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

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by

G.A. Steneker

FOREST RESEARCH LABORATORY

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INTRODUCTION

In 1965 a study was begun to determine the effect of scarification upon the subsequent development of residual white spruce (Picea glauca (Moench) Voss) trees in a white spruce/trembling aspen (Populus tremuloides Michx.) stand. The spruce ranged in age from 70 to 110 years. The stand had been selectively cut for white spruce about 20 years ago and scarification had been carried out in 1964 to promote natural regeneration of the spruce underneath the residual canopy.*

This report presents the relationship between the amount of undisturbed soil around individual spruce trees and diameter increment subsequent to scarification.

METHODS AND RESULTS

In the fall of 1967 increment cores were collected from sample trees with scarified ground in their immediate vicinity (='affected' trees) and from trees with no scarification around for a distance of at least 60 feet (=control trees). Two borings at d.b.h. were taken from each tree, one at the north and one at the south side of the stem. Only trees with a d.b.h. $\geq$ 12 inches were sampled. Increment core analysis provided mean yearly increment for the control and affected trees for the periods 1955-1967 and 1955-1964 respectively (Figure 1). Potential increment of the affected trees for 1965, 1966 and 1967, had no scarification been carried out, was interpolated from the relationship between the mean annual increment of the control and affected trees for the period 1955-1964. This relationship was assumed to be linear, at least for the range of values provided (Figure 2).

Based on the interpolated increment values, potential increment for the 3-year period after scarification averaged 28 per cent of that of the 10-year period before scarification. This potential relationship was then compared with the actual relationship in increment for the two periods for each tree

* See internal report MS-16, 1966.

sampled and a percentage of potential growth was calculated and related to the amount of undisturbed ground with a 30 foot radius around each tree (Figure 3).*

Although the scatter of tree data is quite large, there is a trend, indicating a decrease in diameter increment with a decrease in the size of the undisturbed area around the trees. Little or no loss in increment occurred on the average when the undisturbed area was larger than 1400 square feet, while there was a gradual drop in increment down to an average of 60 per cent of the potential with a decrease to about 200 square feet in the size of the undisturbed area.

No mortality that could be attributed to scarification was noted among the 'affected' trees.

DISCUSSION AND CONCLUSIONS

Judging from the great scatter of individual tree data in Figure 3, size of undisturbed area around trees is not the ideal parameter to assess the effect of scarification. The greater part of the observed variation is likely the result of pattern and extent of the root system of the spruce. Complete excavation of the root system would be needed to obtain a better assessment of the effect of scarification. Even then much variation may still remain, since it is frequently not possible to judge the importance of certain portions of the root system, not to mention other effects of scarification such as soil compaction, ground vegetation removal, etc.

A few guide lines for scarification can be given. Scarification can be as close as three to four feet from the base of a residual spruce at one or even two sides without any detrimental effects on subsequent increment, provided there is little or no disturbance on the remaining sides of the tree within at least 25 feet. Care should be taken that the tree base is not damaged since wounds would create points of entrance for decay organisms. A further chance for fungal infection is through the surface roots which have been cut by scarification. However, since the fungal spread, especially through small roots is slow, the three-year period since scarification is not considered long enough for decay organisms, if present, to become established in the trunk of the tree. No efforts were made therefore to determine the presence of decay organisms in the stem which might have entered through the broken roots.

* Scarification more than 30' away from a tree was not considered to influence its growth.

