Bibliothèque

GROWTH AND YIELD OF BALSAM FIR AND BLACK SPRUCE IN QUEBEC

Quebec Region
Department of Forestry and
Rural Development

Laboratoire des Recherches Forestières
BIBLIOTHÈQUE
LIBRARY
Forest Research Laboratory

by
Paul E. Vézina and André Linteau

FOREST RESEARCH LABORATORY
QUEBEC REGION, QUEBEC
INFORMATION REPORT Q-X-2

CANADA
DEPARTMENT OF FORESTRY
AND RURAL DEVELOPMENT

FORESTRY BRANCH
JULY, 1968

GROWTH AND YIELD OF BALSAM FIR AND BLACK SPRUCE IN QUEBEC

by
Paul E. Vézina and André Linteau

FOREST RESEARCH LABORATORY
QUEBEC REGION, QUEBEC
INFORMATION REPORT Q-X-2

FORESTRY BRANCH
JULY, 1968

ANDRE LINTEAU, 1911-1966

Dr. André Linteau, co-author of this paper, died in February 1966. As Associate Director of the Quebec Region, Canada Department of Forestry and Rural Development, Dr. Linteau was widely known for his outstanding contributions to Silviculture. His bulletin "Forest Site Classification of the Northeastern Coniferous Section, Boreal Forest Region, Quebec" was only the beginning of his long devotion to silvicultural studies. Dr. Linteau's untimely death is mourned by all who knew him, but his professional work will serve as the foundation for future investigations for many years to come.

Paul E. Vézina

GROWTH AND YIELD OF BALSAM FIR AND BLACK SPRUCE IN QUEBEC

Paul E. Vézina[1] and André Linteau

ABSTRACT

Growth and yield tables based on age and site index, and on basal area and height, and volume tables for black spruce (Picea mariana (Mill.) BSP) and balsam fir (Abies balsamea (L.) Mill.) stands have been prepared from 408 sample plots established throughout the Boreal Forest Region of Quebec from 1952 to 1967. The yield tables can assist in predicting stand development, assessing land productivity, and in silvicultural management.

RÉSUMÉ

Un échantillonnage de 408 places d'étude réparties dans toute la Région forestière boréale du Québec et établies durant la période de 1952 à 1967 a permis de construire des tables de croissance et de production ainsi que des tarifs de cubage pour l'épinette noire (Picea mariana (Mill.) BSP) et le sapin baumier (Abies balsamea (L.) Mill.). Les tables de production sont basées, les unes sur l'âge et l'indice de la qualité de station (relation âge-hauteur), les autres sur la surface terrière et la hauteur, tandis que les tarifs de cubage ont été compilés par classes de qualité de station. Les tables de production peuvent servir à prédire le développement futur des peuplements, à déterminer la productivité des terrains forestiers ou encore pour l'aménagement intensif des forêts.

[1] Present address: Faculté de Foresterie et de Géodésie, Université Laval, Québec 10, P.Q.

ACKNOWLEDGMENTS

The authors wish to express their indebtedness to the numerous agencies and individuals that have cooperated or assisted in this project. The forestry staff of the Anglo-Canadian Pulp and Paper Mills, the Canadian International Paper Co., the Price Co., the Consolidated-Bathurst Ltd., the Domtar Woodlands Ltd., the Quebec North Shore Paper Co., the Quebec Department of Lands and Forests, and several other organizations assisted in directing field parties to stands suitable for sampling, and also in providing camp facilities. The early work of Dr. G. J. Lemieux and Mr. D. Gagnon, of the Canada Department of Forestry and Rural Development, in compiling the plot summaries is gratefully acknowledged. Thanks are also due to Dr. D. M. Brown for processing the data on an electronic computer, and to Messrs. M. Gros-Louis and A. Choquette for technical assistance.

INTRODUCTION

The Boreal Forest Region (Rowe 1959) of Quebec is of great economic importance to the country. According to Bedell (1964) its forests extend over an area of 710 million acres, about 77 per cent of which is productive forest land. In this region an immense logging industry has been established during the past decades, and each year approximately 500,000 acres, stocked mostly with balsam fir and black spruce, are logged over. In spite of this vastness, the supply of mature virgin timber is by no means unlimited, and as it becomes less the wood production must come at an increasing rate from young managed stands. It is then of the utmost importance to have definite information

concerning the growth that takes place in these still immature stands of fir and spruce, and the potential yields of the land on which they grow.

This study was concerned with developing growth and yield tables for balsam fir and black spruce growing in even-aged stands in the boreal forest of Quebec. Two types of tables are presented, namely, those based on age and site index, and those based on basal area per acre and height. In addition to the growth and yield tables, volume tables have also been prepared. The growth and yield tables will help anyone interested in a future forest crop in this region to determine the yield of actual stands, to predict their probable development, to decide upon the best rotation age and to assess the productivity of various classes of land.

METHODS

This study was begin in 1952. A fairly large amount of field data has been obtained between 1952 and 1955 while the junior author worked on his site classification in B.1a (Laurentide-Onatchiway) and B.1b (Chibougamau-Natashquan) Forest Sections. Sections B.2 (Gaspé), B.3 (Gouin), B.4 (Northern Clay) and part of B.7 (Missinaibi-Cabonga) were covered in 1956. During the early 1960's, a few minor watersheds were visited to gather data that had been impossible to collect previously. The senior author has assisted in the collection of data from 1954 and has continued the work since 1963. Lately, he has seen to the electronic compilation of the data and written the manuscript.

Field

The plots, usually one-fifth of an acre in size, were established in various stands of uniform age and site quality. It was not possible to get measurements of stands of every age and site quality, but a good distribution among the possible combinations of age and site quality was obtained. The distribution of plots by age and site index classes is shown in Table 1.

The geographical distribution of the sample plots is illustrated in Figure 1. An attempt was made to sample the accessible areas in all the main watersheds of the study area. In some watersheds large areas are covered by forests belonging to one age class. Certain age classes in given site-types were rarely encountered and these had to be collected where opportunity arose.

Tally was taken of all living trees by diameter class with segregation by species and crown classes. A minimum of 15 trees for the main stand component were measured for height. Age of stand was obtained through borings at the stump on at least six trees belonging to the dominant crown classes. Crown closure was obtained by a forest densiometer (Lemmon 1956). The stand description included the following items: location, slope, aspect, soil, ground cover, reproduction, and history of the stand.

Office

Thirty-three plots were discarded because certain essential information had not been taken or species other than fir and spruce predominated. The remaining plots, amounting to 408, were used in all

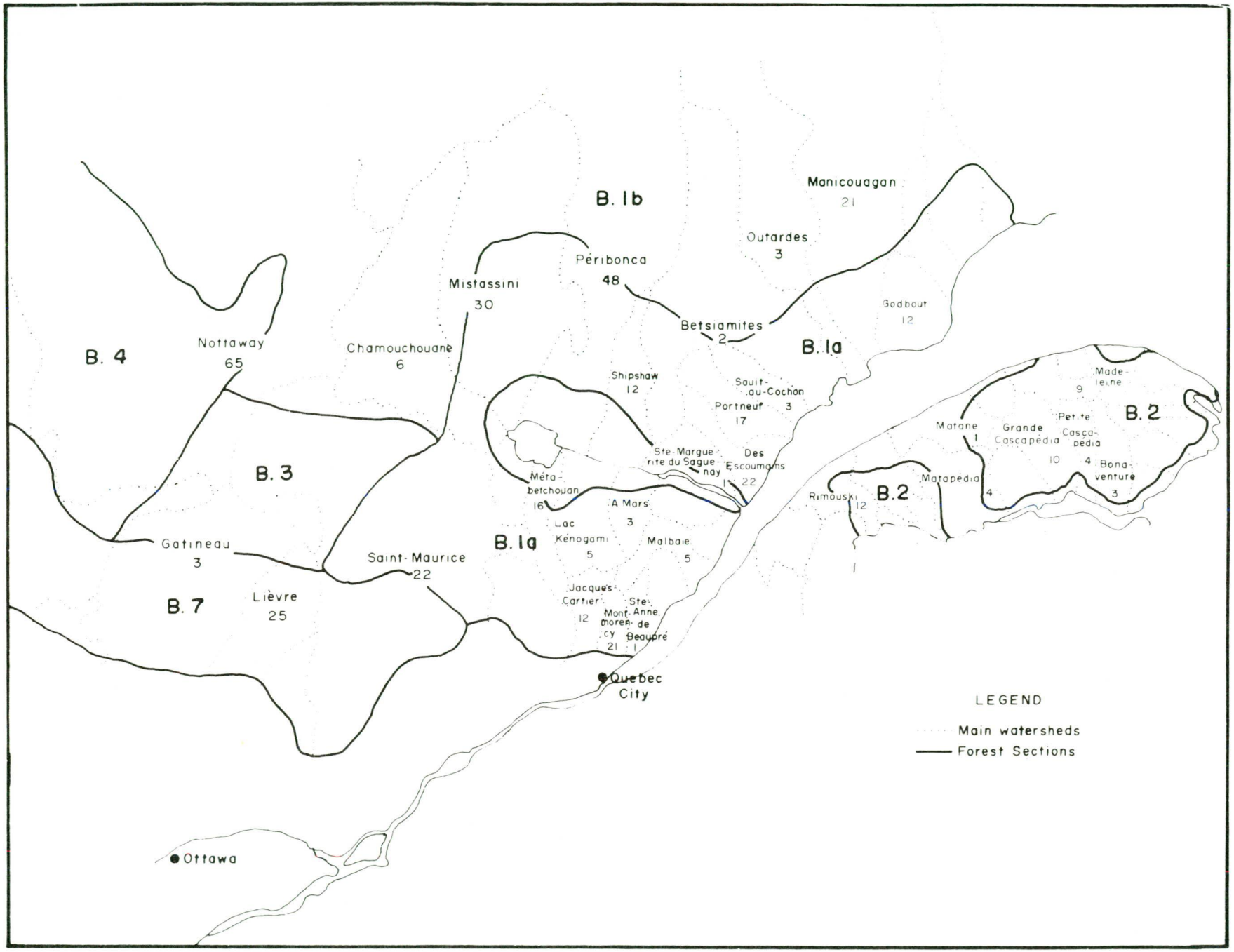

Figure 1. Map showing the Forest Sections included in the spruce and fir growth and yield study and the number of sample plots in the main river watersheds of Quebec.

subsequent analyses as representative of that particular site and age class. This was done by calculating the number of trees in each diameter class on a per-acre basis. The basal area of each diameter class was computed. From a curve of height over diameter the average height of each diameter class was obtained. The cubic-foot total and merchantable volumes for each diameter class were computed with the aid of the Form-Class Volume Tables (Anon. 1948). The basal area of the average tree was obtained by dividing the total basal area of a plot by the total number of trees. The basic procedure followed is that described by Bruce and Schumacher (1950).

