# THE EFFECT OF SCARIFICATION UPON THE DEVELOPMENT OF RESIDUAL SPRUCE TREES IN A PARTIALLY CUT WHITE SPRUCE/TREMBLING ASPEN STAND

Project MS-228-2

by

G. A. Steneker

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## INTRODUCTION

The lack of adequate white spruce (Picea glauca (Moench) Voss) regeneration after logging is an important silvicultural problem in the B18[a] Mixedwood Forest Section (Rowe 1959) in Manitoba and Saskatchewan. Results of work by a number of investigators (Rowe 1955, Crossley 1955, Blyth 1955, Maclean 1958, Place 1955 and Quaite 1956), have indicated, that adequate white spruce natural regeneration can be secured only if suitable seedbeds are prepared by means of scarification, which involves the removal of litter, perinnating parts of the ground vegetation and most of the humus.

A number of studies in the Mixedwood Section, involving seedbed preparation, have been undertaken by the Department of Forestry, to determine the value of several silvicultural systems. Of the various methods tested, which include (1) clearcutting in blocks or strips, removing or leaving the unmerchantable hardwoods, (2) clear-cutting, leaving residual spruce seed trees and (3) uniform shelterwood cutting, the latter, involving at least two harvest cuts, has shown most promise in terms of wood production per acre. After the initial cut (which should leave, besides the unmerchantable hardwoods, 40 to 60 sq. ft. of spruce basal area per acre (Lees 1964)), seedbeds are prepared by means of scarification.

The expense of at least two cuts, 10 to 20 years apart, can only be justified, if the initial cut is made while the stand is still growing vigorously, so that the residual spruce will benefit from the growth stimulus received. Inevitably, some spruce roots will be damaged (bark scraped off, roots severed, etc.) (Figure 1), during the process of seedbed preparation. Such damage could lead to serious loss in vigour or death of residuals before the final harvest cut. Thus a potential advantage of the shelterwood system could be lost. Since little as yet is known about the effect of scarification on residual trees, an investigation was begun in 1965 in a stand which had been cut by the shelterwood system and scarified.

## METHODS

Two adjacent mixedwood stands (Area 4 and 5)* were selected along the south boundary of the Porcupine Forest Reserve in Manitoba. The stands had been cut for spruce 15 to 20 years ago and scarified in the summer of 1964. The stands are made up of white spruce, trembling aspen (Populus tremuloides, Michx), balsam poplar (P. balsamifera L.) and white birch (Betula papyrifera, Marsh.) In 1965 area 4 supported on the average 20 sq. ft. of white spruce basal area and 12 sq. ft. of hardwood basal area per acre. Area 5 supported 50 sq. ft. of white spruce basal area and 20 sq. ft. of hardwood basal area per acre. The considerable amount of variation in stocking existing within both areas has been the result of stand composition and previous harvest cuttings. Age of spruce ranged between 70 and 110 years and average white spruce d.b.h. was about 11 inches.

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* See progress reports on MS-228 for details on these areas.

Within the stands, 85 sample trees were selected. These trees were tagged, their location mapped and their height and d.b.h. measured (Figure 2). The amount of scarification around each of 60 sample trees was measured and mapped in such a way as to show the amount of undisturbed soil surface within a 30 foot radius (observed range in extent of undisturbed soil surface around individual trees: 140 to 1800 sq.ft.). Major roots were traced to check whether they had been cut or damaged by the scarification (Figure 3). It was noted that most surface roots on the scarified patches had been cut or completely exposed. The remaining 25 trees were selected to serve as controls. No scarification had been done within 60 feet from them.

## FUTURE WORK PLANNED

The sample trees will be examined in 1967, three growing seasons after scarification. The height and diameter of all trees will be measured. Two increment borings at breast height will be taken from each sample tree from two cardinal directions and the growth since scarification will be compared with that immediately before scarification, in order to determine the effect of various amounts of root damage upon diameter increment. As the stands have not been disturbed in the last 15 to 20 years, any changes in growth of individual trees will most likely be the result of scarification. The control trees will be used to assess the influence of non-controllable factors such as weather. Mortality and windthrow will be recorded also.

