THE Mensurational Characteristics OF Eastern White Pine

by Robert Marty

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Introduction

THERE probably is a more extensive professional and scientific literature relating to eastern white pine (*Pinus strobus* L.) than for any other North American forest tree species. Unfortunately this material is scattered in thousands of books, theses, bulletins, and journal articles, making access and retrieval a serious problem for the forest researcher and practitioner alike.

Three of the most frequently used classes of white pine mensurational data are estimators of site index, tree volume tables, and stand growth and yield predictors. This paper brings together some of this information. Only the more widely applicable studies are reproduced here; much additional information of local significance is represented in the literature and is available.

This paper is divided into three major sections: *SITE INDEX ESTIMATORS, TREE VOLUME ESTIMATORS,* and *STAND GROWTH AND YIELD ESTIMATORS.* Each section begins with a brief description of the data it contains, but is made up primarily of a set of tables and graphs numbered consecutively within the section. For example, the graph labeled SITE INDEX — 3 is the third table or graph in that section. Table headings have been designed so that most of the information necessary to determine the content of a table, and to distinguish it from others, is condensed in the heading and can be identified quickly.

Site Index Estimators

Site quality is one of the most important determinants of growth and yield. Separate yield tables are prepared for sites of different quality; and site quality is almost always used, directly or indirectly, as a determining variable in other growth and yield predictors as well. The quality of a forest site perhaps is best defined in terms of its potential for producing some product, in this case white pine timber. But site quality has seldom been measured directly in this fashion by foresters, say in terms of maximum sustainable mean annual cubic-foot increment per acre. Instead, site quality has ordinarily been defined in terms of a site index — the height attained by dominant trees at some standard index age.

There are three principal ways of estimating white pine site index. The most common method — and perhaps the most reliable — is to measure the age and total height of pine trees near index age, and determine site index by reference to a set of site-index curves. Site-index curves are constructed to show the relationship of total tree height to age for dominant and codominant trees, which allows estimation of what the height of sample trees was, or will be, at index age.

A second method of estimating site index is on the basis of soil characteristics.[1] Soil characteristics are major determinants of site quality, and they are often correlated rather strongly with other determinants reflecting climate and biotic environment. Moisture availability seems to be a key soil characteristic influencing white pine site quality, at least in some parts of its range.

A third prediction technique makes use of indicator plants. Early work concentrated on relating herbaceous vegetation types with pine site quality. More recently interest has shifted toward relating the site indices of other tree species to pine. These indirect methods, though not so reliable as site-index curves, are essential for situations where suitable pines near index age are not available.

[1]An allied method relates site index to soil series as defined by the soil-classification procedures used by the Soil Conservation Service of the U. S. Department of Agriculture. Site index-soil series relations sometimes are published by SCS as a part of their soil survey county report series.

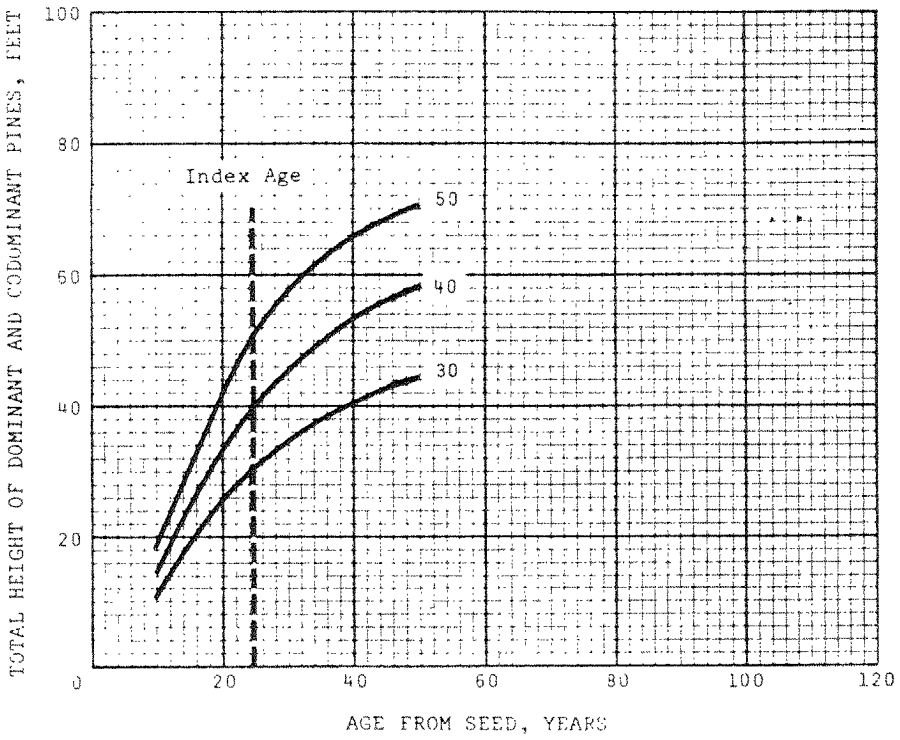
In establishing site index from curves, first measure the total height and age at d.b.h. of five or more dominant and codominant pine trees distributed over the stand area. These index trees should show no evidence of past suppression or serious injury and they should not be open-grown trees. Compute the average total height and age at d.b.h., and determine site index from an appropriate set of curves. If the curves you are using are based on age from seed rather than age above d.b.h., the site-index estimate derived above must be corrected. The listing below shows age corrections to add to average age above d.b.h. to convert this measure to average age from seed for Southern Appalachian conditions. Pine trees in New York and New England may take 1 or 2 more years to reach 4½ feet, particularly on the poorer sites.

Preliminary site index estimate based on average age above d. b. h.	*Years to add to age above d. b. h. to convert it to age from seed for Southern Appalachian conditions*[2]
96 or more	4
81-95	5
66-80	6
65 or less	7

The soil-site index estimators should be used in a similar fashion. Take soil observations at five or more locations within the stand, and average the values for factors measured. Then use these average values to derive an estimate of site index from the appropriate table or formula. When estimating white pine site index on the basis of site index for another species, estimate site index for the indicator species in the fashion outlined above for white pine. Then use this average site index for the indicator species to derive an estimate of white pine site index. Frequently more than one of these methods can be employed. Try several methods and see how they compare. This will give you a better basis for interpreting soil and indicator-plant estimates when these are the only recourse.

[2]Doolittle, W. T., and J. P. Vimmerstedt. SITE INDEX CURVES FOR NATURAL STANDS OF WHITE PINE IN THE SOUTHERN APPALACHIANS. U. S. Forest Serv. Southeast. Forest Expt. Sta. Res. Note 141. 2 pp., illus., 1960.

SITE INDEX—1
HEIGHT/AGE CURVES
Pure Plantations—Ohio and Indiana



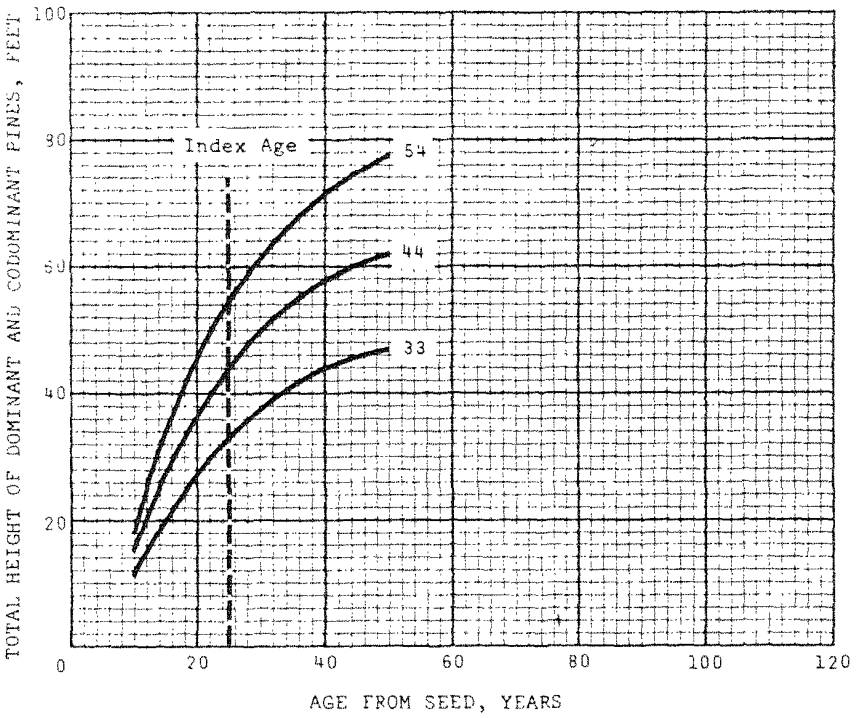
SOURCE: Gaiser, Richard N., and Robert W. Merz. GROWTH OF PLANTED RED AND WHITE PINE IN OHIO AND INDIANA. U. S. Forest Serv. Central States Forest Expt. Sta. Tech. Paper 134. 14 pp., illus., 1953.

LOCATION: Muskingum, Wellston, Zanesville soil association in parts of Ohio and Indiana.

BASIS: Individual tree measurements from 11 plantations.

RELIABILITY: No estimate.

SITE INDEX—2
HEIGHT/AGE CURVES
Mixed Plantations—Ohio and Indiana



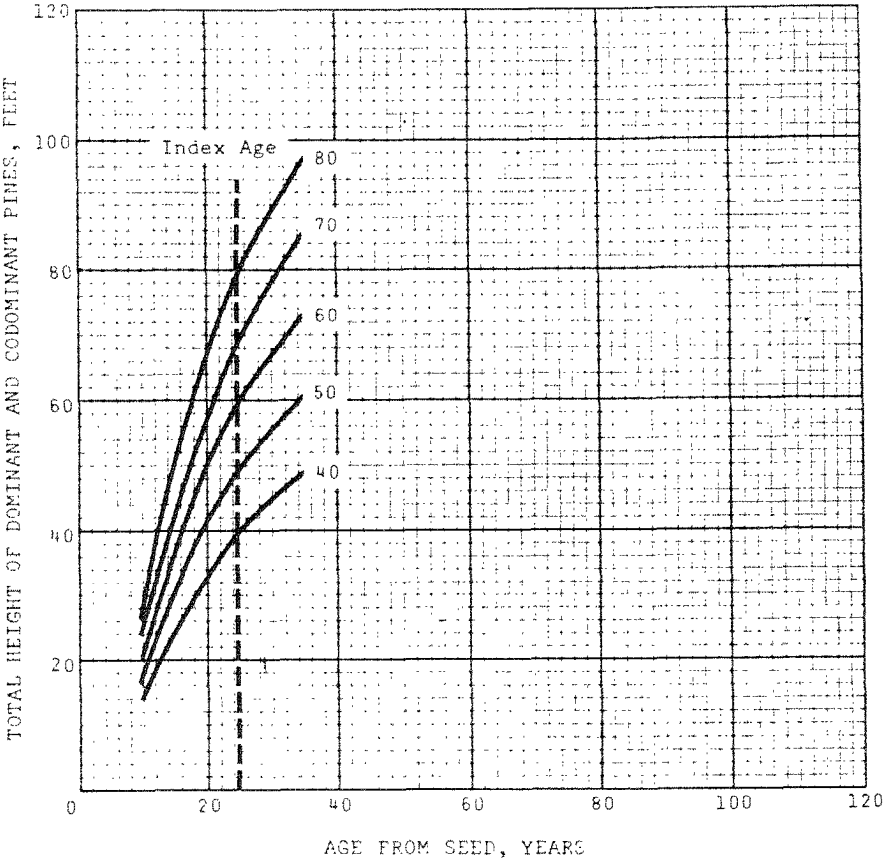
SOURCE: Gaiser, Richard N., and Robert W. Merz. GROWTH OF PLANTED RED AND WHITE PINE IN OHIO AND INDIANA. U. S. Forest Serv. Central States Forest Expt. Sta. Tech. Paper 134. 14 pp., illus., 1953.

LOCATION: Muskingum, Wellston, Zanesville soil association in parts of Ohio and Indiana.

BASIS: Individual tree measurements from 31 plantations.

RELIABILITY: No estimate.

SITE INDEX—3
HEIGHT/AGE CURVES
Pure Plantations—Southern Appalachians



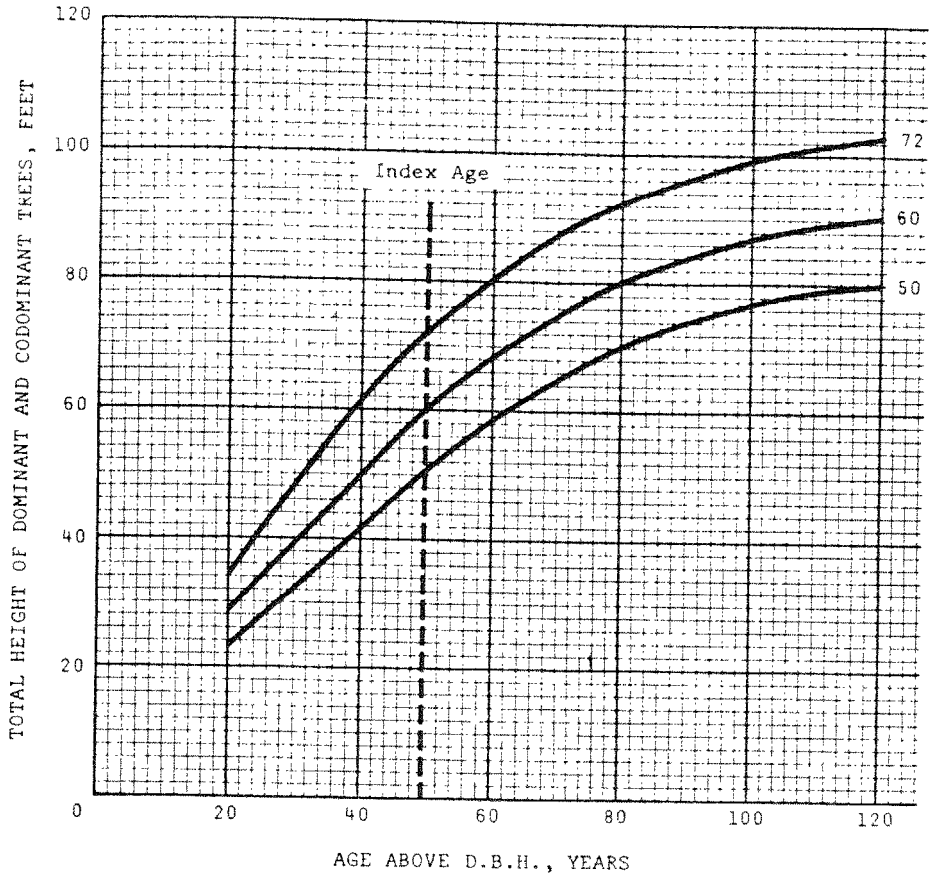
SOURCE: Vimmerstedt, John P. SITE INDEX CURVES FOR SOUTHERN APPALACHIAN WHITE PINE PLANTATIONS. U. S. Forest Serv. Southeast. Forest Expt. Sta. Res. Note 131. 2 pp., illus., 1959.

LOCATION: Mostly western North Carolina with some plots in northern Georgia and eastern Tennessee.

BASIS: Individual tree measurements on 111 sample plots.

RELIABILITY: No estimate.

