Pine Release by Various Weeding Methods

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In the Coastal area of the South Atlantic States, one of the common methods of regenerating loblolly pine is by seed trees. Seedlings established by this method are often overtopped by competing hardwoods which were once in the under-story. The problem continuously arises as to whether the established pines should be released and, if so, by what means. In the past weedings have not been generally accepted as a cultural treatment. This has been due in part to the uncertainty of success from a single release operation, and in part to the fear that repeated release will be too costly. On some sites the sprouts from cut hardwood competitors may frequently again over-top pine, thereby necessitating a second or even a third weeding operation. If re-sprouting can be eliminated, or even delayed, the cost of weedings may be justified in terms of increased survival and growth of released pine. Obviously, the weeding method to be used in any area is largely dictated by field conditions. As an example, let us take a particular area as found on the Santee Experimental Forest in the Flatwoods section of South Carolina.

FIGURE 1.—*Method of weeding with a machete. Undesirable stems are cut to release desirable seedlings.*

The Release Area

During the fall of 1946, an area of 10 acres of loblolly pine was cut after the peak of seedfall for the year, leaving eight trees per acre. An estimated 250,000 sound seed per acre were cast. No ground preparation (other than logging disturbance) or hardwood reduction treatments were made. Conditions during 1947 were quite favorable for pine establishment and survival. As a result, the study area in 1949 contained an estimated 5000 three-year-old loblolly pine seedlings per acre. These seedlings were in heavy competition with hardwood stems (mostly gum, oak and myrtle) ranging from 3 to 12 feet in height. An excellent opportunity was provided to investigate the response of those pine seedlings that would presumably fail to survive unless released.

Plots of 1/40th acre squares (½ chain x ½ chain) were established in the area.[1] On each plot 40 vigorous, disease-free, but over-topped pine seedlings were selected. These seedlings, spaced approximately five feet apart and averaging 2½ feet tall, were completely released except in the control

FIGURE 2.—*A method of chemical weeding. Stems are cut with a machete and stumps are sprayed with chemical. Other methods tested were basal spray applications without cutting of the stem.*

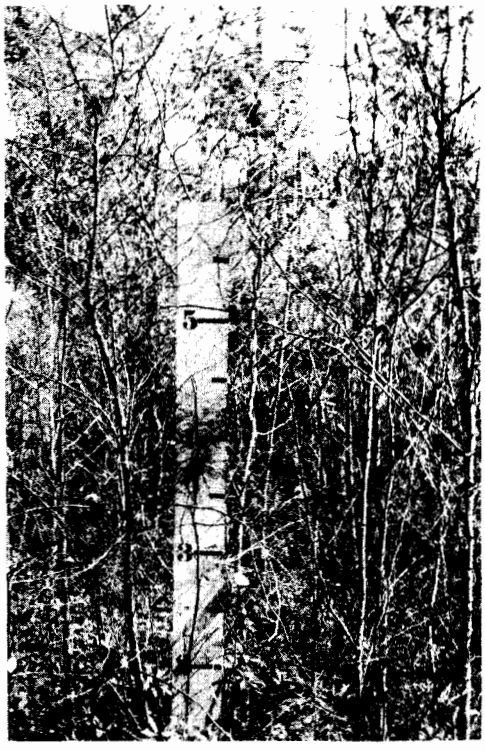

FIGURE 3.—*A loblolly pine seedling overtopped by hardwood competitors in the control plot, photographed after four growing seasons.*

(Figures 1 and 2). All other pine seedlings were removed at the time of plot establishment. The following plot treatments were made just once during the dormant season:

Cut competing stems, no chemical
No cutting or competing stems, basal spray stems with 2,4,5-T[2]
No cutting of competing stems, brush 2,4,5-T on base of stems
Cut competing stems, spray stumps with 2,4,5-T

[1]Study commenced by L. E. Chaiken, formerly of the Santee Research Center.