There is a good chance that a number of the broken and damaged lateral roots will become infected by fungi. It is therefore planned at time of remeasurement to check the damaged roots of a number of sample trees for fungal infection, identify the type of organisms present, and measure their rate of spread into the trees.

It is anticipated that this study will indicate the effect of different degrees of scarification upon subsequent increment, mortality, windthrow and fungal infection among the spruce residuals. If these effects are known, a better evaluation can be made of the merits of shelterwood cutting and subsequent scarification.

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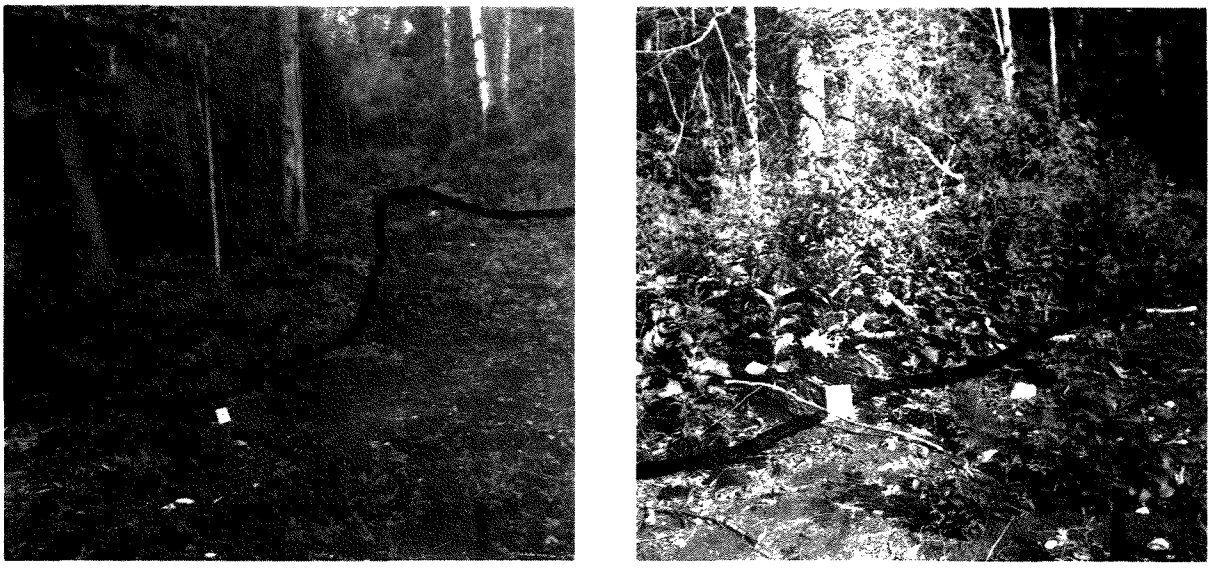

A B

3

Figure 1. Scarification (1) in relation to residual spruce trees. Note the cut roots in plate B.