SITE INDEX—4
HEIGHT/AGE CURVES
Natural Red and White Pine Stands—Canada



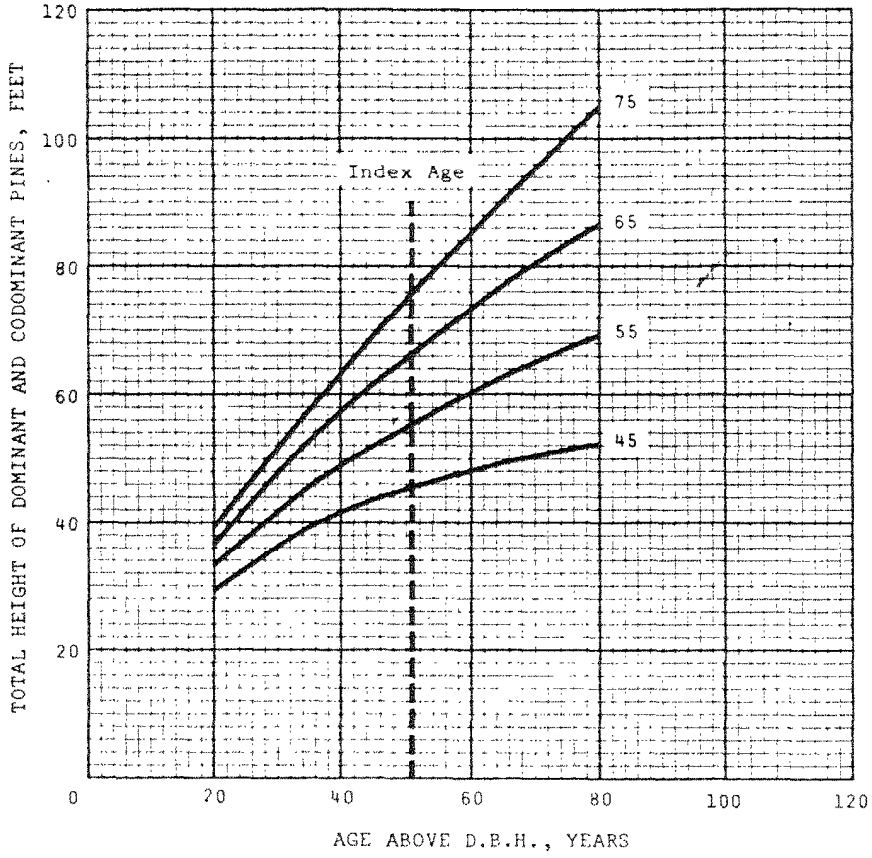
SOURCE: McCormack, R. J. GROWTH AND YIELD OF RED AND WHITE PINE. 1956. (Unpublished report of Canada Dept. North. Affairs and Natural Resources Forestry Br., as reported by Horton, K. W., and G. H. D. Bedell. WHITE AND RED PINE ECOLOGY, SILVICULTURE AND MANAGEMENT. Canada Dept. North. Affairs and Natural Resources Forestry Br. Bul. 124. 185 pp., illus., 1960.)

LOCATION: Ontario and Quebec.

BASIS: Measurements on 1,088 trees.

RELIABILITY: No estimate.

SITE INDEX—5
HEIGHT/AGE CURVES
Natural Stands—New Hampshire



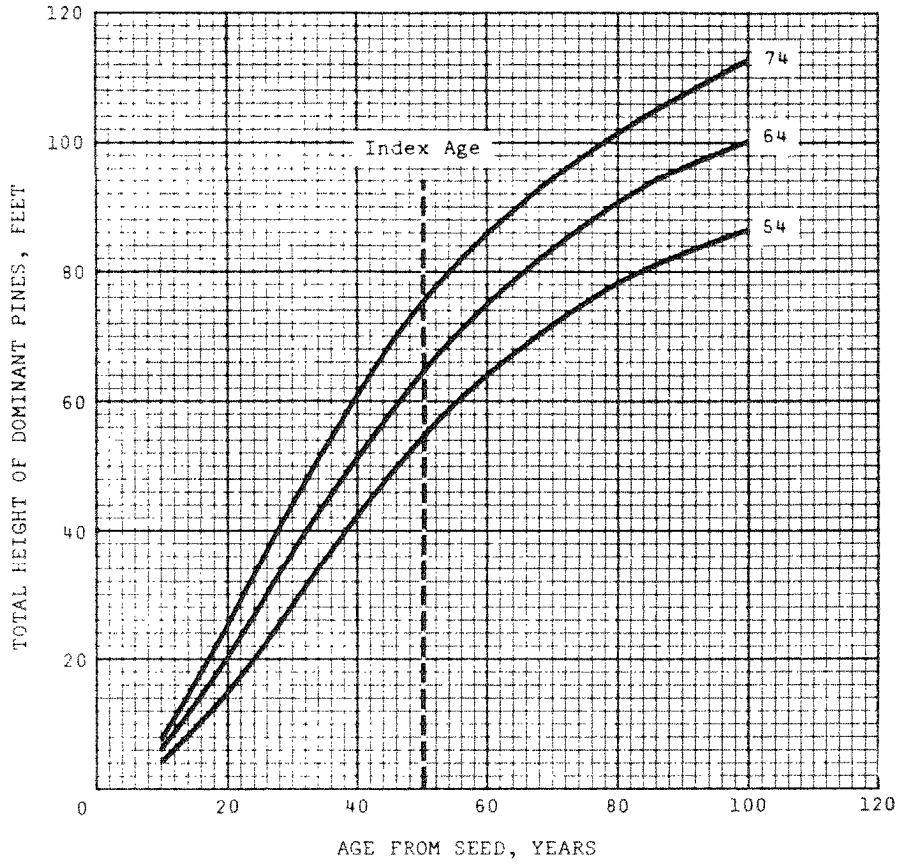
SOURCE: Husch, B. PRELIMINARY SITE INDEX TABLE FOR WHITE PINE IN SOUTHEASTERN NEW HAMPSHIRE. New Hamp. Agr. Expt. Sta. Forestry Mimeo. 1. 2 pp., illus., 1954.

LOCATION: Southeastern New Hampshire.

BASIS: 30 sample plots.

RELIABILITY: No estimate.

SITE INDEX—6
HEIGHT/AGE CURVES
Natural Stands—New Hampshire



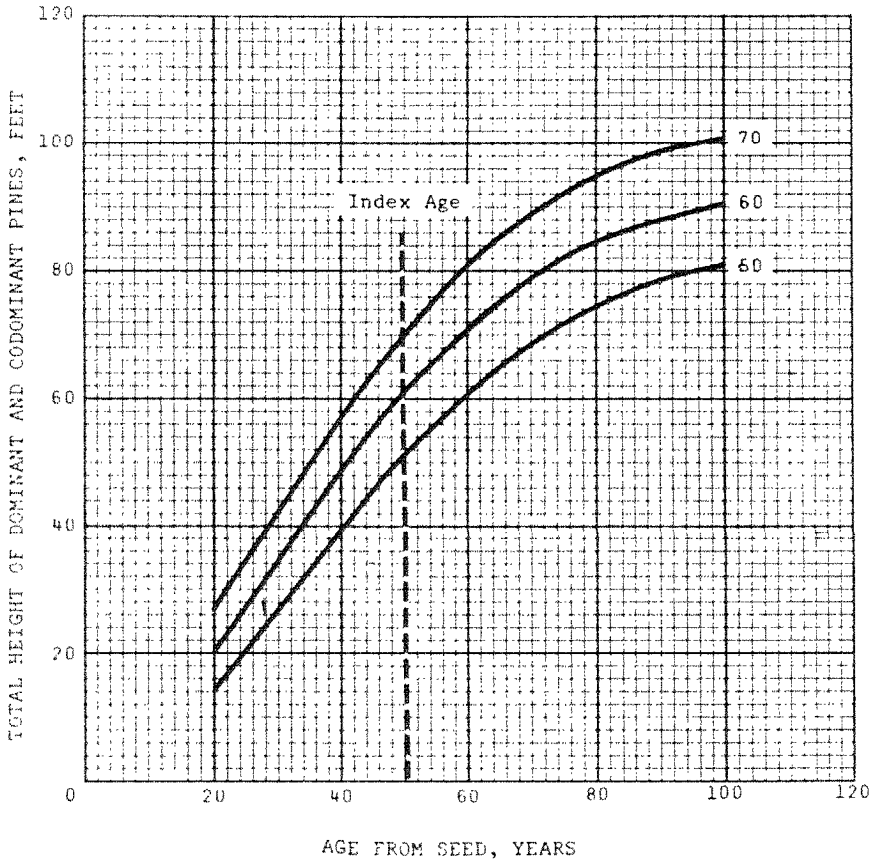
SOURCE: Frothingham, E. H. WHITE PINE UNDER FOREST MANAGEMENT. U.S. Dept. Agr. Bul. 13. 70 pp., illus., 1914.

LOCATION: New Hampshire.

BASIS: 196 plots.

RELIABILITY: No estimate.

SITE INDEX—7
HEIGHT/AGE CURVES
Natural Stands—Massachusetts



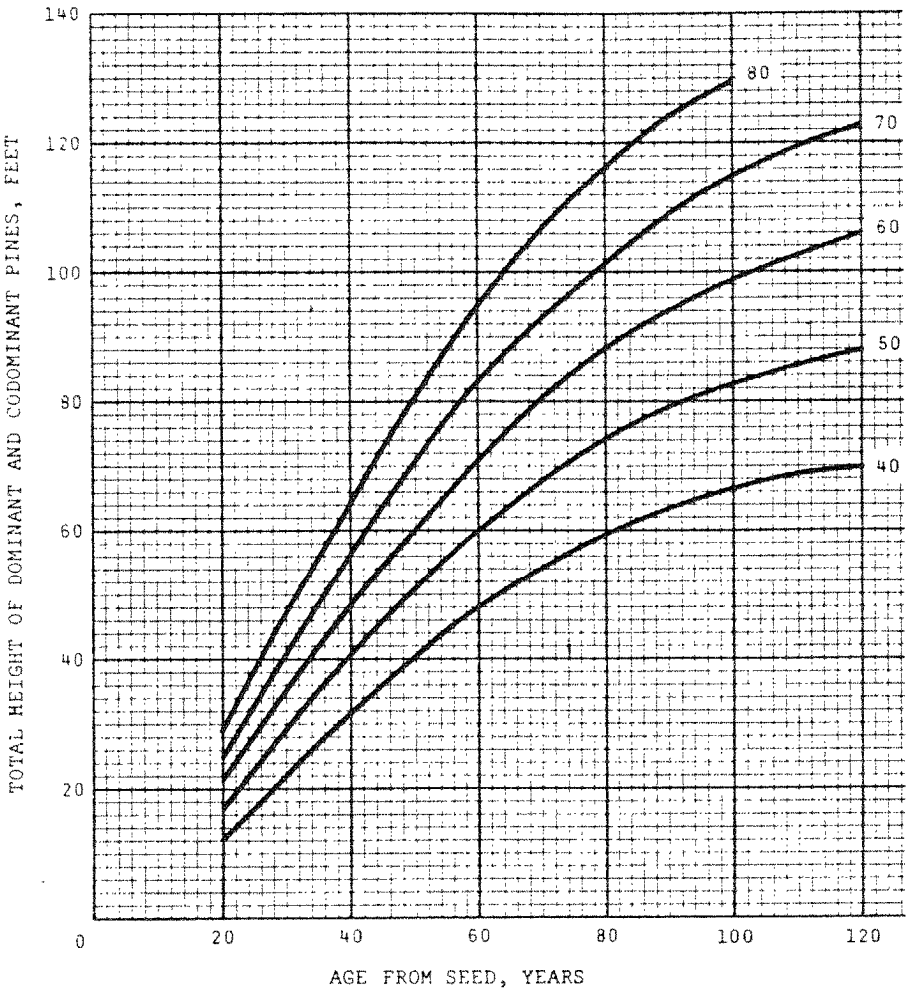
SOURCE: Spurr, Stephen H. FOREST INVENTORY. 476 pp., illus. Ronald Press, New York. 1952.

LOCATION: Massachusetts.

BASIS: Stem analyses and permanent sample-tree growth records for an unstated number of pines.

RELIABILITY: No estimate.

SITE INDEX—8
HEIGHT/AGE CURVES
Natural Stands—Lake States



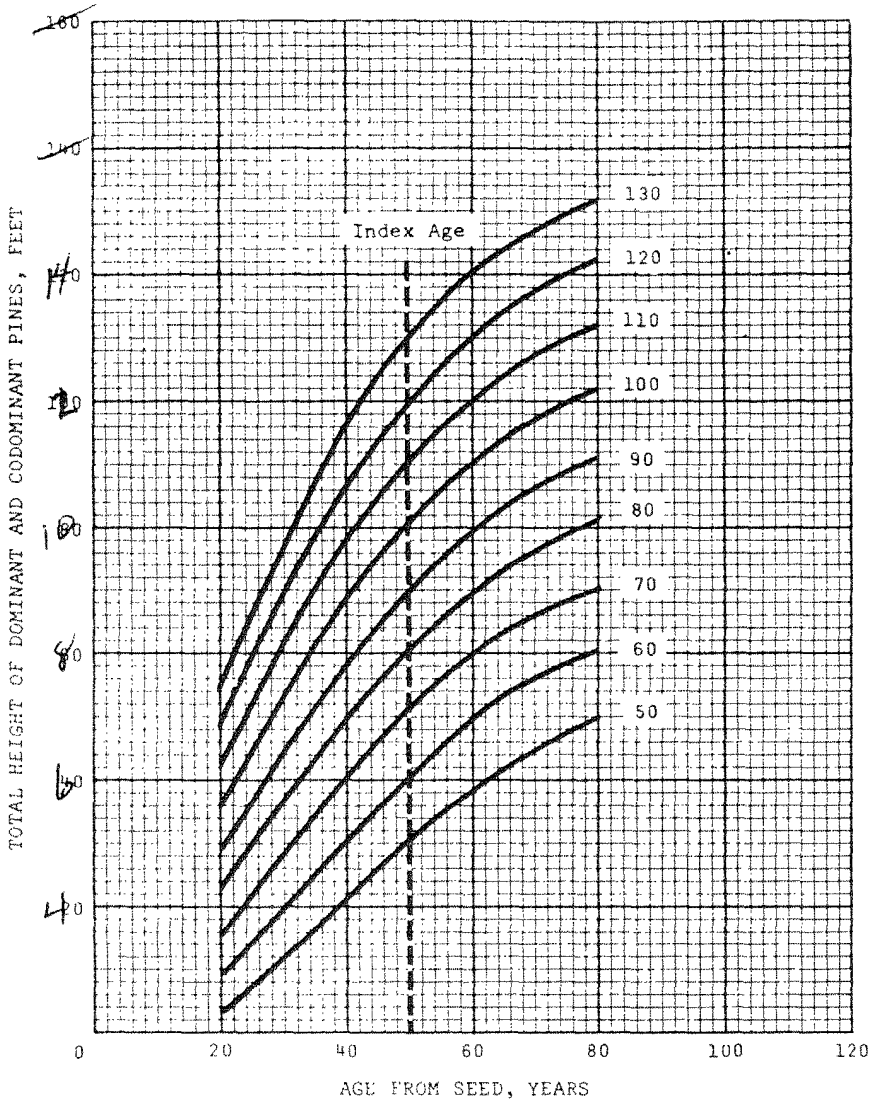
SOURCE: Gevorkiantz, S. R., and Raphael Zon. SECOND-GROWTH WHITE PINE IN WISCONSIN. Wis. Agr. Expt. Sta. Bul. 98. 40 pp., illus., 1930.

LOCATION: Northern Wisconsin.

BASIS: 92 plots.

RELIABILITY: No estimate.

SITE INDEX—9
HEIGHT/AGE CURVES
Natural Stands—Southern Appalachians



SOURCE: Doolittle, Warren T., and John P. Vimmerstedt. SITE INDEX CURVES FOR NATURAL STANDS OF WHITE PINE IN THE SOUTHERN APPALACHIANS. U. S. Forest Serv. Southeast. Forest Expt. Sta. Res. Note 141. 2 pp., illus., 1960.

LOCATION: Western North Carolina and northern Georgia at elevations between 2,000 and 4,000 feet above sea level.

BASIS: 105 plots with 3 to 7 dominant and codominant trees per plot.

RELIABILITY: No estimate.

SITE INDEX—10
SOIL/SITE RELATION
Plantations—Ohio and Indiana

(Average height of dominant and codominant pine at 25 years)

A-horizon thickness	Silt and clay percent						
	30	40	50	60	70	80	90
Inches	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
4	43	43	42	41	41	40	39
6	50	49	49	48	48	47	46
8	54	53	53	52	51	50	49
10	57	56	55	54	54	53	52
12	59	58	57	56	55	54	53
14	60	59	58	57	57	56	55
16	61	60	59	58	57	56	55

SOURCE: Gaiser, Richard N., and Robert W. Merz. GROWTH OF PLANTED RED AND WHITE PINE IN OHIO AND INDIANA. U. S. Forest Serv. Central States Forest Expt.. Sea. Tech. Paper 134. 14 pp., illus., 1953.

