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PRUNING 10- TO 15-YEAR-OLD THINNED ASPEN TO REDUCE INCIDENCE OF DECAY IN THE STEM

PROJECT MS-232

by

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INTRODUCTION

Aspen (Populus tremuloides Michx.) makes up about 30 per cent of the B18[a] Mixedwood Forest Section (Rowe, 1959) in Manitoba and Saskatchewan. In contrast to its abundance, utilization of the species is very small, due to its high susceptibility to decay and its resulting poor quality when it reaches commercial size. Decay studies in aspen have shown fairly conclusively that the greatest losses in aspen volume occur as a result of trunk rot infections, particularly by Fomes igniarius (L. ex Fr.) Kickx., Corticium polygonium Pers., and Radulum caesarium (Morg.) Lloyd (Thomas, Etheridge and Paul 1960, Basham 1958, Black and Kristapovich 1954). There is substantial evidence that trunk rots are introduced through wood tissue exposed to the outside, particularly branch stubs (Basham 1958, Schmitz and Jackson 1927). Etheridge (1961) showed that branch infections on mesic sites were almost twice as frequent in aspen as on dry sites, and attributed this to the proneness of young dead branches to infection and the greater mortality of young branches on mesic sites. He concluded from his studies that decay organisms, which are associated with trunk rots in mature aspen, do not occur in branches until about 8 years following their death.

From the above evidence it would seem that pruning could be a way to reduce decay losses in older trees. The healing over of branch stubs would prevent further infection. Etheridge (1961) suggested the possible value of pruning aspen, particularly in young stands where decay organisms have not yet become established through branch stubs. Pruning should provide the healing over of the pruning wounds in the quickest possible way. Rate of healing will

depend on the type of wounds inflicted. Most rapid healing will occur where living cambium is laid bare by the cut so that callus formation is stimulated. With the exposure of live tissue the danger of introducing decay organisms is markedly increased (Hawley and Smith, 1954). Pruning should therefore be limited to vigorous trees with relatively small branches (Hawley and Smith 1954, Zeedyk and Hough 1958). According to Hawley and Smith (1954) the time required for complete healing is little affected by branch diameter, but Mayer-Wegelin (1936) and Stoeckeler and Arbogart (1957) showed that bigger branches need more time to heal over completely. Mayer-Wegelin (1936) pointed out that healing was hastened by leaving a smooth pruning surface, parallel to the stem, without sharp edges. The use of an antiseptic dressing on the pruning surface has been recommended (Anon. 1958). To reduce or prevent infection, pruning should be carried out when fungal activity is low, which is likely to be before and after the growing season. It has also been pointed out by Etheridge (personal correspondence) that at certain times of the year, principally late summer, certain antagonistic chemicals are present in the wood tissue of some species, which may prevent infection of wounds by certain organisms. Whether this applies to aspen is not known.

With the above background information available and so far no experience in the pruning of aspen, a combined thinning and pruning experiment was started in 1964 in a 10- to 15-year-old aspen stand. The investigation should provide information on the comparative infection of residual trees when infected or susceptible trees are removed; the importance of wounds in infection by canker fungi and to what degree succession of fungi in branches is interrupted by pruning and treatment with wound dressing. Thinning should provide a range in individual tree growth rates so that rate of healing over of pruning wounds can be related to diameter increment.

METHODS

In 1964 a 10- to 15-year-old aspen stand was selected for study along the south boundary of the Porcupine Forest Reserve (map reference: Twp. 38, Rge.28, Sec.16). Trees ranged in size up to 3 inches diameter at breast height and were 15 to 20 feet high. The stand is of fire origin and forms part of gently to strongly rolling moranic plain between 1800 and 2500 feet in elevation. Local topography is gently sloping towards the southeast. Soil texture is clay loam and according to Hills' (1952) classification, the moisture regime is about 4. Limestone is present in abundance throughout the profile.