The analyses of plot data were done with the aid of an I.B.M. 1620 electronic computer.

SITE CLASSIFICATION

Segregation of forest land into the various site, or productivity, classes is based on the average total height of the dominant and codominant fir and/or spruce trees. The average total height attained at 50 years of age is the site index. The site indexes have been grouped in four classes, called sites I, II, III, and IV, and each site class includes one 10-foot site index class. Site can thus be determined by comparing the average total height of 5 to 10 dominant and codominant trees on an homogeneous area with the standard heights corresponding to the age of the stand as given in Figure 2.

Most of the balsam fir stands in the sampled area belong to site classes I and II and are represented by the Dryopteris-Oxalis, Hylocomium-Oxalis, and Calliergon-Oxalis site-types as described by

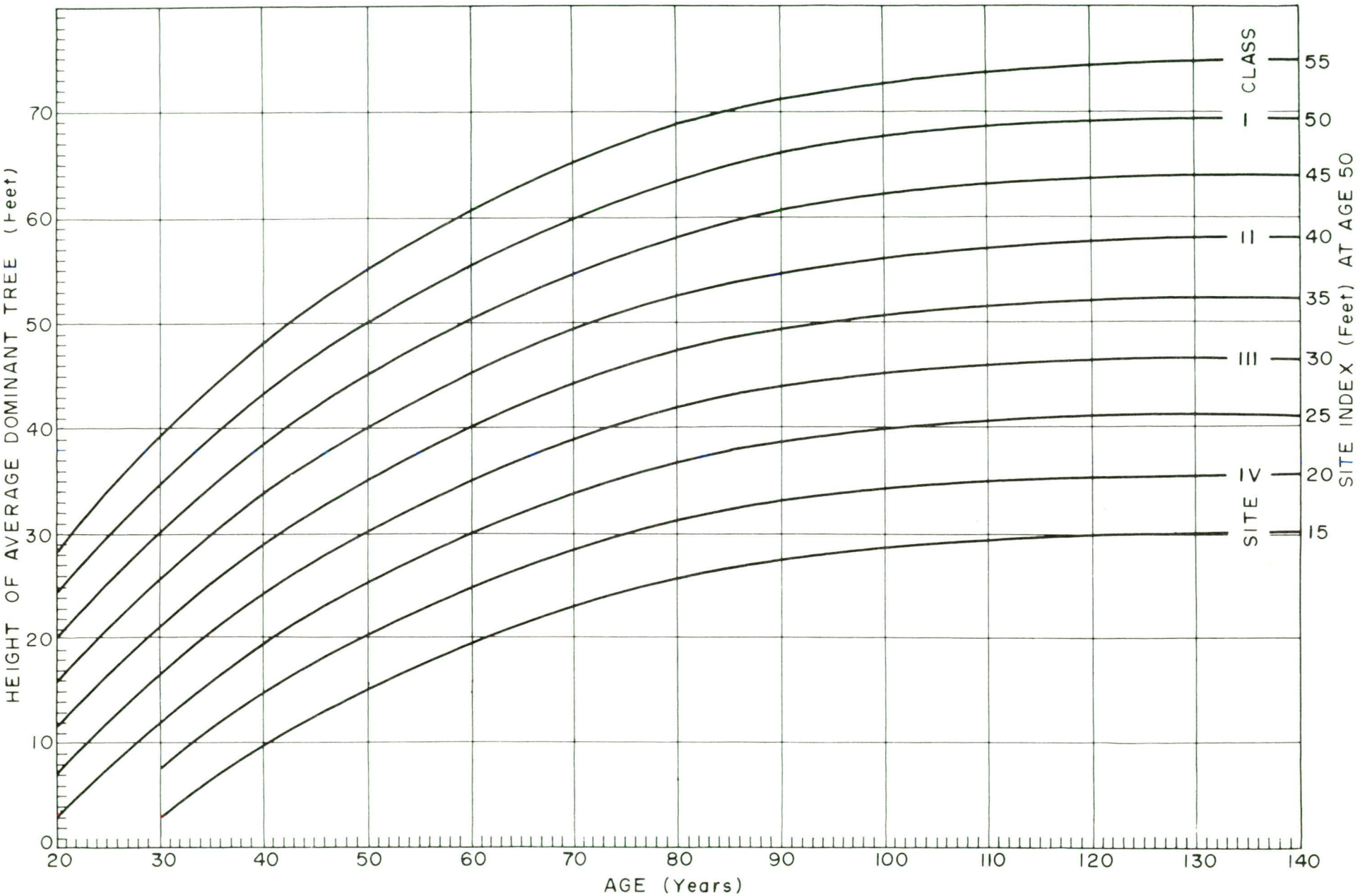

Figure 2. Average total height of dominant and codominant trees (After Linteau 1955).

Linteau (1955) and Lafond (1960). The black spruce stands belong to site classes II to IV and include such various types as the Hypnum-Kalmia, Kalmia-Ledum, Calliergon-Ledum, Sphagnum-Rubus, Sphagnum-Ledum, Calliergon-Vaccinium, and Hypnum types. The spruce-fir stands belong to site classes I to III and are represented by the following site-types: Hylocomium-Cornus, Hypnum-Hylocomium, Cornus-Maianthemum and Hypnum-Cornus.

YIELD TABLES

The yield tables presented hereafter are standards to which actual yields of extensive areas can be referenced. Two sets of tables have been prepared, as follows:

1. Yield tables based on site index and age;
2. Yield tables based on basal area per acre and height.

Site quality and degree of stocking are the most important factors affecting the actual yields obtainable from any stand. Site has a tremendous effect on yield, and it can be shown, for instance, that there exists between the best and poorest black spruce sites a range in productivity, as measured in total cubic volume of wood produced, of about 250 per cent. Stocking also has an important effect on volume production. The yield tables hereafter presented are based on normally, or near normally-stocked stands, that is, natural stands with an effective distribution of trees and where no accidents have interfered with growth.

All trees (except those of the understorey, if present) 0.6 inches in d.b.h. and larger are included in the tables. The age of the stand is the average total age of the dominant and codominant trees.

The height of the stand is the average height of selected dominant and codominant trees. The total volume is that of entire stems including stump and top but excluding bark and limbs. The yield in merchantable cubic-foot volume allows for a minimum top diameter of 3.0 inches, a stump height of 1.0 foot, and represents the volume of all trees 3.6 inches in d.b.h. and larger on one fully stocked acre.

Losses through defect and less complete woods utilization than is indicated in the yield tables may affect the volumes given. If such is the case, proper allowances must be made to account for these other factors affecting yield.

Yield tables based on age and site index

For the stand of trees 0.6 inches in d.b.h. and larger, Tables 2 to 9 record, for balsam fir, black spruce, and spruce-fir stands, respectively, the number of trees, the d.b.h. of the average tree, the average total height, total basal area and, for softwoods and for all commercial species, both total and merchantable volume in cubic feet. The values for each item are arranged by age in 5-year classes and by site classes.

The mean annual increment and the periodic annual increment on a fully-stocked acre in cubic feet for merchantable volumes, also shown in Tables 2 to 9 are illustrated in Figures 3 to 5 for balsam fir, black spruce, and spruce-fir stands. The mean annual increments indicate for any given age of stand the average yearly increase in volume per acre up to that age. The rate of volume growth is not constant throughout the life of a forest; hence the average annual increase in volume reaches a maximum and thereafter diminishes. The