LOCATION: Muskingum, Wellston, Zanesville soil association in parts of Ohio and Indiana.

BASIS: 100 sample plots.

RELIABILITY: No estimate.

SITE INDEX—11
SOIL/SITE RELATION
Natural Stands—Maine

(Average height of dominant and codominant pine at 50 years)

Volume of rocks in B horizon	Depth of A horizon in inches—							
	0	1	2	3	4	5	6	8
Percent	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
5	64	61	58	55	52	50	47	41
15	63	60	57	54	51	48	45	39
25	61	58	55	52	49	47	44	38
35	60	57	54	51	48	45	42	36
45	58	55	52	49	46	44	41	35

SOURCE: Young, Harold E. FOREST SOILS–SITE INDEX STUDY IN MAINE. Soil Sci. Soc. Amer. Proc. 18: 85-87. 1954.

LOCATION. Southern Maine.

BASIS: 16 sample areas.

RELIABILITY. Regression relation upon which this table is based accounted for 58 percent of the variation in site index.

SITE INDEX—12
INDICATOR PLANT RELATION
Natural Stands—Northeast

(White pine site index at 50 years)

Red maple age	Red maple height in feet —											
	20	25	30	35	40	45	50	55	60	65	70	75
Years	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
30	43	49	54	59	64	68	72	76	80	84	87	90
35	39	44	49	53	57	61	65	69	72	76	79	81
40	36	41	45	49	53	57	60	63	67	70	73	75
45	34	38	43	46	50	54	57	60	63	66	69	71
50	32	37	41	44	48	51	54	57	60	63	66	68
55	31	35	39	43	46	49	52	55	58	61	63	66
60	30	34	38	41	45	48	51	53	56	59	61	64
65	29	33	37	40	43	46	49	52	55	57	60	62
70	29	32	36	39	42	45	48	51	53	56	58	60
75	28	32	35	38	41	44	47	50	52	55	57	59
80	27	31	35	38	41	43	46	49	51	54	56	58

SOURCE: Foster, Ralph W. RELATION BETWEEN SITE INDICES OF EASTERN WHITE PINE AND RED MAPLE. Forest Sci. 5: 279-291. 1959. LOCATION: New York, Massachusetts, and Connecticut. BASIS: 70 observations. RELIABILITY: 7.7 percent standard error of estimate.

SITE INDEX—13
INDICATOR PLANT RELATION
Natural Stands—Southern Appalachians

(Comparative site indices at 50 years)

White pine	Virginia pine	White oak	Chestnut & red oaks	Short-leaf & pitch pine	Yellow-poplar
Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
60	54	47	52	44	40
70	63	55	60	53	55
80	72	63	70	63	72
90	81	72	79	73	87
100	90	81	88	83	103
110	99	90	97	92	118

SOURCE: Doolittle, Warren T. SITE INDEX COMPARISONS FOR SEVERAL FOREST SPECIES IN THE SOUTHERN APPALACHIANS. Soil Sci. Soc. Amer. Proc. 22: 455-458. 1958. LOCATION: Southern Appalachians. BASIS: 598 sample plots. RELIABILITY: Correlation coefficients for comparisons of two species range from 0.59 to 0.89, with standard errors of estimate of between 4 and 8 feet.

Tree Volume Estimators

A large number of tree volume estimators for white pine are presented in this section. Each of the five tables making up this section shows tree volume estimates of a particular type:

1. Cubic-foot volume by d.b.h. and total height.
2. Board-foot volume by d.b.h. and total height.
3. Board-foot volume by d.b.h. and merchantable length.
4. Board-foot volume by d.b.h., merchantable length and Girard form class.
5. Pulpwood volume above sawlog merchantability limits.

Most of these tables show volume estimates from several different sources. For example, the cubic-foot volume table shows as many as eight different estimates for each d.b.h. — total height class. The various sources in each table were chosen to reflect different merchantability standards, log rules, localities, and so forth. Thus the user has a variety of estimators from which to choose; and the grouping of sources helps to indicate the extent of variation that differing log rules, merchantability standards, and localities introduce. The various sources are cited and described at the end of each table.

Form-class volume tables require that the user determine average form class for his stands. Form-class often varies with diameter; so a minimum of 50 trees should be measured, representing all diameter classes to establish form-class averages.

TREE VOLUME—1
CUBIC-FOOT VOLUME
By Total Tree Height

(See footnotes for sources of data)

D.b.h. (inches)	Total volume					Merchantable volume		
	With bark		Without bark			4″ top		6″ top
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOTAL TREE HEIGHT 10 FEET								
2	0.21	—	0.132	—	—	—	—	—
4	—	—	.547	—	—	—	—	—
20 FEET								
2	0.25	—	0.206	0.24	0.206	—	—	—
4	.99	—	.850	.90	.810	—	—	—
6	2.1	—	—	—	—	1.11	—	—
8	3.6	—	—	—	—	—	—	—
30 FEET								
2	0.31	—	0.28	0.35	0.31	—	—	—
4	1.38	—	1.17	1.33	1.24	—	—	—
6	3.0	3.0	2.67	2.90	2.74	1.94	2.6	—
8	5.2	5.4	4.80	5.04	—	3.86	4.5	—
10	8.4	8.6	7.58	—	—	—	—	—
40 FEET								
2	—	—	0.36	—	0.41	—	—	—
4	1.9	—	1.48	1.75	1.65	—	—	—
6	4.2	4.3	3.38	3.82	3.58	2.76	3.3	—
8	7.1	7.1	6.10	6.64	6.30	5.32	6.0	5.1
10	11.0	10.5	9.62	10.20	9.58	8.62	9.6	8.8
12	15.4	14.3	13.8	14.30	—	—	13.9	12.8
14	—	—	18.9	—	—	—	—	18.3
50 FEET								
4	—	—	1.78	—	2.05	—	—	—
6	5.6	5.1	4.07	4.73	4.52	3.58	4.3	—
8	9.3	8.8	7.34	8.21	7.72	6.79	7.8	6.2
10	13.9	13.1	11.60	12.50	12.10	10.91	12.0	10.7
12	18.8	18.0	16.80	17.70	17.20	—	17.6	15.9
14	24.5	23.7	23.00	23.70	23.50	—	23.7	21.6
16	30.6	30.7	30.30	30.20	—	—	30.5	28.0
18	37.0	40.0	38.50	—	—	—	—	35.3
20	44.0	—	47.70	—	—	—	—	—

CONTINUED

CONTINUED

D.b.h. (inches)	Total volume					Merchantable volume		
	With bark		Without bark			4″ top		6″ top
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				60 FEET				
4	—	—	—	—	2.46	—	—	—
6	—	6.0	4.79	—	5.41	4.41	—	—
8	11.7	10.5	8.65	9.80	9.19	8.25	9.8	7.2
10	17.4	15.8	13.5	14.90	14.5	13.19	15.0	12.6
12	23.5	22.0	19.7	21.00	20.6	19.24	21.1	19.0
14	30.7	29.1	27.0	28.10	28.0	—	28.7	26.1
16	38.3	37.5	35.4	36.00	36.9	—	36.5	34.0
18	46.9	47.6	45.1	45.00	46.5	—	44.6	42.7
20	56.3	—	55.9	—	—	—	52.9	52.5
22	66.1	—	—	—	—	—	—	63.0
24	76.2	—	—	—	—	—	—	74.2
26	—	—	—	—	—	—	—	86.3
28	—	—	—	—	—	—	—	99.0
				70 FEET				
6	—	6.5	5.5	—	6.3	5.23	—	—
8	14.5	12.2	9.9	—	10.8	9.72	12.0	8.3
10	21.5	18.9	15.6	—	16.8	15.48	17.9	14.6
12	29.1	26.4	22.8	24.30	24.0	22.53	25.3	21.8
14	37.9	34.8	31.2	32.50	32.8		32.5	30.0
16	47.5	44.3	40.9	41.80	42.6	—	42.3	39.3
18	58.3	55.5	52.2	52.00	53.4	—	52.6	49.6
20	69.7	67.1	64.7	—	65.2	—	63.2	60.5
22	81.6	79.1	78.6	—	77.2	—	74.9	72.4
24	93.6	—	94.2	—	90.0	—	87.1	85.0
26	—	—	110.0	—	—	—	—	98.8
28	—	—	—	—	—	—	—	113.3
30	—	—	—	—	—	—	—	129.0
				80 FEET				
6	—	—	—	—	7.1	—	—	—
8	—	13.9	—	—	12.2	11.8	—	—
10	26.0	21.9	—	—	19.3	17.77	20.9	—
12	35.2	30.8	25.7	—	27.4	25.83	29.8	24.7
14	45.8	40.2	35.1	—	37.5	35.35	39.6	34.0
16	58.0	51.0	46.2	—	48.3	—	49.8	44.6

CONTINUED

TREE VOLUME—1
CUBIC-FOOT VOLUME
By Total Tree Height

CONTINUED

D.b.h. (inches)	Total volume					Merchantable volume		
	With bark		Without bark			4″ top		6″ top
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
80 FEET, CONTINUED								
18	71.1	63.9	58.9	—	60.4	—	61.5	56.0
20	84.6	78.1	73.0	—	73.8	—	74.7	68.0
22	99.0	93.1	89.0	—	86.5	—	89.3	81.1
24	113.4	108.6	106.0	—	100.0	—	104.9	95.8
26	—	122.7	124.0	—	—	—	—	111.4
28	—	—	—	—	—	—	—	128.2
30	—	—	—	—	—	—	—	146.0
32	—	—	—	—	—	—	—	165.0
34	—	—	—	—	—	—	—	184.0
90 FEET								
8	—	15.8	—	—	13.6	—	—	—
10	—	25.0	—	—	21.5	20.06	—	—
12	42.2	35.0	28.6	—	30.7	29.12	33.7	—
14	55.1	45.8	39.1	—	41.9	39.83	43.6	—
16	69.6	58.1	51.4	—	54.0	—	55.9	—
18	85.4	72.2	65.6	—	67.3	—	69.1	62.7
20	101.8	88.1	81.3	—	81.5	—	84.8	76.6
22	118.2	105.3	98.7	—	95.4	—	101.4	91.1
24	134.6	121.8	117.0	—	110.0	—	119.0	107.0
26	—	137.8	138.0	—	—	—	—	124.0
28	—	—	—	—	—	—	—	142.5
30	—	—	—	—	—	—	—	162.0
32	—	—	—	—	—	—	—	182.0
34	—	—	—	—	—	—	—	204.0
100 FEET								
8	—	—	—	—	15.2	—	—	—
10	—	—	—	—	24.0	—	—	—
12	—	40.1	—	—	34.4	—	—	—
14	—	51.7	—	—	46.8	—	—	—
16	—	65.1	56.2	—	59.8	—	—	—
18	—	82.0	71.9	—	74.0	—	—	—
20	—	100.2	89.0	—	89.0	—	—	83.8
22	—	118.1	108.0	—	104.0	—	—	100.1
24	—	135.8	129.0	—	118.0	—	—	117.3
26	—	153.1	152.0	—	—	—	—	136.0

CONTINUED

CONTINUED

D.b.h. (inches)	Total volume					Merchantable volume		
	With bark		Without bark			4″ top		6″ top
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
100 FEET, CONTINUED								
28	—	—	—	—	—	—	—	157.0
30	—	—	—	—	—	—	—	179.0
32	—	—	—	—	—	—	—	202.0
34	—	—	—	—	—	—	—	225.0
110 FEET								
12	—	45.9	—	—	37.7	—	—	—
14	—	58.8	—	—	51.0	—	—	—
16	—	73.7	—	—	65.5	—	—	—
18	—	92.1	—	—	80.3	—	—	—
20	—	112.2	—	—	96.3	—	—	—
22	—	131.7	118.0	—	111.0	—	—	—
24	—	149.8	141.0	—	126.0	—	—	128.5
26	—	168.5	166.0	—	—	—	—	149.2
28	—	—	—	—	—	—	—	172.3
30	—	—	—	—	—	—	—	196.0
32	—	—	—	—	—	—	—	221.0
34	—	—	—	—	—	—	—	247.0
120 FEET								
18	—	—	—	—	86.6	—	—	—
20	—	125.6	—	—	103.0	—	—	—
22	—	146.7	129.0	—	118.0	—	—	—
24	—	165.5	154.0	—	133.0	—	—	—
26	—	183.2	181.0	—	—	—	—	—

[1] SOURCE: Aughanbaugh, J. E., 1937, as reported by Delong, Thomas S., in YIELD AND STAND TABLES FOR PLANTATION WHITE PINE IN PENNSYLVANIA. Pa. Dept. Forests and Waters Note 8-b. 20 pp., ilus., 1955. *Location:* Pennsylvania. *Basis:* 898 trees. *Reliability:* Average deviation ±4.0 percent; aggregate difference 0.062 percent low. *Applicability:* Total volume, including stump, stem, top and bark.

[2] SOURCE: Frothingham, E. H. WHITE PINE UNDER FOREST MANAGEMENT. U. S. Dept. Agr. Bul. 13. 70 pp., illus., 1914. *Location:* New Hampshire. *Basis:* 1,568 trees. *Reliability:* No estimate. *Applicability:* Total volume, including stump, stem, top and bark.

[3] SOURCE: Anonymous. INTERPOLATED VOLUME TABLES FOR USE IN COMPILATION OF SAMPLE PLOT DATA. Canada Forest Serv. Misc. Series 3. 19 pp., illus., 1944. *Location:* Eastern Canada. *Basis:* No information. *Reliability:* No estimate. *Applicability:* Total volume.

[4] SOURCE: Olson, Richard A., Gordon Chapman, and Henry W. Hicock. CONNECTICUT VOLUME TABLES FOR PLANTATION GROWN WHITE PINE. Conn. Agr. Expt. Sta. Bul. 514. 23 pp.,

illus., 1948. *Location:* Connecticut. *Basis:* 1,031 trees 17 to 57 feet in total height, 1.7 to 15.0 inches in d.b.h. and 16 to 40 years old. *Reliability:* Average deviation ±4.92 percent; aggregate differences 0.11 percent low. *Applicability:* Total volume of stem less bark; 0.5-foot stump.

[5] SOURCE: Gevorkiantz, S. R. and Raphael Zon. SECOND-GROWTH WHITE PINE IN WISCONSIN. Wis. Agr. Expt. Sta. Bul. 98. 40 pp., illus., 1930. *Location:* Wisconsin. *Basis:* 105 trees. *Reliability:* Average deviation ±4.61 percent; aggregate difference 0.36 percent low. *Applicability:* Total volume of stump, stem, and top without bark.

[6] SOURCE: Vimmerstedt, John P. CUBIC-FOOT VOLUME TABLES FOR SOUTHERN APPALACHIAN WHITE PINE PLANTATIONS. U. S. Forest Serv. Southeast. Forest Expt. Sta. Res. Note 162. 2 pp., illus., 1961. *Location:* Southern Appalachians. *Basis:* 241 trees. *Reliability:* Standard error of the mean volume was ±0.595 cubic feet. *Applicability:* Cubic-foot volume inside bark to a 4.0-inch i.b. top diameter.

[7] SOURCE. Frothingham, E. H. WHITE PINE UNDER FOREST MANAGEMENT. U. S. Dept. Agr. Bul. 13. 70 pp., illus., 1914. *Location:* Massachusetts. *Basis:* Not indicated. *Reliability:* No information. *Applicability:* Cubic-foot volume, including bark, between a 6-inch stump and a 4.0-inch o.b. top diameter.

[8] SOURCE: Demeritt, Dwight B. SECOND-GROWTH WHITE PINE VOLUME TABLE — SOUTHWESTERN MAINE. Univ. Maine Forestry Dept. Tech. Note 18. 5 pp., 1952. *Location:* Maine. *Basis:* 433 trees. *Reliability:* Average deviation ±6.5 percent; aggregate difference 0.82 percent low. *Applicability:* Cubic-foot volume excluding bark between a 1-foot stump and a 6-inch i.b. top diameter.

