

# PROGRESS REPORT OF THE RECLAMATION OF SEVERELY WEEVILED WHITE PINE PLANTATIONS

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A method of reclaiming severely weeviled white pine plantations was developed in 1930. Observations carried on for a four-year period show that the pruned trees are improving. Most of the girdled trees have died, and the stand has been opened gradually. The method has worked out satisfactorily according to the expectations of the authors.

IN 1930 the authors developed a method of improving white pine plantations severely injured by attacks of the white pine weevil (*Pissodes strobi* Peck). This method, which involves the selection and pruning of a sufficient number of the best-formed trees to make the final stand and the elimination by girdling of the overtopping poorly-formed trees, was described in a bulletin published in 1931 by the Massachusetts Forestry Association.<sup>3</sup> Since the dominant crown class contains by far the highest percentage of severely injured trees, desirable crop trees are found chiefly in the codominant and intermediate crown classes. The trees to be eliminated by girdling are almost exclusively scrubby dominants. None of the overtopped trees should be pruned, as they are too small and weak-crowned; and, in addition, it is advisable to include only the more thrifty individuals of the intermediates. Generally not more than 200 to 400 trees per acre should be selected for pruning. In a later publication by the Connecticut Forest and Park Association<sup>4</sup> the authors discussed special measures to correct forked and crooked stems.

It was stated in these publications that plantations having a spacing not wider

than 6 to 7 feet contain enough well-formed crop trees to permit the development of a full crop at maturity, even with extreme weeviling. The authors still assert this to be the case, but it is equally true that with wider spacings, such as 8 x 8 feet, it is impossible to find enough good trees to make a full crop. The costs of the operation when applied on a practical scale have shown some variation, owing to the number of trees pruned per acre, the age of the stand, and other factors. Labor cost figures for the first two treatments, or their equivalent,<sup>5</sup> supplied by the Harvard Forest, the Crane plantations at Dalton, Mass., and the Choate plantations at Petersham, Mass., ranged from \$8.65 to \$12.50 per acre. In all cases pruning was done with handsaws and ladders. The final treatment to complete the pruning and girdling should not cost more than \$6 per acre, making a total of about \$18. This closely approximates the estimated cost stated by the authors in their original publication (1931). It should be recalled that the first treatment is the most costly, since it carries the added expense of selecting the individual trees to be pruned.

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<sup>3</sup>Cline, A. C., and MacAloney, H. J. A method of reclaiming severely weeviled white pine plantations. Mass. For. Assoc. Bull. 152, 12 pp., illus. 1931.

<sup>4</sup>Cline, A. C., and MacAloney, H. J. Additional notes on the improvement of weeviled white pine plantations. Conn. For. and Park Assoc. Pub. 24, 11 pp., illus. 1933.

<sup>5</sup>The lower cost is due to comparatively few trees being pruned per acre.

## RE-EXAMINATION OF SAMPLE PLOTS

In the spring of 1930 4 sample plots were established for the purpose of making detailed observations of the progress in stand improvement. With the passing of 4 growing seasons since the first treatment some definite results may be noted.

1. *The Pruned Trees.*—It is very evident that live-limb cuts heal more rapidly than dead-limb cuts. In the former, callus tissue starts to develop the first growing season after pruning, and at the end of 4 growing seasons the healing of average-size limbs is somewhat over one-half complete. From 3 to 6 more years will be required for complete occlusion, depending upon limb size and the vigor of the tree. Since no living tissue is severed in the removal of dead limbs, the prompt development of callus is lacking, and the rate of occlusion is less than in the case of live-limb cuts. The most commonly observed condition, within 2 years after pruning, is a collar of dead bark, forced outward by growth in the bole, surrounding a depression in the bottom of which fully three-quarters of the area of the limb base is visible. Four years after pruning the proportion of area healed is still noticeably less than with live-limb cuts.

Fully one-half of all the live-limb cuts were completely pitched over within a year after pruning. Cases of partial pitching were limited in general to the largest cuts—upward of 2 inches in diameter. Obviously, there is no exudation of pitch immediately resulting from dead-limb cuts, although some pitching may be in evidence within 2 or 3 years. Most forest pathologists consider the pitch seal a safeguard against the entrance of fungi, and for this reason it is preferable to start pruning before the zone of dead branches extends more than a few feet above ground, and before even the largest limbs exceed  $1\frac{1}{2}$  inches in diameter.

Some evidence of the effect which gird-

ling the severely weeviled “scrubs” has on diameter growth of the pruned crop trees was obtained by a comparison of diameter increases for the last 4 years. This involved separating diameter measurements on the basis of whether or not the pruned tree had grown under conditions of reduced competition through the girdling of a neighboring tree. In 2 of the 4 sample plots laid out in 1930 the overtopping “scrubs” were girdled; in one they were topped so as drastically to reduce their crowns; and in the fourth there was no treatment other than pruning of the desirable trees, because the stand was too young to be in need of it. In the following table, based on two sample plots, an unmistakable tendency is indicated, though the data are too limited to be conclusive.

