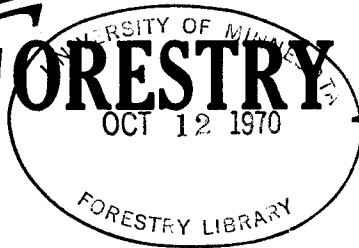


# MINNESOTA FORESTRY NOTES

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## BRANCH CHARACTERISTICS IN A JACK PINE SEED SOURCE PLANTATION<sup>1/</sup>

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The jack pine seed source plantations established in 1942 and 1943 at the Cloquet Forest Research Center have been described by Schantz-Hansen and Jensen<sup>3/</sup>. They noted differences among the seed sources with reference to survival, height growth, winter injury, and tree form. Cone characteristics were described by Schoenike *et al*<sup>4/</sup> in a later study. The present study was designed to supplement the earlier data by providing information on branch characteristics associated with the different seed sources. The field work was done in the summer of 1957 when the plantations were 15 and 16 years old.

From 34 to 50 trees were examined in each of 23 seed sources. The variation in number of trees examined was due to mortality. The following measurements were taken on each tree: total height, height to the base of the longest living branch, maximum crown radius, number of live branches per whorl for four consecutive whorls beginning at the base of the live crown, diameter of the largest branch in each of the four whorls, and branch angle of the largest living branch in each of the four whorls. Branch angle was defined as the upper angle produced by the basal one-foot length of branch and the major axis of the tree. Maximum crown radius was defined as the distance on the ground from the base of the tree to a point beneath the end of the longest living branch. The results are presented in the Table.

The average number of live branches per whorl varied from 3.1 for trees in the Bar Harbor source to 4.0 for trees in the Manistique source. Most of the sources had trees with 3.5 to 3.8 branches per whorl.

The most interesting data were obtained from branch angles. Trees having branch angles averaging 43° to 47° were found in sources from Baldwin, Michigan; Eau Claire, Wisconsin; and two sources from eastern Minnesota. Branch angles averaging between 48° and 52° were found on trees from two sources in central Minnesota, two sources in Lower Michigan, and in five sources from the northwestern part of the range. The 53° to 57° branch angles occurred on trees from five sources northwest of Lake Superior, one source from Upper Michigan, and one from Chalk River, Ontario. Eastern Canada and Maine sources had trees with branch angles exceeding 58°. The very large branch angles found for trees in the Bar Harbor source are partly a reflection of the stunted and crooked stems of the trees in that source.

The data concerning crown form include tree height, maximum crown radius and height from the ground to the longest branch. The raw data have been included in the Table, but as such are strongly influenced by tree height. Hence, to make the data more meaningful, the crown measurements were reduced in proportion to tree height. In addition, the maximum crown radius was doubled to obtain maximum crown diameter. These measurements are shown in the two table-headings, crown size, and crown position. The narrowest tree

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<sup>3/</sup> Minnesota Forestry Note No. 25. 1954.

<sup>4/</sup> Minnesota Forestry Note No. 76. 1959.

crowns were found in the Eau Claire source, with trees having maximum crown diameters averaging 43 percent of total height. Except for the Bar Harbor source, all other sources had trees with crown widths less than 65 percent of the height of the tree. The Bar Harbor source is characterized by bush-type trees, the crowns averaging 158 percent of total tree height.

Crown position (defined in the Table) varied from 54 percent for the Bar Harbor source to 68 percent for the Eau Claire source. These data showed no evidence of a geographical pattern.

Branch size is largely a reflection of tree size, especially of tree diameter. However, if tree diameter at the point of branch attachment is standardized, by considering branch diameter as a percentage value of trunk diameter, then a direct comparison of branch size can be made between the sources. These percentages were derived from a mean of four ratios, one for each of the four whorls measured, and are shown in the last table-column. Smallest branch size occurred on trees from the Hinckley source, the branches averaging only 34 percent of trunk diameter. Values below 40 percent were also recorded for trees in the Michigan, Ontario, and Minnesota sources. Sources from Eau Claire, the northwest, and eastern areas produced trees with larger branches, all averaging over 40 percent of trunk diameter. The stunted Bar Harbor source had trees with branches that averaged over 57 percent as large as the trunk diameter.

Because of possible non-randomness in the original seed source material, the data should only be considered as indicating rough trends.