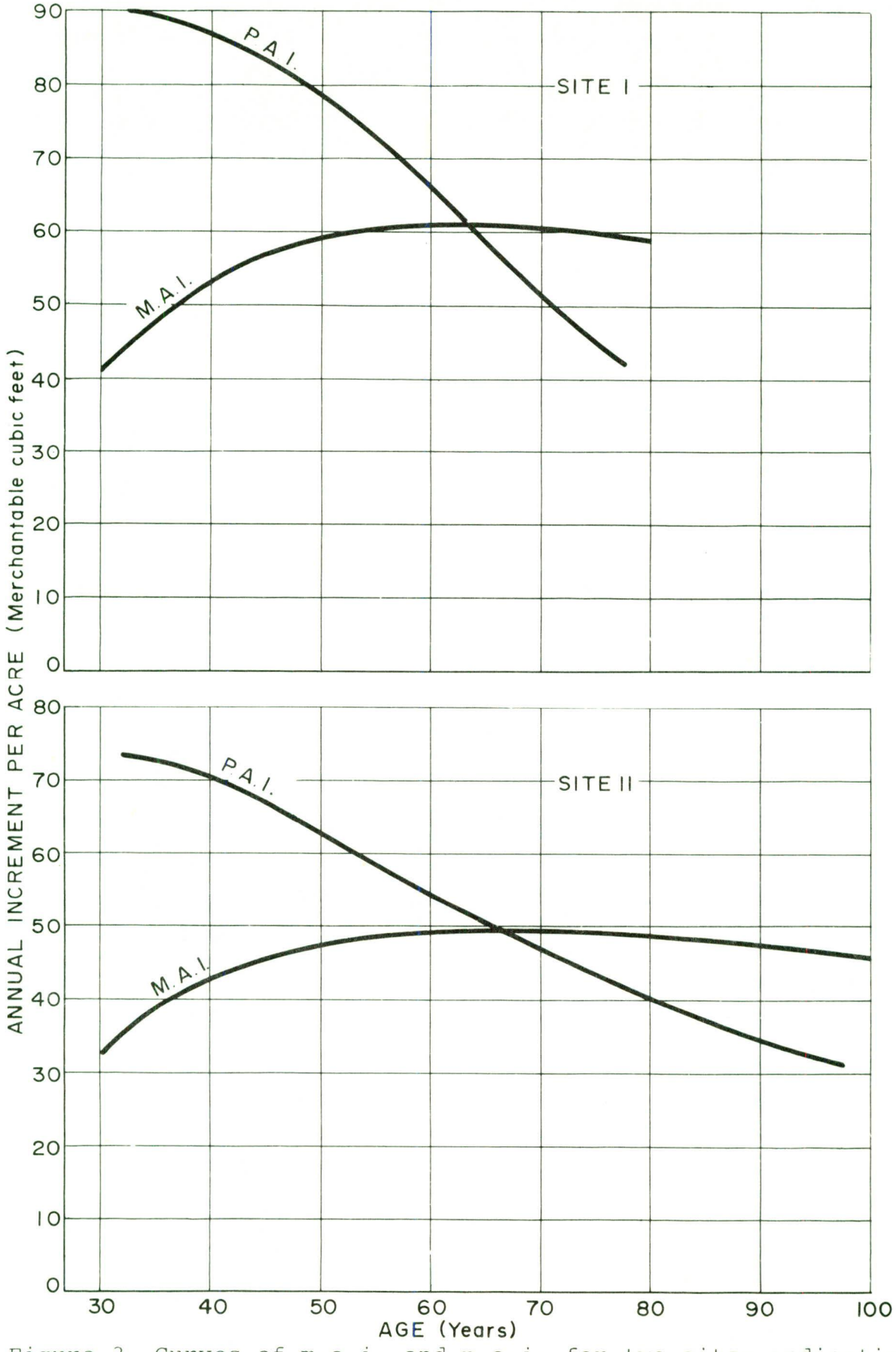

Figure 3. Curves of m.a.i. and p.a.i. for two sites indicating suitable rotation ages (based on trees 3.6 inches and up) for balsam fir stands.

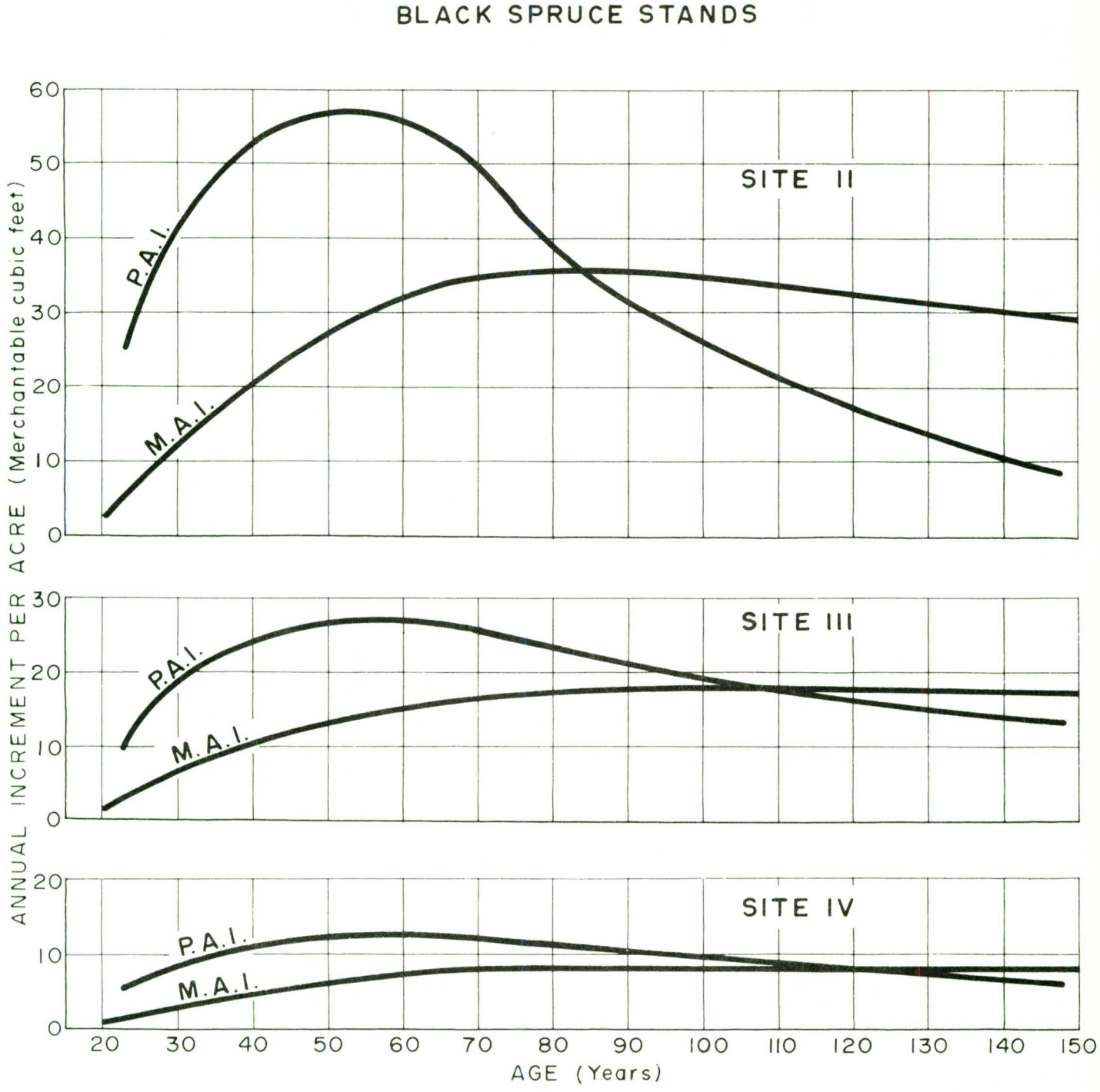

Figure 4. Curves of m.a.i. and p.a.i. for three sites indicating suitable rotation ages (based on trees 3.6 inches and up) for black spruce stands.

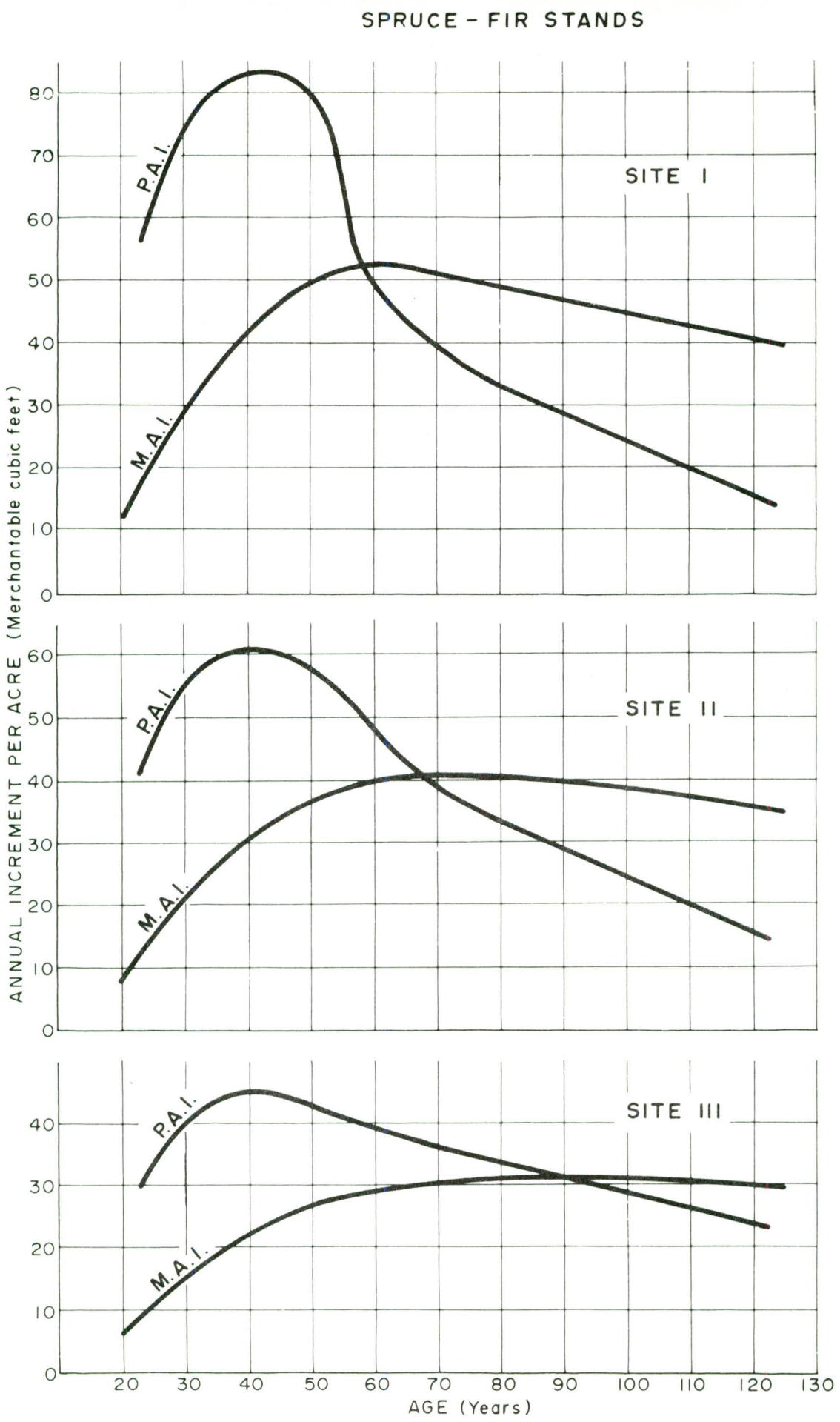

Figure 5. Curves of m.a.i. and p.a.i. for three sites indicating suitable rotation ages (based on trees 3.6 inches and up) for spruce-fir stands.

periodic annual increment indicates the five-year period of most rapid volume growth. The amount of increase varies according to the productive capacity of the site.

Theoretically, the age at which to harvest the forest crop is the age at which m.a.i. culminates, since this coincides with the period of maximum average annual increase in volume.

