THIRD EDITION
$5.00

Board-foot, cubic-foot, and cubic-meter volume tables for commercial forest species of Pennsylvania

PENNSTATE
1855
College of Agricultural Sciences • Cooperative Extension

CONTENTS

Prepared by Brian Turner, former associate professor of forest management, and reviewed by James Finley, assistant professor of forest resources.

LIST OF TABLES

SPECIES INDEX TO TABLES

PREFACE

Potential users of published volume tables are often given insufficient information to decide whether the tables are appropriate for their particular application. The first part of this publication is designed to respond to that criticism by providing answers to questions such as the following:

Over what range of sizes, sites, species, and geographical regions were the data collected?

How were the volumes of the sample trees computed?

For exactly which part of the tree is the volume tabulated?

Which variables and model were finally selected as best?

Just as importantly, which variables and models were tried and found wanting?

What criterion was used in choosing the best?

Users who have no such doubts may wish to go directly to Part 2, but are warned that these tables are somewhat unconventional and that the section in Part 2 on "Application of Tables" is required reading for all users.

I would like to record my appreciation to all those who made the development and publication of these tables possible. To those of the Pennsylvania Bureau of Forestry, the U.S. Forest Service, and The Pennsylvania State University who collected the data and performed the initial analyses, I owe a special debt; it is the high quality of their work that made my continuation of their efforts possible and worthwhile. In particular, I would like to acknowledge the advice, encouragement, and assistance of Dr. Peter Dress, Mr. James Nelson, and Mr. Richard Fisher in making the first edition of these tables possible. I am grateful to Mr. Ken Hickok of the Pennsylvania Bureau of Forestry and Mr. J. Frank Wagner of Ligonier, Pennsylvania, for pointing out some inconsistencies and minor errors in that edition, and to Mr. John Cissel, former graduate assistant, for helping fix them.

This second edition was prompted by the need to make those corrections, by the continuing demand for the tables despite the fact that they have been out of print for some time, and by the desire of the Pennsylvania Bureau of Forestry for metric equivalents of the cubic volume tables.

Brian J. Turner
April 1983

Part 1: DISCUSSION

INTRODUCTION

History of the project

A cooperative project was established in 1955 for the collection of data and construction of volume tables for all species or species groups of commercial importance in Pennsylvania. The project provided that the Pennsylvania Bureau of Forestry (an agency of the Department of Environmental Resources) would collect the data, the U.S. Forest Service would carry out initial calculations of volumes and other data at its Northeastern Forest Experiment Station, and the School of Forest Resources of The Pennsylvania State University would develop the volume-prediction models and produce the volume tables.

Data collection began in the summer of 1955 and continued through 1959. Subsequently, some extra sampling of board-foot volumes of large trees was conducted. The volumes of more than half of the approximately 4,000 tree samples collected were computed at the Northeastern Forest Experiment Station between 1955 and 1959. Mostly these were hand calculated but a computer was used to calculate some preliminary statistics. In early 1959, The Pennsylvania State University took over this phase of the project because of the better availability of computing facilities at the University and the increasing demands of the U.S. Forest Survey on the computing facilities at the Northeastern Forest Experiment Station.

The first analytical work on these data was done by T. W. Beers, who investigated models for estimating volumes of northern red oak from the sample data collected in 1955. He concluded that the combined-variable equation was best for predicting cubic volume; that weighting did not appreciably improve the model; and that the use of the Girard-form class was not warranted as an independent variable in board-foot volume-prediction models. (Beers 1956).

Further analysis by R. J. Hutnik[1] in July of 1957 revealed that the combined variable cubic-volume equation gave poor percentage predictability in the small-diameter classes and that this problem could be overcome by using either weights or the logarithmic model. P. E. Dress confirmed these tentative conclusions and recommended the use of the logarithmic models for cubic-foot volume estimation (Dress 1959).

Following some investigations by Hutnik of board-foot volume-prediction models, a set of tables was published in 1962 (Bartoo, Hutnik 1962). These gave board-foot volumes by the Scribner log rule and the International 1/4 inch log rule for 17 species, derived by the simple combined variable model in the case of Scribner volume and a modified combined variable model in the case of International volume.

This was followed by the publication in 1966 of a "Preliminary Edition" of cubic-foot volume tables using the logarithmic model (Dress, Borden, Bartoo 1966). These tables gave bole volume, including and excluding bark, referenced by total height and merchantable height for the same 17 species.

