THE NORTH CAROLINA DIVISION OF FOREST RESOURCES REGENERATION PROGRAM

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Abstract.--The North Carolina Division of Forest Resources operates three bare-root nurseries and one containerized seedling facility. Production and distribution of approximately 59,000,000 seedlings is anticipated during the 1984-85 season. About 45% of this production will be genetically improved stock. The Division currently manages 227 acres of seed orchards at four locations. Development of an additional 157 acres is planned.

Production of forest tree nursery stock by the then Division of Forestry of the North Carolina Department of Conservation and Development began in 1926; 31,000 seedlings were distributed to forest landowners of the state during the 1926-27 planting season. The state's first "Tree" Nursery was located on an one-quarter acre site owned by North Carolina State College. In 1928 a permanent nursery site near Clayton was purchased by the Division. Almost 300,000 seedlings were shipped from this nursery during the following planting season.

From this rather modest beginning a statewide Nursery Program developed that included four nurseries and produced and distributed almost 98,000,000 seedlings during the 1958-59 planting season. After that peak year of the Soil Bank Program, production gradually decreased until it reached a low of 35,000,000 seedlings in 1964-65. Since that time demand for nursery seedlings has gradually increased; during the past five years seedling distribution has ranged from 50,000,000 to 60,000,000. The current year's sowing schedule for the Division's three bare-root nurseries now in production calls for 59,000,000 seedlings, including almost 8,000,000 custom seedlings for forest industries, the United States Forest Service, and other states. In addition to the pines, included in this schedule are 2,000,000 Fraser fir and 260,000 hardwoods.

PROGRAM ORGANIZATIONAL STRUCTURE

At present, responsibility for the Nursery and Tree Improvement Programs is held by a Senior Staff Forester, who reports to the Section Chief, Field Projects. Also assigned to the Central Office staff is an Accounting Clerk who is responsible for seedling sales and distribution records. A Nursery Technician and a Tree Improvement Staff Forester are stationed at Griffiths Forestry Center near Clayton, as is the Nursery-Tree Improvement Forester who has line responsibility for the programs in the East. The Western Nursery-Tree Improvement Forester is headquartered at Morganton Forestry Center.

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Each individual nursery is under the direction of a Nursery Supervisor. Because of the broad scope of tree improvement activities in the East, a Seed Orchard Manager has responsibility for orchard management at the two facilities where seed orchards are located. Tree Improvement Technicians at these facilities report to this regional Orchard Manager. In the West a Tree Improvement Technician stationed at Morganton Forestry Center manages the existing western seed orchards.

Currently about 80% of the funds expended by the Nursery and Tree Improvement Programs are provided by receipts from the sale of seedlings. These receipts are credited directly into the operating budget. Appropriations are used for salaries and fringe beneifts of supervisory and staff personnel only.

THE NURSERY PROGRAM

As previously stated the Division of Forest Resources operates three bare-root nurseries. The largest of these, F. H. Claridge State Forest Nursery, located in the upper Coastal Plains near Goldsboro, provides seedlings for the eastern two-thirds of the state. As a result of additional purchased and transfer of land from other state agencies, this facility has grown from the initial purchase of 90 acres in 1953 to its present size of approximately 600 acres. Fields totaling 160 acres are permanently irrigated and available for seedling production. As presently developed this nursery can sustain an annual production of 60,000,000 to 65,000,000 seedlings. The 1984-85 sowing schedule calls for the production of 39,000,000 seedlings including loblolly, longleaf, and slash pines, plus red cedar and bald cypress.

In February 1978, fire destroyed the packing building/office at Claridge Nursery. Since the fire, a modern packing building has been constructed and placed in operation; a forestry center office building with space for Nursery and Tree Improvement offices replaced the old office complex. Expansion of seedling cold storage facilities was underway at the time of the fire, this expansion has since been completed and cold storage capacity for 10,000,000 seedlings is currently available. A freezer room with a storage capacity of approximately 50,000 pounds of seed replaced the smaller freezer destroyed in the fire.

The most recent improvement at Claridge Nursery is a completely new seed extractory. This plant includes a dryer-shaker with 120 bushel capacity, plus wet and dry de-wingers, a cleaner-sizer, a scalper, and a gravity table. The new extractory became operational in 1983 and is expected to improve operational efficiency as well as increase seed yield per bushel of cones.

The largest nursery in the western part of the state, Ralph Edwards Nursery near Morganton, was established in 1956 to supplement seedling production from the much smaller Holmes Nursery which had been in operation since 1938. Originally developed on 100 acres of land leased from Crescent Land and Timber Company (a subsidiary of Duke Power Company), this nursery

facility now consists of 179 leased acres at the original site plus 71 acres in a separate tract about 7 miles distant. The smaller area (known as the Annex) was leased in 1983 to expand production capacity and to allow a more conservative field rotation schedule. With an optimum schedule of field rotation, the production capacity of this nursery is about 17,000,000 white pine seedlings from 98 acres of irrigated nursery fields. This year's sowing schedule calls for almost 18,000,000 seedlings. Species included are loblolly, shortleaf, Virginia, and white pines, black walnut, yellow poplar, sweetgum, sycamore, and on an experimental basis, black cherry.

Recent expansion at Edwards Nursery has increased cold storage capacity to 3,000,000 seedlings. A freezer room with an approximate capacity of 10,000 pounds of seed is contained in the packing building. As at Claridge Nursery in the East, the Nursery and Tree Improvement staff at this facility are assigned to the Morganton Forestry Center.