Within the stand twenty-four 1/10-acre permanent sample plots were selected and within each plot 35 dominant and seemingly good quality, evenly spaced aspen were selected. On twelve of the plots, selected randomly, all trees other than the 35 selected trees were removed, providing a 12' x 12' spacing. On the remaining twelve plots no trees were removed (Figure 1). The selected trees on all plots were tagged and tree maps for each plot were made. To each of the selected trees within each plot, one of four pruning treatments and a control treatment was assigned at random in such a way that within each plot all treatments were replicated seven times. Treatments are:

FF - Flush pruning in the fall (September, 1964) of all live and dead branches to a height of 10 feet;

FDF - As FF but an antiseptic dressing applied to the pruned surface;

FS - As FF but pruning done in the spring (April, 1965);

FDS - As FS but an antiseptic dressing applied to the pruned surface;

C - Control, no pruning (Figure 2).

Each treatment was thus given to 84 unreleased and 84 thinned trees, providing a total of 840 sample trees.

To assess the effect of pruning on subsequent tree development a destructive analysis on the trees will be carried out. Therefore it is planned to make the first analysis 5 years after pruning on all trees from 6 sample plots (3 thinned and 3 controls), an additional analysis on another 6 sample plots 10 years after pruning and a final analysis on trees from the remaining 12 plots. The greater number of plots for the final analysis will allow for possible mortality among the sample trees. The time of remeasurement was assigned at random to each plot (Figure 1).

During the fall and spring pruning the height and breast height diameter of all sample trees was recorded. Pruning was carried out to a height of 10 feet and branches were cut flush with the stem, using a sharp knife and hammer. Bartlett asphalt-base tree paint was applied immediately after pruning to those trees receiving the FDF and FDS treatments. The size, height from the ground and status (dead or alive) of all and the age of some pruned branches was recorded. Table 1 gives information on number and size of the branches cut.

At the time of pruning, wood samples from all pruned branches were collected and cultured from the trees to be examined in 5 years, in order to establish the presence or absence of fungi in the branches at time of pruning. Some wood samples were also collected and cultured from the heartwood of trees removed in the thinning in order to assess to what extent the trunks had been invaded by decay organisms. Results from these cultures are not available yet.

ASSESSMENT OF RESULTS

Year to year observations will be made on the pruned trees to observe the progress of healing of pruning wounds. A 5-year, 10-year and final destructive analysis will be carried out. The purpose of the 5-year examination will be to determine the type of pruning which promotes the most rapid healing;

to determine the number of infections during healing, and the effectiveness of painting branch stubs. The purpose of the 10-year examination will be to determine the number of infections after healing. The final examination will reveal the amount of infection in the final product and the extent of invasion of decay in the top and roots. The amount of decay in terms of per cent tree volume will be used as a measure of decay incidence. Diameter at breast height and tree height will be measured at time of remeasurement.

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TABLE 1. SIZE OF SAMPLE TREES AND BRANCH STATISTICS IN 1965.

Treatment	No. of trees treated	Av. d.b.h. (inches)	Av. no. of branches per tree to 10 feet ht.			Av. size of biggest branch pruned per tree (mm)	
			Pruned	Alive	Dead	Alive	Dead
FF	168	2.3	19	0.8	18.2	16	15
FDF	168	2.2	17	0.3	16.7	16	14
FS	168	2.3	17	0.5	16.5	16	15
FDS	168	2.3	18	0.2	17.8	18	16
C	168	2.3	-	-	-	-	-