Since a number of errors in the calculation of the tree volumes had been detected, it was considered desirable that, before further work was performed on the data, the tree volumes should be recalculated by computer. The original measurements were transferred to punched cards during 1967-68 and a computer program prepared (by B. M. Kent, at the Penn State School of Forest Resources) to produce punched-card output suitable for subsequent analysis. All data were processed through this program in 1969.

Justification for the revision of existing volume tables

Tables developed in this project [viz., cubic-foot volume given d.b.h.o.b. and merchantable height, and board foot volume (International 1/4" rule) given d.b.h.o.b. and sawlog height] first appeared in two previous publications (Bartoo, Hutnik 1962; Dress, Borden, Bartoo 1966). The original tables have been revised for presentation here, for several reasons.

First, modern computers have made possible the complete automation of all calculations from the raw data to the final model, eliminating otherwise-inevitable human errors. Although errors in the original work probably had not biased the tabulated values appreciably, they undoubtedly had inflated estimates of the population variances.

[1]On file at School of Forest Resources, The Pennsylvania State University.

Secondly, there was some concern about the logarithmic model used in the cubic-foot volume tables, in that the tabulated values were geometric (rather than arithmetic) means and were therefore slightly biased. It was also felt that further exploration of alternative board-foot volume models was justified. Further, the availability of a non-linear least squares computer program made the investigation of non-linear models feasible.

Thirdly, because of the "superior" tree concept used in selecting the sample trees, volumes as read directly from the tables could be applied only to those trees which were of such good form that the merchantable limit (4.5-inch d.o.b. for cubic-foot volume, 6.5-inch d.o.b. for board-foot volume of softwoods, 8.5-inch d.o.b. for board-foot volume of hardwoods) is reached. For a tree which reaches its limit of merchantability at some lesser height, the height to the prescribed limit must be estimated and a deduction applied to the volume referenced by the estimated height. Although this limitation was pointed out in the publication containing the cubic-foot volume tables, no table of deductions was included. The point was not made obvious in publishing the board-foot volume tables. The Pennsylvania Bureau of Forestry, the major user of the tables, devised its own set of deduction factors, but it was felt desirable that a publication containing the most frequently used volume tables along with appropriate deduction tables and procedures should be issued.

Lastly, the tables previously published are now out of print so the decision to include only those tables that appear here was based on the use requirements of the Pennsylvania Bureau of Forestry. Persons wishing to estimate cubic-foot volumes outside bark, or use total height in place of merchantable height for estimating cubic-foot volume, or estimate board-foot volume by the Scribner rule, should use the previous publications, taking care to derive the volumes of "non-superior" trees correctly.

THE SAMPLE TREE DATA

Distribution of sample

According to the "Outline of Procedure for Field Measurements" prepared by S. Gingrich in 1956,[2] each commercial species in Pennsylvania was to be sampled in direct proportion to its relative occurrence: i) in each section of the Commonwealth, ii) on each growing site, and iii) in each timber type in which it occurred. The state was divided into four physiographic regions; three sites were recognized. Further, it was specified that the sampling of each species should cover the normal diameter range of the species concerned, and the diameter classes should be equally represented. The evidence suggests that this procedure was followed as faithfully as practicable.

Samples were to be obtained as much as possible from State Forest timber sales, large or moderately large blow-down areas, private logging, right-of-way clearings, and strip-mine operations. Estimates of the number of sample trees required ranged at various times from 200 to 500 per species or species group. From Table 1 it can be seen that the major species are represented by 200 to 300 trees for cubic-foot volume estimates and between 150 and 250 for board-foot volume estimates.

The "superior" tree concept

The idea of restricting the sample to trees of good form (so-called "superior" trees) has been ascribed to the late H. A. Meyer, an originator of this project. Since forest-management practices were aimed at increasing the proportion of well-formed trees, the tables would have indefinite applicability in the time scale and in fact would become more applicable with time. On the other hand, tables based on average-formed trees as they now exist would become dated and less useful as the average form improved. A side benefit was that restricting the sample would decrease the within-sample variability, thus reducing the sample size to achieve a given precision of estimate. The major disadvantage of the superior-tree concept is that the tabulated values require substantial adjustment when applied to trees of poor form.

While it is doubtful that the average form of forests will change more rapidly than mensurationists will invent new and presumably better models and computers will become able to numerically solve them (a situation that Dr. Meyer can be forgiven for not foreseeing in 1955), the side benefits of smaller sample size and the relative simplicity of the models finally chosen vindicate at least to some extent the use of a restricted sample. In practice, the use of volume-adjusted factors to estimate the volume of "non-superior" trees has not proved burdensome.

