

WHITE PINE

Spot Seeding Study



Virginia Division of Forestry



Department of Conservation and Economic Development

1963 White Pine Spot-Seeding in the Mountain Section of Virginia

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SUMMARY

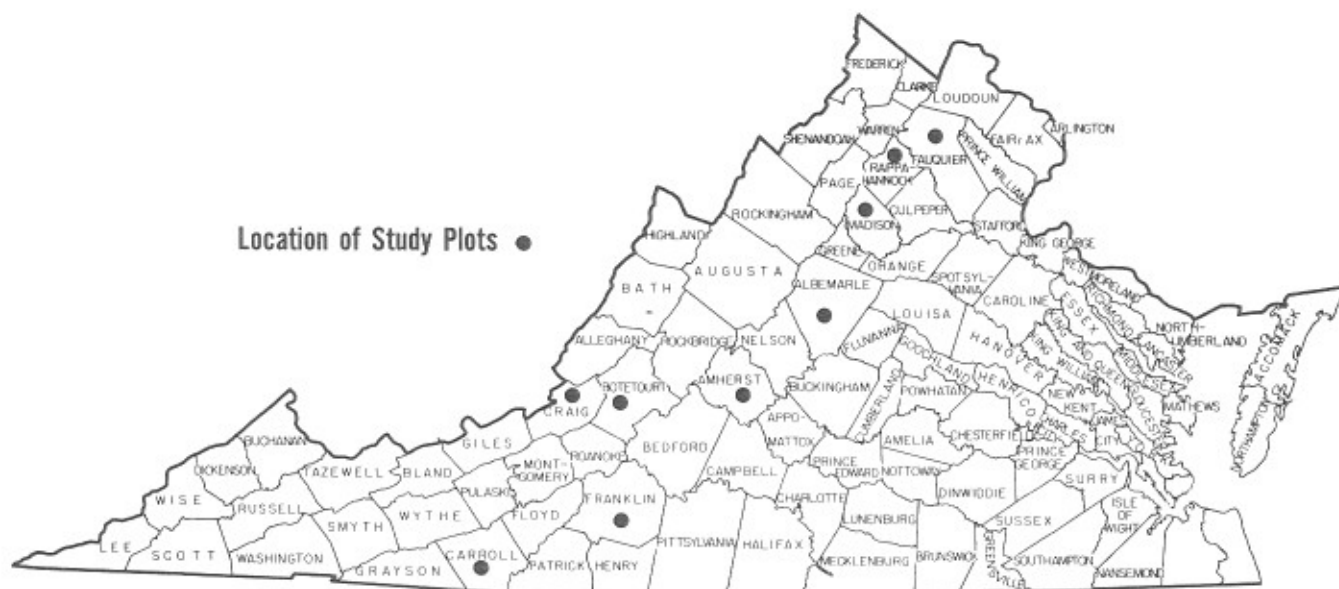
During the late winter and early spring of 1963 the Virginia Division of Forestry carried out a white pine spot-seeding study. The purpose of this study was to test spot-seeding as a method of establishing white pine on cutover land in the mountains.

Results were variable between plots. Stocking percents obtained with the best treatment tested (12 stratified seeds per spot) averaged 34 percent for all plots; however, the range was from 2 percent to 65 percent. Stratified seed gave better results than non-stratified seed. The average height of the tallest seedling in each stocked spot after 3 growing seasons was 5 inches.

DESCRIPTION OF STUDY

Nine one-acre study plots were installed in nine different counties as shown on the map below. All plots had been cutover within the past few

years. The cutting intensity ranged from partial cutting to complete clearcutting. Cutting was the only treatment the plots received prior to seeding.



Seed spots were prepared with a fire rake, raking away the leaves and litter down to mineral soil. The prepared spots were 8 to 12 inches in diameter and their depth varied according to the depth of the leaves and litter, from very shallow to several inches deep. Different rates and dates of sowing were tested. Non-stratified seed was used for the March 1st sowings and stratified seed was used for the April sowings. The six different treatments tested were:

- 4 seeds per spot, non-stratified, sown around March 1st, 1963
- 8 seeds per spot, non-stratified, sown around March 1st, 1963
- 12 seeds per spot, non-stratified, sown around March 1st, 1963
- 4 seeds per spot, stratified, sown during April, 1963
- 8 seeds per spot, stratified, sown during April, 1963
- 12 seeds per spot, stratified, sown during April, 1963

Each one-acre study plot contained four replications. A replication consisted of six rows of ten seed spots (6.6' x 6.6' spacing). The six treatments were randomly assigned to the six rows of each replication. The stratified seed was stratified the equivalent of 60 days in moist sand, and all seed was treated with Endrin, Arasan and aluminum flakes.¹ The seeds were stepped on lightly to press them into the soil, but no attempt was made to cover them.