Yield tables based on basal area per acre and height

Tables 10 to 12 comprise, for balsam fir, black spruce, and spruce-fir stands, respectively, a group of yield tables covering the stand of trees 0.6 inches in d.b.h. and larger and including for both the softwood portion of the stand and all commercial species the total and merchantable cubic-foot volumes. The values for each item are arranged by basal area in 10-square-foot classes and by height in 5-foot classes.

Application of yield tables

The yield tables can be used for estimating both present and future stand volumes. Methods of using the site index yield tables to calculate present stand volumes and to predict future stand volumes are given by Barnes (1962). Information on stocking is used in making yield predictions with these tables. Stocking as used here is the percentage relationship between actual and normal basal area per acre. For both spruce and fir, however, rate of change in stocking with age has yet not been determined. In the absence of any data showing the changes in normality for both understocked and overstocked stands of the above species, the future normality cannot be predicted and, as a result, there is no means of accurately predicting future stand volumes.

Nevertheless, a stocking change of 4 per cent in 10 years can be provisionally used for making yield predictions.

The predictions are made from a map showing the several site and age classes of the cover type under consideration. Once the acreage of the individual site-age classes have been compiled, the total basal area is computed for each individual site-age class. Then the average degree of stocking found in the various site and age classes is computed by dividing the actual basal area per acre of each site-age class by the basal area of the normal stand of the same age and site. The yield predictions are made by reducing or enhancing the volumes given in the normal-yield tables at the age for which the prediction is to be made by the proportion that the actual stand is understocked or overstocked. Assuming a trend toward normality of 4 per cent per decade, the normal volumes in 10 or 20 years for a given site-age class may be multiplied by the corrected stocking factor to get the predicted volumes per acre.

VOLUME TABLES

While collecting information for the forest productivity study there was an opportunity to take numerous sample trees for site index and cubic volume purposes. Some of these trees were felled.

Four site classes were recognized (Figure 2). Diameter-height curves were examined as to general form and scatter of individual values; then, all data pertaining to essentially the same family of curves were pooled and used for a given site class. Similarly, often did curves from various age classes (in general at and over maturity) show nearly the same values for the various diameters. Here too, data were pooled

and a single volume table was prepared. Thus, the same table applies to balsam fir, Site-Class I, from 90 years of age on. Generally, stands 80 to 90 years old and over of a certain density have very little differences in volume, their average height and diameter being nearly the same in a given site class.

In certain cases, whole tables are the product of interpolation between two adjacent tables. This is the case of age class 60 for balsam fir, Site-Class I. In others, one, two or three tables only could be made: in seven years of sampling through the region, the missing age classes could not be found. Thus, for site class I, white spruce, only age classes 60 to 70 are represented. Values curved from actual data are enclosed between horizontal lines in the tables; the values outside these lines were extrapolated.

The local tables were derived from the Form-Class Volume Tables (Anon. 1948). Tables used were as follows: 1, 2, 3, 4 for balsam fir; 28, 29, 30, 31 for jack pine; 123, 124, 125, 126 for black spruce; 151, 152 for white spruce; 182 for white birch; 196 for trembling aspen. The Form-Class Volume Tables do not provide data for merchantable cubic volume in hardwoods. The interpolated values, then, are total volumes.

Merchantable volumes in conifers relate to trees with 1.0-foot stump heights and 3.0-inch top diameters; total volumes include stump and top. A few tables involved double interpolation of values: those for height and form-class.

In balsam fir and black spruce trees clearly show a tendency toward a greater taper with a decrease in site quality.

LITERATURE CITED

Anon. 1948. Form-Class Volume Tables. 2nd Ed. Dominion Forest Service, Dept. of Mines and Resources, Ottawa, Canada. 261 pp.

Barnes, G.H. 1962. Yield of even-aged stands of western hemlock. U.S. Dept. of Agric., Forest Service, Tech. Bull. No. 1273. 52 pp.

Bedell, G.H.D. 1964. Areas of Forest Sections and Regions by provinces in Canada. Dept. of Forestry, Mimeographed paper No. 64-H-2.

Bruce, D., and F.X. Schumacher. 1950. Forest Mensuration. 3 ed. McGraw-Hill Book Company, New York. 483 pp.

Lafond, A. 1960. Notes pour l'identification des types forestiers des concessions de la Quebec North Shore Paper Co., Baie Comeau. 2nd Ed. 93 pp.

Lemmon, P.E. 1956. A spherical densiometer for estimating forest overstory density. For. Sci. 2: 314-320.

Linteau, A. 1955. Forest Site Classification of the Northeastern Coniferous Section, Boreal Forest Region, Quebec. Canada Dept. of North. Aff.and Nat. Res., Forestry Branch, Bull. No. 118. 85 pp.

Rowe, J.S. 1959. Forest Regions of Canada. Canada Dept. of North. Aff. and Nat. Res., Forestry Branch, Bull. No. 123, 71 pp.

SCIENTIFIC NAMES

Balsam fir	*Abies balsamea* (L.) Mill.
Black spruce	*Picea mariana* (Mill.) BSP
White spruce	*Picea glauca* (Moench) Voss
Jack Pine	*Pinus banksiana* Lamb.
White birch	*Betula papyrifera* Marsh.
Trembling aspen	*Populus tremuloides* Michx.

TABLE 1. DISTRIBUTION OF SAMPLE PLOTS BY AGE AND SITE-INDEX CLASSES

Age class	Site-index class									total
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	
	Number of plots									
25-34		2	3	5	1	4	2		1	28
35-44					4	3	2	2		1
45-54		2	2	1	5	11	5	5	1	32
55-64		3		2	4	12	9	4	2	36
65-74	1	1	2	8	8	10	6	4		40
75-84		2	10	15	16	22	3	1	1	70
85-94	2	1	10	13	16	12	7	1		62
95-104		1		12	11	10	5			39
105-114		5	3	10	12	6	1			37
115-124	1	1	4	13	6	3	1			29
125-134		3	2	5	6	1	1			18
135-144			1	1	1					3
145-154		1		2						3
Total	4	22	37	87	100	94	42	17	5	408

TABLE 2. YIELD OF FULLY-STOCKED STANDS OF BALSAM FIR BASED ON AGE AND SITE INDEX

Site Class I

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per acre All species Volume	Total Volume per acre All species P.A.I.	Total Volume per acre All species M.A.I.	Total Volume per acre Soft-woods	Merchantable Volume per Acre All species Volume	Merchantable Volume per Acre All species P.A.I.	Merchantable Volume per Acre All species M.A.I.	Merchantable Volume per Acre Soft-woods	Age
Years	Feet	Inches	Number	Sq. Ft.	Cu. Ft.	Cu.Ft.	Cu.Ft.	Cu. Ft.	Cu. Ft.	Cu.Ft.	Cu.Ft.	Cu. Ft.	Years
30	31.9	3.1	3170	153	2190		73	2070	1220		41	1155	30
35	37.3	3.8	2090	157	2610	84	75	2465	1670	90	48	1580	35
40	41.9	4.4	1520	161	2970	72	74	2810	2120	90	53	2000	40
45	45.9	5.0	1190	164	3290	64	73	3110	2545	85	57	2400	45
50	49.4	5.5	980	166	3570	56	71	3375	2950	81	59	2780	50
55	52.4	6.0	840	168	3820	50	69	3605	3320	74	60	3130	55
60	55.1	6.4	730	170	4040	44	67	3810	3670	70	61	3460	60
65	57.5	6.8	655	172	4230	38	65	3995	3980	62	61	3765	65
70	59.6	7.1	595	173	4405	35	63	4160	4250	54	61	4050	70
75	61.5	7.4	545	174	4560	31	61	4305	4490	48	60	4310	75
80	63.1	7.7	510	175	4705	29	59	4440	4700	42	59	4555	80

TABLE 3. YIELD OF FULLY-STOCKED STANDS OF BALSAM FIR BASED ON AGE AND SITE INDEX

Site Class II

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre All species Volume	Total Volume per Acre All species P.A.I.	Total Volume per Acre All species M.A.I.	Total Volume per Acre Soft-woods	Merchantable Volume per Acre All species Volume	Merchantable Volume per Acre All species P.A.I.	Merchantable Volume per Acre All species M.A.I.	Merchantable Volume per Acre Soft-woods	Age
Years	Feet	Inches	Number	Sq. Ft.	Cu. Ft.	Cu.Ft.	Cu.Ft.	Cu. Ft.	Cu. Ft.	Cu.Ft.	Cu.Ft.	Cu. Ft.	Years
30	25.9	2.1	5890	149	2000		67	1895	985		33	920	30
35	30.3	2.7	3720	154	2390	73	68	2260	1350	73	39	1270	35
40	34.1	3.3	2640	157	2720	66	68	2575	1710	72	43	1610	40
45	37.3	3.8	2020	160	3010	58	67	2850	2055	69	46	1930	45
50	40.1	4.3	1630	162	3270	52	65	3095	2380	65	48	2235	50
55	42.6	4.7	1370	164	3500	46	64	3305	2680	60	49	2520	55
60	44.7	5.1	1180	166	3700	40	62	3495	2960	56	49	2785	60
65	46.7	5.5	1040	168	3880	36	60	3660	3220	52	49	3030	65
70	48.4	5.8	940	169	4040	32	58	3810	3470	49	50	3260	70
75	49.9	6.1	860	170	4180	28	56	3950	3695	45	49	3470	75
80	51.3	6.4	790	171	4310	26	54	4070	3900	42	49	3665	80
85	52.6	6.7	740	171	4430	24	52	4180	4095	39	48	3850	85
90	53.7	6.9	690	172	4540	22	50	4280	4275	36	47	4020	90
95	54.7	7.1	655	173	4630	18	49	4375	4445	34	47	4175	95
100	55.7	7.3	620	173	4720	18	47	4460	4600	31	46	4320	100

