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ESTABLISHMENT OF SHORTLEAF PINE IN THE MISSOURI OZARKS

FOLLOWING SEED BED PREPARATION AND RELEASE^{2/}

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Natural regeneration of shortleaf pine in many of the stands in the Missouri Ozarks is not occurring at a sufficiently rapid rate to assure the percentage of pine considered necessary for a well-balanced mixed oak-pine forest. The distribution of the existing pine reproduction is spotted and relatively more abundant along abandoned tramways, road banks and other open places where mineral soil has been exposed or disturbed. This indicates that it might be possible through some method of seed bed preparation prior to seed fall or artificial seeding to supplement the present rather slow and costly practice of planting. In the fall of 1938 an experiment was initiated to study the effects of five seed bed treatments under two densities of overstory on germination and the subsequent behavior of pine seedlings.

The Study

This study was established in Howell County on the Willow Springs Ranger District of the Mark Twain National Forest. Four

^{1/} The majority of the field work in connection with this study was done by CCC enrollees from Camp F-12 under the direction of John L. Arend, Junior Forester (CCC).

^{2/} Assistance in analysis of data for this report was furnished by the personnel of the Works Progress Administration's official project No. 01-2-42-446.

Latin squares, each having 25 milacre plots, were laid out in second growth oak-pine pole stands in which there was no current crop of pine seed. The topography in this vicinity is level to rolling and the soil is predominantly Clarksville gravelly loam.

After the Latin squares were laid out, two of them were selected at random and about 75 percent of the overstory was removed. The milacre plots on all the squares were then given the following treatments: a, removal of litter with a rake; b, removal of litter and cultivation of the soil; c, cultivation of litter into the soil; d, removal of litter by burning; and e, check. This was followed by the broadcast sowing of native shortleaf pine seed at the rate of 5 pounds per acre. The seed was only 40 percent viable and since there were fifty thousand per pound approximately 100 viable seeds fell on each milacre plot.

The amount of germination was obtained from a count of the seedlings on each plot in June, 1939. A second set of observations was made in the fall of 1939 to ascertain height growth and survival during the summer. Additional observations will be made in succeeding years to check on subsequent mortality and height growth.

Results

The effects of the five seed bed treatments on germination, and the survival and height growth of pine seedlings in oak-pine pole stands with open and dense overstories are shown graphically in Figure 1.

The germination of pine seed on plots receiving treatment b (litter removed and soil cultivated) was significantly better than that on the plots receiving any other treatment, including the check plots, regardless of the density of the overstory. The differences in the amount of germination between treatments a, c, d, and e were not significant. For all types of seed bed preparation, germination was significantly greater on the unreleased plots.

With regard to the number of seedlings surviving at the end of the first summer under released and unreleased conditions, treatment b was again superior to the others. Likewise, differences between the other methods of treatment were not significant. The mortality on the released plots was lower for all treatments. However, there was no appreciable difference within any treatment in the number of seedlings surviving on the released and unreleased plots at the end of the first growing season.

