

TREE IMPROVEMENT WORK IN PROGRESS AT THE
QUETICO-SUPERIOR WILDERNESS RESEARCH CENTER

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The Quetico-Superior Wilderness Research Center is a private enterprise located in northeastern Minnesota on Basswood Lake in the Superior National Forest. It is engaged in biological research primarily related to the surrounding forest. Some of the work under way has to do with tree improvement. Because of the facilities available and the interests of the personnel, our main emphasis has been on working out field techniques so that the results of the geneticist can be put directly to practical use in our area.

The first phase of work deals with the grafting in the field of blister rust-resistant selections of eastern white pine onto understocks of the same species ranging in age from 8 to 20 years and in height from 4 to 20 feet. These selections have been developed by Dr. A. J. Riker of the University of Wisconsin, who first stimulated our interest in tree improvement work. Over a 3-year period we have obtained a total of some 800 white pine grafts with a survival of better than 70 percent,

Terminal grafts survived and developed better than lateral grafts. Early spring grafting has been most successful, although fall grafting has shown promise. We have found that the side slit method of grafting is most satisfactory. In applying this technique we have found it necessary to match the cambial tissue on one side only. In other words, the scion does not have to be the same diameter as the understock.

Contrary to common practice, we have found it advantageous to leave an 8- to 10-inch length of terminal stub on the stock above the graft union. This should be left intact for the first 2 years. One or two lateral buds are left on the stub to maintain its life during this period. Shoot growth is pruned back periodically. In this way, successful graft unions will have completely callused and made two rings of wood circling the stub, thereby reducing the incidence of rot. The scion can also be tied to this stub, thereby reducing snow damage. Eventually the stub can be pruned flush with the graft union,

1/ This paper was illustrated by 17 kodachrome slides.

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Many of our third-year grafts, and some of the first- and second-year grafts have developed pistillate flowers which we have pollinated using pollen from Riker's selections in the Duluth area, Growth and development of the control-pollinated cones has been the same as that of wind-pollinated cones on the scions and on mature, 180-year-old pines in the same area. From our results we feel that this type of field propagation can be applied satisfactorily.

Another phase of work, in cooperation with a state agency, deals with the grafting of Norway (red) pine. The aim here is to work out a means of top grafting young red pine up to 20 feet in height with scion wood from older age classes. It is hoped that this work will help in the establishment of seed orchards in which seed can be produced from desirable stock. We have 400 grafts of this type. Again, the terminal graft is the most successful. Survival here runs better than 50 percent. We found that the hard pine tissue requires a firmer binding than the white pine, so plastic raffia is now used.

Still another phase of the grafting work deals with the interspecific and intergeneric grafts. The aim of this work is to find out which species are compatible in order that exotic species can be propagated vegetatively in the field on native understocks. We have made interspecific grafts of *Pinus peuce*, *P. cembra*, and *P. koraiensis* on understocks of eastern white pine and Norway pine. We have also grafted white pine on Norway pine and the reverse, as well as black spruce on white spruce and noble fir on balsam fir. Our intergeneric trial has been *P. koraiensis* on balsam fir. Survival of these intergeneric and interspecific grafts varies from 10 to 98 percent, the lowest being the grafts between white and Norway pine done in the fall.

Another phase of work involves the inversion of trunk tissues. As you know, Sax and others have successfully inverted the phloem tissues in fruit trees, thereby inducing flowering of very young trees. With this in mind, we inverted phloem on small white and Norway pines. Results for the first season showed a stimulation in growth of the white pine and a reduction in growth of the Norway pine. These results are, of course, very preliminary.

These, then, are the attempts we are making to develop techniques for bridging the gap between the work of the geneticist and the forest in our particular region. In the future we intend to extend our grafting work and, as the grafts flower, to expand our hybridization work,