TABLE 4. YIELD OF FULLY-STOCKED STANDS OF BLACK SPRUCE BASED ON AGE AND SITE INDEX

Site Class II

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre				Merchantable Volume per Acre				Age
					All species			Soft-	All species			Soft-	
					Volume	P.A.I.	M.A.I.	woods	Volume	P.A.I.	M.A.I.	woods	
Years	Feet	Inches	Number	Sq. Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Years
20	12.9	1.5	5060	80	470		24	295					20
25	18.7	2.2	3020	94	790	64	32	560	180		7	130	25
30	23.9	2.8	2150	105	1120	66	37	865	355	35	12	280	30
35	28.6	3.4	1670	113	1440	64	41	1170	580	45	17	470	35
40	32.6	3.8	1390	120	1740	60	43	1460	835	51	21	710	40
45	36.1	4.3	1210	125	2010	54	45	1750	1110	55	25	970	45
50	39.3	4.6	1080	130	2260	50	45	2010	1390	56	28	1240	50
55	42.0	4.9	980	134	2490	46	45	2260	1680	58	30	1520	55
60	44.4	5.2	910	137	2690	40	45	2490	1950	54	32	1810	60
65	46.6	5.5	845	140	2880	38	44	2710	2220	54	34	2100	65
70	48.5	5.7	800	142	3050	34	44	2910	2480	52	35	2360	70
75	50.3	5.9	760	145	3210	32	43	3080	2720	48	36	2600	75
80	51.9	6.1	730	147	3350	28	42	3250	2900	36	36	2800	80
85	53.3	6.3	700	149	3490	28	41	3410	3080	36	36	2960	85
90	54.6	6.4	680	150	3620	26	40	3550	3250	34	36	3110	90
95	55.8	6.5	660	151	3730	22	39	3690	3380	26	36	3250	95
100	56.9	6.7	640	153	3820	22	38	3800	3510	26	35	3380	100
105	57.9	6.8	625	154	3930	22	37	3910	3640	26	35	3500	105
110	58.9	6.9	610	155	4040	22	37	4000	3750	22	34	3620	110
115	59.7	7.0	600	156	4150	22	36	4080	3860	22	34	3720	115
120	60.5	7.1	590	157	4240	18	35	4170	3960	20	33	3820	120
125	61.3	7.2	580	158	4330	18	35	4250	4060	20	32	3910	125
130	62.0	7.3	570	158	4420	18	34	4320	4130	14	32	4000	130

TABLE 5. YIELD OF FULLY-STOCKED STANDS OF BLACK SPRUCE BASED ON AGE AND SITE INDEX

Site Class III

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre All species Volume	Total Volume per Acre All species P.A.I.	Total Volume per Acre All species M.A.I.	Total Volume per Acre Soft-woods	Merchantable Volume per Acre All species Volume	Merchantable Volume per Acre All species P.A.I.	Merchantable Volume per Acre All species M.A.I.	Merchantable Volume per Acre Soft-woods	Age
Years	Feet	Inches	Number	Sq. Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Years
20	9.9	0.9	7520	29	285		14	185					20
25	14.4	1.4	4490	42	485	40	19	345					25
30	18.4	1.8	3190	54	695	42	23	535	165		5	130	30
35	21.9	2.2	2490	64	885	38	25	720	270	21	8	220	35
40	25.1	2.6	2070	73	1070	37	27	900	390	24	10	330	40
45	27.8	2.9	1790	81	1230	32	27	1080	515	25	11	450	45
50	30.2	3.2	1600	87	1390	32	28	1240	645	26	13	580	50
55	32.3	3.5	1460	93	1520	26	28	1390	780	27	14	720	55
60	34.1	3.7	1350	99	1650	26	27	1540	910	26	15	850	60
65	35.8	3.9	1260	103	1770	24	27	1670	1040	26	16	980	65
70	37.3	4.1	1190	108	1870	20	27	1790	1160	26	17	1110	70
75	38.6	4.3	1140	111	1970	20	26	1900	1275	23	17	1240	75
80	39.9	4.4	1090	115	2060	18	26	2000	1390	23	17	1360	80
85	41.0	4.5	1045	118	2140	16	25	2100	1500	22	18	1450	85
90	42.0	4.7	1010	121	2210	14	24	2190	1600	20	18	1570	90
95	42.9	4.8	980	123	2280	14	24	2260	1700	20	18	1670	95
100	43.7	4.9	955	126	2350	14	23	2330	1800	20	18	1770	100
105	44.5	5.0	930	128	2420	14	23	2400	1900	20	18	1870	105
110	45.2	5.1	910	130	2490	14	23	2460	1990	18	18	1960	110
115	45.9	5.2	890	132	2560	14	22	2510	2080	18	18	2040	115
120	46.5	5.2	875	133	2620	12	22	2560	2170	18	18	2120	120
125	47.1	5.3	860	135	2670	10	21	2600	2260	18	18	2190	125
130	47.7	5.4	850	137	2720	10	21	2640	2350	18	18	2260	130

TABLE 6. YIELD OF FULLY-STOCKED STANDS OF BLACK SPRUCE BASED ON AGE AND SITE INDEX

Site Class IV

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre All species Volume	Total Volume per Acre All species P.A.I.	Total Volume per Acre All species M.A.I.	Total Volume per Acre Soft-woods	Merchantable Volume per Acre All species Volume	Merchantable Volume per Acre All species P.A.I.	Merchantable Volume per Acre All species M.A.I.	Merchantable Volume per Acre Soft-woods	Age
Years	Feet	Inches	Number	Sq. Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Years
20	7.6	0.5	11200	11	175		9	115					20
25	11.0	0.9	6670	19	295	24	12	215					25
30	14.1	1.2	4750	28	420	25	14	335					30
35	16.9	1.5	3700	36	540	24	15	445	125		4	110	35
40	19.3	1.8	3080	44	655	23	16	555	180	11	4	150	40
45	21.4	2.0	2660	52	755	20	17	665	240	12	5	210	45
50	23.2	2.2	2380	59	840	19	17	765	300	12	6	270	50
55	24.8	2.4	2170	65	935	17	17	860	360	12	6	330	55
60	26.2	2.6	2000	71	1010	15	17	945	420	12	7	400	60
65	27.5	2.8	1880	76	1080	14	17	1030	480	12	7	460	65
70	28.7	2.9	1770	81	1150	14	16	1100	540	12	8	520	70
75	29.7	3.1	1750	86	1220	14	16	1170	595	11	8	550	75
80	30.6	3.2	1620	90	1290	14	16	1240	645	10	8	640	80
85	31.5	3.3	1550	94	1350	12	16	1300	695	10	8	690	85
90	32.3	3.4	1500	97	1400	10	16	1350	745	10	8	740	90
95	33.0	3.5	1460	100	1440	8	15	1400	795	10	8	770	95
100	33.6	3.6	1420	103	1480	8	15	1440	845	10	8	830	100
105	34.2	3.7	1380	106	1520	8	14	1470	895	10	8	880	105
110	34.8	3.7	1350	109	1550	6	14	1510	935	8	8	920	110
115	35.3	3.8	1325	111	1580	5	14	1540	975	8	8	960	115
120	35.8	3.9	1300	114	1610	6	13	1570	1015	8	8	1010	120
125	36.2	3.9	1280	116	1640	6	13	1590	1055	8	8	1050	125
130	36.7	4.0	1260	118	1670	6	13	1620	1095	8	8	1090	130
135	37.1	4.1	1240	120	1700	6	13	1650	1130	7	8	1120	135
140	37.4	4.1	1220	122	1730	6	12	1670	1160	6	8	1150	140

TABLE 7. YIELD OF FULLY-STOCKED STANDS OF SPRUCE-FIR BASED ON AGE AND SITE INDEX

Site Class I

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre				Merchantable Volume per Acre				Age
					All species			Soft-woods	All species			Soft-woods	
					Volume	P.A.I.	M.A.I.		Volume	P.A.I.	M.A.I.		
Years	Feet	Inches	Number	Sq. Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Years
20	16.7	1.8	8570	149	1090		54	420	235		12	70	20
25	23.8	2.7	4090	152	1590	100	64	740	515	56	21	190	25
30	30.2	3.4	2500	155	2050	92	68	1040	870	71	29	385	30
35	35.8	4.1	1750	157	2460	82	70	1360	1270	80	36	620	35
40	40.7	4.7	1345	158	2820	72	70	1660	1680	82	42	900	40
45	44.9	5.2	1100	159	3130	62	70	1930	2100	84	47	1200	45
50	48.6	5.6	930	159	3400	54	68	2160	2500	80	50	1510	50
55	51.9	6.0	810	160	3640	48	66	2410	2890	78	53	1820	55
60	54.7	6.3	730	160	3860	44	64	2610	3150	52	53	2130	60
65	57.3	6.6	660	160	4050	38	62	2800	3375	45	52	2320	65
70	59.6	6.9	610	160	4220	34	60	2980	3580	41	51	2550	70
75	61.6	7.2	570	161	4380	32	58	3150	3760	36	50	2750	75
80	63.5	7.4	535	161	4520	28	56	3290	3940	36	49	2950	80
85	65.2	7.6	505	161	4650	26	55	3430	4100	32	48	3100	85
90	66.7	7.8	480	161	4770	24	53	3550	4250	30	47	3250	90
95	68.1	8.0	460	162	4870	20	51	3660	4390	28	46	3400	95
100	69.4	8.1	445	162	4970	20	50	3770	4520	26	45	3530	100
105	70.6	8.3	430	162	5060	18	48	3870	4640	24	44	3640	105
110	71.7	8.4	415	162	5150	18	47	3960	4750	22	43	3750	110
115	72.7	8.5	405	162	5230	16	46	4050	4840	18	42	3860	115
120	73.6	8.6	390	162	5300	14	44	4140	4920	16	41	3950	120
125	74.5	8.7	380	163	5370	14	43	4210	4990	14	40	4010	125

