistance, to establish plantings of resistant stock, and to make plans for seed progeny tests.

R. Hansbrough, Chairman
C.L. Morris
R.P. True
D.S. Welch
R.A. Zabel