(See footnotes for sources of data)

D. b. h. (inches)	Mill tally		International ¼-inch			Scribner		Maine
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOTAL TREE HEIGHT 30 FEET								
6	15	13	—	5	3	—	5	—
8	25	24	—	10	16	—	10	—
10	40	41	—	20	34	—	20	—
40 FEET								
6	20	20	—	10	8	—	8	—
8	35	36	25	15	24	25	17	25
10	55	53	45	35	45	40	31	40
12	75	73	60	55	72	55	48	60
14	100	95	—	80	105	—	67	—
16	—	—	—	—	145	—	—	—
50 FEET								
6	30	23	—	10	14	—	12	—
8	50	45	35	25	31	25	23	30
10	75	70	60	45	55	55	42	55
12	105	100	85	75	86	75	65	80
14	140	137	110	110	123	100	91	110
16	180	181	140	150	167	120	125	140
18	—	238	—	195	—	145	167	—
20	—	302	—	245	—	—	216	—
60 FEET								
6	—	27	—	15	19	—	16	—
8	65	53	40	30	39	30	30	40
10	95	85	75	60	66	65	54	70
12	135	125	110	95	100	95	82	105
14	175	173	150	140	141	130	116	145
16	230	230	190	190	189	165	159	190
18	295	297	235	250	—	205	212	240
20	380	379	290	315	—	255	274	290
22	—	—	360	—	—	315	—	350
24	—	—	430	—	—	385	—	410
26	—	—	—	—	—	470	—	470

CONTINUED

TREE VOLUME—2
BOARD-FOOT VOLUME
By Total Tree Height

CONTINUED

D. b. h. (inches)	Mill tally		International ¼-inch			Scribner		Maine
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				70 FEET				
6	—	29	—	20	—	—	19	—
8	85	62	45	40	—	35	37	45
10	125	102	90	75	—	75	65	85
12	165	151	135	115	—	115	99	125
14	215	210	185	170	—	160	140	180
16	275	277	240	230	—	205	193	235
18	350	352	300	300	—	260	256	295
20	435	436	375	380	—	325	332	360
22	520	522	455	—	—	400	—	430
24	600	—	535	—	—	480	—	505
26	—	—	620	—	—	575	—	585
28	—	—	710	—	—	680	—	665
30	—	—	—	—	—	—	—	750
				80 FEET				
6	—	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—	—
10	145	119	—	85	—	—	76	—
12	200	177	160	135	—	135	116	150
14	265	243	225	200	—	190	165	215
16	335	323	290	275	—	250	227	285
18	410	411	365	355	—	315	301	355
20	505	506	455	450	—	395	389	430
22	595	597	545	—	—	485	—	515
24	690	674	645	—	—	580	—	600
26	—	737	750	—	—	685	—	690
28	—	—	855	—	—	800	—	785
30	—	—	970	—	—	935	—	880
				90 FEET				
10	—	138	—	—	—	—	—	—
12	230	200	—	160	—	—	134	—
14	310	277	265	230	—	—	190	—
16	380	370	340	315	—	295	261	335
18	475	475	435	410	—	380	345	415
20	580	583	535	515	—	470	446	505
22	680	681	640	—	—	570	—	600
24	780	769	750	—	—	680	—	695

CONTINUED

CONTINUED

D. b. h. (inches)	Mill tally		International ¼-inch			Scribner		Maine
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
90 FEET, CONTINUED								
26	885	846	870	—	—	795	—	800
28	—	—	1,000	—	—	925	—	905
30	—	—	1,160	—	—	1,070	—	1,010
100 FEET								
10	—	—	—	—	—	—	—	—
12	260	228	—	—	—	—	—	—
14	335	312	—	—	—	—	—	—
16	420	415	—	—	—	—	—	—
18	530	531	—	—	—	—	—	—
20	660	660	630	—	—	540	—	575
22	780	779	740	—	—	655	—	680
24	890	889	860	—	—	780	—	795
26	995	994	990	—	—	905	—	910
28	—	—	1,150	—	—	1,050	—	1,030
30	—	—	1,345	—	—	1,200	—	1,145
110 FEET								
12	—	245	—	—	—	—	—	—
14	—	348	—	—	—	—	—	—
16	—	479	—	—	—	—	—	—
18	—	610	—	—	—	—	—	—
20	—	750	—	—	—	—	—	—
22	—	887	—	—	—	—	—	—
24	—	1,030	960	—	—	880	—	890
26	—	1,180	1,125	—	—	1,015	—	1,020
28	—	—	1,300	—	—	1,170	—	1,145
30	—	—	1,530	—	—	1,335	—	1,270
120 FEET								
14	—	—	380	—	—	—	—	—
16	—	—	590	—	—	—	—	—
18	—	688	635	—	—	—	—	—
20	—	840	795	—	—	—	—	—
22	—	990	930	—	—	—	—	—
24	—	1,135	1,070	—	—	—	—	—
26	—	—	1,250	—	—	—	—	—

CONTINUED

TREE VOLUME—2
BOARD-FOOT VOLUME
By Total Tree Height

CONTINUED

D. b. h. (inches)	Mill tally		International ¼-inch			Scribner		Maine
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				130 FEET				
18	—	—	700	—	—	—	—	—
20	—	—	880	—	—	—	—	—
22	—	—	1,025	—	—	—	—	—
24	—	—	1,175	—	—	—	—	—
26	—	—	1,370	—	—	—	—	—
				140 FEET				
26	—	—	1,500	—	—	—	—	—

[1] SOURCE: Frothingham, E. H. WHITE PINE UNDER FOREST MANAGEMENT. U. S. Dept. Agr. Bul. 13. 70 pp., illus., 1914. *Location:* Massachusetts. *Basis:* Not indicated. *Reliability:* No estimate. *Applicability:* 6-inch stump height, 4-inch i.b. minimum top diameter.

[2] SOURCE: Frothingham, E. H. WHITE PINE UNDER FOREST MANAGEMENT. U. S. Dept. Agr. Bul. 13. 70 pp., illus., 1914. *Location:* New Hampshire. *Basis:* 1,578 trees. *Reliability:* No estimate. *Applicability:* Merchantability limits not given; mill output averaged 30 percent dimension lumber and 70 percent boards, of which 60 percent were cut round-edged.

[3] SOURCE: Demeritt, Dwight B. SECOND-GROWTH WHITE PINE VOLUME TABLE — SOUTHWESTERN MAINE. Univ. Maine. Forestry Dept. Tech. Note 18. 5 pp., 1952. *Location:* Maine. *Basis:* 437 trees. *Reliability:* Average deviation, ±10.3 percent; aggregate difference, 0.32 percent low. *Applicability:* 1-foot stump height, and a 6-inch i.b. top diameter; no deduction for defect.

[4] SOURCE: Anonymous. FORM-CLASS VOLUME TABLES:. Canada Forest Service, Ottawa. 2nd Ed., 261 pp., 1948. *Location:* Ontario and New Brunswick. *Basis:* 522 trees. *Reliability:* No estimate. *Applicability:* 1.5-foot stump height; minimum top diameter of 6-8 inches increasing with d.b.h.; absolute form quotient of 70; trees less than 120 years old.

[5] SOURCE: Olson, Richard A., Gordon Chapman, and Henry W. Hicock. CONNECTICUT VOLUME TABLES FOR PLANTATION GROWN WHITE PINE. Conn. Agr. Expt. Sta. Bul. 514. 23 pp., illus., 1948. *Location:* Connecticut. *Basis:* 847 trees. *Reliability:* Average deviation ±8.7 percent; aggregate difference 0.33 percent low. *Applicability:* Stump height 0.5 feet; minimum top diameter 5.0 inches i.b.

[6] SOURCE: Demeritt, Dwight B. SECOND-GROWTH WHITE PINE VOLUME TABLE — SOUTHWESTERN MAINE. Univ. Maine. Forestry Dept. Tech. Note 18. 5 pp., 1952. *Location:* Maine. *Basis:* 434 trees. *Reliability:* Average deviation ±10.6 percent; aggregate difference 0.91 percent low. *Applicability:* Stump height 1 foot; minimum top diameter 6 inches i.b.; no deduction for defect.

[7] SOURCE: Anonymous. FORM–CLASS VOLUME TABLES. Canada Forest Service. Ottawa. 2nd Ed., 261 pp., 1948. *Location:* Ontario and New Brunswick. *Basis:* 522 trees. *Reliability:* No estimate. *Applicability:* Stump height, 1.5 feet; minimum top diameter 6-8 inches increasing with d.b.h.; absolute form quotient, 70; trees less than 120 years old.

[8] SOURCE: Demeritt, Dwight B. SECOND-GROWTH WHITE PINE VOLUME TABLE — SOUTHWESTERN MAINE. Univ. Maine. Forestry Dept. Tech. Note 18. 5 pp., 1952. *Location:* Maine. *Basis:* 433 trees. *Reliability:* Average deviation ±10.8 percent; aggregate difference 0.9 percent low. *Applicability:* Stump height 1 foot, scaled as utilized; defect deducted.

TREE VOLUME—3
BOARD-FOOT VOLUME
In Merchantable Lengths[1]

D. b. h. (inches)	International ¼-inch		Scribner	
	(2)	(3)	(4)	(5)
		½ LOG		
8	6	—	7	—
10	11	—	11	—
12	16	—	16	—
14	23	—	22	—
16	30	—	29	—
		1 LOG		
8	14	—	14	—
10	23	—	22	—
12	34	—	32	—
14	47	—	44	—
16	62	—	57	—
18	78	—	72	—
20	97	—	89	—
		1½ LOGS		
8	22	26	21	28
10	35	34	33	34
12	52	—	48	—
14	71	—	65	—
16	93	—	86	—
18	118	—	108	—
20	146	—	134	—
22	177	—	162	—
24	211	—	193	—
26	248	—	226	—
		2 LOGS		
8	30	40	29	34
10	48	51	45	42
12	69	64	64	51
14	95	—	87	64
16	125	—	114	—
18	158	—	144	—
20	196	—	178	—
22	237	—	216	—
24	282	—	257	—
26	331	—	301	—
28	385	—	349	—
30	442	—	401	—

CONTINUED

TREE VOLUME—3
BOARD-FOOT VOLUME
In Merchantable Lengths[1]

CONTINUED

D. b. h. (inches)	International ¼-inch		Scribner	
	(2)	(3)	(4)	(5)
		2½ LOGS		
8	38	52	36	47
10	60	68	56	60
12	87	86	80	77
14	119	109	109	94
16	156	131	143	116
18	198	—	181	—
20	245	—	223	—
22	296	—	270	—
24	353	—	321	—
26	415	—	377	—
28	481	—	437	—
30	553	—	501	—
32	629	—	570	—
34	710	—	644	—
36	796	—	722	—
		3 LOGS		
8	46	—	—	—
10	72	88	67	79
12	105	118	96	99
14	143	148	131	125
16	188	178	171	157
18	238	217	217	193
20	294	—	267	—
22	356	—	324	—
24	424	—	385	—
26	498	—	452	—
28	578	—	524	—
30	663	—	602	—
32	755	—	685	—
34	853	—	773	—
36	956	—	866	—
		3½ LOGS		
8	—	—	—	—
10	85	101	78	98
12	123	142	112	125
14	167	176	153	158

CONTINUED

CONTINUED

D. b. h. (inches)	International ¼-inch		Scribner	
	(2)	(3)	(4)	(5)
3½ LOGS, CONTINUED				
16	219	220	200	198
18	278	267	253	241
20	343	317	312	304
22	416	—	377	—
24	495	—	449	—
26	581	—	527	—
28	674	—	611	—
30	774	—	702	—
32	881	—	799	—
34	995	—	902	—
36	1,115	—	1,011	—
4 LOGS				
10	97	—	89	—
12	140	167	128	152
14	192	213	175	193
16	251	260	228	240
18	318	316	289	304
20	392	373	357	380
22	475	—	431	—
24	566	—	513	—
26	664	—	603	—
28	771	—	699	—
30	885	—	802	—
32	1,007	—	913	—
34	1,137	—	1,030	—
36	1,275	—	1,155	—
4½ LOGS				
12	158	195	144	180
14	216	244	197	225
16	282	303	257	288
18	358	367	325	364
20	442	441	401	450
22	535	525	485	544
24	637	—	578	—
26	748	—	678	—
28	867	—	786	—
30	996	—	903	—

CONTINUED

TREE VOLUME—3
BOARD-FOOT VOLUME
In Merchantable Lengths[1]

CONTINUED

D. b. h. (inches)	International ¼-inch		Scribner	
	(2)	(3)	(4)	(5)
4½ LOGS, CONTINUED				
32	1,133	—	1,027	—
34	1,279	—	1,159	—
36	1,435	—	1,300	—
		5 LOGS		
14	240	276	218	261
16	314	342	285	340
18	397	418	361	427
20	491	502	446	523
22	594	584	539	620
24	708	674	642	715
26	831	—	753	—
28	964	—	874	—
30	1,107	—	1,003	—
32	1,259	—	1,141	—
34	1,422	—	1,288	—
36	1,594	—	1,444	—
		5½ LOGS		
14	264	—	240	—
16	345	385	314	388
18	437	471	397	484
20	540	559	490	583
22	654	652	593	682
24	779	754	706	786
26	914	—	829	—
28	1,060	—	961	—
30	1,217	—	1,103	—
32	1,385	—	1,255	—
34	1,564	—	1,417	—
36	1,754	—	1,588	—
		6 LOGS		
16	377	425	342	440
18	477	520	433	540
20	589	615	535	641
22	714	719	647	745
24	849	828	770	860
26	997	—	904	—

CONTINUED

CONTINUED

D. b. h. (inches)	International ¼-inch		Scribner	
	(2)	(3)	(4)	(5)
6 LOGS, CONTINUED				
28	1,157	—	1,048	—
30	1,328	—	1,203	—
32	1,511	—	1,365	—
34	1,706	—	1,546	—
36	1,913	—	1,733	—
		6½ LOGS		
18	—	569	—	590
20	639	669	579	694
22	773	783	701	809
24	920	900	834	940
26	1,080	—	979	—
28	1,253	—	1,136	—
30	1,439	—	1,304	—
32	1,637	—	1,483	—
34	1,849	—	1,674	—
36	2,073	—	1,877	—
		7 LOGS		
20	—	724	—	740
22	834	848	755	862
24	991	977	898	1,000
26	1,164	—	1,054	—
28	1,350	—	1,223	—
30	1,550	—	1,404	—
32	1,763	—	1,597	—
34	1,991	—	1,803	—
36	2,232	—	2,022	—

[1] Merchantable length is expressed in 8-foot half-logs and 16-foot logs.

[2] SOURCE: Bartoo, R. A., and R. J. Hutnik. BOARD FOOT VOLUME TABLES FOR TIMBER SPECIES IN PENNSYLVANIA. Pa. State Forest School. Res. Paper 30. 35 pp., 1962. *Location:* Pennsylvania. *Basis:* 187 trees. *Reliability:* Variation accounted for by estimating relation, 99.1 percent. *Applicability:* Stump height 1 foot; top diameter 6.0 inches inside back.

[3] SOURCE: Brown, R. M., and S. R. Gevorkiantz. VOLUME, YIELD, AND STAND TABLES FOR TREE SPECIES IN THE LAKE STATES. Minn. Agr. Expt. Sta. Tech. Bul. 39. 208 pp., illus., 1934. *Location:* Wisconsin. *Basis:* No information. *Reliability:* Average deviation ±6.9 percent; aggregate difference 0.1 percent high. *Applicability:* Stump height 1 foot; top diameter 5 inches inside bark.

[4] SOURCE: Bartoo, R. A., and R. J. Hutnik. BOARD FOOT VOLUME TABLES FOR TIMBER SPECIES IN PENNSYLVANIA. Pa. State Forest School. Res. Paper 30 35 pp., 1962. *Location:* Pennsylvania. *Basis:* 187 trees. *Reliability:* Variation accounted for by estimating relation, 99.4 percent. *Applicability:* Stump height 1 foot; top diameter 6 inches inside bark.

[5] SOURCE: Gevorkiantz, S. R., and Raphael Zon. SECOND-GROWTH WHITE PINE IN WISCONSIN. Wis. Agr. Expt. Sta. Res. Bul. 98. 40 pp., illus., 1930. *Location:* Wisconsin. *Basis:* 105 trees. *Reliability:* Average deviation ± 7.42 percent; aggregate difference 0.08 percent high. *Applicability:* Stump height 1 foot; top diameter 6 inches inside bark.

