

HEIGHT GROWTH PERFORMANCE OF WHITE SPRUCE (PICEA GLAUCA  
(MOENCH)VOSS) PROVENANCES IN CENTRAL MAINE

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ABSTRACT.--Height growth measurements were made in a range-wide geographic seed source test of white spruce on the Penobscot Experimental Forest, Bradley, Maine, after 10- and 15-growing seasons. After 15 years in the field, 14 of 24 seed-sources exceeded the plantation mean in height growth. Most of the fastest growing seed-sources are from the southeastern part of the range of white spruce. Trees from the more northern sources were poorly adapted to the planting site and had slow overall growth. The local source exceeded plantation mean height growth by 15 percent. Six other seed sources exceeded the mean by 18 to 32 percent. The six tallest seed-sources after 15 years were also the tallest at 10 years and among the 9 tallest at 5 years. Two sources, one from Beachburg, Ontario, and the other from northcentral Michigan were 12 and 15 percent faster growing than the local source. Significant improvement could be made by simply introducing seed from these two sources into the region represented by the test plantation site.

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INTRODUCTION

Range-wide provenance tests of many tree species have provided basic information on genetic variation and evolutionary patterns, and they have also been useful in identifying well-adapted and rapid-growing seed-sources for local and wide-spread reforestation. A range-wide test of white spruce (Picea glauca (Moench)Voss) initiated by the Institute of Forest Genetics, USFS, Rhinelander, Wisconsin, that was field-planted in 14 locations across the northern United States and southern Canada has shown that seed-source differences in seedling height growth after five years were highly significant (Nienstaedt 1969).

In this same test, trees from several seed-sources; most notably one from Minnesota, one from Quebec, and two from Ontario grew well on all outplanting sites. Trees from seed collected in the Beachburg area in Ontario grew particularly well with height growth 35 percent better than average. Based on these results

and those from other provenance tests of white spruce (Teich 1970) Carlisle and Teich (1971) estimated that. an increase in yield of 15 percent can be obtained by using superior provenances of white spruce for reforestation.

The objective of my study was to evaluate height-growth performance of these range-wide white spruce seed-sources after 10- and 15-years of growth on the Penobscot Experimental Forest in central Maine and to specifically identify those sources that are fast-growing and well-adapted to the New England region.

#### MATERIALS AND METHODS

The range-wide provenance test plantation on the Penobscot Experimental Forest in Bradley, Maine, (latitude 44.5° N - longitude 68.4°W) contains 24 seed-sources of white spruce originating from Alaska to Maine. A complete description of the origin of these seed sources is presented in Table 1; adapted from Nienstaedt (1969). One source, number 1655, originated on the Penobscot Forest and represents the local source against which the other sources can be compared in growth performance.

The seedlings, received as 2-2 stock from the nursery in Rhinelander, Wisconsin, were field-planted in 1962. The plantation location is an open-field site, and the seedlings were planted on the existing sod which received no prior or subsequent preparation, weed control, or fertilization. The plantation design is a 10-block randomized block design with 4-tree-square-plots. Trees were spaced at 6' x 6'.

I measured height growth in the fall of 1971 and 1976; the end of the tenth and fifteenth growing seasons in the field. Each set of data, including 5-year height (Nienstaedt 1969), was analyzed by an analysis of variance using a least-squares analysis with unequal subclass numbers based on plot means. A one-way analysis of cross products was used to obtain seed-source and individual tree correlations between height growth at 5-, 10-, and 15-years.

#### RESULTS AND DISCUSSION

Fifteen year survival and mean height growth at 10-, and 15-years for each seed source are listed in Table 2. Height growth is also expressed as a percentage of the plantation mean and as a percentage of the height of the local seed source (1655) at both ages.