TABLE 8. YIELD OF FULLY-STOCKED STANDS OF SPRUCE-FIR BASED ON AGE AND SITE INDEX

Site Class II

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre All species Volume	Total Volume per Acre All species P.A.I.	Total Volume per Acre All species M.A.I.	Total Volume per Acre Soft-woods	Merchantable Volume per Acre All species Volume	Merchantable Volume per Acre All species P.A.I.	Merchantable Volume per Acre All species M.A.I.	Merchantable Volume per Acre Soft-woods	Age
Years	Feet	Inches	Number	Sq. Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Years
20	13.6	1.2	12600	106	920		46	420	170		8	60	20
25	19.4	1.9	6020	118	1340	84	54	720	375	41	15	160	25
30	24.5	2.5	3680	125	1730	78	58	1030	635	52	21	325	30
35	29.1	3.1	2600	133	2070	68	59	1350	930	59	27	530	35
40	33.0	3.6	2000	138	2380	62	60	1650	1230	60	31	765	40
45	36.5	4.0	1620	143	2640	52	59	1920	1540	62	34	1020	45
50	39.5	4.4	1370	146	2870	46	57	2150	1830	58	37	1290	50
55	42.1	4.8	1200	148	3070	40	56	2390	2120	58	39	1550	55
60	44.4	5.1	1070	151	3260	38	54	2600	2380	52	40	1810	60
65	46.5	5.4	975	153	3430	34	53	2800	2640	52	41	2070	65
70	48.4	5.6	900	155	3570	28	51	2970	2880	48	41	2320	70
75	50.0	5.9	835	157	3700	26	49	3130	3100	44	41	2560	75
80	51.6	6.1	785	158	3820	24	48	3250	3300	40	41	2790	80
85	52.9	6.3	745	159	3920	20	46	3420	3480	36	41	3000	85
90	54.2	6.4	710	160	4020	20	45	3510	3650	34	40	3220	90
95	55.3	6.6	680	161	4110	18	43	3640	3800	30	40	3420	95
100	56.4	6.8	650	162	4200	18	42	3760	3940	28	39	3610	100
105	57.3	6.9	630	163	4270	14	41	3860	4070	26	39	3770	105
110	58.2	7.0	610	164	4340	14	39	3960	4180	22	38	3890	110
115	59.0	7.1	595	165	4410	14	38	4040	4270	18	37	3990	115
120	59.8	7.2	580	165	4470	12	37	4130	4320	10	36	4070	120
125	60.5	7.3	565	165	4530	12	36	4190	4370	10	35	4120	125

TABLE 9. YIELD OF FULLY-STOCKED STANDS OF SPRUCE-FIR BASED ON AGE AND SITE INDEX

Site Class III

Age	Average height	Average d.b.h.	Trees per acre	Basal Area per acre	Total Volume per Acre All species Volume	Total Volume per Acre All species P.A.I.	Total Volume per Acre All species M.A.I.	Total Volume per Acre Soft-woods	Merchantable Volume per Acre All species Volume	Merchantable Volume per Acre All species P.A.I.	Merchantable Volume per Acre All species M.A.I.	Merchantable Volume per Acre Soft-woods	Age
Years	Feet	Inches	Number	Sq. Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Cu.Ft.	Years
20	11.0	1.1	18600	75	780		39	420	125		6	50	20
25	15.7	1.3	8880	92	1140	72	46	710	275	30	11	140	25
30	19.9	1.9	5420	103	1460	64	49	1020	465	38	16	275	30
35	23.6	2.3	3810	113	1750	58	50	1350	680	43	19	450	35
40	26.8	2.8	2920	121	2010	52	50	1640	900	44	22	650	40
45	29.6	3.1	2380	128	2230	44	50	1900	1130	46	25	870	45
50	32.0	3.5	2020	134	2440	42	49	2150	1340	42	27	1100	50
55	34.2	3.8	1770	138	2630	38	48	2380	1550	42	28	1320	55
60	36.1	4.1	1580	142	2810	36	47	2550	1740	38	29	1540	60
65	37.8	4.4	1440	146	2970	32	46	2710	1930	38	30	1760	65
70	39.3	4.6	1320	149	3120	30	45	2860	2120	38	30	1930	70
75	40.2	4.8	1240	151	3260	28	44	3000	2310	38	31	2100	75
80	41.9	5.0	1160	154	3390	26	42	3140	2490	36	31	2280	80
85	43.1	5.2	1100	156	3510	24	41	3260	2650	32	31	2450	85
90	44.0	5.3	1050	159	3610	20	40	3370	2810	32	31	2600	90
95	44.9	5.5	1000	160	3710	20	38	3450	2960	30	31	2750	95
100	45.8	5.6	965	162	3810	20	38	3540	3110	30	31	2900	100
105	46.5	5.8	930	163	3900	18	37	3610	3250	28	31	3020	105
110	47.3	5.9	900	165	3960	12	36	3670	3390	28	31	3150	110
115	47.9	6.0	875	166	4010	10	35	3720	3520	26	31	3270	115
120	48.6	6.1	850	167	4060	10	34	3770	3640	24	30	3370	120
125	49.2	6.2	830	168	4110	10	33	3820	3760	24	30	3460	125

TABLE 10. YIELD TABLE FOR BALSAM FIR ON FULLY-STOCKED ACRE, BASED ON BASAL AREA PER ACRE AND AVERAGE TOTAL HEIGHT OF DOMINANT AND CODOMINANT TREES.

Height (feet)	Basal area per acre (Square feet) 110	120	130	140	150	160	170	180	190	200
				Total volume (Cubic feet)						
25	1588	1691	1794	1898	2001	2104	2207	2311		
30	1815	1939	2063	2187	2310	2434	2558	2682	2806	
35	2042	2187	2331	2476	2620	2765	2909	3054	3198	3343
40	2269	2434	2600	2765	2930	3095	3260	3425	3590	3756
45	2496	2682	2868	3054	3240	3425	3611	3797	3983	4169
50	2723	2930	3136	3343	3549	3756	3962	4169	4375	4582
55		3177	3405	3632	3859	4086	4313	4540	4767	4994
60			3673	3921	4169	4416	4664	4912	5160	5407
65				4210	4478	4747	5015	5283	5552	5820
	TV= 452.5 + 0.4129 B.H.									
				Total softwood volume (Cubic feet)						
25	1441	1541	1642	1743	1844	1944	2045	2146		
30	1662	1783	1904	2025	2146	2266	2387	2508	2629	
35	1884	2025	2166	2307	2448	2589	2729	2870	3011	3152
40	2105	2266	2427	2588	2750	2911	3072	3233	3394	3555
45	2327	2508	2689	2870	3052	3233	3414	3595	3776	3956
50	2548	2750	2951	3152	3354	3555	3756	3958	4159	4360
55		2991	3213	3434	3656	3877	4098	4320	4542	4763
60			3474	3716	3958	4199	4441	4682	4924	5166
65				3998	4260	4521	4783	5045	5307	5568
	TSV= 333.4 + 0.4027 B.H.									

TABLE 10. (Cont'd.) Basal area per acre (Square feet)

Height (feet)	110	120	130	140	150	160	170	180	190	200
25	782	898	1014	1129	1245	1361	1477	1593		
30	1037	1176	1315	1454	1593	1732	1871	2009	2148	
35	1292	1454	1616	1778	1940	2102	2264	2426	2588	2751
40	1546	1732	1917	2102	2287	2473	2658	2843	3028	3214
45	1801	2009	2218	2426	2635	2843	3052	3260	3466	3677
50	2056	2287	2519	2751	2982	3214	3445	3677	3909	4140
55		2565	2820	3074	3330	3584	3839	4094	4349	4603
60			3121	3399	3677	3955	4233	4511	4789	5067
65				3723	4024	4325	4627	4928	5229	5530

MV= -491.8 + 0.4632 B.H.

Merchantable softwood volume (Cubic feet)

25	675	787	900	1012	1124	1237	1349	1462		
30	922	1057	1192	1327	1462	1596	1731	1866	2001	
35	1169	1327	1484	1641	1799	1956	2113	2271	2428	2585
40	1417	1596	1776	1956	2136	2316	2496	2675	2855	3035
45	1664	1866	2068	2271	2473	2675	2878	3080	3282	3484
50	1911	2136	2361	2585	2810	3035	3260	3484	3709	3934
55		2406	2653	2900	3147	3394	3642	3889	4136	4383
60			2945	3215	3484	3754	4024	4294	4563	4893
65				3529	3822	4114	4406	4698	4990	5282

MSV= -561.1 + 0.4495 B.H.

TABLE 11. YIELD TABLE FOR BLACK SPRUCE ON FULLY-STOCKED ACRE, BASED ON BASAL AREA PER ACRE AND AVERAGE TOTAL HEIGHT OF DOMINANT AND CODOMINANT TREES

Height (feet)	Basal area per acre (Square feet) 40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
							Total volume (Cubic feet)										
15	370	432	495	557	620	682	745	807	870	932							
20	453	536	620	703	786	870	953	1036	1120	1203	1287						
25	526	640	745	849	953	1057	1161	1265	1370	1474	1578	1682					
30	620	745	870	995	1120	1245	1369	1494	1620	1745	1869	1995	2120				
35	703	849	995	1140	1286	1432	1578	1723	1870	2016	2161	2307	2453	2598			
40		954	1120	1286	1453	1619	1786	1952	2120	2287	2453	2620	2787	2952	3120		
45			1245	1432	1619	1807	1994	2181	2370	2558	2745	2932	3120	3306	2495	3683	
50				1578	1786	1994	2203	2410	2670	2829	3036	3244	3453	3660	3870	4079	4286
55					1953	2182	2411	2639	2870	3100	3328	3557	3786	4014	4245	4475	4703

TV= 119.7 + .4166B.H.

Height (feet)	Basal area per acre (Square feet) 40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
							Total softwood volume (Cubic feet)										
15	302	366	429	493	556	619	682	746	809	872							
20	386	472	556	640	725	809	893	978	1062	1147	1232						
25	471	577	682	789	894	999	1104	1210	1316	1421	1527	1632					
30	555	683	809	937	1063	1189	1315	1442	1569	1696	1823	1949	2075				
35	640	788	936	1084	1232	1379	1526	1675	1823	1970	2118	2266	2413	2562			
40		894	1063	1232	1401	1579	1737	1907	2076	2245	2414	2583	2751	2921	3089		
45			1194	1380	1570	1759	1948	2140	2329	2519	2710	2899	3089	3280	3469	3659	
50				1528	1728	1949	2159	2372	2583	2794	3005	3216	3427	3639	3849	4060	4272
55					1907	2139	2370	2604	2836	3068	3301	3533	3764	3998	4229	4462	4694

TSV= 48.89 + .4223B.H.