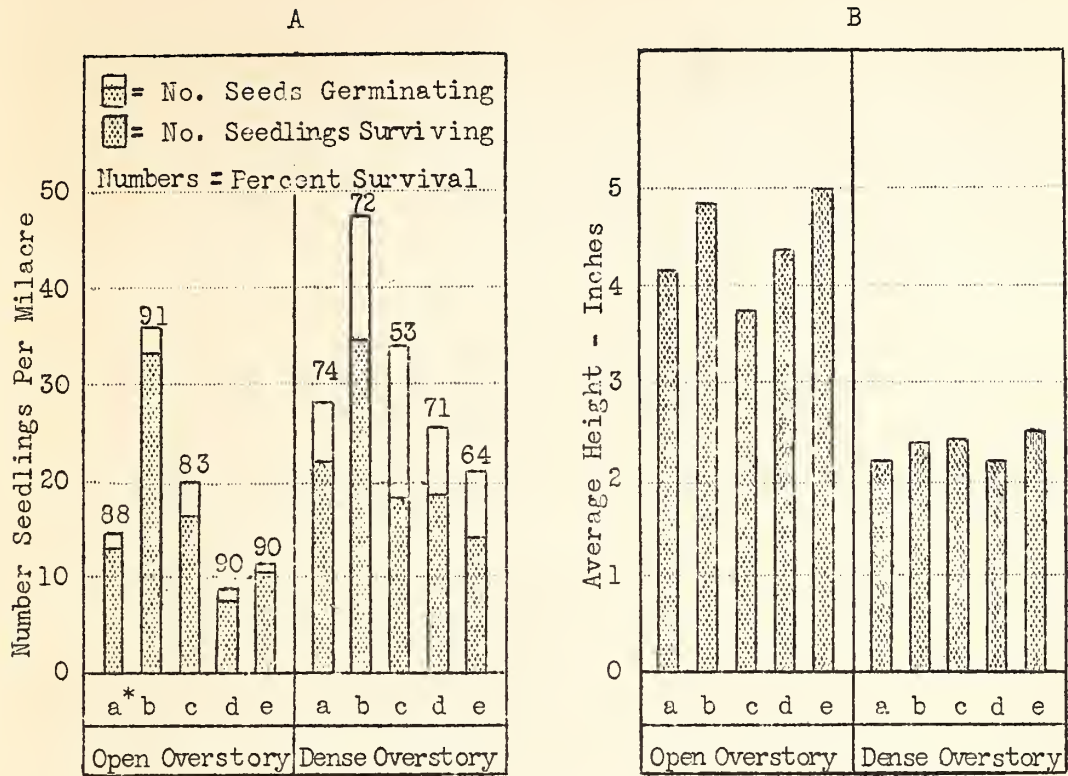


Fig. 1--Effects of five seed bed treatments under two densities of overstory on (A) germination and survival, and (B) the height of shortleaf pine seedlings after one growing season.

* The treatments are: a, removal of litter with a rake; b, removal of litter and cultivation of soil; c, cultivation of litter into the soil; d, removal of litter by burning; and e, check.

Although the growth of the surviving pine seedlings was not materially affected by seed bed treatment, the effects of release were very obvious. The foliage was denser, had a darker green color, and the height growth was increased 100 percent.

Discussion

The removal of litter plus cultivation of the soil was the only one of the five treatments that resulted in a significant increase in germination and the number of pine seedlings surviving after one growing season. Although this treatment might be well suited

to the practice of seed spotting, the difficulty of removing the litter from any large area practically precludes its use as a means of increasing natural pine regeneration. Moreover, since a large number of the seeds falling on check plots, under open and dense overstories, produced seedlings that survived the first summer, the apparent need for some method of seed bed preparation in connection with natural seeding is somewhat reduced.

Even though pine seedlings survive the first year the problem is not solved because subsequent mortality has been observed to be high, particularly in the denser stands. The very striking effect which release at the time of seeding had on growth indicates that such a practice may be instrumental in reducing this mortality. Further experimentation will be necessary to find out if postponing release until sometime after seedling establishment will materially alter its beneficial effect.

Summary

The first-year results of a study on the effects of five seed bed treatments under two densities of overstory in oak-pine pole stands on the germination and the survival and height growth of short-leaf pine seedlings are summarized as follows:

1. Broadcast seeding of pine at the rate of 250 seeds per milacre produced, on the average, 12 seedlings per milacre on the check plots at the end of the first growing season.
2. The removal of litter and cultivation of soil was the only treatment that resulted in a significantly better germination and survival of seedlings.
3. The height growth of seedlings was not appreciably affected by seed bed preparation.
4. Removal of 75 percent of the overstory did not result in a significant change in the number of surviving seedlings after one growing season.
5. Release resulted in a 100-percent increase in the height growth and a decided increase in plant vigor.

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