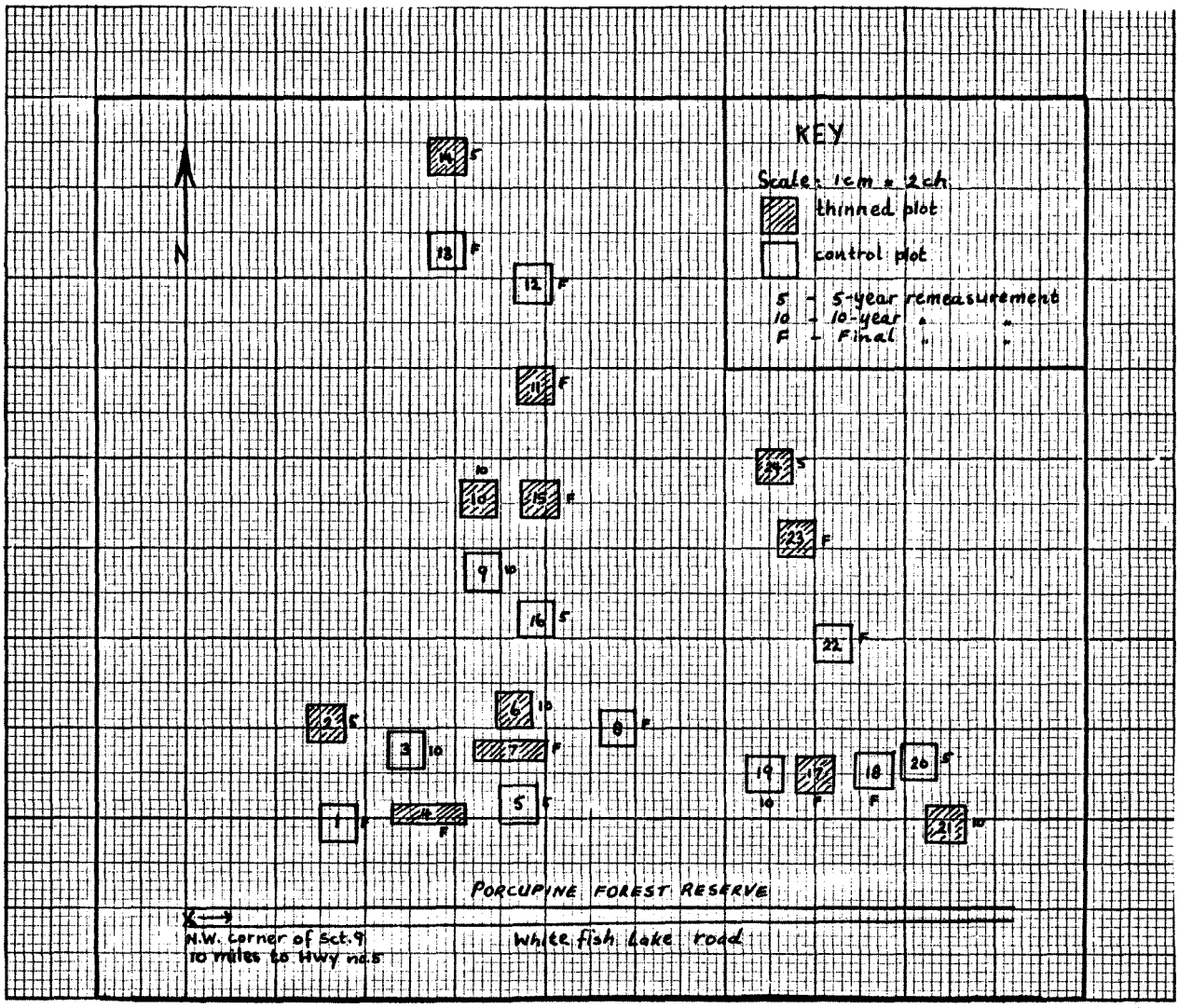
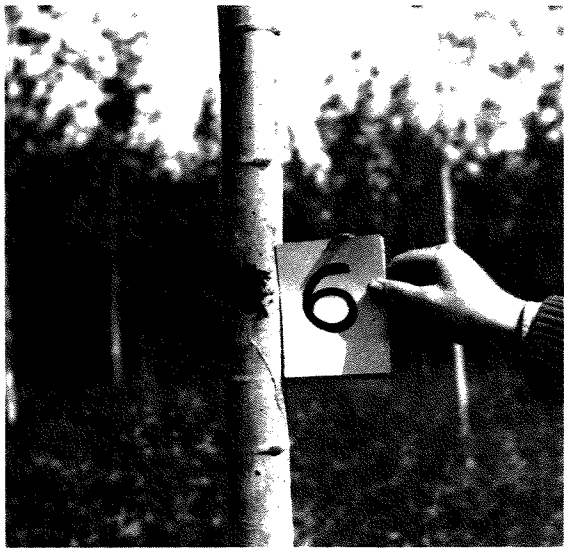


Figure 1. Experimental lay out.

Thinned, but not pruned.

Thinned and pruned.



Thinned, pruned and dressing

General view of thinned sample plot. Note pruned and unpruned trees.

Figure 2. Illustrations show thinned, pruned and dressed sample trees.