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 66[1]

(International ¼-inch rule)

D.b.h. (inches)	Merchantable length, 16-foot logs						
	1	1½	2	2½	3	3½	4
10	24	31	—	—	—	—	—
12	38	49	57	—	—	—	—
14	53	69	81	90	—	—	—
16	74	96	111	125	—	—	—
18	95	124	145	163	178	—	—
20	119	156	183	206	224	—	—
22	146	191	225	253	277	298	—
24	176	231	272	306	337	363	—
26	211	276	325	366	404	437	—
28	246	322	379	429	473	511	546
30	284	373	441	496	547	593	633

[1] In this table and the following tables based on form class, the sources of data based on the different log rules are as follows:

INTERNATIONAL ¼-INCH RULE: Bickford, C. Allen. FORM-CLASS VOLUME TABLES FOR ESTIMATING BOARD-FOOT CONTENTS OF NORTHERN CONIFERS. U. S. Forest Serv. Northeast. Forest Expt. Sta., Sta. Paper 38. 33 pp., illus., 1951. *Location:* New England. *Basis:* Not indicated. *Reliability:* No information. *Applicability:* Minimum top diameter 6-inches inside bark.

MAINE RULE: Carl, Clayton M., and Harold E. Young. FORM-CLASS VOLUME TABLES FOR ESTIMATING BOARD-FOOT CONTENTS OF NORTHERN CONIFERS — MAINE LOG RULE. Univ. Maine. Dept. Forestry Tech. Note 22. 4 pp., 1953. *Location:* New England. *Basis:* Based on data contained in Bickford volume tables, above. *Reliability:* No information. *Applicability:* Minimum top diameter 6-inches inside bark.

SCRIBNER RULE: Brown, R. M., and S. R. Gevorkiantz. VOLUME, YIELD, AND STAND TABLES FOR TREE SPECIES IN THE LAKE STATES. Minn. Agr. Expt. Sta. Tech. Bul. 39. 208 pp., illus., 1934. *Location:* Lake States. *Basis:* 103 trees. *Reliability:* Average deviation ±4.5 percent; aggregate difference 0.2 percent. *Applicability:* Variable top diameter not less than 6 inches inside bark; stump height, 1 foot for trees less than 12 inches d.b.h., 1½ feet for trees 12 inches to 18 inches d.b.h., and 2 feet for trees over 18 inches d.b.h.

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 68

(International ¼-inch rule)

D. b. h. (inches)	Merchantable length, 16-foot logs						
	1	1½	2	2½	3	3½	4
10	26	33	—	—	—	—	—
12	41	52	61	—	—	—	—
14	58	75	88	98	—	—	—
16	78	102	120	134	148	—	—
18	100	133	156	176	193	—	—
20	127	167	197	222	243	262	—
22	157	205	243	273	301	324	—
24	188	247	293	330	364	394	—
26	224	294	348	394	435	471	502
28	260	344	408	462	510	553	592
30	302	399	472	534	591	641	686

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 70

D. b. h. (inches)	Merchantable length, 16-foot logs							
	1		1½		2		2½	
	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine
10	28	31	36	—	—	—	—	—
12	43	46	56	59	66	72	73	—
14	62	65	81	82	95	99	107	—
16	83	86	109	108	129	130	144	147
18	108	111	142	139	168	167	189	188
20	136	140	179	174	212	209	238	242
22	166	171	219	212	261	254	294	288
24	200	206	264	256	314	306	355	346
26	237	244	313	302	372	361	422	406
28	278	286	367	354	437	423	495	477
30	321	331	425	410	504	488	572	551

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3		3½		4		4½	
	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine
16	159	164	—	—	—	—	—	—
18	208	210	224	—	—	—	—	—
20	262	274	284	—	—	—	—	—
22	325	322	350	349	375	376	—	—
24	392	385	426	418	454	451	—	—
26	466	452	506	493	541	534	—	—
28	548	531	596	576	638	622	—	—
30	635	614	690	668	740	721	783	—

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 72

D. b. h. (inches)	Merchantable length, 16-foot logs							
	1		1½		2		2½	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
10	30	33	39	43	45	53	—	—
12	46	49	60	63	72	77	80	—
14	66	69	87	88	102	106	116	—
16	88	91	116	116	138	140	155	158
18	115	119	151	149	179	179	203	203
20	144	148	191	186	227	223	256	252
22	176	181	234	226	279	272	316	307
24	213	219	282	274	336	328	382	370
26	251	259	333	322	398	386	452	437
28	296	305	390	379	466	453	530	512
30	341	351	453	436	539	522	614	590

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3		3½		4		4½	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
14	127	—	—	—	—	—	—	—
16	171	176	—	—	—	—	—	—
18	224	227	242	—	—	—	—	—
20	283	282	306	—	327	—	—	—
22	350	342	378	373	405	404	—	—
24	422	411	459	449	491	487	—	—
26	501	488	545	531	584	574	621	—
28	588	571	640	622	687	672	729	—
30	681	659	743	718	797	777	846	—

D. b. h. (inches)	Merchantable length, 16-foot logs							
	1		1½		2		2½	
	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine
10	32	35	42	46	49	56	—	—
12	50	52	65	66	78	81	87	—
14	71	73	93	93	110	113	125	128
16	93	97	123	123	147	149	167	169
18	121	125	160	158	191	191	217	216
20	153	157	203	198	242	238	275	270
22	188	193	250	242	297	291	338	330
24	226	233	300	292	359	350	409	396
26	266	274	354	344	424	414	482	468
28	311	321	414	402	496	483	566	546
30	361	372	481	465	574	558	656	633

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3		3½		4		4½	5
	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Int. ¼″
14	136	144	—	—	—	—	—	—
16	183	189	197	—	—	—	—	—
18	240	242	260	—	—	—	—	—
20	305	303	329	330	352	356	—	—
22	375	368	407	401	435	434	—	—
24	453	443	493	484	529	524	562	—
26	537	522	584	570	628	618	667	—
28	629	610	684	666	736	722	782	—
30	727	708	796	772	855	835	909	958

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 75

D. b. h. (inches)	Merchantable length, 16-foot logs							
	1		1½	2		2½	3	
	Int. ¼″	Scribner	Int. ¼″	Int. ¼″	Scribner	Int. ¼″	Int. ¼″	Scribner
8	—	12	—	—	—	—	—	—
10	33	25	43	50	40	—	—	—
12	51	42	67	80	69	89	—	—
14	72	63	95	113	105	128	141	131
16	97	86	127	152	144	173	190	182
18	125	113	165	197	191	224	249	240
20	157	144	209	250	245	284	315	309
22	193	177	258	307	302	350	388	383
24	232	—	309	370	—	422	469	—
26	275	—	365	438	—	499	556	—
28	321	—	426	512	—	585	650	—
30	371	—	495	592	—	678	752	—

D. b. h. (inches)	Merchantable length, 16-foot logs					
	3½	4		4½	5	
	Int. ¼″	Int. ¼″	Scribner	Int. ¼″	Int. ¼″	Scribner
14	—	—	162	—	—	—
16	205	—	232	—	—	—
18	270	288	306	—	—	—
20	341	365	392	—	—	430
22	422	452	488	479	—	538
24	510	548	—	582	—	—
26	606	651	—	692	—	—
28	708	763	—	811	—	—
30	824	886	—	943	994	—

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 76

D. b. h. (inches)	Merchantable length, 16-foot logs							
	1		1½		2		2½	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
10	34	37	45	48	52	60	—	—
12	52	55	69	71	83	87	92	—
14	74	77	98	98	117	120	132	136
16	100	104	132	132	157	160	179	182
18	129	133	171	169	204	205	232	232
20	162	166	216	209	258	252	294	288
22	198	203	266	256	317	310	362	352
24	237	244	319	308	382	371	436	422
26	284	292	377	367	452	442	516	501
28	331	341	439	428	528	515	604	584
30	381	394	510	494	611	595	700	676

D. b. h. (inches)	Merchantable length, 16-foot logs									
	3		3½		4		4½		5	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
14	146	153	—	—	—	—	—	—	—	—
16	197	203	214	—	—	—	—	—	—	—
18	258	258	280	282	299	305	—	—	—	—
20	326	324	354	352	379	381	—	—	—	—
22	402	394	437	430	469	465	498	—	—	—
24	485	472	528	515	567	558	603	—	—	—
26	575	560	628	613	675	666	717	—	—	—
28	672	653	733	715	790	777	840	825	886	880
30	778	757	852	827	917	897	977	956	1,031	1,016

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 78

D. b. h. (inches)	Merchantable length, 16-foot logs									
	1		1½		2		2½		3	
	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine
10	36	39	48	51	56	63	63	—	—	—
12	56	59	74	76	88	93	98	106	109	119
14	78	81	104	104	124	127	140	146	156	164
16	106	109	141	139	168	169	192	192	212	216
18	136	140	182	178	217	217	248	247	276	277
20	171	176	229	224	275	271	313	309	348	347
22	211	217	282	274	337	332	387	378	430	424
24	252	259	338	328	406	396	463	452	517	507
26	299	308	400	389	480	470	550	534	614	599
28	347	358	464	452	560	546	642	622	716	698
30	403	416	540	524	648	633	744	721	830	809

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3½		4		4½		5	
	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine	Int. ¼″	Maine
14	167	—	—	—	—	—	—	—
16	231	236	247	256	—	—	—	—
18	300	302	321	328	—	—	—	—
20	379	378	407	409	431	—	—	—
22	467	462	503	501	535	—	—	—
24	563	552	606	598	644	—	681	—
26	672	656	722	713	768	760	814	806
28	783	764	844	829	898	886	948	942
30	909	885	980	961	1,045	1,026	1,104	1,090

D. b. h. (inches)	Merchantable length, 16-foot logs									
	1			1½		2			2½	
	Int. ¼″	Maine	Scribner	Int. ¼″	Maine	Int. ¼″	Maine	Scribner	Int. ¼″	Maine
8	—	—	15	—	—	—	—	—	—	—
10	39	42	30	51	55	60	68	48	68	—
12	59	62	50	78	80	93	99	81	105	113
14	83	86	74	110	111	133	136	121	151	155
16	112	115	101	149	148	178	180	168	204	206
18	144	148	131	193	190	231	231	219	265	264
20	181	186	166	242	237	291	288	279	333	329
22	221	228	204	297	290	357	351	344	410	401
24	266	274	—	357	348	431	422	—	494	482
26	315	324	—	423	411	509	498	—	585	568
28	367	379	—	493	480	595	582	—	683	664
30	424	438	—	571	554	687	671	—	791	766

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3			3½		4		
	Int. ¼″	Maine	Scribner	Int. ¼″	Maine	Int. ¼″	Maine	Scribner
12	116	127	97	—	—	—	—	—
14	167	174	152	180	—	—	—	189
16	226	231	209	246	252	265	272	265
18	295	296	276	321	324	345	351	353
20	371	370	352	404	404	435	437	448
22	457	451	436	499	493	537	535	556
24	551	542	—	602	592	649	641	—
26	652	639	—	715	700	771	762	—
28	765	745	—	837	814	902	882	—
30	884	861	—	969	943	1,046	1,025	—

D. b. h. (inches)	Merchantable length, 16-foot logs				
	4½		5		
	Int. ¼″	Maine	Int. ¼″	Maine	Scribner
18	367	—	—	—	387
20	462	—	—	—	498
22	571	572	602	608	615
24	691	686	729	731	—
26	822	813	870	866	—
28	963	946	1,017	1,010	—
30	1,117	1,095	1,182	1,165	—

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 82

D. b. h. (inches)	Merchantable length, 16-foot logs									
	1		1½		2		2½		3	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
10	41	44	54	58	65	72	74	—	—	—
12	62	65	82	84	99	104	113	119	124	134
14	88	91	117	117	142	144	162	165	178	185
16	117	121	157	156	189	191	216	218	241	246
18	153	157	205	201	246	245	283	262	315	279
20	190	196	256	250	308	305	354	350	394	394
22	232	239	312	306	378	372	434	425	484	478
24	281	289	377	368	456	448	525	510	585	573
26	331	341	446	434	538	527	620	602	691	678
28	388	401	522	510	630	618	724	706	815	794
30	447	463	603	588	727	713	839	816	938	918

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3½		4		4½		5	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
12	134	—	—	—	—	—	—	—
14	194	—	208	—	—	—	—	—
16	262	269	283	292	—	—	—	—
18	343	308	369	338	393	—	—	—
20	430	366	463	467	494	—	518	—
22	531	524	572	570	608	608	643	647
24	642	629	693	685	738	731	777	777
26	759	743	820	808	876	866	926	923
28	891	870	961	946	1,029	1,012	1,086	1,079
30	1,029	1,006	1,112	1,095	1,189	1,171	1,260	1,247

D. b. h. (inches)	Merchantable length, 16-foot logs									
	1		1½		2		2½		3	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
10	43	46	57	60	69	75	79	—	86	—
12	66	69	87	90	105	111	120	128	132	144
14	93	97	124	126	150	155	172	176	190	198
16	123	127	166	164	200	202	230	231	258	260
18	160	164	216	212	261	259	300	297	334	335
20	200	206	270	264	327	323	376	370	419	417
22	246	253	329	324	400	395	460	452	514	509
24	296	305	397	390	481	474	554	542	620	611
26	347	358	471	458	570	559	658	639	736	719
28	406	419	550	536	665	652	768	746	864	840
30	470	486	635	620	769	754	887	864	995	974

D. b. h. (inches)	Merchantable length, 16-foot logs							
	3½		4		4½		5	
	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine	Int. ¼"	Maine
12	144	—	—	—	—	—	—	—
14	207	—	221	—	—	—	—	—
16	280	285	301	310	321	—	—	—
18	365	366	393	397	419	—	—	—
20	460	448	495	480	527	—	557	—
22	564	558	609	607	650	648	687	688
24	681	672	739	732	785	781	829	830
26	809	790	875	862	936	922	989	982
28	946	923	1,024	1,006	1,097	1,078	1,160	1,150
30	1,094	1,070	1,184	1,166	1,267	1,248	1,343	1,329

TREE VOLUME—4
BOARD-FOOT VOLUME
Girard Form Class 85

D. b. h. (inches)	Merchantable length, 16-foot logs							
	1		1½	2		2½	3	
	Int. ¼″	Scribner	Int. ¼″	Int. ¼″	Scribner	Int. ¼″	Int. ¼″	Scribner
8	—	19	—	—	—	—	—	—
10	45	36	59	71	58	81	90	—
12	68	58	91	108	94	124	136	115
14	95	84	127	154	138	177	196	171
16	127	115	171	206	192	237	266	237
18	164	150	222	268	251	308	344	313
20	205	189	277	336	316	387	432	398
22	251	234	338	411	391	473	529	493
24	302	—	407	493	—	569	637	—
26	357	—	484	586	—	677	758	—
28	417	—	564	683	—	790	888	—
30	481	—	651	790	—	911	1,023	—

D. b. h. (inches)	Merchantable length, 16-foot logs					
	3½	4		4½	5	
	Int. ¼″	Int. ¼″	Scribner	Int. ¼″	Int. ¼″	Scribner
12	149	—	146	—	—	—
14	214	228	220	—	—	—
16	289	311	306	332	—	340
18	376	405	404	432	456	449
20	475	511	513	544	576	574
22	581	627	634	671	709	709
24	700	759	—	809	855	—
26	834	903	—	966	1,020	—
28	974	1,056	—	1,131	1,197	—
30	1,126	1,220	—	1,306	1,384	—

D.b.h. (inches)	Volume from 8.0 inches i.b. to 4.0 inches i.b.		
	Cubic feet	Peeled cords	Rough cords
	1 BOLT		
27	1.161	0.012	0.014
28	1.177	.012	.014
29	1.192	.013	.014
30	1.205	.013	.014
	2 BOLTS		
17	1.977	0.021	0.023
18	2.040	.021	.024
19	2.094	.022	.025
20	2.139	.023	.025
21	2.178	.023	.026
22	2.212	.023	.026
23	2.242	.024	.026
24	2.268	.024	.028
25	2.291	.024	.027
26	2.311	.024	.027
27	2.329	.025	.027
28	2.345	.025	.028
29	2.360	.025	.028
30	2.373	.025	.028
	3 BOLTS		
15	2.981	0.031	0.035
16	3.071	.032	.036
17	3.146	.033	.037
18	3.209	.034	.038
19	3.263	.034	.038
20	3.308	.035	.039
21	3.347	.035	.039
22	3.381	.036	.040
23	3.411	.036	.040
24	3.437	.036	.040
25	3.460	.036	.041
26	3.480	.037	.041
27	3.498	.037	.041
28	3.514	.037	.041
29	3.529	.037	.041
30	3.542	.037	.042

