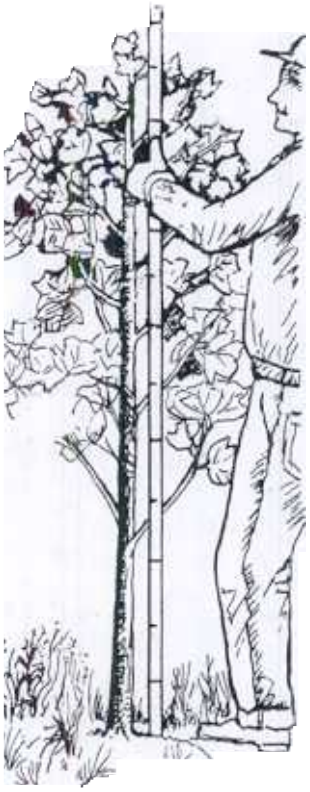

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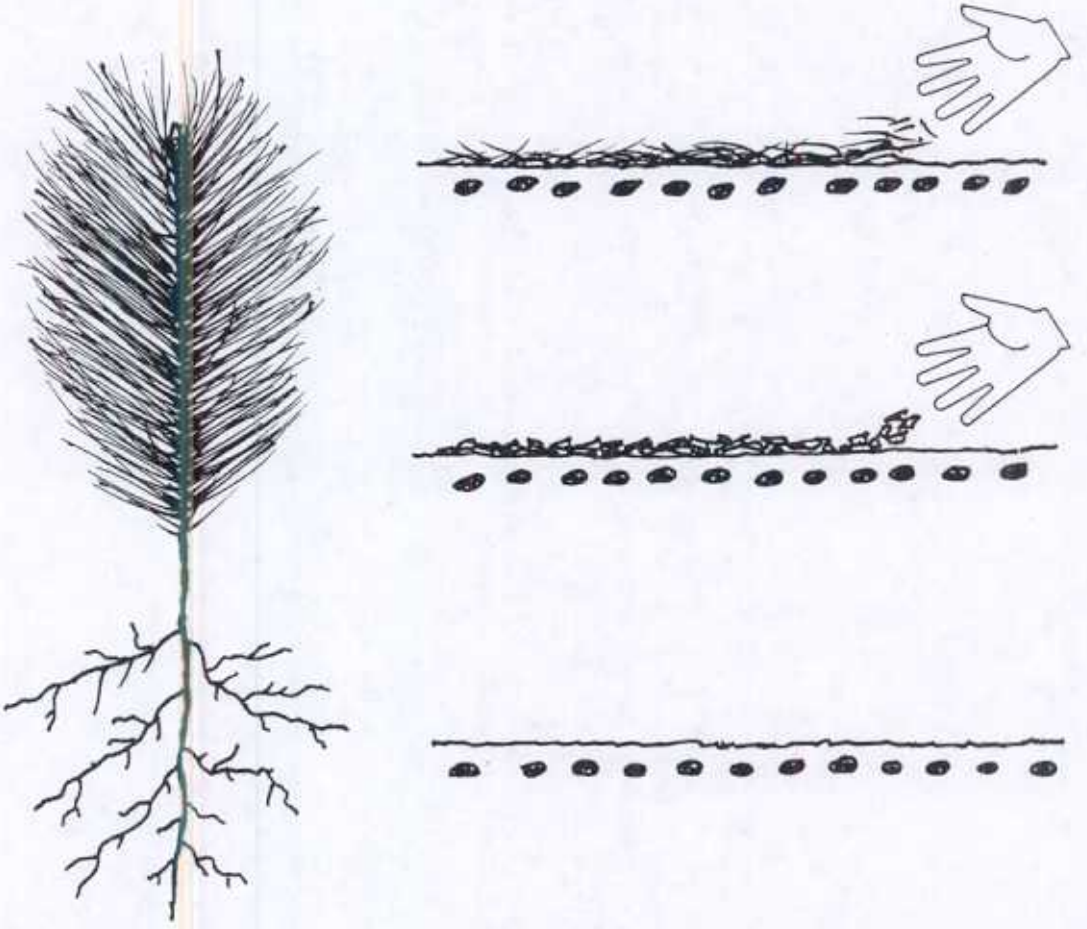


