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ASSESSMENT OF COMPETITION IN A WHITE SPRUCE-TREMBLING ASPEN STAND

PROJECT MS-244

by

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**FOREST RESEARCH LABORATORY
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INTRODUCTION

Work by Cayford (1957), Kagis (1952) and Kabzems (1952) has illustrated that within the white spruce- (Picea glauca (Moench) Voss) trembling aspen (Populus tremuloides Michx) stands of the B18a Mixedwood Forest Section (Rowe 1959) much potential volume of spruce is lost due to suppression from overtopping hardwoods. Although experimental release cuttings have shown (Steneker 1963) that growth of spruce can be stimulated by release from hardwoods, little information is available so far on the magnitude of interspecific and intraspecific competition within these stands, and the factors which influence individual tree growth. With regularly stocked pure stands such as of trembling aspen or jack pine individual tree performance can be readily related to stand data per unit area. In the white spruce-trembling aspen stands great variation in spacial distribution of the spruce exists however. Such conditions necessitate a study of individual tree performance in relation to local stand density, rather than a per acre assessment of stand performance under various stand densities.

Efforts have been made by a number of investigators to relate individual tree performance to local stand conditions. Spurr (1962) found a significant relationship between the increment of individual Douglas fir trees and point density, using a 5-diopter relascope. Lemmon and Schumacher (1962) found that individual tree increment showed a better relationship with point density using a basal area factor of 10

rather than 20, 30 or 40. Ward (1964) developed a crown competition index, assuming that crown competition upon a tree is directly proportional to the number of competitors and their crown class, and indirectly proportional to the distance to competitors. Drinkwater (1960) used the formula $\frac{d \times h \times \% \text{ crown}}{D}$ to express the amount of competition exerted by individuals upon each other. Gagnon (1964) showed a significant relationship between periodic diameter increment of individual balsam fir trees and the percent of their crowns exposed to direct sunlight. Steneker and Jarvis (1963) related increment of individual spruce trees to size and proximity of surrounding competitors in an intermediate-aged white spruce-trembling aspen stand in Saskatchewan and showed a significant relationship between increment and total basal area of all competitors within a 30 foot radius.

To confirm and improve the results obtained so far in the mixedwood stands and to develop a simple formula which in a meaningful and practical way will evaluate the competition exerted by individual trees, additional data were collected in 1965.

METHODS

A 70- to 90-year-old white spruce-trembling aspen mixedwood stand, located along the north boundary of the Divide Forest Reserve (Figure 1) was selected for study. When the stand was cut-over in 1963 defective spruce and a few commercial aspen were removed. Stocking per acre in 1965 averaged 80 sq. ft. and on the average 60 per cent was made up of white spruce.

Ninety-nine white spruce trees, ranging in size from 8 to 16 inches d.b.h. were selected along a traverse through the stand. The