[2]The commercial product was Weedone 2,4,5-T, containing 3 lbs. of 2,4,5-T acid per gallon. The present product, as most others, contains 4 lbs. of 2,4,5-T per gallon. In terms of the latter strength, the mixture used is obtained by mixing one part 2,4,5-T, 4 lbs. acid equivalent per gallon, to 29 parts of kerosene.

Chemical Drift and Fusiform Rust

Filed observations obtained at the end of the second and fourth growing season after weeding showed that less than one per cent of all pine seedlings released by chemicals had been killed from spillage or drift. With reasonable precaution, it is concluded that 2,4,5-T as used in this test can be applied to the stems or stumps of hardwood competitors without undue injury to the neighboring pine seedlings.

FIGURE 4.—*Released pines four growing seasons after applying the cut and stump-spray treatment. Satisfactory release can also be obtained with any of the other treatments.*

A re-examination of all treatments indicated that most of the seedling mortality was the direct result of fusiform rust. By the end of the fourth growing season, the incidence of fusiform occurring on the main stems was 12 per cent of all released pines, indicating continued infestation with advancing age on all treatments. There was no relationship between incidence of fusiform and the method of release. Additional mortality from fusiform rust can be expected.

Growth Response to Treatment

Although the number of seedlings set free to grow is the most important result of the initial weeding treatment, height-growth response becomes important as the age of the stand increases. Using height growth as a criterion, at the end of the fourth growing season all treatments showed a significantly greater height growth than the untreated (check) plot. The cut-stem and spray-stump treatment showed the most significant height-growth response when compared with the check plot. Further analysis reveals this treatment to be significantly better than cutting alone or spraying the stems. Many of the seedlings on the untreated control plots are becoming more and more suppressed by the vigorous hardwood competitors (Figure 3). In comparison, the pine seedlings released by any of these four methods have been able to compete successfully with the re-sprouting hardwoods.

Although there were marked differences in height growth between seedlings in treated and untreated plots, the ratio of crown to stem length remained about the same. The relative success of the various weeding treatments is indicated in Table 1.

Summary and Discussion

Under site conditions similar to those of this experiment, some method of release is necessary to free over-topped seedlings. Only one seedling out of five was able to free itself from hardwood competition without release. By applying any of the methods tested, a much larger number can be freed from hardwood competitors. As many as 97 per cent of the seedlings can be set free to grow by cutting the competing hardwoods and spraying the stumps with chemical. On the other hand, a satisfactory degree of release (71 per cent) may be obtained at only a little more than one-half the cost by simply cutting back competitors with a machete or comparable tool. This treatment does not thoroughly eliminate re-sprouting, but delays it long enough to allow most of the pine to become dominant. Furthermore, the method produced virtually the same number of free seedlings as the brush-stem treatment but without the additional cost of chemicals.

The conventional method of weeding has provided satisfactory release from competing hardwoods under the pine-hardwood site conditions as here described. Obviously, there is no need for a second weeding, and the additional cost of chemical does not appear justified in terms of increased growth and survival of released loblolly pine seedlings.

Where the pine seedlings are younger than the hardwood sprouts, or where there are barely enough pine seedlings to start with, the use of chemicals to reduce re-sprouting would be fully justified. For this purpose the basal spray treatment is recommended, in view of its apparent effectiveness at only slightly higher cost than the conventional machete treatment.

Table 1.—Relative cost of weeding treatments, and their effectiveness after four growing seasons

Treatment[1]	Relative cost[2]	*Seedlings free to grow*	*Average total height*[3]
	Index	*Per cent*	*Feet*
Check, no treatment	0	22	4.9
Cut competing stems, no chemical	100	71	6.7
No cutting, basal spray with 2,4,5-T	124	80	7.2
No cutting, brush 2,4,5-T on stems	188	70	7.6
Cut competing stems, spray 2,4,5-T on stumps	194	97	8.8

[1]Each treatment replicated 3 times on 1/40th acre plots.

[2]Includes labor and chemical charges, relative to each other.

[3]Based on best 75 seedlings for each treatment.

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