CONTINUED

TREE VOLUME—5
TOPWOOD VOLUME
4-Foot Bolts Above 8-Inch Top

CONTINUED

D.b.h. (inches)	Volume from 8.0 inches i.b. to 4.0 inches i.b.		
	Cubic feet	Peeled cords	Rough cords
	4 BOLTS		
10	3.213	0.034	0.038
11	3.505	.037	.041
12	3.728	.039	.044
13	3.901	.041	.046
14	4.038	.043	.047
15	4.149	.044	.049
16	4.239	.045	.050
17	4.314	.045	.051
18	4.377	.046	.051
19	4.431	.047	.052
20	4.476	.047	.053
21	4.515	.047	.053
22	4.549	.048	.053
23	4.579	.048	.054
24	4.605	.049	.054
25	4.628	.049	.054
26	4.648	.049	.055
	5 BOLTS		
10	4.381	0.046	0.051
11	4.673	.049	.055
12	4.896	.051	.058
13	5.069	.053	.060
14	5.206	.055	.061
15	5.317	.056	.063
16	5.407	.057	.064
17	5.482	.058	.065
18	5.545	.058	.065
19	5.599	.059	.066
20	5.644	.059	.066
21	5.683	.060	.067
22	5.717	.060	.067
23	5.747	.061	.068
24	5.773	.061	.068
25	5.796	.061	.068
26	5.816	.061	.068

CONTINUED

CONTINUED

D.b.h. (inches)	Volume from 8.0 inches i.b. to 4.0 inches i.b.		
	Cubic feet	Peeled cords	Rough cords
	6 BOLTS		
10	5.549	0.058	0.065
11	5.841	.061	.069
12	6.064	.064	.071
13	6.237	.066	.073
14	6.374	.067	.075
15	6.485	.068	.076
16	6.575	.069	.077
	7 BOLTS		
10	6.718	0.071	0.079
11	7.010	.074	.083
12	7.233	.076	.085
13	7.406	.078	.087
	8 BOLTS		
10	7.886	0.083	0.093
11	8.178	.086	.096

SOURCE: Carl, C. M., J. C. Mawson, and H. E. Young. WHITE PINE TOPWOOD VOLUME TABLES. Univ. Maine Dept. Forestry. Tech. Note 36. 4 pp., 1955.

LOCATION: Maine.

BASIS: 150 trees.

RELIABILITY: No information.

APPLICABILITY: To determine the pulpwood volume above sawlog merchantability limits.

Stand Growth and Yield Estimators

Much forest mensuration is aimed at developing projections of timber growth and yield. Such projections are usually based on two distinct analytical techniques: yield tables and stand tables. A yield table generally indicates the volume (or weight) of timber that will be available per unit area at various ages and for various site qualities. Yield table variants include:

Normal yield tables.—Provide estimates of yield based on standage and site quality for only the single stocking condition called normal stocking. Normal stocking is not a precise concept, but implies a fully occupied site and generally a number of trees per unit area in excess of the minimum number necessary to fully occupy the site.

Empirical yield tables.—Provide similar information, again for only a single level of stocking, but this time for the average level of stocking found on the sample plots that serve as the table's basis.

Variable-density yield tables.—Provide yield estimates for various stand densities as well as for various ages and site qualities.

Normal and empirical yield-table estimates of volume must be modified when they are applied to stands with non-normal or other-than-average densities. Methods of application for these cases are given in most standard forest mensuration texts. Yield tables usually include other information about stands beside volume, such as basal area, average height of trees, average number of trees, and average d.b.h.

A second approach to growth and yield estimation is provided by the stand table projection. Stand table projection is most often used to provide estimates of the increase in volume to anticipate for a short period in the future, in contrast to the long projections available from yield tables. Instead of relating yield to age, site, and density, the stand table projection relates change

in yield to direct estimates of accretion, ingrowth, and mortality based on the average numbers of trees in various diameter classes, and their rates of diameter growth, height growth, and mortality. Stand table projections are often more precise estimates for short-term growth and yield than are yield tables.

All the growth and yield information presented here is presented on a per-acre basis, and all refers to second-growth rather than virgin stands.

STAND GROWTH—1
NORMAL YIELD TABLE
Natural Stands—New Hampshire

Stand age from seed	Average total height of dominants	All trees[1]			Gross volume		
		Average d.b.h.	Number of trees	Basal area	Total cubic feet		Board[4] feet
					Rough[2]	Peeled[3]	
Years	*Feet*	*Inches*	*No.*	*Sq. ft.*	*Cu. ft.*	*Cu. ft.*	*M bd. ft.*
		50-YEAR SITE INDEX: 54					
10	4.0	1.0	2,408	14	530	420	—
20	14.5	2.3	2,060	60	1,350	1,130	—
30	28.5	3.9	1,676	139	2,450	2,060	5.3
40	42.5	5.5	1,118	183	3,780	3,180	14.2
50	54.0	7.0	764	204	5,200	4,370	24.1
60	64.0	8.6	543	219	6,530	5,490	33.6
70	71.5	10.1	412	229	7,760	6,520	42.3
80	78.0	11.7	318	238	8,820	7,410	50.1
90	83.0	13.2	258	245	9,750	8,190	57.0
100	87.0	14.5	219	251	10,530	8,845	62.8
		50-YEAR SITE INDEX: 64					
10	6.0	1.4	2,015	20	650	550	—
20	19.5	3.2	1,626	90	1,750	1,470	—
30	36.5	5.1	1,192	169	3,250	2,730	9.6
40	51.5	7.1	760	209	5,130	4,310	23.5
50	64.0	8.9	537	232	7,000	5,880	36.6
60	74.5	10.7	397	248	8,500	7,140	46.9
70	83.0	12.4	311	261	9,840	8,270	56.1
80	90.0	14.1	251	272	10,930	9,180	64.0
90	95.5	15.7	210	282	11,850	9,950	70.9
100	100.0	17.1	182	290	12,630	10,610	77.0

CONTINUED

CONTINUED

Stand age from seed	Average total height of dominants	All trees[1]			Gross volume		
		Average d.b.h.	Number of trees	Basal area	Total cubic feet		Board[4] feet
					Rough[2]	Peeled[3]	
50-YEAR SITE INDEX: 74.5							
10	7.2	1.7	1,728	29	800	670	—
20	24.5	4.0	1,322	115	2,100	1,760	4.5
30	44.0	6.4	879	196	4,000	3,360	13.9
40	61.0	8.6	583	235	6,500	5,460	32.8
50	74.5	10.8	408	260	8,800	7,390	49.1
60	85.5	12.8	311	278	10,500	8,820	60.2
70	94.5	14.7	249	293	11,900	10,000	69.9
80	101.5	16.5	207	307	13,000	10,920	77.8
90	108.0	18.2	177	319	14,000	11,760	84.8
100	113.0	19.8	154	330	14,700	12,350	91.2

[1] Minimum diameter not given but probably is 0.5 inch d.b.h.

[2] Total cubic-foot volume, including stump, stem, top, and bark of all trees 5.0 inches d.b.h. and over.

[3] Rough cubic-foot volume reduced by 16 percent.

[4] Based on a mill-tally volume table for New Hampshire, shown in TREE VOLUME — 1 in this report.

SOURCE: Frothingham, E. H. WHITE PINE UNDER FOREST MANAGEMENT. U. S. Dept. Agr. Bul. 13. 70 pp., illus., 1914. *Location:* New Hampshire. *Basis:* Observations in 196 normally stocked stands. *Reliability:* No estimate.

Stand age from seed	Average total height of dominants	All trees 0.5 inches + d.b.h.				Trees 9.0 inches + d.b.h.[1]				Gross volume		
		Average total height	Average d.b.h.	Number of trees	Basal area	Average total height	Average d.b.h.	Number of trees	Basal area	Total	Merchantable	
Years	*Feet*	*Feet*	*Inches*	*No.*	*Sq. ft.*	*Feet*	*Inches*	*No.*	*Sq. ft.*	*Cu. ft.*[2]	*M bd. ft.*[3]	*M bd. ft.*[4]
					50-YEAR SITE INDEX: 50							
30	27	23	3.2	2,800	156	—	—	—	—	1,750	—	—
40	39	35	5.0	1,360	184	—	—	—	—	3,100	4.0	—
50	50	47	6.3	930	201	54	9.9	39	21	4,250	11.5	2.4
60	59	56	7.3	730	212	61	10.2	119	68	5,350	19.8	9.5
70	67	64	8.2	605	219	69	10.6	188	116	6,300	28.0	19.4
80	74	71	9.0	510	224	75	11.0	238	156	7,080	36.5	28.9
90	79	77	9.8	440	229	79	11.4	260	184	7,700	43.5	34.9
100	83	81	10.5	385	232	82	11.9	262	201	8,200	49.0	43.3
110	86	84	11.0	356	235	85	12.2	262	214	8,600	53.0	49.1
120	88	86	11.5	330	237	87	12.6	258	222	8,900	56.0	51.6
					50-YEAR SITE INDEX: 60							
30	32	28	3.9	2,150	179	—	—	—	—	2,250	—	—
40	47	44	6.1	1,040	210	51	9.9	28	15	4,200	10.5	1.7
50	60	57	7.6	725	230	63	10.3	154	90	5,800	23.0	12.5
60	71	68	9.0	546	242	71	11.0	254	167	7,200	36.5	29.0
70	80	77	10.1	447	250	80	11.6	284	208	8,470	49.0	42.4

80	88	85	11.1	384	257	87	12.3	287	236	9,500	59.0	54.8
90	94	92	11.9	337	262	92	12.9	271	246	10,400	66.5	63.5
100	99	97	12.6	303	265	97	13.5	257	254	11,100	72.0	68.4
110	103	101	13.2	278	267	100	13.9	247	260	11,700	77.0	75.3
120	106	104	13.7	263	270	103	14.3	238	267	12,200	80.5	78.4

50-YEAR SITE INDEX: 70

30	38	34	4.3	1,800	188	—	—	—	—	2,900	—	—
40	55	52	6.7	890	221	59	10.1	70	39	5,150	15.5	5.4
50	70	68	8.5	613	242	73	10.7	227	143	7,200	34.5	25.9
60	82	80	9.9	475	255	83	11.5	288	207	9,000	51.5	43.5
70	93	91	11.2	386	263	93	12.4	293	244	10,570	66.0	61.7
80	103	101	12.3	327	271	102	13.2	274	259	11,900	77.0	72.8
90	110	109	13.3	284	275	108	14.0	252	270	12,950	85.0	84.3
100	115	114	14.2	255	280	112	14.8	235	279	13,750	91.5	97.9
110	120	119	14.9	235	283	117	15.4	221	286	14,400	96.5	105.4
120	123	122	15.4	220	285	119	15.8	209	286	14,900	100.0	108.5

[1] An extension of data originally presented.

[2] Total cubic-foot volume including stump, stem, and top, but excluding bark, as reported.

[3] All trees 7.0 inches d.b.h. and above based on International 1/8-inch log rule, 1-foot stump, and 5.0-inch top diameter inside bark, as reported.

[4] All trees 9.0 inch d.b.h. and over based on International 1/4-inch log rule, 1-foot stump, and 6.0-inch top diameter inside bark, not reported by source.

SOURCE: Gevorkiantz, S. R., and Raphael Zon. SECOND-GROWTH WHITE PINE IN WISCONSIN. Wis. Agr. Expt. Sta. Bul. 98. 40 pp., illus., 1930. *Location:* Northern Wisconsin. *Basis:* 92 sample plots varying from 1/10 to 3/10 acre. *Reliability:* No estimate.

STAND GROWTH—3
NORMAL YIELD TABLE
Natural Stands—Southern Appalachians

Age	Basal area	Volume[1]		Age	Basal area	Volume[1]	
Years	*Sq. ft.*	*Cu. ft.*	*Bd. ft.*	*Years*	*Sq. ft.*	*Cu. ft.*	*Bd. ft.*
	SITE 50				SITE 80		
30	125	1,400	—	30	155	2,825	—
40	147	2,480	3,200	40	181	4,880	16,240
50	161	3,400	9,220	50	200	6,800	34,720
60	170	4,280	15,840	60	210	8,600	47,680
70	175	5,040	22,400	70	218	10,080	60,800
80	179	5,664	29,200	80	225	11,320	70,400
90	183	6,160	34,800				
100	186	6,560	39,200				
	SITE 60				SITE 90		
30	143	1,800	—	30	158	3,280	—
40	168	3,360	8,400	40	183	5,560	20,800
50	184	4,640	18,400	50	203	7,680	41,040
60	194	5,760	29,200	60	214	9,920	57,600
70	200	6,776	39,200	70	223	11,600	72,400
80	206	7,600	47,200	80	231	12,960	82,400
90	210	8,320	53,200				
100	212	8,880	57,600				
	SITE 70				SITE 100		
30	150	2,320	—	30	161	3,700	—
40	177	4,120	12,400	40	185	6,160	24,800
50	194	5,760	27,600	50	205	8,400	46,400
60	204	7,200	41,200	60	216	11,144	66,720
70	211	8,456	52,800	70	226	12,920	82,400
80	217	9,520	61,600	80	235	14,400	92,560

[1] Cubic-foot volume includes all trees. Board-foot volume includes trees above 7 inches d.b.h. utilized to a 5-inch top diameter. Volumes do not include bark.

SOURCE: Doolittle, W. T. YIELD TABLES FOR WHITE PINE. (Unpublished data adapted from Gevorkiantz, S. R. and Raphael Zon. SECOND GROWTH WHITE PINE IN WISCONSIN. Wis. Agr. Expt. Sta. Res. Bul. 98, 40 pp., illus., 1930.) U. S. Forest Serv. Southeast. Forest Expt. Sta., 1956. *Location:* Southern Appalachians. *Basis:* Wisconsin data reported by Gevorkiantz and Zon. *Reliability:* No estimate.