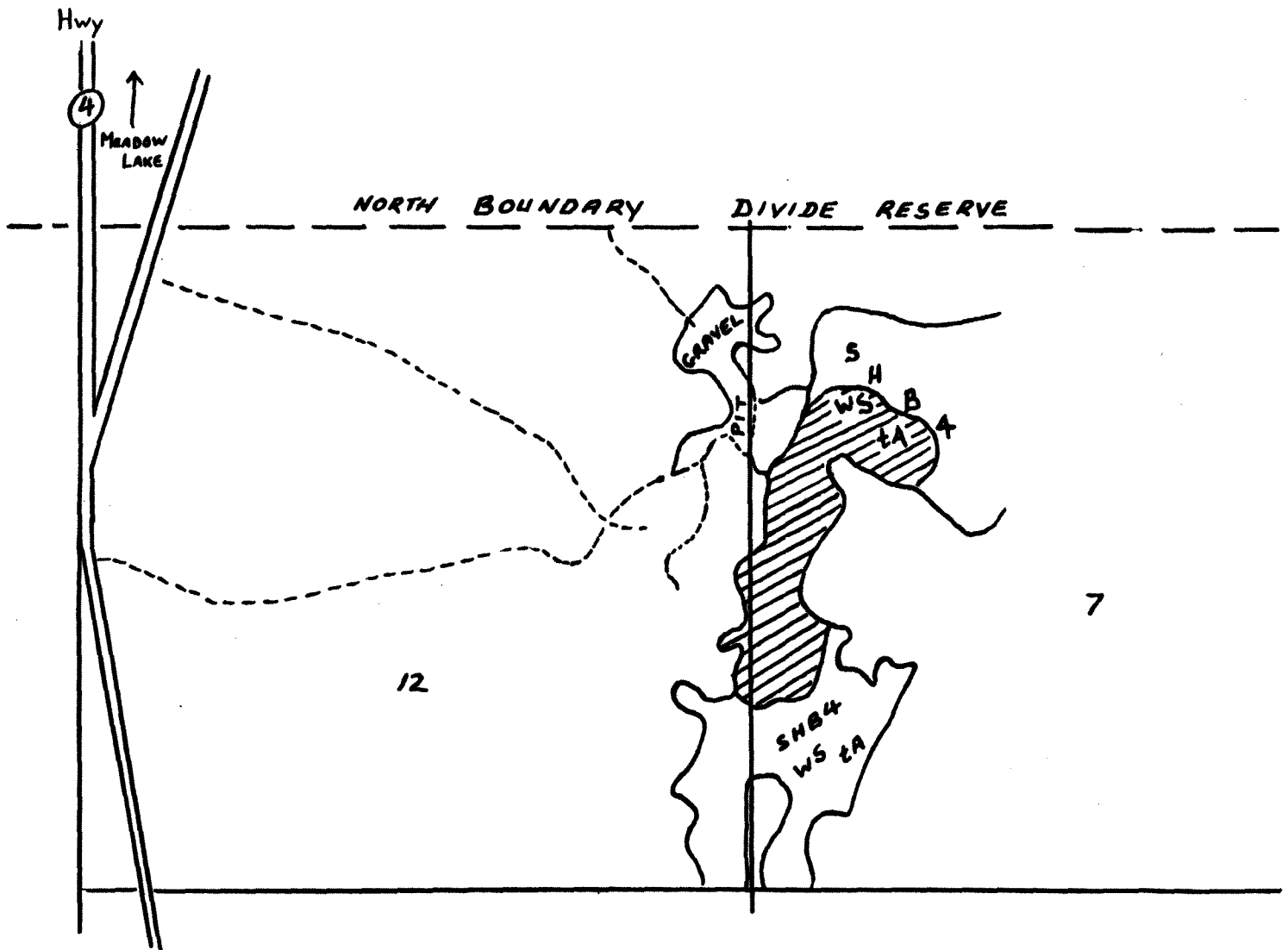
selected trees were tagged and their diameter, height and crown diameter was measured. In addition the proximity, size, and bearing of all competitors and stumps (from the 1963 cut) within a 30-foot radius of each selected spruce was measured and tallied by species (Figure 2). The height and diameter of a number of trembling aspen was measured and height/diameter curves for the spruce and aspen were constructed (Figure 3).

FUTURE WORK PLANNED

After three growing seasons (fall of 1968) increment borings at b.h. will be collected from all tagged spruce. Periodic diameter increment will be related to various expressions of competition. Particular attention will be given to the competition potential of the two species, white spruce and trembling aspen, to the significance of directional release and to the influence of vigour, proximity and size of the competitors. As the location and size of stumps of the 1963 cut is known, periodic increment of the selected trees before and after the cut will also be related to the density of competitors before and after the cut.

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EXPERIMENTAL AREA

MAP REFERENCES:

Tp 58 R 17 SECTION - 12

Tp 58 R 16 SECTION - 7

Figure 1. Location of study area.