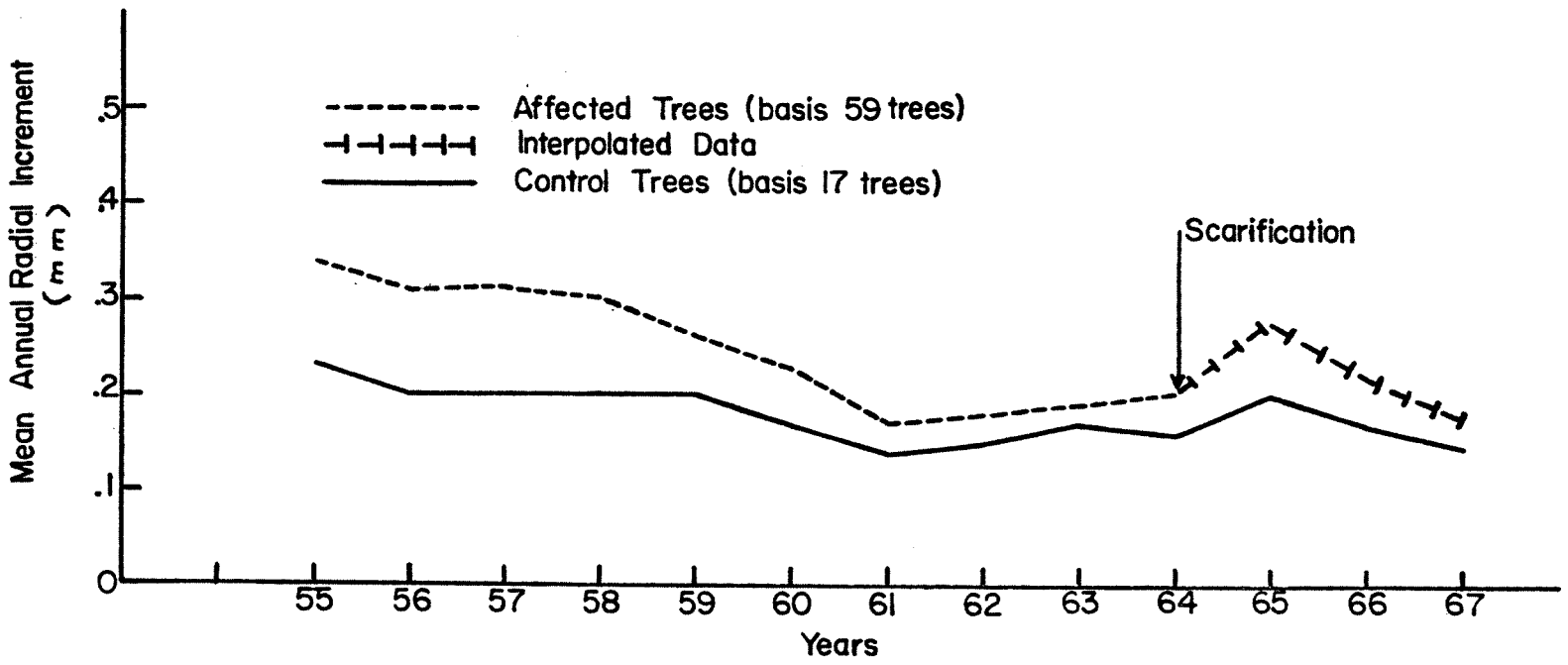

Figure 1. Mean Annual Increment for Control and Affected Trees for the Period 1955-1967.

