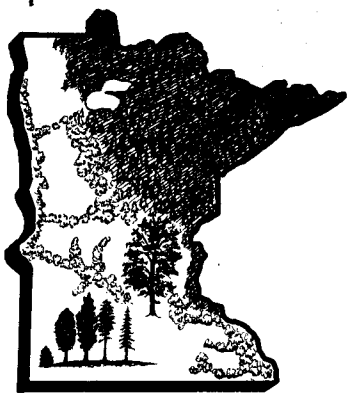

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GROWTH OF MATURE RED PINE

Stephen H. Spurr & J. H. Allison[1)]

Permanent sample plot data from Itasca State Park and the Cloquet Experimental Forest provide information on the growth and development of mature red (or Norway) pine (Pinus resinosa). At Itasca a 5-acre permanent sample area was established in 1923 in a 100-year-old red pine stand. Trees in this block of fifty 1/10-acre plots were remeasured to the nearest 0.1 inch DBH for the seventh time in 1952. At Cloquet a 100-per cent cruise of the 42-acre Scenic Forest was made by 2-inch diameter classes in 1919 when the stand was 95 years old. A comparable cruise was made again in 1952. Also, growth data are available for the same stand from ten 1/4-acre sample plots measured to the nearest inch in DBH in 1939 and 1949. In both the Itasca and Cloquet stands the mean height of dominant and codominant trees was approximately 85 feet at 120 years of age, the site index thus classifying as average.

Volume and growth computations have been made covering each 5-year period of the Itasca stand for the 8 sites and stands into which the 5-acre plot has been divided. The most significant results, summarizing the data for the most extensive red pine site at Itasca (covering 2.46 acres of the 5-acre plot) and the two sets of measurements in the Cloquet Scenic Forest stand are given in the following table.

Representative growth data for red pine portion of stand.

STAND DATA	Itasca main red pine stand (100 per cent cruise)		Cloquet stand (100 per cent cruise)		Cloquet stand (¼-acre plots)	
(per acre)	1928	1952	1919	1952	1939	1949
No. of trees	177	165	80	78	81	80
Average DBH (inches)	11.4	12.9	14.6	16.6	14.9	15.6
Basal area (sq. feet)	126	151	93	117	99	106
Cubic feet (inside bark)	4120	5070	3170	4090	3390	3670
M board feet (Int.¼"rule)	22.5	29.2	19.0	25.2	20.4	22.4
GROWTH PER ACRE PER YEAR (Based on data before rounding off)						
No. of trees	-0.50		-0.05		-0.16	
Average DBH (inches)	0.06		0.06		0.07	
Basal area (sq. ft.)	1.04		0.77		0.76	
Cubic feet (inside bark)	39.7		28.7		28.4	
Board feet (Int.¼"rule)	276		194		200	

[1)] Former Associate Professor and Professor Emeritus, respectively, University of Minnesota School of Forestry.

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From the preceding table and other data yet to be published, a number of conclusions may be drawn:

(1). The growth of these stands is markedly better than would be expected on the basis of the yield table published in U.S.D.A. Circ. 778, 1948, Red Pine Management in Minnesota. For 120-year-old fully-stocked stands on the same average sites, this yield table predicts a growth of 15 cubic feet and 75 board feet Scribner (which log rule gives results comparable to the International 1/4" rule for the tree sizes concerned) per acre per year. This is approximately half of the actual cubic foot growth and 1/3 of the actual growth in board feet.

(2). Pure red pine stands of the type sampled at Itasca and Cloquet were originally red pine - jack pine (Pinus banksiana) mixtures. Jack pine made up 16 per cent of the stand basal area at Itasca in 1923 as contrasted to only 3 per cent in 1952. At Cloquet jack pine made up 8 per cent of the stand basal area in 1919 and 3 per cent in 1952. The good growth and low mortality of the red pine in these 100-130-year-old red pine stands is made possible by this natural thinning resulting from the gradual dropping out of jack pine. This condition is probably typical for the older red pine stands inasmuch as most such stands start out with a jack pine component.

(3). The above table gives the growth for the red pine portion of the stand only. At Itasca, the white pine (Pinus strobus) portion grew at an average rate of 33 board feet per acre per year while the jack pine retrogressed at a rate of 101 board feet per acre per year. The net rate of pine growth, therefore, has been 208 board feet per acre per year. White pine accounted for 6 per cent of the 1928 basal area and yet put on 22 per cent of the basal area growth in the 24-year period. At Cloquet, from the 32-year record, the board foot growth rates for white pine, jack pine, and all pine are 16, - 31, and 185, respectively.

(4). An analysis of the growth of the individual trees in the Itasca stand (main stand, 2.46 acres) revealed that the largest 70 per cent of the trees (classified by DBH) accounted for 90.5 per cent of the basal area in 1928, and contributed 97.0 per cent of the net growth over a 24-year period. Only 30 per cent of the total red pine mortality occurred in this 70 per cent of the larger trees. The smallest 30 per cent of the trees contributed only 3.0 per cent of the total net growth. These trees contributed practically nothing to the development of the stand and apparently could have been removed without affecting unfavorably the utilization of the site and the growth of the residual trees.

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