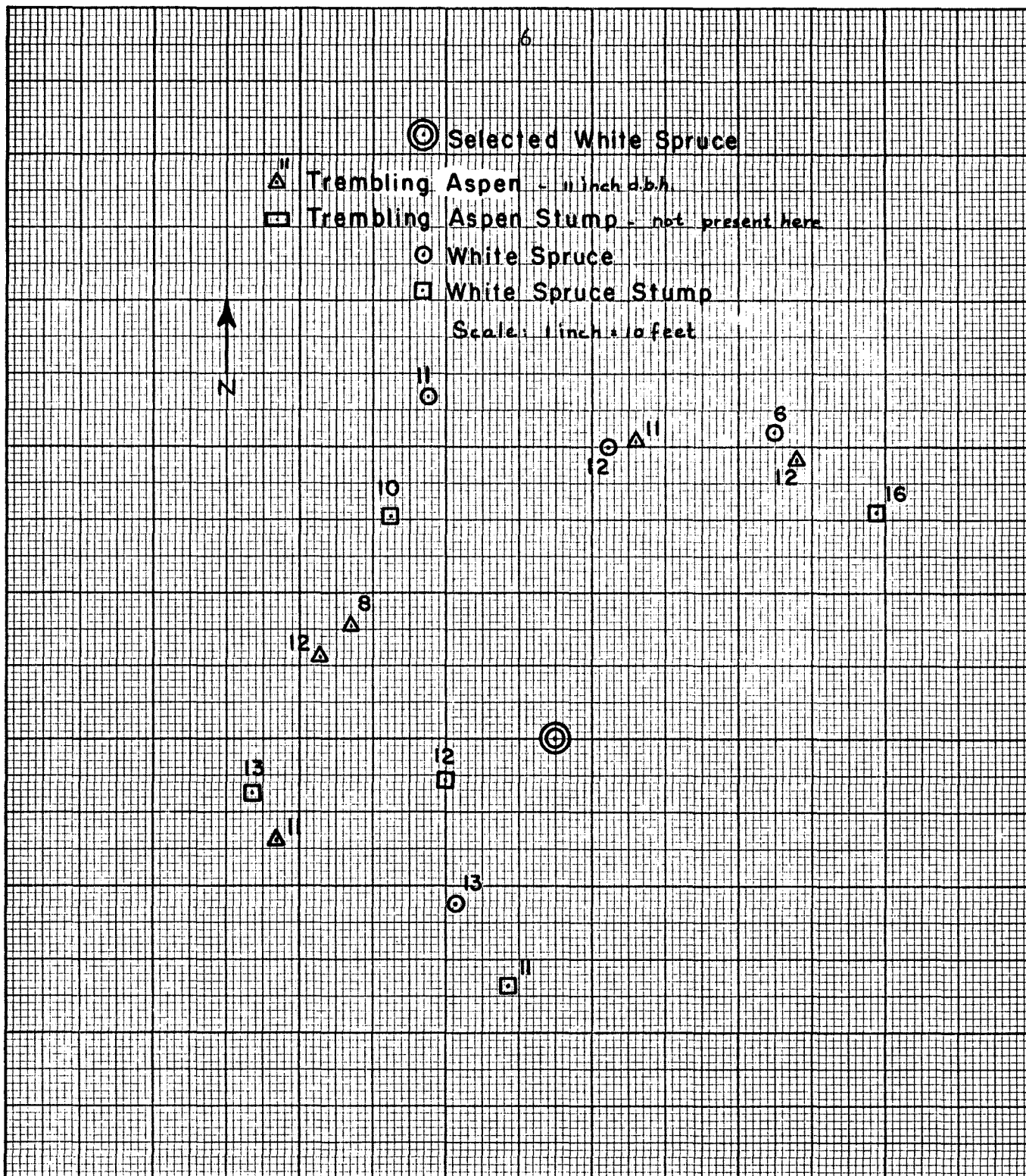


Figure 2. Individual tree map showing location and size of selected white spruce trees and its competitors and stumps within a 30-foot radius.