The third nursery operated by the Division of Forest Resources is Linville River Nursery, located on the Joseph Gill. State Forest in the northwestern part of the state. Development of this nursery began in 1968. The first crop was seeded in 1970, although Fraser fir transplants had been moved here from Holmes Nursery in 1969 (Holmes Nursery has now become a Small State Forest). Development of nursery fields has continued until 27 acres of irrigated fields are now available. The physical plant at this nursery includes a packing building with offices and cold storage facilities for 2,000,000 seedlings. Linville River was originally planned for the production of 3-2 Fraser fir seedlings. However, in 1980 the decision was made to produce 3-0 transplant stock, and to phase out 3-2 production. Present policy limits distribution to 4,000,000 3-0 seedlings each year, although the existing fields could produce more than double this number of seedlings annually with a satisfactory field rotation.

In 1975 the Division of Forest Resources constructed a 4,300 square feet greenhouse at Griffiths Forestry Center near Clayton, on land originally purchased for the first nursery (bare-root production was discontinued at this nursery after the 1972-73 shipping season; most of the site has since been developed as a Small State Forest). An old storage building was moved into position to serve as "headhouse". This containerized seedling facility was planned to produce Fraser fir seedlings over the winter; lack of demand for the seedlings and a subsequent change in program goals made this use obsolete. The facility now produces three crops (about 900,000 seedlings) of loblolly pine annually. Since its completion, the facility has successfully produced containerized seedlings of Fraser fir and loblolly, longleaf, slash, and eastern white pines. Although adequate land is available at this location, no expansion of this facility is planned at this time.

THE TREE IMPROVEMENT PROGRAM

Initial efforts in tree improvement began when the Division of Forest Resources joined the North Carolina State University - Industry Tree Improvement Cooperative in 1963. Grafting began the following spring, with seed orchard development beginning later that year. Initially begun on a relatively small scale, this program has grown to a current acreage of 227 acres of established seed orchard; plans are firm for the establishment of an additional 157 acres. The Division is well on its way to meeting its goal of producing all major pine species and Fraser fir seedlings from genetically improved seed. The 1984 sowing schedule calls for 45% of non-custom production of these species from improved seed. In addition, all sycamore seedlings produced will come from seed orchard seed.

The original 28 acres of first generation loblolly pine seed orchards were established at Claridge Nursery, beginning in 1965. Later 5 acres of pond pine and 2 acres of sycamore orchards were added. The loblolly orchards have produced significant amounts of seed since 1976, with 1981 being the best year when 2,107 bushels of cones yielded 3,813 pounds of seed.

The Tree Improvement Program in the East received a big boost in 1981 when control of 192 acres of land adjacent to the Claridge Nursery site was transferred to the Division of Forest Resources for seed orchard expansion. To date 60 acres of second generation loblolly pine seed orchard have been established on this land. When the planned expansion is completed, the Claridge Nursery seed orchards will consist of 165 acres.

Longleaf pine seed orchard establishment began at Bladen Lakes State Forest in the southeastern part of the state in 1965. A total of 20 acres of first generation orchard was initially established. Significant seed production began in 1977 with the implementation of an adequate pest control program. The highest yield was obtained in 1981 when 1,098 bushels of cones produced 1,617 pounds of seed.

Expansion of the longleaf pine seed orchard acreage began in 1975 and at present a 30 acre expansion area is about 60% complete, with another 20 acres cleared and ready for establishment. This total of 70 acres of orchard should produce enough seed to sustain an annual nursery production of 5,000,000 longleaf pine seedlings.

In order to allow nursery expansion, movement of some established loblolly orchards from Claridge Nursery to Bladen Lakes State Forest was begun in 1970. Because of site problems, these loblolly orchards were not completed until 1975. This 24 acre block of seed orchards is just beginning significant seed production. No further expansion of loblolly pine orchards in this area is planned.

Seed orchard establishment began in the West at Edwards Nursery in 1964. Today, 43 acres of eastern white pine, Virginia pine, shortleaf pine, and sycamore are producing at least some seed. For several years all Virginia and shortleaf pine seedlings distributed have been produced from improved

seed. Efforts are now underway to evaluate Virginia pine progeny tests for Christmas tree characteristics. Eventually it may be possible to offer "Christmas tree" or "timber" varieties of improved seedlings of this species.

Seed production from the white pine orchard has been sporadic and generally unsatisfactory. However, a bumper crop of cones is anticipated this year, and it is hope that improved pest control practices will improve seed yields. Limited quantities of improved white pine seedlings were available to landowners for the first time during the past shipping season.

In order to meet future Nursery goals, an active search is now underway to locate a satisfactory site large enough to expand to 65 the white pine seed orchard acreage. An orchard of this size should produce enough seed to sustain the production of 10,000,000 seedlings annually.

In 1968, development of a Fraser fir seed orchard began on a hill above the Linville River Nursery. Eventually over 300 selections from existing Christmas tree plantations were transplanted onto this site. To date, significant production of viable seed has not occurred, but one open-pollinated progeny test has been established from this orchard and a good crop of cones will be harvested from this orchard this year. Production of genetically improved Fraser fir is planned as soon as seed is available.

Because of the lack of a consistently dependable source of Fraser fir seed, major seed orchard expansions of this species are underway. In the last two years, 10 acres of orchard (composed of grafts of some of the best trees in the existing orchards) have been established at a higher elevation on the Gill State Forest property. Another 5 acres expansion is planned this year. Agreement has been reached with the United States Forest Service for use of a tract on the Nantahala National Forest in the southwest part of the state and the establishment of an additional 20 acres of Fraser fir seed orchard is planned on that site. The Division also is developing a seed production area of about 25 acres in a wild stand on Roan Mountain near the state's northwestern border.

It is hoped that this paper gives some idea of the size and complexity of the forest regeneration effort in North Carolina. The program is 58 years old this year and is continuing to strive to produce adequate numbers of the highest quality seedlings at the lowest possible cost.