TABLE 11. (Cont'd.)

Height (feet)	Basal area per acre (Square feet)																
	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
	Merchantable volume (Cubic feet)																
15				79	141	203	265	327	389	452							
20		58	141	224	307	389	472	555	638	721	804						
25	58	162	265	369	472	576	680	783	887	990	1094	1198					
30	141	265	389	514	638	762	887	1011	1136	1260	1384	1509	1633				
35	224	369	514	659	804	949	1094	1239	1384	1529	1675	1820	1965	2110			
40		472	638	804	970	1135	1302	1467	1633	1799	1965	2131	2296	2462	2628		
45			762	949	1136	1322	1509	1695	1882	2068	2255	2441	2628	2814	3001	3188	
50				1094	1301	1508	1716	1923	2130	2337	2545	2752	2959	3166	3374	3581	3788
55					1467	1695	1924	2151	2379	2607	2835	3063	3291	3519	3747	3975	4203

MV= -356.7 + .4145B.H.

	Merchantable softwood volume (Cubic feet)																
15				68	130	192	253	315	377	439							
20		48	130	212	295	377	459	541	624	706	788						
25	48	151	253	356	459	562	664	767	871	974	1076	1179					
30	130	253	377	500	624	742	870	994	1117	1241	1364	1488	1611				
35	212	356	500	644	788	932	1076	1220	1364	1508	1652	1796	1640	2083			
40		459	623	788	953	1118	1282	1446	1611	1776	1940	2105	2269	2433	2598		
45			747	932	1118	1303	1487	1672	1858	2043	2227	2413	2598	2783	2968	3153	
50				1076	1282	1488	1693	1898	2105	2316	2515	2722	2927	3132	3338	3544	3749
55					1446	1673	1899	2125	2351	2577	2803	3030	3256	3482	3709	3933	4160

MSV= -363.6 + .4113B.H.

TABLE 12. YIELD TABLE FOR SPRUCE-FIR ON FULLY-STOCKED ACRE, BASED ON BASAL AREA PER ACRE AND AVERAGE TOTAL HEIGHT OF DOMINANT AND CODOMINANT TREES

Height (feet)	Basal area per acre (Square feet)											
	90	100	110	120	130	140	150	160	170	180	190	200
	Total volume (Cubic feet)											
20	1236	1316	1396	1476	1556	1636						
25	1416	1516	1616	1716	1816	1916	2016					
30	1596	1716	1836	1956	2076	2196	2316	2436				
35	1776	1916	2056	2196	2336	2476	2616	2756	2896			
40	1956	2116	2276	2436	2596	2756	2916	3076	3235	3395		
45	2136	2316	2496	2676	2855	3035	3215	3395	3575	3755	3935	
50		2516	2716	2916	3115	3315	3515	3715	3915	4115	4315	4515
55			2936	3156	3375	3595	3815	4035	4255	4475	4695	4915
60				3395	3635	3875	4115	4355	4595	4835	5075	5315
	TV= 516.0 + .3999B·H.											
	Total softwood volume (Cubic feet)											
20	801	876	950	1024	1099	1173						
25	969	1062	1155	1248	1341	1434	1527					
30	1136	1248	1360	1471	1583	1695	1807	1918				
35	1304	1434	1564	1695	1825	1955	2086	2216	2346			
40	1471	1620	1769	1918	2067	2216	2365	2514	2663	2812		
45	1639	1806	1974	2142	2310	2477	2644	2812	2979	3147	3315	
50		1993	2179	2365	2552	2737	2924	3110	3296	3483	3669	3855
55			2384	2589	2794	2998	3203	3408	3612	3818	4022	4227
60				2812	3036	3259	3482	3706	3929	4153	4376	4600
	TSV= 130.7 + .3724B·H.											

TABLE 12. (Cont'd.)

Height (feet)	Basal area per acre (Square feet)											
	90	100	110	120	130	140	150	160	170	180	190	200
	Merchantable volume (Cubic feet)											
20	297	391	486	580	674	768						
25	509	627	785	863	980	1098	1216					
30	721	863	1004	1145	1287	1428	1570	1711				
35	933	1098	1263	1428	1593	1758	1923	2088	2253			
40	1145	1334	1522	1711	1899	2088	2277	2465	2654	2842		
45	1358	1570	1782	1994	2206	2418	2630	2842	3054	3266	3478	
50		1805	2041	2276	2512	2748	2984	3219	3455	3690	3926	4162
55			2300	2559	2818	3078	3337	3596	3855	4115	4374	4633
60				2842	3125	3408	3690	3973	4256	4539	4822	5104

MV= -551.3 + .4713B·H.

	Merchantable softwood volume (Cubic feet)											
20	82	165	249	332	416	499						
25	270	374	478	582	686	791	895					
30	457	582	707	832	957	1082	1207	1332				
35	645	791	936	1082	1228	1374	1520	1666	1811			
40	832	999	1166	1332	1499	1666	1832	1999	2166	2332		
45	1019	1209	1345	1582	1770	1957	2145	2332	2520	2707	2895	
50		1416	1624	1832	2041	2249	2457	2666	2874	3082	3291	3499
55			1853	2082	2312	2541	2770	3000	3228	3457	3687	3916
60				2332	2583	2832	3082	3333	3582	3832	4083	4332

MSV= -668.0 + .4167B·H.

VOLUME TABLES

Balsam Fir

Site Class I

Total Volume

Form Class 70

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches				Cubic Feet			
1	.045	.056	.060	.061	.063	.066	.069
2	.247	.305	.325	.333	.342	.355	.371
3	.676	.818	.864	.884	.904	.942	.979
4	1.38	1.64	1.72	1.75	1.79	1.85	1.92
5	2.40	2.80	2.93	2.98	3.03	3.14	3.25
6	3.78	4.35	4.55	4.60	4.65	4.83	4.98
7	5.54	6.29	6.52	6.61	6.70	6.94	7.17
8	7.72	8.69	8.96	9.07	9.18	9.52	9.87
9	10.3	11.5	11.8	11.9	12.1	12.6	13.1
10		14.8	15.1	15.3	15.6	16.3	16.9
11					19.7	20.6	21.3
12					24.5	25.5	26.4
13					29.7	31.1	32.1
14					35.8	37.3	38.5
15					42.5	44.3	45.7
16					49.8	51.9	53.5
17					57.8	60.3	62.2

Basis: 53, 99, 64, int., 66, 55 and 110 trees.

Balsam Fir

Site Class I

Merchantable Volume

Form Class 70

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches	Cubic Feet						
4	1.33	1.48	1.52	1.54	1.56	1.60	1.64
5	2.24	2.53	2.62	2.65	2.69	2.77	2.86
6	3.50	4.00	4.17	4.22	4.27	4.46	4.62
7	5.10	5.87	6.10	6.17	6.24	6.53	6.77
8	7.15	8.18	8.49	8.60	8.72	9.08	9.43
9	9.76	11.0	11.4	11.5	11.7	12.1	12.6
10		14.3	14.7	14.8	15.0	15.7	16.2
11					19.0	19.8	20.4
12					23.5	24.5	25.3
13					28.5	29.8	30.8
14					34.4	35.9	37.1
15					40.9	42.7	44.1
16					48.2	50.4	52.0
17					56.1	58.7	60.6

Basis: 53, 99, 64, int., 66, 55 and 110 trees.

Balsam Fir

Site Class II

Total Volume

Form Class 68

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100
Inches				Cubic Feet				
1	.043	.049	.053	.058	.062		.069	
2	.228	.260	.284	.307	.327		.352	
3	.618	.695	.764	.813	.867		.920	
4	1.25	1.39	1.54	1.61	1.71		1.79	
5	2.16	2.36	2.63	2.73	2.87		2.99	
6	3.37	3.64	4.06	4.23	4.40		4.55	
7	4.93	5.22	5.85	6.01	6.30		6.46	
8	6.80	7.17	8.03	8.21	8.59		8.82	
9	9.11	9.44	10.6	10.8	11.3		11.6	
10	11.8	12.1	13.6	13.8	14.4		14.7	
11		15.1	17.0	17.2	18.1		18.6	
12		18.7	21.0	21.4	22.4		23.0	
13		22.6	25.5	26.0	27.0		27.8	
14			30.5	31.0	32.3		33.3	
15					38.2		39.3	
16							45.9	
17							53.1	

Basis: 70, 97, 97, 125, 121 and 296 trees.

Balsam Fir

Site Class II

Merchantable Volume

Form Class 68

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100
Inches	Cubic Feet							
4	1.21	1.31	1.42	1.47	1.54		1.59	
5	2.03	2.19	2.42	2.50	2.62		2.72	
6	3.13	3.37	3.76	3.88	4.07		4.22	
7	4.49	4.80	5.42	5.60	5.90		6.05	
8	6.23	6.57	7.49	7.69	8.09		8.33	
9	8.44	8.79	10.0	10.2	10.8		11.1	
10	11.1	11.4	12.9	13.2	13.8		14.2	
11		14.3	16.2	16.5	17.3		17.8	
12		17.6	20.1	20.4	21.4		21.9	
13		21.4	24.5	24.9	25.9		26.6	
14			29.2	29.6	30.9		31.8	
15					36.6		37.6	
16							44.0	
17							50.9	

Basis: 70, 97, 97, 125, 121 and 296 trees.

Balsam Fir

Site Class III

Total Volume

Form Class 65

Diameter Breast Height	Age of tree in years					
	30	40	50	60	70	80 +
Inches				Cubic Feet		
1	.044			.051		.053
2	.177			.272		.273
3	.467			.721		.732
4	.920			1.43		1.48
5	1.56			2.40		2.53
6	2.35			3.67		3.92
7				5.22		5.69
8				7.10		7.87
9				9.30		10.5
10				11.9		13.6
11				14.8		17.2
12				18.1		21.4
13				21.8		26.1

Basis: 25, 15 and 94 trees.

Balsam Fir

Site Class III

Merchantable Volume

Form Class 65

Diameter Breast Height	Age of tree in years					
	30	40	50	60	70	80 +
Inches	Cubic Feet					
4	.821			1.33		1.38
5	1.39			2.23		2.36
6	2.09			3.41		3.66
7				4.85		5.27
8				6.59		7.36
9				8.64		9.8
10				11.1		12.8
11				13.8		16.2
12				16.8		20.2
13				20.3		24.6

Basis: 25, 15 and 94 trees.

