Progress Report: Seedling Production in the South[1]

Clark W. Lantz[2]

Abstract.-Filling the "Regeneration Gap" in the South will require the cooperative efforts of state, industry and U.S. Forest Service personnel in an extensive reforestation project.

Seedling production in the South for 1977-8 totaled 895 million, including 370 million (41X) genetically improved seedlings.

INTRODUCTION

The "Regeneration Gap" in the South has presented a real challenge to reforestation personnel. Although pine growth has exceeded the cut for many years, we have lost over 7 million acres of pine type in the last 10 years. Failure to regenerate pine stands, lack of effective brush control, improved fire control (which has favored less desirable species) and hardwood competition are all factors which have contributed to this situation (Williston 1977).

In order to recover this lost acreage, it is estimated that 1,860,000 acres of private, non-industrial land must be planted, direct seeded or regenerated naturally each year. Since the current area being planted averages between 250,000 and 300,000 acres, a tremendous increase is needed.

LIMITATIONS ON STATE NURSERY PRODUCTION

A recent analysis of nursery production in the Southeastern Area identified the major restrictions to increased production in the state nurseries as the need for: (1) Additional land, (2) Increased budgets, and (3) An improved labor situation. The limited land base at many state nurseries has prevented effective crop rotation systems resulting in the production of lower quality seedlings in many cases. Budget and labor problems are continual concerns in most state nurseries. A concentrated effort is being made to deal with these three areas of need. We feel that significant increases in nursery production will require a well-coordinated plan with state, industry and Forest Service participation.

CURRENT NURSERY PRODUCTION

Overall nursery production in the South has increased from 857 million seedlings in 1975-6 to 877 million in 1977-8 (figure 1). In 1975-6, state nurseries produced 54% of the total southern production while in 1977-8, state nurseries produced 55% of this total.

Reforestation personnel in the 13 southeastern area states (AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, and VA) predict that the 1979-80 seedling crop will total 599 million (figure 1). If the 29 southern industrial nurseries continue to produce 391 million seedlings, the total will be 990 million for this season. However, heavy rains this spring washed out seedbeds in some nurseries and cool weather delayed germination in others. For these reasons, this season's production may not reach the prediction of 990 million seedlings.

New industrial nurseries in Alabama, Arkansas, Georgia, Mississippi, South Carolina, and Texas will make a significant impact on the overall reforestation effort in the South. A total of nine nurseries are in various stages of construction, including one (Champion -

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[2]Nursery/Tree Improvement Specialist, State and Private Forestry, USDA Forest Service, Atlanta, Georgia.

South Carolina) which started in production this spring. Since about 44% of the state nursery production is contract-grown seedlings for industry, the completion of these new industrial nurseries should free a substantial production area within the state nurseries. Hopefully, this will enable some state nurseries to establish better crop rotation schedules and improved soil management procedures.

one loblolly orchard (Weyerhaeuser - North Carolina) which averaged 197 pounds per acre

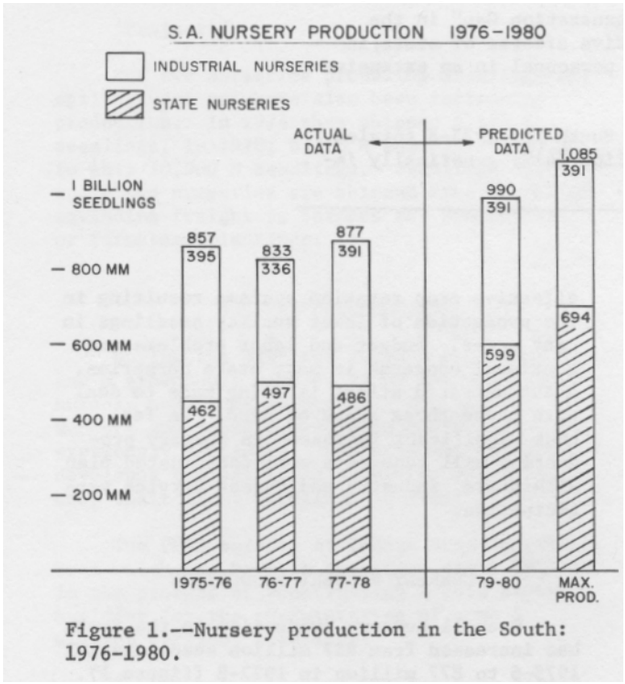


Figure 1.--Nursery production in the South: 1976-1980.

