THE EFFECT OF SEEDBED DENSITY ON SEEDLING PRODUCTION AT THE GEORGIA FOREST NURSERIES

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As demand for pine seedling stock increases, State Foresters are confronted with the problem of developing additional nurseries. Because of high investment in buildings and equipment, the other alternative is to utilize existing facilities intensively. This can be accomplished either by growing seedlings successively on the same land or increasing seedbed density.

This study seeks the maximum seedbed density at which slash and loblolly can be produced.

Literature Review

Wakeley 2/ states that the maximum density at which loblolly seedlings can be grown is 50 to 55 per square foot and that slash pine grown at densities of more than 30 per square foot may be decreased in size. He further states that 80 percent of the living seedlings at digging time should be plantable. TVA Nurseries 3/ grow loblolly pine at 36 to 40 seedlings per square foot and expect 30 to 32 of these to be plantable. Muntz, 4/ in 1944, reported growing slash pine seedlings at densities of from 10 to 50 per square foot with and without compost in the soil. On the basis of his studies, he recommended a seedbed density of 30 per square foot.

1/ The Georgia Forestry Commission furnished all manual and technical assistance and provided suitable seedbed facilities. The author is employed under a cooperative agreement with the Georgia Forestry Commission

2/ Wakeley, Philip C. 1954. Planting the southern pines. U.S. Dept. Agr. Forest Service. Agr. Monog. No. 18, 233 pp. , illus.

3/ Tennessee Valley Authority. 1954. Operations manual for TVA forest nurseries. TVA Div. of Forestry Relations .

4/ Muntz, H. H. 1944. Effects of compost and stand density upon longleaf and slash pine nursery stock. Jour. Forestry .42(2): 114-118.

Experimental Methods

Some beds of loblolly and slash seedlings sown by the standard methods at each of the four Georgia Nurseries were divided into 5-foot plots and thinned in May of 1955 to densities of 20, 25, 30, 35, and 40 seedlings per square foot. Two replicates each of slash and loblolly were established at three of the four nurseries, and four replicates of slash at the other nursery.

During the week of November 21, seedlings from a 3-square foot portion of each plot were dug. Each group was graded and the number of plantable seedlings recorded. These were further divided into those with stem diameter of 3/16 inch or more at the ground level (Wakeley grade #1). They were also sorted into three classes of root development- -good, medium, and poor. A further subdivision on the basis of top length separated those between 9 and 15 inches tall. One hundred seedlings from each plot were planted in the State forest at Waycross. (Survival and growth data on these seedlings will be taken in 1957.)

Results

Table 1 shows the effect of seedbed density on the number of seedlings in the various grades.

Table 1.--Effect of seedbed density on slash and loblolly pine seedling quality at the Georgia nurseries

SLASH

Density after thinning	Living at digging	Plantable	3/16-in. stem	Top length 9 to 15 in.	With good roots
		Number of seedlings per square foot			
20	19	18	10	14	10
25	25	23	10	15	12
30	28	26	10	20	13
35	37	32	12	23	17
40	40	35	11	28	20

LOBLOLLY

20	19	18	8	15	12
25	24	21	7	18	14
30	33	28	10	22	16
35	32	27	6	17	13
40	36	33	8	26	21

The total number of plantable seedlings increased with seedbed density up to the 40-per-square-foot level. This indicates that under Georgia conditions both slash and loblolly seedlings were produced more profitably at a density of 40 per square foot than at any lower density. Examination of the figures shows that the proportion of seedlings with 3/16-inch stem diameter was not decreased with an increase in seedbed density. Eight to ten grade 1 seedlings were produced per square foot at the lowest density and this could not be increased by using additional seed. If #1 seedlings were the only grade desired, optimum seedbed density would be ten. Fifty-seven percent of the seedlings were rated as having good roots and seventy-six percent were between 9 and 15 inches tall. These percentages remained reasonably constant at all densities. There is no evidence from root development or top length to justify using a density of less than 40 per square foot.

Muntz's data for seedlings in beds treated with compost are in reasonable agreement with that reported here. If his figures for percent marketable are converted to marketable seedlings per square foot, the comparison is as follows:

Density	Plantable seedlings (after Muntz)	Plantable seedlings (current study)
20	20	18
30	28	26
40	33	35

The fertility level of Georgia Nurseries is probably comparable with that of his plots treated with compost.

Summary

More plantable seedlings of slash and loblolly pine can be produced at a seedbed density of 40 per square foot than at lower densities under Georgia conditions. Number of seedlings with stem diameter of 3/16 inches or more was not changed by varying densities. By this means, 1,161, 600 seedlings can be grown per acre instead of the 871, 200 which would be produced at a 30-seedling-per-square foot density. 5/

5/ These calculations are based on the fact that seedbeds 4 feet wide are separated by 2-foot alleys, so that 1 acre of nursery contains 29, 040 square feet of seedbed.