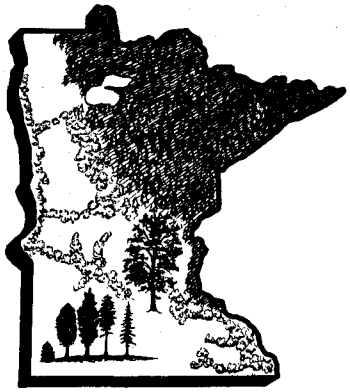

MINNESOTA FORESTRY NOTES

No. 50

April 15, 1956

GROWTH AND MORTALITY IN A NORTHERN MINNESOTA FOREST 1/

John W. Hubbard 2/

Five hundred and fifty-eight permanent one-tenth acre plots located on the Minnesota and Ontario Paper Company's Experimental Forest near Loman, Minnesota, were remeasured in 1953-1954 after a five year lapse since previous measurement. These plots were systematically located and included 14,688 trees in a predominantly mature to overmature forest. About 38 percent of the cord volume is spruce-balsam, 35 percent is aspen, 15 percent is other hardwoods of sawtimber size and the remainder is mixed species. Estimated growth and mortality on the 1,077 net productive acres are shown in Table 1.

Table 1. Volume Changes Over Five-Year Period
Based on Five Percent Systematic Sample

	Cords	Cords/Acre/Year	Percent of Total Growth
Ingrowth	495	.09	19
Growth on original trees	2,045	.38	81
Total growth	2,540	.47	100
Natural mortality	1,255	.23	49
Net growth	1,285	.24	51

Aspen and Balsam Growth

A separate growth tabulation was made for aspen (*Populus tremuloides*) and balsam fir (*Abies balsamea*). Both species were classified by one inch d.b.h. classes, vigor classes, and growth. The four vigor classes used are defined as follows:

Vigor 1. Dominants and strong codominants of good form and low risk with cull not exceeding five percent.
Vigor 2. Trees between 1 and 3 in vigor with not over 15 percent cull.
Vigor 3. Suppressed and weak intermediates, trees having poorly formed bole, those of high risk, or those showing 15 to 50 percent cull.
Vigor 4. *Hypoxylon* infected aspens showing stem cankers.

Figures 1 and 2 and Tables 2 and 3 show the relationships of d.b.h., growth and vigor classes for both species.

Good vigor balsam trees put on almost twice as much annual growth as the average poor vigor tree. The difference among vigor classes is less pronounced in aspen. While aspen has almost a straight line growth curve, balsam grows more slowly, probably under suppression, until it is about six inches in d.b.h. Then following a greatly accelerated growth, it levels off to a greater extent than aspen in the higher diameter classes.

1/ Contribution of Minnesota and Ontario Paper Company.
2/ Forester, Minnesota and Ontario Paper Company.

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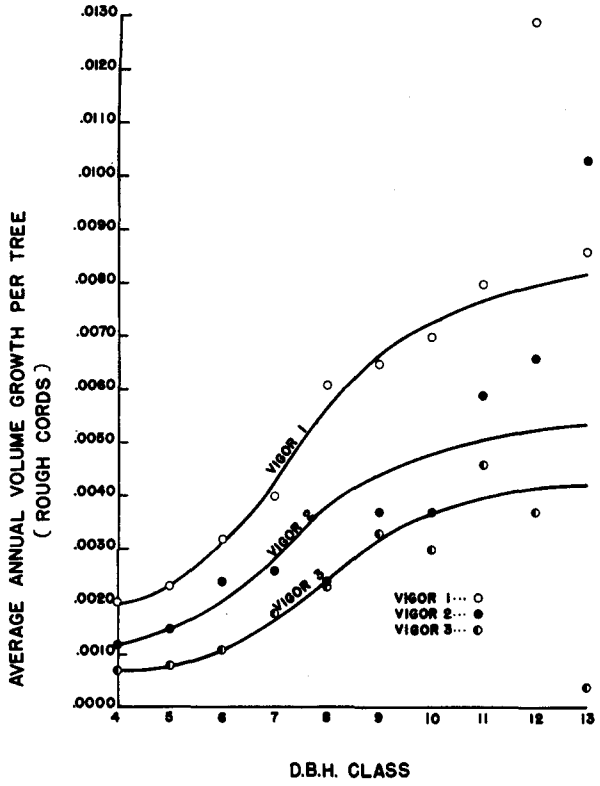

Fig. 1. Annual volume growth per balsam fir tree by d.b.h. and vigor classes.