STAND GROWTH—4
EMPIRICAL YIELD TABLE
4 x 4-foot Plantations—Pennsylvania

Stand age from planting	Average total height of dominants and co-dominants	All trees 1.0 inch + d.b.h.				Volume	
		Average d.b.h.	Average total height	Number of trees	Basal area	Total[1]	Merchantable[2]
Years	*Feet*	*Inches*	*Feet*	*No.*	*Sq. ft.*	*Cu. ft.*	*Cords*
			50-YEAR SITE INDEX: 40				
15	11	2.0	13.9	1,001	20.0	658	—
20	16	2.7	17.4	2,519	97.0	1,007	—
25	20	3.3	20.5	2,324	135.0	1,456	0.5
30	24	3.8	23.7	1,991	157.3	1,975	2.6
35	29	4.3	27.8	1,697	171.4	2,498	5.6
40	33	4.8	31.6	1,424	179.0	3,011	9.4
45	38	5.2	35.1	1,228	181.3	3,461	13.8
50	40	5.5	37.4	1,083	181.3	3,838	17.1
55	42	5.8	39.4	1,006	181.3	4,177	19.3
			50-YEAR SITE INDEX: 50				
15	14	2.5	15.5	1,326	43.1	780	—
20	20	3.2	20.0	2,071	116.0	1,330	0.2
25	26	3.8	24.4	1,882	150.9	1,977	2.6
30	31	4.4	29.0	1,611	171.0	2,684	6.3
35	36	5.0	34.5	1,372	183.2	3,393	10.4
40	41	5.5	39.6	1,148	189.4	4,079	16.2
45	46	6.0	44.1	976	191.2	4,692	22.2
50	50	6.5	47.5	840	191.2	5,210	27.6
55	54	6.7	50.2	774	191.2	5,656	32.5
			50-YEAR SITE INDEX: 60				
15	18	2.9	17.0	1,369	64.2	929	—
20	24	3.7	22.5	1,784	132.4	1,723	1.4
25	30	4.4	28.2	1,570	164.9	2,609	5.9
30	37	5.0	34.2	1,322	183.0	3,549	12.1
35	43	5.7	41.1	1,101	193.6	4,482	19.8
40	50	6.3	47.5	919	198.9	5,377	27.9
45	55	7.0	53.0	759	199.9	6,185	35.0
50	60	7.5	57.6	651	199.9	6,869	41.4
55	64	8.0	60.9	576	199.9	7,454	47.0
			50-YEAR SITE INDEX: 70				
15	21	3.3	18.6	1,386	82.9	1,076	0.2
20	30	4.2	25.1	1,543	146.3	2,110	3.6

CONTINUED

STAND GROWTH—4
EMPIRICAL YIELD TABLE
4 x 4-foot Plantations—Pennsylvania

CONTINUED

Stand age from planting	Average total height of dominants and co-dominants	All trees 1.0 inch + d.b.h.				Volume	
		Average d.b.h.	Average total height	Number of trees	Basal area	Total[1]	Merchant-able[2]
50-YEAR SITE INDEX: 70, CONTINUED							
25	38	5.0	32.1	1,324	176.8	3,231	10.4
30	44	5.7	39.4	1,104	192.8	4,399	19.5
35	51	6.4	47.7	900	202.5	5,553	30.0
40	58	7.2	55.4	729	206.7	6,655	40.1
45	64	8.0	62.0	594	207.3	7,654	48.6
50	70	8.8	67.6	489	207.3	8,505	56.0
55	75	9.6	71.8	412	207.3	9,224	62.7
50-YEAR SITE INDEX: 80							
15	25	3.7	20.1	1,266	97.0	1,208	0.9
20	34	4.6	27.7	1,342	157.6	2,458	6.2
25	43	5.5	35.9	1,142	186.4	3,793	15.1
30	51	6.3	44.6	932	201.3	5,166	26.5
35	59	7.2	54.3	736	209.6	6,519	40.3
40	66	8.2	63.3	582	213.1	7,806	52.5
45	72	9.3	71.0	453	213.3	8,978	62.3
50	80	10.5	77.6	357	213.3	9,980	70.4
55	85	11.6	82.5	288	213.3	10,819	78.2
50-YEAR SITE INDEX: 90							
Years	Feet	Inches	Feet	No.	Sq. ft.	Cu. ft.	Cords
15	28	4.2	21.7	1,098	104.1	1,332	1.9
20	38	5.1	30.2	1,156	164.2	2,787	8.5
25	48	6.0	39.7	992	192.0	4,322	19.5
30	57	6.9	49.8	793	206.1	5,890	33.5
35	66	7.9	60.9	624	213.8	7,435	50.6
40	75	9.2	71.1	474	216.8	8,894	64.1
45	84	10.7	79.9	349	216.8	10,236	74.5
50	90	12.3	87.6	262	216.8	11,375	83.4
55	95	14.1	92.3	203	216.8	12,327	91.3

[1] Total cubic-foot volume including stump, stem and bark, but not limbwood.

[2] Rough cords to a variable top of not less than 4.0 inches i.b., and a 1-foot stump.

SOURCE: Delong, Thomas S. YIELD AND STAND TABLES FOR PLANTATION WHITE PINE IN PENNSYLVANIA. Pa. Dept. Forests and Waters Note 8-b., 1955. *Location:* Data from 8 counties in eastern and central Penna. *Basis:* Remeasurement data on 22 sample plots from 1/10 to 1/4 acre, in white pine plantations with spacings from 3½ x 3½ feet to 5 x 5 feet. *Reliability:* Standard errors of estimate range from 5 to 13 percent for various statistics.

Age above breast height	Average total height		Volume per square feet of basal area[1]			Average basal area[2]	Average volume per acre[1]		
	Dominants	All trees	Total cubic feet	Merchantable cubic feet	Merchantable board feet		Total cubic feet	Merchantable cubic feet	Merchantable board feet
Years	*Feet*	*Feet*	*Cu. ft.*	*Cu. ft.*	*Bd. ft.*	*Sq. ft.*	*Cu. ft.*	*Cu. ft.*	*M bd. ft.*
			50-YEAR SITE INDEX: 40						
20	20	—	—	—	—	50	—	—	—
40	33	25	14.8	7.1	15	93	1,376	660	1.4
60	46	36	17.8	11.1	28	106	1,887	1,177	3.0
80	55	44	20.3	14.5	43	110	2,233	1,595	4.7
100	60	49	22.2	16.7	55	115	2,553	1,921	6.3
120	65	54	24.2	19.0	66	118	2,856	2,242	7.8
140	67	57	25.3	20.3	75	122	3,087	2,477	9.2
160	69	59	26.2	21.4	81	126	3,301	2,696	10.2
180	70	60	26.7	21.9	84	130	3,471	2,847	10.9
200	71	61	27.0	22.3	87	133	3,591	2,966	11.6

CONTINUED

STAND GROWTH—5
EMPIRICAL YIELD TABLE
Mixed Red and White Pine—Canada

STAND GROWTH—5
EMPIRICAL YIELD TABLE
Mixed Red and White Pine—Canada

CONTINUED

Age above breast height	Average total height		Volume per square feet of basal area[1]			Average basal area[2]	Average volume per acre[1]		
	Dominants	All trees	Total cubic feet	Merchantable cubic feet	Merchantable board feet		Total cubic feet	Merchantable cubic feet	Merchantable board feet
Years	*Feet*	*Feet*	*Cu. ft.*	*Cu. ft.*	*Bd. ft.*	*Sq. ft.*	*Cu. ft.*	*Cu. ft.*	*M bd. ft.*
				50-YEAR SITE INDEX:		50			
20	25	—	—	—	—	69	—	—	—
40	43	33	16.8	9.9	24	121	2,033	1,198	2.9
60	58	47	21.5	15.8	49	126	2,709	1,991	6.2
80	69	59	26.2	21.4	81	130	3,406	2,782	10.5
100	75	66	29.1	24.8	105	135	3,929	3,348	14.2
120	80	72	31.9	27.6	124	138	4,402	3,809	17.1
140	83	76	33.8	29.8	140	143	4,833	4,261	20.0
160	85	79	35.2	31.2	153	147	5,174	4,586	22.5
180	86	80	35.6	31.8	157	151	5,376	4,802	23.7
200	87	81	36.1	32.3	161	155	5,595	5,006	25.0
				50-YEAR SITE INDEX:		60			
20	30	*22	14.2	6.2	13	99	*1,406	*614	*1.3
40	52	42	19.7	13.6	39	155	3,054	2,108	6.0
60	68	57	25.3	20.3	75	161	4,073	3,268	12.1
80	78	69	30.6	26.3	114	166	5,080	4,366	18.9
100	85	79	35.1	31.2	152	172	6,037	5,366	26.1

160	95	90	40.1	36.5	196	189	7,579	6,899	37.0
180	97	92	40.8	37.2	202	194	7,915	7,217	39.2
200	98	93	41.2	37.6	205	200	8,240	7,520	41.0
				50-YEAR SITE INDEX: 70					
20	37	28	15.5	8.1	18	113	1,752	915	2.0
40	61	50	22.6	17.1	56	170	3,842	2,907	9.5
60	79	71	31.5	27.3	121	176	5,544	4,805	21.3
80	90	85	38.0	34.2	179	179	6,916	6,224	32.6
100	98	93	41.2	37.6	205	188	7,746	7,069	38.5
120	103	*97	42.5	39.1	215	194	*8,245	*7,585	*41.7
140	106	*99	43.1	39.6	219	200	*8,620	*7,920	*43.8
160	109	*100	43.4	40.0	222	206	*8,940	*8,240	*45.7
180	111	*101	43.7	40.2	223	212	*9,264	*8,522	*47.3
200	112	*102	43.9	40.4	224	218	*9,570	*8,807	*48.8

* Extrapolations of data.

[1] Merchantable board-foot volume is based on the Ontario log rule. Other volumes measured are not defined in this source, nor are merchantability limits given.

[2] Estimates of present and future volume for stands of other than average basal area, and/or with intermediate site indices, are made as follows: A. Using the table closest to the age-dominant height relationship observed in the stand of interest, determine the average volume per square foot of basal area that corresponds to the observed dominant height. For example, if a 64-year-old stand has a dominant height of 73 feet, the site-index 60 table indicates an average total cubic-foot volume per square foot of basal area of 28.0 for a dominant height of 73 feet, by interpolation. This average multiplied by the observed basal area provides the adjusted estimate of present volume. B. Compute the percentage differences in dominant height and basal area that exist now from observed and table values. Apply these percentages to the table values for dominant height and basal area for the future age of interest, and proceed as above to estimate an adjusted future volume. This projection assumes that the relative degree of normal stocking will be maintained, and so should be modified for long projection periods.

SOURCE: McCormack, R. J. 1956. GROWTH AND YIELD OF RED AND WHITE PINE. (Unpublished report of the Canada Dept. North. Affairs and Natural Resources, Forestry Br.; as reported by Horton, K. W. and Bedell, G. D. H. 1960. WHITE AND RED PINE ECOLOGY, SILVICULTURE AND MANAGEMENT. Canada Dept. North. Affairs and Natural Resources, Forestry Br. Bul. 124. 185 pp., illus.) *Location:* Ontario and Quebec. *Basis:* More than 500 one-fifth acre plots. *Reliability:* No estimate.

STAND GROWTH—5
EMPIRICAL YIELD TABLE
Mixed Red and White Pine—Canada

STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantal yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
	25-YEAR SITE INDEX: 45			
		Original spacing 4' x 4'		
10	15	3.1	298	—
15	28	3.7	1,171	—
20	38	4.2	2,150	—
25	45	4.7	2,958	1,542
30	51	5.2	3,548	3,581
35	55	5.7	3,955	5,650
		Original spacing 5' x 5'		
10	15	3.5	249	—
15	28	4.1	1,040	—
20	38	4.6	1,967	557
25	45	5.2	2,754	2,311
30	51	5.7	3,344	4,435
35	55	6.3	3,758	6,561
		Original spacing 6' x 6'		
10	15	3.8	226	—
15	28	4.4	975	—
20	38	5.0	1,874	1,016
25	45	5.6	2,650	2,912
30	51	6.2	3,237	5,137
35	55	6.7	3,656	7,332
		Original spacicng 6' x 7'		
10	15	3.9	219	—
15	28	4.6	955	—
20	38	5.2	1,845	1,199
25	45	5.8	2,617	3,157
30	51	6.5	3,205	5,427
35	55	7.1	3,623	7,659
		Original spacing 7' x 7'		
10	15	4.1	213	—
15	28	4.7	938	86
20	38	5.4	1,820	1,388
25	45	6.0	2,589	3,411
30	51	6.7	3,175	5,736
35	55	7.4	3,596	8,003

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Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
		Original spacing 8′ x 8′		
10	15	4.3	205	—
15	28	5.1	914	257
20	38	5.7	1,786	1,702
25	45	6.4	2,550	3,848
30	51	7.1	3,135	6,256
35	55	7.8	3,557	8,586
		Original spacing 9′ x 9′		
10	15	4.6	200	—
15	28	5.3	898	403
20	38	6.1	1,763	1,974
25	45	6.8	2,524	4,231
30	51	7.5	3,108	6,728
35	55	8.3	3,531	9,117
		Original spacing 10′ x 10′		
10	15	4.8	196	—
15	28	5.6	888	531
20	38	6.4	1,747	2,217
25	45	7.1	2,504	4,575
30	51	7.9	3,089	7,150
35	55	8.7	3,512	9,588
		Original spacing 12′ x 12′		
10	15	5.2	192	6
15	28	6.1	873	753
20	38	6.9	1,725	2,640
25	45	7.8	2,481	5,175
30	51	8.6	3,065	7,883
35	55	9.5	3,487	10,449
		25-YEAR SITE INDEX: 50		
		Original spacing 4′ x 4′		
10	17	3.3	380	—
15	31	3.8	1,495	—
20	42	4.3	2,746	577
25	50	4.9	3,777	2,980
30	56	5.4	4,531	5,837
35	61	5.9	5,050	8,723

CONTINUED

STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
25-YEAR SITE INDEX: 50, CONTINUED				
		Original spacing 5′ x 5′		
10	17	3.6	318	—
15	31	4.2	1,327	—
20	42	4.8	2,512	1,327
25	50	5.4	3,516	3,892
30	56	6.0	4,271	6,857
35	61	6.6	4,800	9,815
		Original spacing 6′ x 6′		
10	17	3.9	289	—
15	31	4.6	1,245	107
20	42	5.2	2,393	1,884
25	50	5.9	3,383	4,623
30	56	6.5	4,134	7,714
35	61	7.2	4,669	10,758
		Original spacing 6′ x 7′		
10	17	4.1	280	—
15	31	4.8	1,219	238
20	42	5.4	2,357	2,110
25	50	6.1	3,341	4,925
30	56	6.7	4,093	8,073
35	61	7.4	4,627	11,164
		Original spacing 7′ x 7′		
10	17	4.2	272	—
15	31	4.9	1,197	366
20	42	5.6	2,324	2,342
25	50	6.3	3,305	5,239
30	56	7.0	4,055	8,457
35	61	7.7	4,592	11,592
		Original spacing 8′ x 8′		
10	17	4.5	262	—
15	31	5.3	1,167	579
20	42	6.0	2,280	2,731
25	50	6.7	3,255	5,783
30	56	7.4	4,004	9,107
35	61	8.2	4,543	12,323

CONTINUED

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
		Original spacing 9′ x 9′		
10	17	4.8	255	—
15	31	5.5	1,147	761
20	42	6.3	2,251	3,071
25	50	7.1	3,223	6,266
30	56	7.8	3,969	9,699
35	61	8.6	4,509	12,989
		Original spacing 10′ x 10′		
10	17	5.0	251	—
15	31	5.8	1,133	921
20	42	6.6	2,230	3,377
25	50	7.4	3,197	6,697
30	56	8.2	3,945	10,233
35	61	9.1	4,485	13,585
		Original spacing 12′ x 12′		
10	17	5.4	245	50
15	31	6.4	1,115	1,200
20	42	7.2	2,204	3,914
25	50	8.1	3,167	7,454
30	56	9.0	3,914	11,159
35	61	9.9	4,454	14,678
		25-YEAR SITE INDEX: 55		
		Original spacing 4′ x 4′		
10	19	3.4	474	—
15	34	4.0	1,865	—
20	46	4.5	3,425	1,551
25	55	5.1	4,711	4,980
30	62	5.6	5,652	8,893
35	68	6.2	6,298	12,780
		Original spacing 5′ x 5′		
10	19	3.8	397	—
15	34	4.4	1,656	69
20	46	5.0	3,133	2,416
25	55	5.6	4,386	6,030
30	62	6.2	5,327	10,071
35	68	6.9	5,986	14,048

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
25-YEAR SITE INDEX: 55, CONTINUED				
		Original spacing 6′ x 6′		
10	19	4.1	360	—
15	34	4.8	1,553	467
20	46	5.5	2,985	3,075
25	55	6.1	4,220	6,898
30	62	6.8	5,157	11,092
35	68	7.5	5,822	15,173
		Original spacing 6′ x 7′		
10	19	4.3	349	—
15	34	5.0	1,521	623
20	46	5.6	2,940	3,346
25	55	6.3	4,168	7,261
30	62	7.0	5,105	11,524
35	68	7.7	5,770	15,664
		Original spacing 7′ x 7′		
10	19	4.4	340	—
15	34	5.2	1,493	777
20	46	5.9	2,899	3,625
25	55	6.6	4,123	7,642
30	62	7.3	5,058	11,991
35	68	8.0	5,727	16,186
		Original spacing 8′ x 8′		
10	19	4.7	327	—
15	34	5.5	1,456	1,034
20	46	6.2	2,844	4,097
25	55	7.0	4,061	8,304
30	62	7.7	4,995	12,786
35	68	8.5	5,665	17,078
		Original spacing 9′ x 9′		
10	19	5.0	319	—
15	34	5.8	1,431	1,256
20	46	6.6	2,808	4,513
25	55	7.4	4,019	8,891
30	62	8.2	4,951	13,510
35	68	9.0	5,623	17,896

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STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