Virginia
Department of Forestry

PERFORMANCE OF PINE NEEDLE AND WOOD CHIP MULCHES, COMPARED TO NO MULCH, ON LOBLOLLY PINE SEEDBEDS

By Thomas A. Dierauf and Laurie J. Apgar

ABSTRACT

A two-year study compared no mulch with mulches of pine needles or wood chips. Whether mulched or not, seed drilled 1/4 to 1/2 inch deep produced higher stocking than surface sown seed. When seed was drilled, mulches did not improve seedbed stocking, but when used to cover surface sown seed, mulches immensely improved stocking: from 9.5 to 45.6 seedlings per square foot in 1982 and from 5.6 to 37.9 seedlings per square foot in 1983.

INTRODUCTION

Genetically improved loblolly pine seed, especially from advanced generation orchards or tailored clonal mixes, is usually limited in supply. Our organization's operational nursery practice is to drill seed, covering it with soil, but no mulch. One method of stretching this valuable seed supply would be to apply a mulch, if doing so would allow a reduction in seeding rates, while still achieving comparable stocking. Mulching is standard practice at most nurseries in the South.

Of course, the benefits of mulching would need to be significant in order to justify the added expense, the possible increased risk of damping off, and the potential for decreasing the number of possible lifting days due to slower thawing and drying of the soil in the winter.

To quantify the effects of mulching on subsequent seedbed stocking, a two-year study was carried out to compare pine needle or wood chip mulches with no mulch, on both surface sown and drilled seed. The study was conducted in sand to loamy sand soils at the New Kent nursery in the Coastal Plain of Virginia.

PROCEDURE

The first year's study also tested several other mulching materials, including net and burlap (which were removed as germination started), as well as a lighter rate of needles and chips. However, only the most promising heavier rates of needles and chips (illustrated in Figure 1) were included in the second year's study. The study was installed on April 30 in 1982 and on April 28 in 1983, using a Whitfield seeder with and without its covering apparatus.

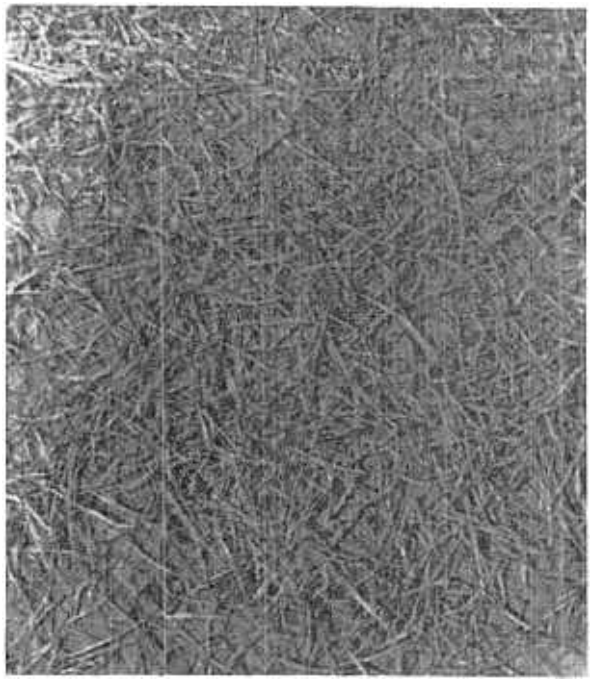
The study was composed of four replications in 1982 and five in 1983, located in a single seedbed each year. The seed was surface sown on half of each replication and, on the other half, the covering apparatus was lowered to cover the seed with 1/4 to 1/2 inch of soil. The mulches were then applied by hand, with one five-foot plot of each mulching treatment randomized within each half of each replication.

Seedbed density was evaluated in the fall by counting four 6-inch wide samples across the bed within each treatment plot. Thus, a total of 8 square feet was sampled in each treatment plot.