PRODUCTION OF GENETICALLY IMPROVED SEEDLINGS

In almost 30 years of active tree improvement work in the South, we can be proud of many accomplishments. We have three active tree improvement cooperatives which include eight southern state forestry organizations, 36 forest industries and one forest seed company. The other five southern state forestry organizations all have independent tree improvement programs, most of which have cooperative arrangements with universities or U.S. Forest Service research projects. In addition, the southern region of the U.S. Forest Service and TVA both have active tree improvement programs.

There are more than 9,000 acres of seed orchards established in the South. These orchards produced over 60 tons of pine seed in 1977. Six of these orchards have produced more than 100 pounds of seed per acre including over the entire 33 acre orchard.

The number of genetically improved seedlings produced in the state, company, and federal nurseries in the South has steadily increased in the past three years from 27% in 1975 to 41% in 1977-8.

State nurseries have made the most dramatic improvement by increasing their percentage of improved seedlings from 14 in 1975-6 to 38 in 1977-8. It is predicted that the 197980 state nursery crop will be 43% improved seedlings. Industrial nurseries increased the number of improved seedlings from 41 to 45% in the 1975-8 period, while the Ashe nursery percentage increased from 35 to 39%.

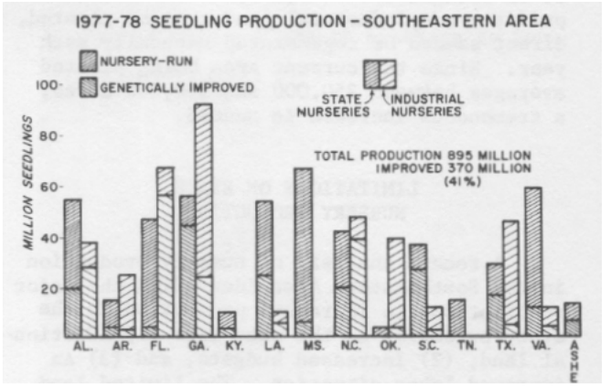
With one exception, all the southeastern state nurseries produced some improved seedlings in the 1977-8 season (figure 2). State nurseries in Alabama, Georgia, Louisiana, North Carolina, South Carolina, Texas and Virginia produced substantial numbers of improved seedlings in that season. The three states with the highest percentage of improved seedlings were Georgia (80%), South Carolina (73%), and Texas (59%).

Company nurseries in Alabama, Florida, Georgia, North Carolina and Virginia produced substantial numbers of improved seedlings during 1977-8. The highest percentages of improved seedlings were produced by company nurseries in Florida (85%), North Carolina (81x) and Alabama (76%).

Figure 2.--Improved seedling production: 1977-8.

HOW CAN WE MAXIMIZE THE GAINS FROM IMPROVED SEEDLINGS?

In order to develop the full potential of these improved seedlings, nursery management



techniques need to be improved. Emphasis must be placed on quality rather than quantity.

1. Soil management procedures must be updated (Leaf 1976). New sources of organic matter must be found to replace depleted stocks of sawdust and bark. Composting of sewage sludge with wood residues is a promising technique which is currently under evaluation at several nurseries. Fish sludge and MILORGANITE are being used successfully at the USFS Wind River nursery (Dutton 1979).

2. Precision seed sowing is essential in order to better utilize improved seed and to enable mechanized pruning of lateral roots. Low seedbed densities (20-25 seedlings per square foot) are necessary to enable adequate diameter growth and root development.

3. New species of mycorrhizae indicate a great potential for improving both nursery and field performance of pines and hardwoods (Cordell, et al 1979; Kormanik, et al 1977).

4. New herbicides are more effective and cheaper than the chemicals used in the past (South 1979).

5. Root wrenching has been an effective means of encouraging compact, dense root systems of Pinus caribaea and P. radiata in New Zealand (Bacon and Hawkins 1979). Use of this technique in this country, in the Pacific Northwest and the South resulted in variable degrees of success. New evaluation studies are underway by both federal and industrial research groups.

