

## DOES SEEDLING DOMINANCE IN NURSERY SEEDBEDS CONTINUE IN THE PLANTATION?

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### Review of Literature

Much work and discussion has been devoted to the effect of seed and seedling size on the survival and growth of seedlings in plantations.

Fowells (2) found that large seed of ponderosa and Jeffrey pine produced more large seedlings than medium or small seed and that the larger seedlings, regardless of seed size, outgrew medium and small seedlings. Survival for the large seedlings was also better than for the medium and small seedlings.

Stoeckeler and Limstrom (5) and Limstrom and Finn (3) found that survival and height growth of red pine was best for the larger classes of stock. Curtis (1) found that the larger red pine stock grew more rapidly the first year after planting, and that the difference in height growth continued throughout the 12-year study. He found that size classes did not significantly affect survival.

Limstrom et al. (4) found that for yellow-poplar the survival increased as stem caliper increased if root development or root

pruning did not destroy the plant balance.

Limstrom and Finn (3) found that yellow-poplar seedlings with larger stem diameters and top heights continued to grow more rapidly in the plantation.

### Experiment

Red pine is the most popular species for reforestation in the Lake States region because it grows well on the sandy, acid soils found in most of the forest areas and because it is relatively free from diseases and insects when planted on suitable sites.

Most of the stock planted in the Lake States is graded as to stem caliper, top length, and root length. However, no effort is made to grade the plantable stock in different size classes according to top length and stem caliper.

In 1957 and 3-0 red pine seedbeds at the Chittenden Nursery contained many seedlings that had made exceptional growth. As the first step in determining if these outstanding seedlings would continue their faster growth, some of them were planted with regular planting stock of the same seed source.

Several hundred outstanding trees were selected and marked in the seedbeds. As the trees were lifted, the seedlings selected according to height and location in the bed were collected. The selected seedlings were 7 inches or more in height and were from the interior of the bed. One hundred and fifty superior seedlings were selected at random and measured (table 1). Fifty regular seedlings were also selected and measured. The regular seedlings were graded to meet the minimum specifications for the region (3/32-inch stem caliper and 4-inch top).

The seedlings were machine planted on the Cadillac District of the Huron-Manistee National Forest in the spring of 1957. Spacing was approximately 6 by 8 feet. The site is rolling with an east aspect. The soil is a sandy loam slightly better than that of most areas on the forest but typical of the soil in this area. Six rows, each containing approximately 225 trees, were planted; selected trees were adjacent to rows planted with regular stock. At planting the selected seedlings averaged 4 inches more in height than the average for the regular seedlings (table 1).

Field measurements were made in 1960 and 1964. Fifty selected trees and fifty of the bed run trees were measured. The trees to be measured were determined by use of random tables, were numbered, and were marked with an aluminum tag. The height of the tree, growth, and caliper at ground line were recorded for each designated tree. Other data, including survival, European pine shoot moth infestations,

TABLE 1.--Dimensions of selected and regular 3-0 red pine

Item	Top length		Stem caliper	
	Average	Range	Average	Range
Selected	<i>Inches</i> 9.88	<i>Inches</i> 7.25-12.25	<i>32d inches</i> 6.7	<i>32d inches</i> 6-8
Regular	5.9	4-12.25	5	4-8

and double leaders, were also recorded.

### Results

In the fall of 1960, the selected trees were an average of 6.3 inches taller than the bed run trees (table 2).

In 1964 the difference was 10.6 inches. Thus, 8 years after planting the selected seedlings had increased their height growth over the regular seedlings by 6.6 inches.

The average stem caliper in 1964 was 2.65 inches for the selected trees and 2.58 inches for regular stock. This is approximately the same difference present at planting.

These measurements indicate that the selected seedlings have each year made slightly more height growth than the regular stock. Curtis (1) found that the larger stock made better growth the first season after planting. This apparently was not true in this planting.

Hough found that the larger red pine based on weight not only grew faster initially but continued to increase their growth rate in comparison to that of smaller stock. No significant faster growth has occurred in the selected seedlings in this planting.

Survival counts made in 1960 showed that the selected seedlings had a survival of 93

TABLE 2.--Field measurements - red pine

Item	1960						1964					
	Height			Stem caliper			Height			Stem caliper		
	Short- est	Tall- est	Aver- age	Small- est	Larg- est	Aver- age	Short- est	Tall- est	Aver- age	Small- est	Larg- est	Aver- age
Selected seed- ling.....	<i>Inches</i> 21	<i>Inches</i> 50	<i>Inches</i> 36.7	<i>Inches</i> 0.625	<i>Inches</i> 1.469	<i>Inches</i> 1	<i>Inches</i> 58.8	<i>Inches</i> 140.4	<i>Inches</i> 105.4	<i>Inches</i> 1.34	<i>Inches</i> 3.56	<i>Inches</i> 2.65
Regular seedling	14	43	30.38	.344	1.344	.75	49.2	126.0	94.8	1.14	3.56	2.58

percent, compared to 81 percent for the regular seedlings. This survival had not changed appreciably by 1964. This agrees with the findings of Fowells, Stoeckeler, and Limstrom.

In 1959 and 1960 the plantation was infested with European pine shoot moth. When examined in 1960, 8 of the selected seedlings and 11 of the regular seedlings had been infested with the moth. When the trees were remeasured in 1964, five of the selected trees and two of the regular trees had recovered from the attack and were growing well. One of the selected trees had died, and the other two selected trees and all the regular trees had died back to about 18 inches above ground and were attempting to develop a new leader.

During measurements in 1960 double leaders occurred on many of the selected and regular seedlings. When they were remeasured in 1964, this condition had in most cases disappeared. Examination of these trees revealed that one of the leaders continued as a leader and the other bent down and occurred as a limb in the whorl of branches. However, it was always bigger than the other branches in the whorl and had a sharper angle in relation to the stem.

### Conclusions

Selected seedlings that have expressed a dominance or made greater height growth in a seedbed did not continue to make this rapid growth when planted in the field. After 8 years in the plantation the selected seedlings had increased their average height by only 6.6 inches over the regular seedlings. No rapid growth occurred on the seedlings the first year after planting as has been found on similar plantings

of red pine and other species. Survival was better for the selected seedlings. There did not seem to be any significant difference between the selected and regular seedlings in relation to their ability to resist attacks of European pine shoot moth. The regular trees had a few more trees infested but made a better recovery.

This study seems to indicate that grading seedlings that meet planting specifications into several grades based on top length and stem caliper would do little to increase the height growth in the plantation. However, survival might be increased somewhat.

### Literature Cited

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