Black Spruce

Site Class I

Total Volume

Form Class 70

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches			Cubic Feet				
1			.045	.049	.053	.055	.059
2			.286	.303	.321	.326	.337
3			.794	.833	.872	.886	.912
4			1.63	1.69	1.75	1.77	1.81
5			2.85	2.93	3.02	3.05	3.12
6			4.52	4.63	4.75	4.81	4.91
7			6.74	6.86	6.99	7.09	7.19
8			9.51	9.63	9.75	9.86	10.0
9			12.9	13.0	13.1	13.2	13.4
10			16.8	16.9	17.0	17.1	17.3
11					21.6	21.8	22.1
12					27.0	27.3	27.5
13						33.4	33.8
14						40.5	40.9
15						48.3	48.7

Basis: 18, int., 60, 45 and 54 trees.

Black Spruce

Site Class 1

Merchantable Volume

Form Class 70

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches				Cubic Feet			
4			1.02	1.05	1.09	1.10	1.13
5			2.25	2.31	2.38	2.41	2.46
6			3.99	4.09	4.19	4.24	4.32
7			6.21	6.32	6.43	6.51	6.62
8			9.00	9.10	9.24	9.36	9.53
9			12.5	12.6	12.7	12.8	13.0
10			16.5	16.6	16.7	16.8	17.0
11					21.1	21.3	21.6
12					26.4	26.7	26.9
13						32.7	33.0
14						39.5	39.8
15						47.0	47.4

Basis: 18, int., 60, 45 and 54 trees.

Black Spruce

Site Class II

Total Volume

Form Class 67

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches	Cubic Feet						
1	.031	.033	.035		.036		.037
2	.197	.226	.247		.250		.253
3	.522	.652	.708		.724		.740
4	1.06	1.29	1.46		1.52		1.58
5	1.80	2.20	2.52		2.69		2.78
6	2.77	3.55	3.92		4.23		4.40
7	3.96	5.09	5.70		6.13		6.44
8		6.94	7.84		8.40		8.94
9			10.4		11.1		11.8
10			13.4		14.2		15.1
11					17.7		19.0
12					21.7		23.4
13					26.0		28.2
14							33.7
15							39.6

Basis: 225, 31, 139, 548 and 881 trees.

Black Spruce

Site Class II

Merchantable Volume

Form Class 67

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches	Cubic Feet						
4	.850	.936	.972		.99		.99
5	1.43	1.84	2.00		2.14		2.19
6	2.32	3.10	3.31		3.67		3.82
7	3.49	4.63	5.11		5.62		5.87
8		6.47	7.35		7.86		8.33
9			9.97		10.5		11.2
10			13.0		13.4		14.6
11					16.8		18.3
12					20.7		22.5
13					24.9		27.2
14							32.4
15							38.1

Basis: 225, 31, 139, 548 and 881 trees.

Black Spruce

Site Class III

Total Volume

Form Class 65

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100 +
Inches	Cubic Feet							
1	.029		.030		.030		.031	
2	.187		.209		.215		.218	
3	.501		.598		.623		.629	
4	1.02		1.26		1.33		1.36	
5	1.76		2.12		2.34		2.43	
6	2.73		3.25		3.72		3.90	
7					5.46		5.78	
8					7.59		8.08	
9					10.1		10.9	
10					13.2		14.2	
11					16.8		18.2	
12					20.9		22.8	
13					25.4		27.8	
14							33.6	
15							40.1	

Basis: 107, 29, 793 and 618 trees.

Black Spruce

Site Class III

Merchantable Volume

Form Class 65

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100 +
Inches	Cubic Feet							
4	.843		.917		.940			.948
5	1.40		1.72		1.87			1.94
6	2.30		2.81		3.20			3.35
7					4.95			5.20
8					7.06			7.52
9					9.64			10.3
10					12.6			13.6
11					16.1			17.4
12					20.0			21.7
13					24.3			26.6
14								32.1
15								38.3

Basis: 107, 29, 793 and 618 trees.

Black Spruce

Site Class IV

Total Volume

Form Class 65

Diameter Breast Height	Age of tree in years					
	30	40	50	60	70	80 +
Inches	Cubic Feet					
1	.027					.030
2	.192					.208
3	.546					.593
4	1.14					1.25
5	1.94					2.20
6	2.97					3.54
7	4.20					5.32
8	5.65					7.59
9	7.40					10.4
10	9.30					13.8

Basis: 103 and 245 trees.

Black Spruce

Site Class IV

Merchantable Volume

Form Class 65

Diameter Breast Height	Age of tree in years					
	30	40	50	60	70	80 +
Inches	Cubic Feet					
4			.878			.914
5			1.54			1.76
6			2.53			3.07
7			3.79			4.83
8			5.29			7.06
9			6.99			9.87
10			8.92			13.2

Basis: 103 and 245 trees.

White Spruce

Site Class 1

Total Volume

Form Class 70

Diameter Breast Height	Age of tree in years					
	30	40	50	60	70	80 +
Inches				Cubic Feet		
1				.033	.035	
2				.312	.328	
3				.856	.875	
4				1.69	1.74	
5				2.90	2.95	
6				4.49	4.57	
7				6.50	6.60	
8				8.99	9.05	
9				11.9	12.1	
10				15.3	15.6	
11				19.4	19.7	
12				24.0	24.4	
13				29.1	29.6	
14				34.9	35.5	
15				41.4	42.0	
16				48.6	49.4	

Basis: 30 and 32 trees.

White Spruce

Site Class I

Merchantable Volume

Form Class 70

Diameter Breast Height	Age of tree in years					
	30	40	50	60	70	80 +
Inches	Cubic Feet					
4				1.38	1.41	
5				2.63	2.68	
6				4.21	4.28	
7				6.13	6.24	
8				8.47	8.62	
9				11.3	11.5	
10				14.7	15.0	
11				18.7	19.1	
12				23.3	23.7	
13				28.3	28.8	
14				33.9	34.5	
15				40.2	40.8	
16				47.1	47.9	

Basis: 30 and 32 trees.

White Spruce

Site Class II

Total Volume

Form Class 70

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100
Inches	Cubic Feet							
1			.042			.044		
2			.268			.282		
3			.733			.775		
4			1.48			1.57		
5			2.55			2.73		
6			4.01			4.30		
7			5.86			6.33		
8			8.17			8.88		
9			10.9			11.9		
10			14.3			15.6		
11			18.2			20.0		
12						25.0		
13						30.6		
14						36.9		
15						44.1		
16						52.3		

Basis: 16 and 52 trees

White Spruce

Site Class II

Merchantable Volume

Form Class 70

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100
Inches	Cubic Feet							
4			1.19		1.27			
5			2.32		2.48			
6			3.74		4.02			
7			5.54		5.98			
8			7.70		8.37			
9			10.4		11.3			
10			13.7		15.0			
11			17.5		19.3			
12					24.3			
13					29.8			
14					36.0			
15					42.9			
16					50.8			

Basis: 16 and 52 trees.

Jack Pine

Site Class I

Total Volume

Form Class 65

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches			Cubic Feet				
1			.061				
2			.317				
3			.839				
4			1.69				
5			2.92				
6			4.59				
7			6.75				
8			9.47				
9			12.8				
10			16.8				
11			21.5				
12			26.6				
13			32.7				
14			39.8				
15			47.8				

Basis: 12 trees.

Jack Pine

Site Class I

Merchantable Volume

Form Class 65

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches	Cubic Feet						
4			.77				
5			2.15				
6			3.95				
7			6.22				
8			9.03				
9			12.3				
10			16.2				
11			20.9				
12			26.1				
13			32.2				
14			39.1				
15			47.0				

Basis: 12 trees.

Jack Pine

Site Class II

Total Volume

Form Class 66

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches	Cubic Feet						
1			.061				
2			.313				
3			.814				
4			1.60				
5			2.72				
6			4.20				
7			6.04				
8			8.31				
9			11.0				
10			14.1				
11			17.8				
12			22.1				
13			26.8				
14			32.2				
15			38.2				

Basis: 52 trees.

Jack Pine

Site Class II

Merchantable Volume

Form Class 66

Diameter Breast Height	Age of tree in years						
	30	40	50	60	70	80	90 +
Inches			Cubic Feet				
4							
5			1.92				
6			3.46				
7			5.39				
8			7.69				
9			10.4				
10			13.5				
11			17.1				
12			21.3				
13			26.0				
14			31.3				
15			37.2				

Basis: 52 trees.

White Birch

Site Class I

Total Volume

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100 +
Inches					Cubic Feet			
1		.097			.100			.102
2		.411			.450			.461
3		.960			1.08			1.11
4		1.71			2.00			2.05
5		2.64			3.22			3.32
6		3.74			4.77			4.91
7		5.02			6.65			6.85
8		6.47			8.86			9.16
9		8.12			11.4			11.8
10		9.90			14.3			14.8
11		11.8			17.6			18.3
12					21.2			22.0
13					25.3			26.3
14					29.7			30.9
15					34.5			35.9
16								41.4

Basis: 23, 54 and 16 trees.

Trembling Aspen

Site Class I

Total Volume

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100 +
Inches			Cubic Feet					
1			.090					
2			.444					
3			1.12					
4			2.15					
5			3.56					
6			5.33					
7			7.51					
8			10.1					
9			13.2					
10			16.8					
11			20.9					
12			25.5					
13			30.7					
14			36.5					
15			42.8					
16			49.9					
17			57.5					
18			65.8					

Basis: 34 trees.

Trembling Aspen

Site Class II

Total Volume

Diameter Breast Height	Age of tree in years							
	30	40	50	60	70	80	90	100 +
Inches			Cubic Feet					
1			.082					
2			.424					
3			1.10					
4			2.10					
5			3.46					
6			5.10					
7			7.10					
8			9.45					
9			12.1					
10			15.1					
11			18.5					
12			22.2					
13			26.4					
14			31.0					
15			35.9					
16			41.2					

Basis: 33 trees.