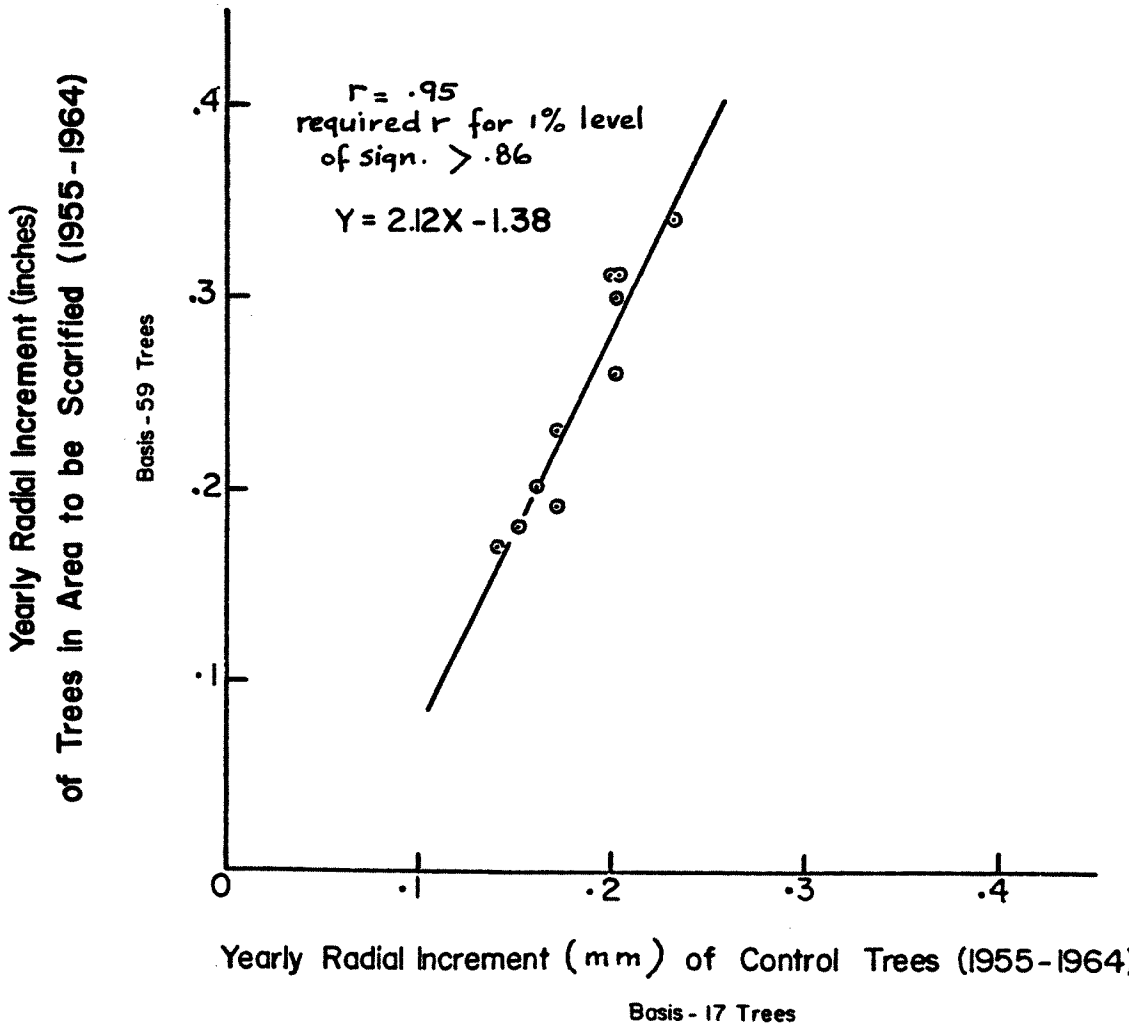

Figure 2. Increment of trees in the area to be scarified in relation to that of the control trees for the period 1955-1964

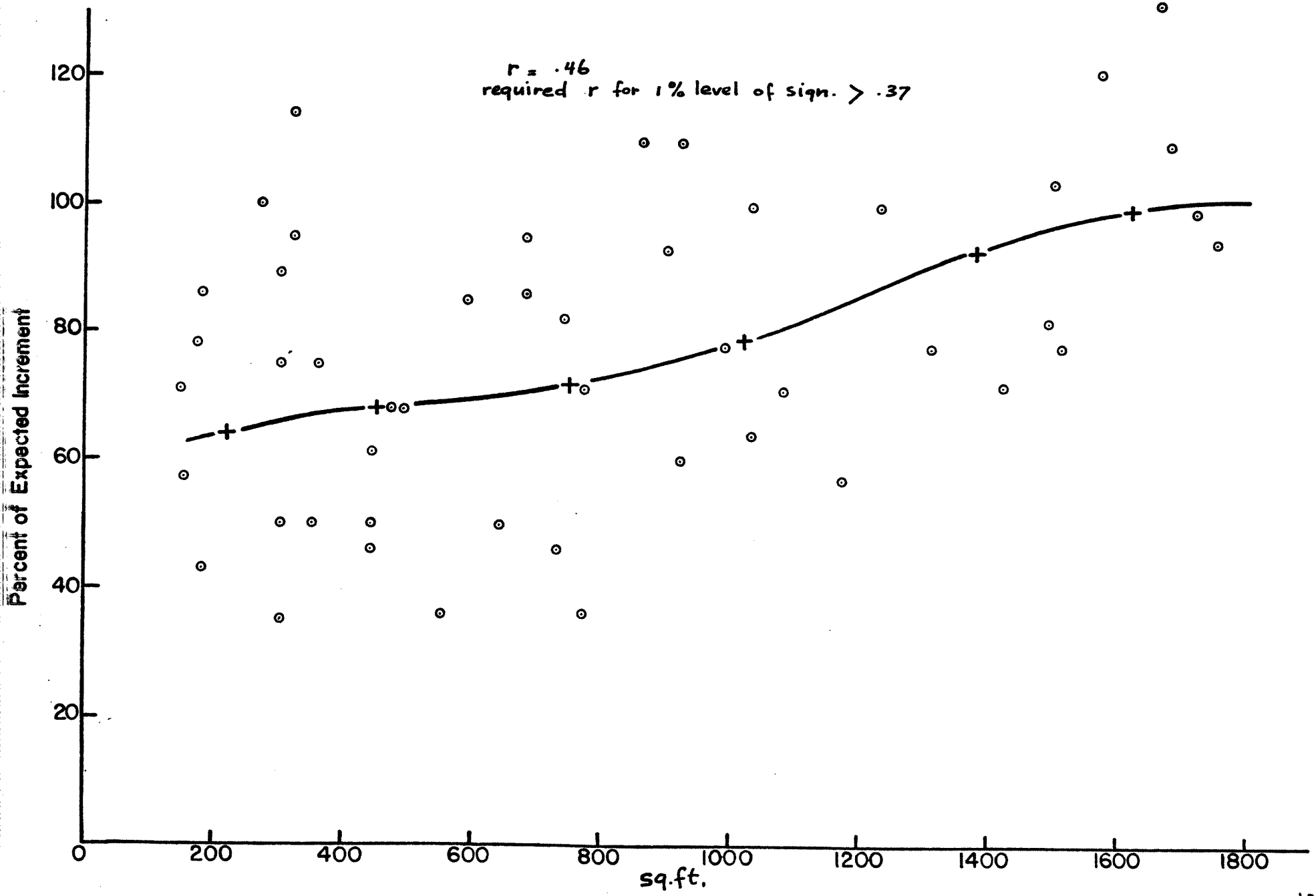

Figure 3 Percent of expected increment of affected trees in relation to the amount of undisturbed soil surface around them.