

CURRENT TREE IMPROVEMENT RESEARCH BY
THE CENTRAL STATES FOREST EXPERIMENT STATION

G. A. Limstrom

Forest tree improvement research by the Central States Forest Experiment Station has two broad objectives: First, to improve the yield and quality of plantation products, and second, to improve natural reproduction in existing forests. We have made a modest beginning in studies to attain the first objective; the second objective, difficult to approach but perhaps more important because of the extensive areas involved, is becoming an important consideration in timber-stand-improvement and cutting-methods research. Both objectives require a careful evaluation of the contribution made by environment as well as by the inherent characteristics of the trees under study.

Hardwoods occupy more than 95 percent of the total forest area in the Central States. Except for sites that have been altered -- and sometimes abused -- by our use in the past, soils and climate are apparently more suitable for hardwoods than conifers. It is obvious then, that most of our long-range research in tree improvement should be largely with our most promising hardwood species. However, most of the tree planting in the region is, and will continue to be for a long time, on open, nonstocked land. Site conditions on this land -- especially the old fields in the southern half of the region -- have deteriorated to such an extent that few if any hardwoods are suitable pioneer species for reforesting them. The survival and growth of conifers have, on the other hand, been exceptionally good on such land, so much of the planting in the region will continue to be with conifers, especially pine.

Our tree-improvement studies with conifers consist mainly of testing various seed sources in search for seed that will assure the highest quality and yield of forest plantations. Two tests of shortleaf pine in the Missouri Ozarks have resulted in much better survival of local and northern sources than from sources of more southern latitudes. First-year survival ranged from 77 percent for trees from Louisiana seed to 94 percent for those from local and from New Jersey seed, the northernmost source. In test plantings in southern Illinois, survival and growth of loblolly pine from a Maryland source were better than trees from five other sources of more southern origin. Many trees from the three southernmost sources were frost-killed the second winter after planting; however, frost had little effect on survival of trees from Maryland, Virginia, and Arkansas sources. In Indiana, the height of jack pine 5 years after planting was found to be significantly greater for trees of several sources from the southern parts of the Lake States than from the northern parts of that region. A recent experiment in southern Illinois revealed striking differences in growth, form, and foliage color of eastern redcedar among several sources.

Two other pine seed-source studies have been established recently. One of these is a study of five pitch pine seed sources on strip-mined land in Indiana. The other is a region-wide test of eastern white pine. Sixteen widely separated, selected sources, from Maine to Iowa and from Canada to Georgia, are being studied in this test.

Current studies with the poplars include testing for wood quality as well as growth. One of two natural poplar hybrids recently discovered in Iowa has a wavy figure of high value for veneer stock. Cuttings from these trees have been planted to determine if this important wood quality is heritable. Fiber length of cottonwood, an important pulping property, is also being studied. We are cooperating with industry and public agencies to find fast-growing poplars. In one test in Ohio, for example, the average height of 50 clones of various poplar hybrids received from the Northeastern Forest Experiment Station, and planted on strip-mined land, ranged from 3.8 to 11.1 feet after 5 years; survival ranged from 47 to 97 percent. Even more striking differences in growth are being obtained in tests of a great many poplar selections planted in Illinois and Iowa.

The Station is cooperating with Dr. Ashby of the University of Chicago in a seed-source study of American basswood. Tests of several sources of this species have been established on the Kaskaskia Experimental Forest in southern Illinois. In Ohio, cuttings from a number of promising black locust selections are to be planted on old fields and strip-mined land to check possible resistance to the black locust borer. A study of the germination and progeny development of two forms of bur oak has been begun. We are now planning a rather comprehensive seed-source test of black walnut wood quality and growth.

In 1952 we began an intensive study of environmental and genetic factors affecting germination, growth, and development of yellow poplar. We expect these studies to give us information that will be useful in the management of natural stands as well as plantations. They include the viability of yellow poplar seed when stored in the forest floor, seed development, nursery effects, and progeny tests of both seed trees and stands selected from various locations throughout the natural range of this species. Exploratory work in pollination and grafting, to obtain information needed for the establishment of yellow poplar seed orchards, has also been started.

Although the yellow poplar seed source tests are necessarily of a long-term nature, some early results that should be considered in our current planting program have been obtained. The relative height of 1-0 seedlings grown in the same nursery seedbed appears to be a good indicator of the relative heights in the field--at least for the first 5 years. Frost-caused dieback in a 3-year-old plantation in Ohio was only 3.9, 10.6, and 16.4 percent for trees from seed sources near Dowagiac, Michigan, Marietta, Ohio, and Newburgh, New York, respectively; from more southern sources, North Carolina, Mississippi, and southern Illinois, the dieback was 30.0, 31.8, and 47.0 percent, respectively.

Some variation in growth of seedlings from different seed trees in the same stand has also been noted. Average 5-year heights of trees planted on an old field in Ohio, for seedlings from five different seed trees of a southern Illinois source, ranged from 1.4 to 4.9 feet. From an Ohio source the range was from 1.7 to 3.5 feet. Similar but less marked differences have been noted for other sources included in the test.

The problem of tree improvement in existing stands--planted and natural--is a challenging one. Basically, we want reproduction following cutting to be composed not only of the desired species but of individual trees with the best possible growth and quality potential. Present

studies to determine the size of openings to make in the group selection method of cutting are a step in this direction. To improve the reproduction following cutting in this and other ways, criteria for judging good seed trees, and practical measures for preventing seed production and sprouting of inferior trees are needed. The results of these kinds of studies, with practical applications, should make a substantial contribution to our present-day silviculture.