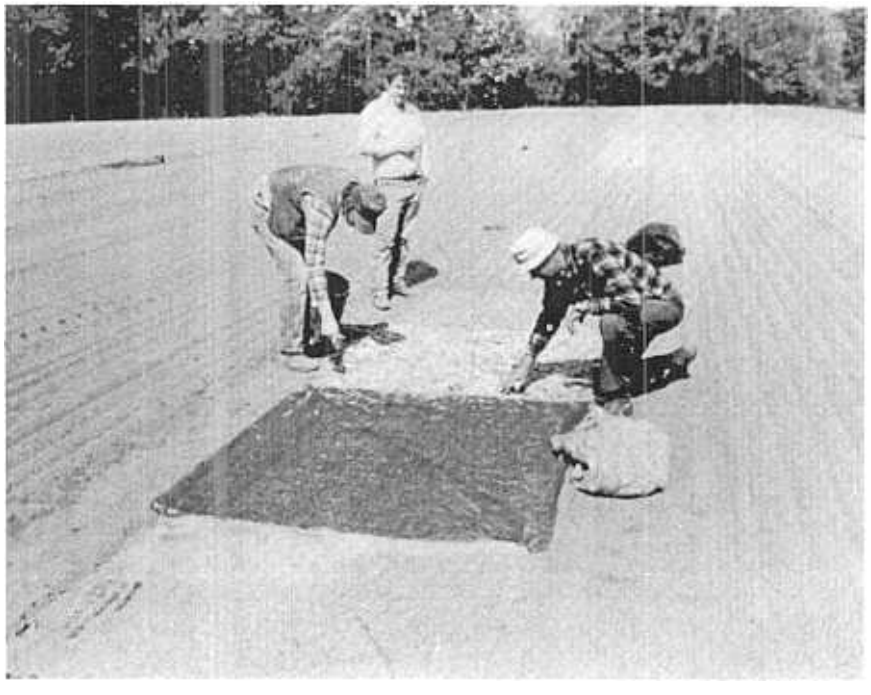
The treatments where seed was drilled showed the highest seedbed densities and, because this is our standard operational procedure, only these treatments were selected for outplanting. For outplanting, a six-inch sample across the bed (2 square feet) was lifted from the center of each treatment plot. Proportional numbers from each sample plot were used to make up the planting rows. Each year, 5 replications containing one 20-seedling row of each treatment were outplanted on a Virginia Piedmont site. In 1982, seedlings were lifted on December 17 and planted on December 21. In 1983, seedlings were lifted on December 22 and frozen ground delayed planting until January 27, 1984.

Seedling survival and height were measured annually for three seasons in the field. However, the tract containing the 1983 study was accidently release-sprayed twice with Roundup herbicide during the third season, resulting in severe topkill and some mortality. Therefore, analysis was done using second year data for the 1983 study and third year data for the 1982 study.

Wood chip mulch



Pine needle mulch



Applying wood chip mulch

Figure 1. Illustration of mulch application.

RESULTS AND DISCUSSION

The most striking difference among the six treatments was the extremely poor performance of seed sown on the surface and not mulched 1/ (Table 1 and Figure 2). Mulching was extremely beneficial for seed sown on the surface. Averaging the results for both needles and chips, mulching improved stocking by 36 and 32 seedlings per square foot in 1982 and 1983 respectively.

For seed drilled from 1/4 to 1/2 inch below the surface, mulching did not improve stocking. In 1982, the average for chips was slightly greater than for no mulch (56.8 vs. 55.0), but the difference was far from being statistically significant.1/

When mulch was used, either needles or chips, drilling the seed from 1/4 to 1/2 inch below the surface produced higher stocking than sowing it on the surface, in both years.1/

Mulching did not improve field survival, and there was no significant effect on height after 2 or 3 seasons in the field.2/ (Table 2).

1/ Analyses of variance for a split-plot design were performed. In both studies, there was a very strong and highly significant interaction between method of seeding (drilled or surface) and mulching (none, needles, or chips), due almost entirely to the excellent germination of unmulched seed when drilled but very poor germination when sown on the surface. For this interaction, the probability of a larger F was 7.0×10^{-9} in 1982 and 3.9×10^{-11} in 1983.

Comparisons among treatments were made using a t test. (Steele and Torrie. 1960. p. 235-39). The following are of interest:

	Probability of a larger t
1. No mulch vs. chips, for drilled seed in 1982	.332
2. Drilled vs. surface sown, for mulched seed (needles and chips combined)	
1982	.01
1983	.05

2/ Field survival and height were subjected to analyses of variance. Survival percent was first transformed to arc sine percent. Differences among individual treatments were tested using Duncan's New Multiple Range Test. Figures in Table 2 not followed by the same letter are different at the .05 level.