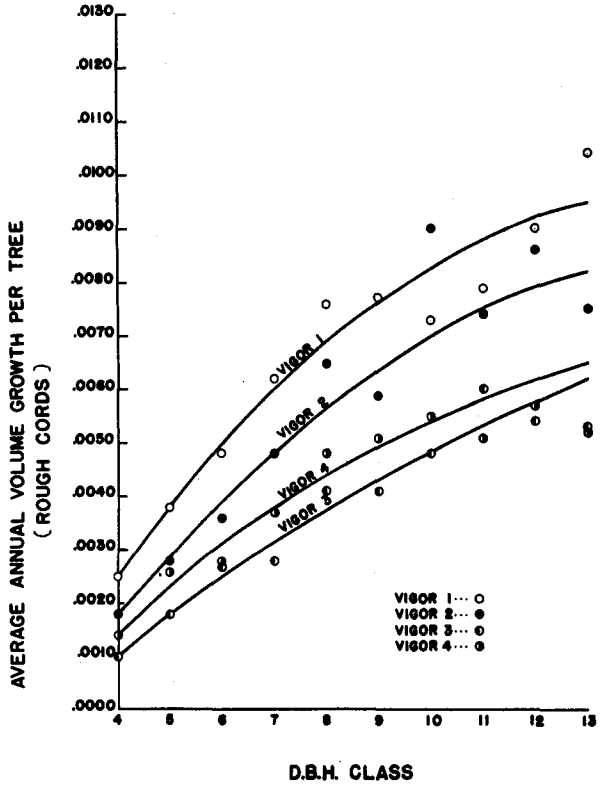

Fig. 2. Annual volume growth per aspen tree by d.b.h. and vigor classes.

Table 2. Average Annual Growth in Cords Per Balsam Fir Tree

DBH	Vigor 1		Vigor 2		Vigor 3	
	# Trees	Ave. An.Gr.	# Trees	Ave. An.Gr.	# Trees	Ave. An.Gr.
4	104	.0020	214	.0012	259	.0007
5	102	.0023	176	.0015	127	.0008
6	93	.0032	119	.0024	69	.0011
7	76	.0040	68	.0026	36	.0018
8	52	.0061	44	.0024	28	.0023
9	27	.0065	28	.0037	11	.0033
10	15	.0070	11	.0037	8	.0030
11	8	.0080	8	.0059	10	.0046
12	4	.0129	2	.0066	3	.0037
13	2	.0086	2	.0103	2	.0004

Table 3. Average Annual Growth in Cords Per Aspen Tree

DBH	Vigor 1		Vigor 2		Vigor 3		Vigor 4	
	# Trees	Ave. An.Gr.	# Trees	Ave. An.Gr.	# Trees	Ave. An.Gr.	# Trees	Ave. An.Gr.
4	223	.0025	289	.0018	345	.0010	18	.0014
5	281	.0038	190	.0029	141	.0018	41	.0026
6	216	.0048	115	.0036	70	.0027	38	.0028
7	123	.0062	87	.0048	45	.0028	27	.0037
8	80	.0076	49	.0055	32	.0041	24	.0048
9	37	.0077	46	.0059	29	.0041	20	.0051
10	30	.0073	20	.0090	20	.0048	8	.0055
11	23	.0079	17	.0074	21	.0060	6	.0051
12	13	.0090	15	.0086	15	.0054	5	.0067
13	4	.0104	14	.0075	12	.0053	1	.0052