

# Tree Improvement in Ohio

by

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Ohio's 25 million acres were once about 95 percent forested and recent surveys indicate that about 5.25 million acres are still in forest. An additional 600,000 to 700,000 acres of rural Ohio are in abandoned farm lands, marginal crop fields, or strip mine spoil banks which should be reforested and devoted to the continuous production of forest products.

Natural regeneration is slowly stocking some of this land, often with undesirable species. More rapid and more effective results must be obtained to supply future wood and fiber requirements. It is essential that planting stock having the greatest capacity to survive, grow, and produce high quality products be made available to the owners of this land.

To provide reforestation planting stock at reasonable rates which will encourage planting these non-productive lands, the Division of Forestry and Reclamation operates three nurseries which produce and distribute hardwood and coniferous seedlings. They have the facilities and capacity on their 414 acres to produce and distribute 20 million seedlings annually. For the past several years, Ohio cooperators have planted 14 to 15 million trees a year from this source. In the past 10 years, 150,643,000 trees, consisting of about 50 percent hardwoods and 50 percent conifers, have been shipped and planted. Farmers planted 26 percent of the stock, strip miners 48 percent, and miscellaneous agencies the balance.

Since this production is entirely from seed, enormous quantities of tree seeds are required each year. It is not unusual for the annual seeding schedule to call for 5,000 bushels of hardwood seeds and 1,000 lb. of conifer seeds.

Local collection has been the source of most hardwood seeds and some of the conifers, with the balance needed being purchased from commercial collectors. Every effort is made to obtain seeds from the same climatic region as Ohio.

Over the years, seed collected by state forest and nursery crews has of necessity, due to volume and fund limitations, been the gathering of all seed of

desirable species which could be found. No special regard for parent tree quality was observed. As a result, many poorly formed and poor quality trees have been perpetuated because they were good seeders, accessible, and the seed easily collected.

It was evident that some seed sources produced more vigorous seedlings which made more rapid growth and had better form when field planted. This emphasized the need for genetic improvement through the selection of seed sources.

Our interest in improving the quality of forest trees through genetics was stimulated in the late 1950's by activities at the Ohio Agricultural Experiment Station (now Ohio Agricultural Research and Development Center) and the Central States Forest Experiment Station. These efforts were brought to the attention of Division foresters and drove home the need to improve the quality and production potential of planting stock being distributed to Ohio landowners from the state nurseries.

The initial efforts were somewhat negative but even so were an improvement. Seed from trees known to be defective or of very low quality was not collected. Seed on the market which was not climatically suited to Ohio or of doubtful quality was not purchased.

It was realized that much more needed to be done to improve individual tree quality and to us the development of seed orchards from superior parent trees looked like the answer. This answer could not, however, materialize overnight or even in the next few years due to the time required to develop orchards to the seed harvest stage. Vegetative reproduction was prohibitive due to the cumbersome mechanics involved in mass regeneration.

The idea of developing seed orchards in Ohio was not abandoned but the annual seed requirements had to be met. To do so and still improve seed quality, seed production areas utilizing existing stands or plantations of apparent superior quality were selected. Reforestation plantings made by CCC boys in

the 1930's and immediately after World War II were producing some quantities of seeds which were being collected for nursery use.

It was noted that plantations showing the most vigor and seed production promise rapidly outgrew easy collection size and the volume of seed production declined. It was felt that specific areas of high quality potential should be given cultural treatment to keep the trees in seed production for a long period and to improve collection opportunities.

Hardwood plantings in general had not been successful to the extent that they were producing collectable quantities of seed. An exception to this is black locust and European black alder, both being early and prolific seeders on some sites, with sufficient quantities being easily collected.

Therefore, the Division's major development efforts have been directed towards seed production and collection areas in pine plantations of an age which could be successfully converted for continuous collection. With eastern white pine seedlings being in greatest demand, our interest was directed towards plantations of this species of known origin. Even so, our first production area effort was an attempt to develop a 12-acre tract of native shortleaf pine on the Raccoon State Forest which appeared to be producing heavily.