RESULTS

The plots were first evaluated in the early fall of 1963 at the end of the first growing season, and final evaluation was made in the late summer of 1965 following three full growing seasons. Many seedlings died between the first and final

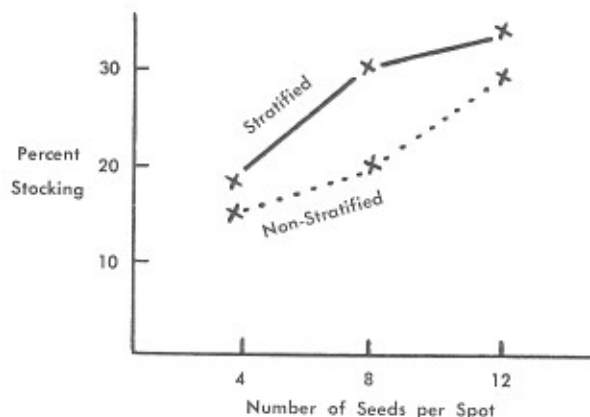
¹ Arasan 75-W was applied at the rate of 8 pounds and Endrin 75-W at the rate of 1 pound per 100 pounds of seed.

evaluation. On the average there were $\frac{1}{3}$ fewer seedlings present at the end of the 1965 season than there were at the end of the 1963 season. (Mortality was actually somewhat greater than this, but was offset somewhat by a small amount of delayed germination from seed laying dormant through 1963 and germinating in 1964.)

The average stocking (percent of spots with one or more living seedlings) for all nine plots at the end of three growing seasons was as follows:

| Treatment | Percent Stocking |
|---|------------------|
| 4 seeds, non-stratified, sown around March 1st | 15 |
| 8 seeds, non-stratified, sown around March 1st | 19 |
| 12 seeds, non-stratified, sown around March 1st | 29 |
| 4 seeds, stratified, sown during April | 18 |
| 8 seeds, stratified, sown during April | 30 |
| 12 seeds, stratified, sown during April | 34 |

Stratified seed produced about 50 percent more seedlings than non-stratified seed. Stocking percents were, therefore, higher for treatments using stratified seed—averaging about $\frac{1}{3}$ higher. Percent stocking increased with number of seeds per spot as shown below:



Seeding success varied considerably from plot to plot. This is illustrated by the following table which shows the stocking obtained on each plot for the treatment which gave the best results (12 stratified seeds sown during April).

| Plot Location (County) | Percent Stocking |
|------------------------|------------------|
| Albemarle | 2 |
| Rappahannock | 15 |
| Fauquier | 22 |
| Craig | 22 |
| Botetourt | 36 |
| Franklin | 42 |
| Greene | 50 |
| Amherst | 55 |
| Carroll | 65 |

This treatment gave a stocking percent of 40 or better (400 stocked spots per acre for a thousand spots installed) on only four of the nine plots.

The treatment which gave the poorest results had the fewest multiple seedling spots (spots with more than 1 seedling) and the most successful treatment had the greatest number of multiple seedling spots. The table below summarizes all nine plots at the end of three full growing seasons.

When the plots were evaluated at the end of the third growing season, the tallest seedling at each spot was measured. A total of 522 seedlings were measured. The tallest seedling was 17 inches tall, but 93 percent of the seedlings ranged between

2 and 9 inches in height and the average height was 5 inches.



The average height of the tallest seedling at each spot after 3 growing seasons was 5 inches.

STATISTICAL NOTE

The data were subjected to analysis of variance using an arc sin transformation for percent stocking and a logarithmic transformation for number of seedlings. Overall treatment F was highly significant (at 1 percent). The effect of stratification and the linear relationship between percent stocking and number of seeds sown were both highly significant (also at 1 percent level).

Percent of Spots by Number of Seedlings per Spot

| Treatment | Number of Seedlings per spot | | | | | | | |
|--|------------------------------|----|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | (percent) | | | | | | | |
| 4 seeds, non-stratified, sown around March 1 | 85 | 12 | 2 | 1 | | | | |
| 8 " , " , " | 81 | 12 | 4 | 1 | 1 | 1 | | |
| 12 " , " , " | 71 | 14 | 7 | 4 | 1 | 1 | 1 | 1 |
| 4 seeds, stratified, sown during April | 82 | 12 | 3 | 3 | | | | |
| 8 " , " , " | 70 | 14 | 7 | 5 | 2 | 1 | 1 | |
| 12 " , " , " | 66 | 12 | 8 | 5 | 4 | 2 | 2 | 1 |

DISCUSSION

The 1963 season was extremely dry. According to climatological data of the U. S. Weather Bureau, 1963 was the driest year in Virginia since 1930. This may account in part for the rather low average stocking percents obtained. Some parts of the state, however, received more rain than others in the form of summer thunder showers, and these local rainfall differences were probably responsible for much of the difference in seeding results among plots.

The greatest cause of seedling mortality appeared to be "smothering", caused by leaves filling the seed spots. In many cases even two year old seedlings were "smothered" during their second winter. In general, smothering occurred more frequently where leaf litter was deeper.

Sprout growth, in addition to hardwoods left after cutting, is overtopping the seedlings on *all* plots, making release necessary for proper seedling growth and development.