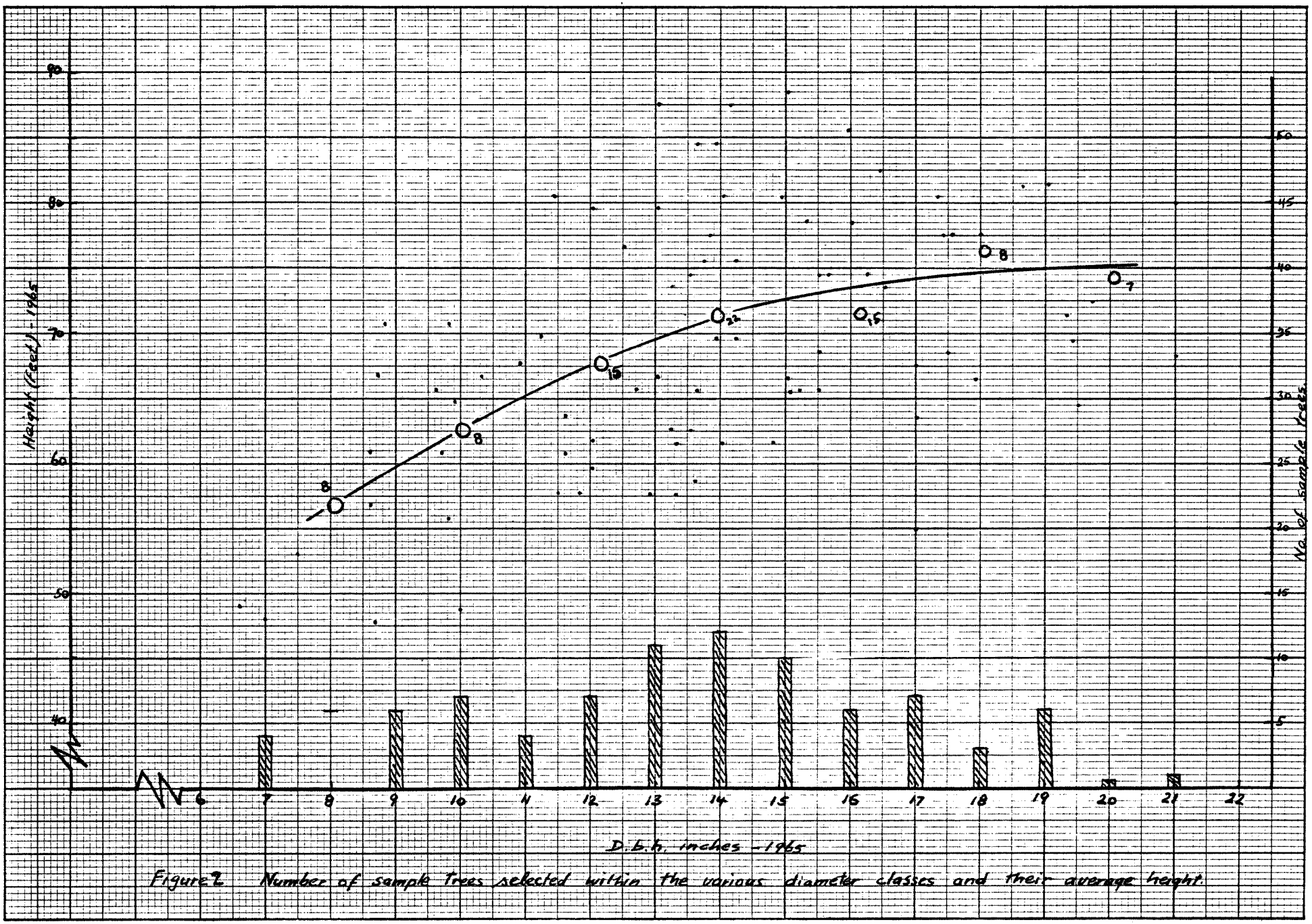


Figure 2 Number of sample trees selected within the various diameter classes and their average height.

X - broken root
size of undisturbed area: 148 sq. ft.
scale: 2 inch = 10 feet

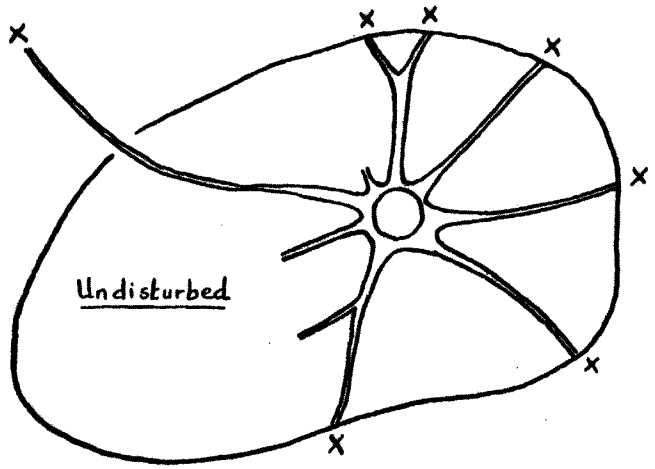


Figure 3 Plan, showing the extent of scarification around a sample tree and the amount of major roots cut.