This stand was 20 to 35 years of age with about 500 trees per acre. This was reduced to 100 to 140 trees per acre in the first thinning and subsequent treatment reduced the numbers to 90 seed trees per acre. The stumps of cut trees were treated with creosote to prevent *Fomes annosus* infection. This treatment proved to be ineffective and therefore no further cutting has been done. Development has been abandoned due to this fungus and the height of the crop trees.

Our first attempt to develop a seed orchard took place in the spring of 1961 with the planting of 3.5 acres of loblolly pine rootstock seedlings on an open ridge top site on the Zaleski Forest. Selected scion material from superior loblolly trees was to be grafted to these seedlings after they became established.

Prior to planting, the site was mowed and 4-foot-wide strips 30 feet apart were plowed and disked. The trees were planted 12 feet apart in these strips. An adjacent 3.2 acre tract was planted, using black pine (*Pinus nigra*) which had been collected from many sources by the Department of Forestry here at the Ohio Agricultural Research and Development Center. An unfavorable first growing season reduced the survival in both tracts so low that they were abandoned.

The next effort in this direction was on the 320-acre Gifford Forest in Athens County, where several accessible fields were still being used for agricultural purposes. The slopes were gently rolling to almost level, facing easterly.

The establishment of this orchard in 1963 was the combined effort of the Ohio Agricultural Research and Development Center, the Central States Forest Experiment Station, and the Division of Forestry. The first plantings were specially selected and prepared black walnut (1.5 acres), white pine (5.5 acres), and yellow-poplar (6.5 acres). Selected European black alder varieties were planted somewhat later. The white pine was grafted stock furnished by the Ohio Agricultural Research and Development Center, the black walnut seedlings were provided by the Central States Forest Experiment Station, and the yellow-poplar was grown and grafted on the Marietta Nursery under the guidance of the Central States foresters.

During the summer of 1965, severe drought and a 17-year locust infestation combined to destroy the yellow-poplar planting. The black walnut and white pine survived, although some mortality occurred. The area is being perpetuated, however, and is regularly mowed and mulched. Some planting will be necessary to re-establish stocking.

The establishment of seed production areas was resumed in 1964 with the selection of a 12-acre white pine plantation on the Zaleski Forest. Originally it consisted of alternate rows of white pine and Scotch pine spaced 6x7 feet. The Scotch pine had been removed at an earlier date, leaving a 7x7 foot spacing for the white pine.

To convert this plantation to a seed production area, all undergrowth was cleared out and the area was brush-hogged. Roads were developed and the trees low-pruned to provide access for equipment. Plans to thin the stand and to top the crop trees were delayed until the cones were mature. This was carried out in the fall of 1965 when the area produced 191 bushels of cones. The spacing resulting from this first thinning is about 21x24 feet. Some further reduction in the number of stems will probably be necessary and the trees will be pruned periodically to keep them low.

Treatment similar to that just described has been started on another 10-acre mixed white and red pine plantation on the Zaleski Forest. The red pine will be removed and the white pine retained for seed production.

A third seed production area is being developed on the Maumee Forest in northwestern Ohio. A 15-acre white, red, and Scotch pine third-row planting started in 1953 is being thinned and prepared for seed

production. The Scotch pine has been removed and the red pine is being reduced gradually. There are currently 350 trees per acre. These will be reduced to about 100 per acre, leaving only the white pine.

Facilities and methods of seed handling, storage, and seeding have been improved in the field and at the nurseries. A new seed extractory at the Zanesville Nursery is complete with drying shed, kiln, tumbler, dewinger, seed cleaners, and seed sizing equipment. Cold storage, dry storage, and stratification pits are in use to keep seed supplies viable. Soil amend-

ments, seedbed preparation, and seeding and mulching practices have been improved to insure the greatest opportunity for germination and growth.

It is our intention to use our facilities and the know-how of our nurserymen to grow high quality seedlings which will give good field survival and growth. We have used and will continue to use all available information and, services to improve the genetic potential of our seed sources. We must grow and distribute trees of superior capability to produce timber and fiber for the future.