Table 1. Seedbed stocking, in number of seedlings per square foot, average of all replications.

TREATMENT		YEAR 1982	1983
Drilled	None	55.0	45.6
	Needles	53.2	42.3
	Chips	56.8	42.0
Surface Sown	None	9.5	5.6
	Needles	41.5	38.8
	Chips	49.7	36.9
Overall Means		44.3	35.2

Figure 2. Average seedbed stocking for all replications, in number per square foot.

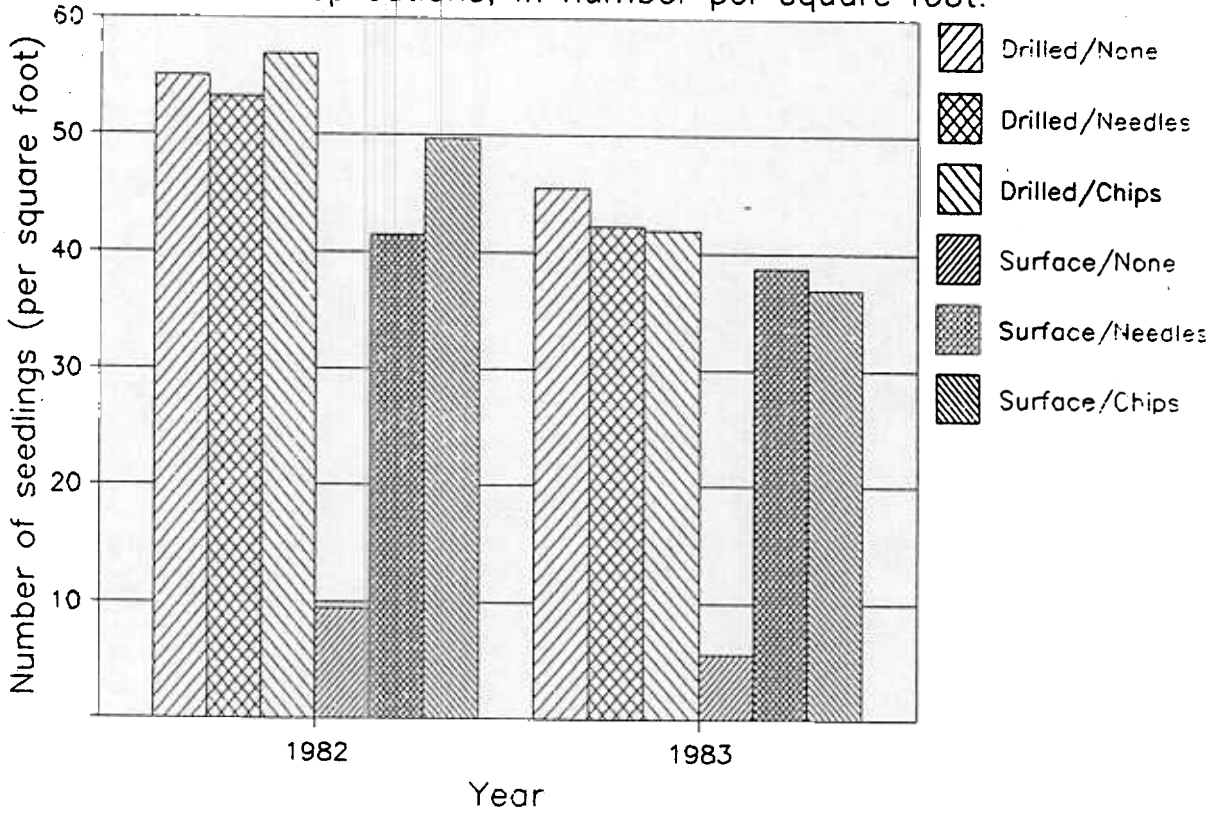


Table 2. Field survival and average height after three growing seasons for the 1982 study and two growing seasons for the 1983 study, drilled treatments only.

Treatment	1982		1983	
	Survival Percent	Height (feet)	Survival Percent	Height (feet)
None	92 a	5.1 a	100 a	2.9 a
Needles	91 a	5.5 a	97 b	3.0 a
Chips	93 a	4.9 a	98 ab	3.1 a
Overall Means	92	5.2	98	3.0