Table 1 shows that diameter growth in the pruned trees situated next to girdled trees has been substantially greater than in those that were too distant to benefit by reduced competition. Especially significant is the response of trees in the intermediate crown class. This may be interpreted as indicating that normally vigorous intermediates (small-crowned intermediates were not favored as crop trees) may be depended upon to make satisfac-

TABLE 1.

DIAMETER GROWTH OF PRUNED TREES FOR A  
4-YEAR PERIOD FOLLOWING TREATMENT  
(Based on a total of 87 trees)

		Average diameter increases in inches by crown class		
		Inter- mediate Inches	Codom- inant Inches	Dom- inant Inches
Case 1. ....	A	0.91 <sup>1</sup>	0.93	1.05
Plantation 25 years old in 1930.....	B	.60	.81	.93
Difference .....		.31	.12	.12
Case 2. ....	A	.70	.77	1.05
Plantation 18 years old in 1930.....	B	.44	.53	.82
Difference .....		.26	.24	.23

A, One or more neighboring trees girdled.

B, None of the neighboring trees girdled.

<sup>1</sup>Four years' growth in diameter at breast height.

tory crop trees. Previously, doubt had existed in the author's minds as to whether the growth of intermediates could be increased sufficiently to permit their taking a dominant position in the final crop.

With respect to the influence of pruning on height growth, no significant differences were noted between pruned and unpruned

trees. This undoubtedly is due to the conservative degree of pruning—approximately to one-half the total height of the tree. The possibility that pruning 2 or 3 whorls of live branches might reduce weevil attack for a year or two has been suggested. This was based on the assumption that live-limb pruning would reduce



Fig. 1.—Twenty-year-old white pine plantations, showing a well-formed tree, pruned, and a severely weeviled "scrub," girdled and dead. The first treatment was made in 1930; the second in 1934. Although the girdled tree has been riddled by bark beetles and wood borers, the pruned tree has not been attacked.

the vigor and size of the leader, thereby making it less attractive to the weevil. A tree-by-tree record of weevil attacks in the sample plots for the first two seasons following pruning showed that there was no appreciable difference between pruned and unpruned trees so far as susceptibility to attack was concerned. The removal of a very large portion of the green crown undoubtedly reduces the growth of the tree temporarily, and might influence weeviling to some extent during the period of recovery.

Occasionally the pitch-mass borer (*Parharmonia pini* Kell.) has entered where live limbs were pruned, especially in older plantations. Tunneling is limited to the immediate vicinity of the cut, and it is doubtful if any appreciable defect results, although the burrows retard or prevent healing. The pitch midge (*Retinodiplosis* sp.), which lives within the exuded pitch of the cuts, occurs more commonly than the pitch-mass borer, but does no tunneling under the bark and causes no apparent damage.

2. *The Girdled Trees.*—Out of 42 trees girdled with a chain saw 21 died within 2 years, and 11 more during the next 2 years. The remaining 10 are at present dying. These 10 include 4 trees with bridged girdles, apparently made possible by too shallow a cut with the chain saw. These trees were regirdled in April, 1934. The remaining 6 trees of those still alive show a marked increase in diameter above the girdles, as compared with that below, indicating a stoppage of the downward passage of elaborated food at the point of girdling.<sup>6</sup> This condition also is believed to be associated with shallow girdling. It is also possible that root

grafting may be a factor in these cases.

In practice, girdled trees remaining alive for longer than the period between treatments should be regirdled. Evidence points to a relationship between the depth of the cut and the time required to kill the tree; that is, the deeper the cut the shorter the length of time required. It should be pointed out, however, that very deep cuts may result in the breaking off of the tree at the girdle. This defeats the purpose of girdling, namely, that of affording the greatest amount of protection and support to the crop trees during the period of readjustment. Sun scald and snowbreak have been observed in cases where the weeviled "scrubs" were cut rather than girdled.

For practical purposes, in plantations of pruning age it appears advisable to instruct the workmen to make chain-saw cuts about half an inch deep, including bark thickness. Trees girdled 4 years ago and now dead are still standing intact, and it appears certain that their break-up will be gradual. Meanwhile, though they are no longer taking nutrients from the soil, they afford support and protection to the crop trees and retard the growth of branches that will not be removed until the final pruning. Several species of wood borers and bark beetles attacked the girdled trees, but not the pruned trees.

By way of summary, it may be stated that thus far the method developed for reclaiming severely weeviled white pine plantations has worked out satisfactorily and in accordance with the expectations of the authors, as expressed in the original publication in 1931. The final treatment will be made in 1936, at which time a further progress report will be in order.

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<sup>6</sup>Incidentally, the authors have observed the same phenomenon in the case of Scotch pine girdled near the base by rodents.