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Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
	Original spacing 10′ x 10′			
10	19	5.2	313	37
15	34	6.1	1,414	1,452
20	46	6.9	2,782	4,888
25	55	7.7	3,988	9,424
30	62	8.6	4,920	14,164
35	68	9.5	5,594	18,633
	Original spacing 12′ x 12′			
10	19	5.7	305	116
15	34	6.6	1,391	1,795
20	46	7.5	2,749	5,549
25	55	8.4	3,951	10,358
30	62	9.3	4,882	15,310
35	68	10.3	5,554	19,980
	25-YEAR SITE INDEX: 60			
	Original spacing 4′ x 4′			
10	20	3.5	580	—
15	37	4.1	2,282	—
20	50	4.7	4,191	2,925
25	60	5.3	5,765	7,637
30	68	5.9	6,915	12,849
35	74	6.4	7,706	17,940
	Original spacing 5′ x 5′			
10	20	3.9	485	—
15	37	4.6	2,026	518
20	50	5.2	3,834	3,896
25	60	5.9	5,368	8,817
30	68	6.5	6,518	14,177
35	74	7.1	7,323	19,374
	Original spacing 6′ x 6′			
10	20	4.3	440	—
15	37	5.0	1,900	978
20	50	5.7	3,653	4,658
25	60	6.4	5,164	9,824
30	68	7.1	6,310	15,369
35	74	7.8	7,124	20,695

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STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
25-YEAR SITE INDEX: 60, CONTINUED				
		Original spacing 6′ x 7′		
10	20	4.4	427	—
15	37	5.2	1,861	1,161
20	50	5.9	3,597	4,975
25	60	6.6	5,100	10,250
30	68	7.3	6,246	15,878
35	74	8.1	7,060	21,276
		Original spacing 7′ x 7′		
10	20	4.6	416	—
15	37	5.4	1,827	1,342
20	50	6.1	3,547	5,305
25	60	6.8	5,045	10,701
30	68	7.6	6,189	16,434
35	74	8.4	7,007	21,898
		Original spacing 8′ x 8′		
10	20	4.9	400	—
15	37	5.7	1,782	1,647
20	50	6.5	3,480	5,866
25	60	7.3	4,970	11,493
30	68	8.1	6,111	17,382
35	74	8.9	6,931	22,965
		Original spacing 9′ x 9′		
10	20	5.2	390	56
15	37	6.0	1,751	1,912
20	50	6.9	3,436	6,365
25	60	7.7	4,918	12,196
30	68	8.5	6,058	18,256
35	74	9.4	6,880	23,953
		Original spacing 10′ x 10′		
10	20	5.4	383	112
15	37	6.3	1,729	2,146
20	50	7.2	3,404	6,815
25	60	8.1	4,881	12,840
30	68	8.9	6,020	19,045
35	74	9.8	6,844	24,842

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Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
		Original spacing 12′ x 12′		
10	20	5.9	373	207
15	37	6.9	1,702	2,561
20	50	7.8	3,363	7,612
25	60	8.8	4,835	13,970
30	68	9.7	5,973	20,432
35	74	10.7	6,795	26,475
	25-YEAR SITE INDEX: 65			
		Original spacing 4′ x 4′		
10	22	3.7	699	—
15	40	4.3	2,747	418
20	54	4.9	5,045	4,760
25	65	5.5	6,939	11,052
30	73	6.1	8,323	[1] 17,860
35	80	6.7	9,277	24,399
		Original spacing 5′ x 5′		
10	22	4.1	584	—
15	40	4.8	2,439	1,148
20	54	5.4	4,615	5,823
25	65	6.1	6,461	12,344
30	73	6.7	7,845	19,322
35	80	7.5	8,817	25,987
		Original spacing 6′ x 6′		
10	22	4.5	530	—
15	40	5.2	2,287	1,668
20	54	5.9	4,397	6,687
25	65	6.6	6,216	13,491
30	73	7.4	7,594	20,682
35	80	8.1	8,576	27,502
		Original spacing 6′ x 7′		
10	22	4.6	514	—
15	40	5.4	2,240	1,877
20	54	6.1	4,330	7,052
25	65	6.9	6,139	13,985
30	73	7.6	7,518	21,276
35	80	8.4	8,500	28,182

CONTINUED

STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
25-YEAR SITE INDEX: 65, CONTINUED				
		Original spacing 7′ x 7′		
10	22	4.8	500	—
15	40	5.6	2,199	2,087
20	54	6.4	4,271	7,437
25	65	7.1	6,073	14,509
30	73	7.9	7,449	21,924
35	80	8.7	8,435	28,906
		Original spacing 8′ x 8′		
10	22	5.1	482	73
15	40	6.0	2,144	2,442
20	54	6.8	4,190	8,092
25	65	7.6	5,981	15,435
30	73	8.4	7,355	23,037
35	80	9.3	8,344	30,165
		Original spacing 9′ x 9′		
10	22	5.4	469	150
15	40	6.3	2,108	2,754
20	54	7.1	4,136	8,677
25	65	8.0	5,920	16,268
30	73	8.9	7,291	24,071
35	80	9.8	8,283	31,337
		Original spacing 10′ x 10′		
10	22	5.7	461	216
15	40	6.6	2,082	3,031
20	54	7.5	4,098	9,211
25	65	8.4	5,875	17,030
30	73	9.3	7,246	25,010
35	80	10.3	8,240	32,396
		Original spacing 12′ x 12′		
10	22	6.2	449	328
15	40	7.2	2,048	3,521
20	54	8.2	4,049	10,159
25	65	9.1	5,820	18,376
30	73	10.1	7,190	26,666
35	80	11.2	8,181	34,345

CONTINUED

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
	25-YEAR SITE INDEX: 70			
		Original spacing 4′ x 4′		
10	24	3.9	830	—
15	43	4.5	3,261	1,195
20	58	5.1	5,991	7,122
25	70	5.7	8,241	15,333
30	79	6.4	9,883	24,021
35	86	7.0	11,015	32,261
		Original spacing 5′ x 5′		
10	24	4.3	693	—
15	43	5.0	2,896	1,982
20	58	5.7	5,480	8,258
25	70	6.4	7,674	16,717
30	79	7.0	9,315	25,594
35	86	7.8	10,469	33,984
		Original spacing 6′ x 6′		
10	24	4.7	630	—
15	43	5.4	2,715	2,562
20	58	6.2	5,222	9,222
25	70	6.9	7,382	17,999
30	79	7.7	9,018	27,126
35	86	8.4	10,181	35,691
		Original spacing 6′ x 7′		
10	24	4.8	610	15
15	43	5.6	2,660	2,799
20	58	6.4	5,142	9,636
25	70	7.1	7,291	18,561
30	79	7.9	8,927	27,804
35	86	8.8	10,093	36,479
		Original spacing 7′ x 7′		
10	24	5.0	594	81
15	43	5.8	2,612	3,038
20	58	6.6	5,071	10,073
25	70	7.4	7,213	19,164
30	79	8.2	8,845	28,550
35	86	9.1	10,016	37,317

CONTINUED

STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
25-YEAR SITE INDEX: 70, CONTINUED				
		Original spacing 8′ x 8′		
10	24	5.3	572	186
15	43	6.2	2,546	3,445
20	58	7.1	4,975	10,828
25	70	7.9	7,104	20,234
30	79	8.8	8,734	29,842
35	86	9.6	9,908	38,780
		Original spacing 9′ x 9′		
10	24	5.6	557	275
15	43	6.6	2,503	3,806
20	58	7.5	4,911	11,507
25	70	8.3	7,031	21,203
30	79	9.3	8,658	31,047
35	86	10.2	9,836	40,152
		Original spacing 10′ x 10′		
10	24	5.9	547	352
15	43	6.9	2,472	4,128
20	58	7.8	4,866	12,130
25	70	8.8	6,978	22,096
30	79	9.7	8,604	32,145
35	86	10.7	9,784	41,390
		Original spacing 12′ x 12′		
10	24	6.4	534	483
15	43	7.5	2,432	4,702
20	58	8.5	4,807	13,240
25	70	9.5	6,912	23,675
30	79	10.6	8,537	34,091
35	86	11.7	9,714	43,683
25-YEAR SITE INDEX: 75				
		Original spacing 4′ x 4′		
10	26	4.0	974	—
15	46	4.7	3,828	2,224
20	63	5.3	7,031	10,064
25	75	6.0	9,669	20,582

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CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
30	84	6.6	11,601	31,503
35	92	7.3	12,930	41,736
		Original spacing 5′ x 5′		
10	26	4.5	814	—
15	46	5.2	3,399	3,056
20	63	5.9	6,431	11,251
25	75	6.6	9,003	22,026
30	84	7.3	10,935	33,161
35	92	8.1	12,291	43,577
		Original spacing 6′ x 6′		
10	26	4.8	739	68
15	46	5.7	3,187	3,691
20	63	6.4	6,128	12,309
25	75	7.2	8,662	23,441
30	84	8.0	10,585	34,857
35	92	8.8	11,954	45,483
		Original spacing 6′ x 7′		
10	26	5.0	716	143
15	46	5.9	3,122	3,955
20	63	6.7	6,034	12,771
25	75	7.5	8,555	24,072
30	84	8.3	10,479	35,624
35	92	9.1	11,847	46,362
		Original spacing 7′ x 7′		
10	26	5.2	697	217
15	46	6.1	3,066	4,223
20	63	6.9	5,951	13,265
25	75	7.7	8,463	24,753
30	84	8.6	10,382	36,471
35	92	9.5	11,757	47,321
		Original spacing 8′ x 8′		
10	26	5.5	671	336
15	46	6.4	2,989	4,686
20	63	7.4	5,838	14,123
25	75	8.2	8,335	25,975
30	84	9.1	10,252	37,951
35	92	10.1	11,631	49,003

CONTINUED

STAND GROWTH—6
VARIABLE DENSITY YIELD TABLE
Plantations—Southern Appalachians

CONTINUED

Age from seed	Average height of dominants and codominants	D. b. h. of tree of average basal area	Total yield[1]	Merchantable yield[2]
Years	*Feet*	*Inches*	*Cu. ft.*	*Bd. ft.*
25-YEAR SITE INDEX: 75, CONTINUED				
		Original spacing 9′ x 9′		
10	26	5.8	654	437
15	46	6.8	2,938	5,097
20	63	7.8	5,764	14,905
25	75	8.7	8,249	27,088
30	84	9.6	10,163	39,341
35	92	10.6	11,545	50,581
		Original spacing 10′ x 10′		
10	26	6.1	642	525
15	46	7.2	2,902	5,468
20	63	8.2	5,711	15,622
25	75	9.1	8,187	28,118
30	84	10.1	10,100	40,612
35	92	11.1	11,484	52,017
		Original spacing 12′ x 12′		
10	26	6.7	626	676
15	46	7.8	2,855	6,133
20	63	8.9	5,642	16,909
25	75	9.9	8,110	29,952
30	84	11.0	10,021	42,873
35	92	12.2	11,403	54,689

[1] Cubic-foot yield of white pine per acre, including bark, for all trees 3.0 inches d.b.h. and larger to a 3.0 d.i.b. top.

[2] Board-foot yield of white pine per acre to a 6.0-inch top diameter i.b., International ¼-inch rule.

SOURCE: Vimmerstedt, John P. SOUTHERN APPALACHIAN WHITE PINE PLANTATIONS: SITE, VOLUME, AND YIELD. U. S. Forest Serv. Southeast. Forest Expt Sta., Sta. Paper 149. 13 pp., illus., 1962. *Location:* North Carolina, Tennessee, and Georgia. *Basis:* 112 plots in 78 plantations that were unburned, unthinned, and free of large openings or significant numbers of trees of other species. *Reliability:* The regression equations upon which the estimate of cubic-foot yield, average d.b.h and board-foot yield are based accounted for 90 percent, 93 percent and 95 percent of the total variation in the data, respectively.

(Net annual volume growth per acre, [1] in board feet)

Current gross volume per acre[1] (M bd. ft.)	No. of trees per acre in the 7.6 to 8.5-inch d.b.h. class						
	5	10	20	40	60	80	100
REGION B, SITE I[2]							
1.0	102	120	174	305	407	485	531
2.0	166	185	238	369	472	550	595
3.0	223	241	294	425	528	606	651
4.0	272	291	344	475	578	656	701
6.0	332	351	404	535	638	715	761
8.0	403	422	475	606	709	786	832
10.0	441	460	514	644	748	824	860
15.0	550	569	623	753	857	933	969
20.0	585	602	655	786	890	968	1,013
25.0	640	657	710	841	945	1,023	1,068
30.0	680	697	750	881	985	1,063	1,108
40.0	717	734	787	918	1,022	1,200	1,145
50.0	726	743	796	927	1,031	1,209	1,154
REGION B, SITE II[2]							
1.0	90	117	173	208	274	332	368
2.0	149	167	201	286	334	390	427
3.0	201	219	253	338	386	442	479
4.0	223	240	274	340	406	464	500
6.0	303	320	354	420	486	544	580
8.0	381	398	432	498	564	622	658
10.0	430	447	481	548	613	671	707
15.0	470	487	521	588	653	711	747
20.0	535	554	587	654	720	776	814
25.0	439	458	491	558	624	680	618
REGION C, SITE I[2]							
1.0	131	149	201	329	429	505	550
2.0	194	212	264	392	492	568	613
3.0	248	266	318	446	546	632	667
4.0	294	312	365	492	593	669	714
6.0	353	371	424	551	652	728	773
8.0	427	445	498	625	726	802	847
10.0	475	493	545	673	774	850	895
15.0	627	645	697	725	826	1,002	1,047
20.0	707	725	777	805	906	1,082	1,127

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STAND GROWTH—7
STAND PROJECTION GROWTH ESTIMATES
Natural Stands—New York

CONTINUED

Current gross volume per acre[1] (M bd. ft.)	No. of trees per acre in the 7.6 to 8.5-inch d.b.h. class						
	5	10	20	40	60	80	100
25.0	791	809	861	989	1,135	1,165	1,191
30.0	850	868	920	1,048	1,194	1,224	1,250
40.0	869	886	938	1,066	1,212	1,242	1,268
50.0	828	846	898	1,026	1,172	1,202	1,228
REGION C, SITE II[2]							
1.0	86	102	145	238	303	343	366
2.0	139	155	198	291	356	396	419
3.0	186	202	245	338	404	443	466
4.0	229	245	288	380	446	486	509
6.0	278	294	337	429	495	535	558
8.0	349	364	407	500	565	605	627
10.0	399	415	458	550	616	656	678
15.0	515	530	574	666	731	771	793
20.0	488	504	547	639	705	745	767
25.0	414	430	473	565	631	671	693

[1] Both current gross volume and net annual growth per acre are in terms of the International ¼-inch log rule and assume a 1-foot stump and a 6-inch diameter top inside bark. Current gross volume includes all volume within merchantability limits on live trees 8.6 inches or more in d.b.h. Net annual growth is made up of an estimate of accretion based on current gross volume, plus an estimate of ingrowth based on the number of trees in 7.6 to 8.5-inch d.b.h. class, minus an estimate of mortality and cull percent based on current gross volume.

[2] Region B is that part of northern New York characterized by a growing season of 105 to 134 days and soils of very low productivity. This region centers on Hamilton County and includes parts of surrounding counties as well. Region C comprises areas in Northern New York with a growing season of 135-159 days and with soils of low productivity. Region C extends in a band to the north, east, and south of region B.

Site is classified on the basis of average d.b.h./merchantable height relation among dominant and codominant pines. Merchantable height is measured to a 4-inch top diameter inside bark. The following tabulation provides the basis for site classification:

Average d.b.h. of dominant and codominant pines (inches)	*Average merchantable height*	
	Site I (feet)	*Site II (feet)*
6	19	16
8	35	30
10	49	41
12	58	47
14	64	51
16	69	53
18	73	55
20	76	56
22	78	57
24	80	—
26	81	—

SOURCE: Ferree, Miles J., and Robert K. Hagar. TIMBER GROWTH RATES FOR NATURAL FOREST STANDS IN NEW YORK STATE. N. Y. State Univ. Coll. Forestry Tech. Pub. 78. 56 pp., illus., 1956. Syracuse. *Location:* Northern New York. *Basis:* 63 one-fifth acre plots. *Reliability:* Estimates based on 10 or more ⅕ acre plots in relatively homogeneous stands will usually be subject to standard errors of less than 10 percent, if current gross volume and number of ingrowth trees on these sample plots are typical for the stand.

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