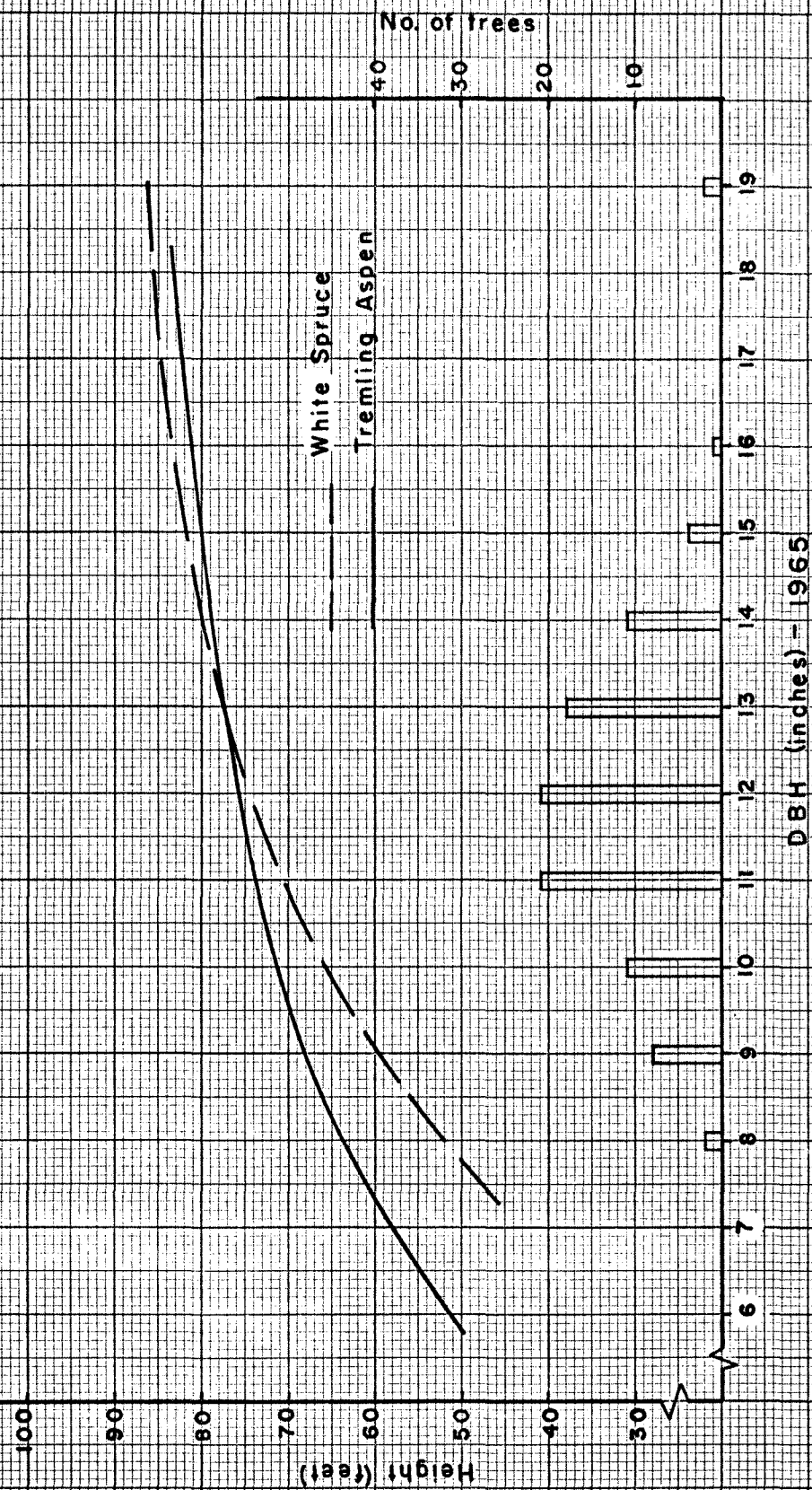


Figure 3. Average height of white spruce and trembling aspen by one-inch diameter classes in 1965 and the total number of white spruce trees selected within each one-inch class.