6. Top pruning has been used by several nurseries to restrict top growth, add diameter growth and encourage root growth through the fall (Dierauf 1977).

7. A well-planned schedule of withholding nutrients and water in the fall will also slow down active top growth and promote earlier dormancy.

8. Careful adjustment and operation of mechanical lifting equipment will minimize damage to the seedlings. The optimum survival and growth of seedlings is dependent on undamaged root systems and intact mycorrhizae.

9. There seems to be a popular belief that seedlings packed in Kraft/Polyethylene bags can be treated like pulpwood! Nothing is farther from the truth. The K/P bags were developed specifically for cold storage use. Seedlings confined in the bags will produce considerable heat just in the process of respiration. When temperatures rise inside the bags, fermentation can take place very quickly.

Recent studies in the Pacific Northwest[3] have indicated the importance of good air circulation in cold storage units. The internal temperatures of K/P bags without good air circulation were as much as 22°F higher than those with good air circulation. Merely piling bags more than two deep on pallets resulted in a 10°F increase in temperature. These increases in temperature where bagged seedlings were maintained in cold storage, point out the potential for rapid temperature increases when seedlings are packed in K/P bags and taken out of cold storage. Bagged seedlings left in the sun for just a few minutes can build up lethal temperatures. The entire process of tree breeding, improved seed production and high quality seedling production in the nursery is a complete waste of time and money if the seedlings do not survive! Careful inspection and constant supervision of the storage, shipping and planting operations are essential for the realization of maximum genetic gains from the overall tree improvement and reforestation process.

SUMMARY

The "Regeneration Gap" in the South represents a great challenge for the cooperative efforts of state, industry and U. S. Forest Service reforestation personnel.

Southeastern Area state nursery personnel have identified their major restrictions to increased seedling production as the need for additional land, increased budgets and a better labor supply.

Seedling production in the South for 19778 totaled 895 million, including 370 million genetically improved seedlings (41% of the total production).

Many southern seed orchards are producing commercial quantities of seed with a total production of over 60 tons of pine seed produced in 1977. Maximum genetic gains from this improved seed will be accomplished only if major improvements in nursery technology and seedling handling can be implemented.

LITERATURE CITED

Bacon, C. J. and P. J. Hawkins. 1979. Intensive root wrenching: a prerequisite for

[3]Personal communication from P. J. Heide, Scott Paper Company, Hamilton, Wash.

the successful establishment of 1-0 Pinus caribaea (Mor.) seedlings. Tree Planters Notes 30(1):5-7.

Cordell, C. E., R. L. Anderson and D. H. Marx. 1979. National Pisolithus tinctorius ectomycorrhae nursery evaluation. pp. 97-103. Proc. 1978 Southeastern Area Nursery Conf. (in press). USFS, Atlanta, GA.

Dierauf, T. A. 1977. Top clipping in the nursery bed. pp. 37-43. Proc. 1976 Southeastern Area Nursery Conf. USFS, Atlanta, GA.

Dutton, D. W. 1979. Organic additives at Wind River nursery. pp. 106-118. Proc. 1978 Southeastern Area Nursery Conf. (in press). USFS, Atlanta, GA.

Kormanik, P. P., W. C. Bryan and R. Schultz. 1977. Endomycorrhizae: their importance in nursery production of hardwood seedlings. pp. 16-21. Proc. 1976 Southeastern Area Nursery Conf. USFS, Atlanta, GA

Leaf, A. L. 1976. Nursery soils program in northeastern states. pp. 90-100. Proc. Northeastern Area Nurserymen's Conf. Ontario Ministry of Natural Resources, Kemptville, Ontario.

South, D. B. 1979. Integrated weed management in southern forest nurseries. pp. 138148. Proc. 1978 Southeastern Area Nursery Conf. (in press). USFS, Atlanta, GA.

Williston, H. L. 1977. Pine reforestation task force report. USDA Forest Service, Southeastern Area, State & Private Forestry, Atlanta, GA. 40 pp.