TABLE BRANCH CHARACTERISTICS OF JACK PINE SEED SOURCES AT THE CLOQUET FOREST RESEARCH CENTER

| <u>Source</u>           | <u>Basis</u><br>No.<br>of<br>Trees | <u>Tree</u><br><u>Height</u><br>Mean<br>in<br>Feet | <u>Branches</u><br>per<br><u>Whorl</u><br>Mean<br>No. | <u>Branch</u><br><u>Angle</u><br>Mean<br>in<br>Degrees | <u>Height to</u><br>Base of<br>Longest<br><u>Branch</u><br>Mean in<br>Feet | <u>Crown</u> <sup>1/</sup><br><u>Position</u><br>Mean<br>Per-<br>cent | <u>Maximum</u><br><u>Crown</u><br><u>Radius</u><br>Mean in<br>Feet | <u>Crown</u> <sup>2/</sup><br><u>Size</u><br>Mean<br>Per-<br>cent | <u>Diameter</u><br>of<br>Largest<br><u>Branches</u><br>Mean in<br>mm. | <u>Branch</u> <sup>3/</sup><br><u>Size</u><br>Mean<br>Per-<br>cent |
|-------------------------|------------------------------------|--|---|--|--|---|--|---|---|--|
| 1. Baldwin, Mich.       | 48                                 | 20.4   | 3.9   | 44   | 12.2   | 60  | 5.2  | 52  | 20  | 35   |
| 2. Wellston, Mich.      | 38                                 | 20.7   | 3.6   | 48   | 12.0   | 59  | 5.6  | 54  | 22  | 35   |
| 3. Huron, Mich.         | 44                                 | 21.5   | 3.6   | 51   | 12.8   | 60  | 5.6  | 54  | 22  | 36   |
| 4. Manistique, Mich.    | 46                                 | 22.2   | 4.0   | 54   | 12.2   | 56  | 5.9  | 54  | 22  | 35   |
| 5. Peterson, Minn.      | 48                                 | 21.7   | 3.6   | 47   | 12.8   | 59  | 5.2  | 48  | 22  | 37   |
| 6. Eau Claire, Wis.     | 34                                 | 12.8   | 3.3   | 46   | 8.4  | 68  | 2.8  | 43  | 14  | 41   |
| 7. Hinckley, Minn.      | 49                                 | 23.2   | 3.8   | 47   | 12.9   | 56  | 5.5  | 48  | 21  | 34   |
| 8. Jenkins, Minn.       | 48                                 | 23.7   | 3.8   | 50   | 13.1   | 55  | 5.6  | 47  | 23  | 35   |
| 9. Park Rapids, Minn.   | 47                                 | 23.4   | 3.7   | 49   | 13.4   | 57  | 5.7  | 49  | 23  | 35   |
| 10. Cloquet, Minn.      | 49                                 | 21.4   | 3.8   | 53   | 12.2   | 57  | 5.3  | 49  | 21  | 35   |
| 11. Chisholm, Minn.     | 48                                 | 21.7   | 3.8   | 54   | 12.6   | 59  | 6.0  | 55  | 23  | 37   |
| 12. Grand Marais, Minn. | 49                                 | 19.2   | 3.8   | 57   | 11.2   | 59  | 4.8  | 50  | 19  | 36   |
| 13. Fort Frances, Ont.  | 48                                 | 19.9   | 3.6   | 54   | 11.0   | 56  | 4.9  | 48  | 20  | 36   |
| 14. Sandilands, Man.    | 46                                 | 20.7   | 3.5   | 55   | 12.1   | 59  | 5.3  | 51  | 22  | 36   |
| 15. The Pas, Man.       | 50                                 | 16.1   | 3.6   | 48   | 10.2   | 64  | 3.8  | 47  | 18  | 43   |
| 16. Regina, Sask.       | 41                                 | 14.3   | 3.5   | 51   | 9.0  | 64  | 3.8  | 53  | 18  | 46   |
| 17. Fort McMurray, Alb. | 50                                 | 15.4   | 3.7   | 49   | 9.6  | 65  | 3.9  | 51  | 18  | 43   |
| 18. Iroquois Lake, Alb. | 44                                 | 11.0   | 3.6   | 52   | 6.5  | 60  | 3.5  | 65  | 16  | 49   |
| 19. Smith Landing, Alb. | 48                                 | 14.8   | 3.5   | 50   | 9.0  | 62  | 3.8  | 53  | 19  | 46   |
| 20. Chalk River, Ont.   | 50                                 | 21.1   | 3.6   | 53   | 12.2   | 59  | 5.3  | 50  | 21  | 36   |
| 21. Lake St. John, Que. | 49                                 | 17.4   | 3.7   | 60   | 9.7  | 57  | 4.4  | 51  | 19  | 40   |
| 22. Miramichi, N. B.    | 45                                 | 14.4   | 3.6   | 59   | 8.6  | 62  | 4.3  | 59  | 19  | 43   |
| 23. Bar Harbor, Maine   | 46                                 | 6.1  | 3.1   | 70   | 3.1  | 54  | 4.6  | 158   | 19  | 57   |

<sup>1/</sup> Computed as a ratio of height-to-longest branch to total height.

<sup>2/</sup> Computed as a ratio of crown diameter (twice the crown radius) to total height.

<sup>3/</sup> Computed as a ratio of diameter of largest branch in each whorl to trunk diameter at point of branch attachment. This is a mean value of 4 ratios, one for each of the 4 whorls measured.