Characteristics which prevented a tree's inclusion in the sample were i) excessive limbiness or large wolf crown, ii) excessive butt swell, iii) deformed or scarred bole, iv) loose or seriously damaged bark, v) forked main stem causing a material reduction of stem diameter, vi) elliptical cross-section caused by excessive lean, vii) occurrence of organic defect, viii) any condition which would terminate merchantability before a minimum top diameter outside bark was reached, or ix) any condition that would negate the accurate determination of total height.

The data collected

The following data were collected for each sample tree:

1) *Whole tree data*
   a) Species, number, county, locality, stand category, crew, and date.
   b) D.b.h.o.b., total height, height to 4.5 inches top o.b., height for sawlogs, and merchantable length.

[2]On file, School of Forest Resources, The Pennsylvania State University.

TABLE 1. Species and size (number of trees) of the sample on which tables and equations are based.

Species		Sample size	
Common name	Scientific name	Cubic-foot volumes	Board-foot volumes
Eastern white pine	*Pinus strobus* L.	218	188
Eastern hemlock	*Tsuga canadensis* (L.) Carr.	283	241
Pitch pine	*Pinus rigida* Mill.	253	245
Miscellaneous softwoods		83	68
Red pine	*Pinus resinosa* Ait.	32	---
Sugar maple	*Acer saccharum* Marsh.	225	150
Red maple	*Acer rubrum* L.	230	112
Northern red oak	*Quercus rubra* L.	286	200
Black oak	*Quercus velutina* Lam.	103	66
Scarlet oak	*Quercus coccinea* Muenchh.	260	155
White oak	*Quercus alba* L.	233	175
Chestnut oak	*Quercus prinus* L.	243	118
Sweet birch	*Betula lenta* L.	153	40
Yellow birch	*Betula alleghaniensis* Britton	74	12
American beech	*Fagus grandifolia* Ehrh.	248	172
White ash	*Franxinus americana* L.	258	175
American basswood	*Tilia americana* L.	110	70
Yellow-poplar	*Liriodendron tulipifera* L.	254	199
Aspen	*Populus* spp. L.	76	34
Black cherry	*Prunus serotina* Ehrh.	237	161
Miscellaneous hardwoods		148	59

2) *Data for calculating volumes*
   a) The smallest average d.o.b. (mean of two caliper readings) was recorded for each of the following heights above ground up to 4.5 inches d.o.b.: 1.0, 5.1, 9.2, 13.2, 17.3, 21.4, 29.5, 37.7, 45.8, 54.0, 62.1, 70.3, 78.4, 86.6, 94.7, 102.9, 119.2, 126.0 feet. The points above 17.3 feet correspond with the mid-points and end-points of 16-foot logs (plus trim). Twice bark thickness (sum of two Swedish bark gauge readings) was recorded at 1.0, 5.1, and 17.3 feet and at the end of each 16-foot log thereafter.
   b) Diameters outside bark and bark thickness at the mid-points of the last section and of branchwood larger than 4.5 inches top o.b. were recorded as were the lengths of these sections.

SAMPLE TREE DATA PROCESSING

Calculations of volumes

The following system was used in performing the original calculations by hand. The same procedure was followed in the computer calculations, except where otherwise noted in the following section.

Diameter inside bark was calculated directly by subtraction of bark-thickness measurements (when available) from diameter outside bark. Otherwise, they were estimated by interpolation of d.i.b./d.o.b. ratios.

Cubic-foot volumes were calculated inside and outside bark, including and excluding branchwood, by the following formulae:

a) for the lowest two 8-foot sections by Newton's formula; and
b) for all other 8-foot, or less, sections by Huber's formula.

Board-foot volumes were calculated by 16-foot logs by referring to International 1/4-inch and Scribner log rule tables, respectively. The volume of the final section of sawlog, to the Sawlog Height as recorded, was interpolated from the tables.

The summation of appropriate sectional volumes gave the following tree-volume contents:

1) cubic-foot volume inside bark, excluding branchwood,
2) cubic-foot volume outside bark, excluding branchwood,
3) cubic-foot volume inside bark, including branchwood,
4) cubic-foot volume outside bark, including branchwood,
5) board-foot volume (International 1/4-inch rule), inside bark, and
6) board-foot volume (Scribner rule), inside bark.

Kent's program

The computer program (written in 1968 by B. M. Kent) reads data in the form in which it was collected, except that the inside bark diameters as calculated are read, rather than the bark-thickness measurements. Cubic-foot volumes were calculated as indicated in the previous section. Board-foot (International 1/4-inch) volumes were calculated by formulae rather than by table look-up. In general, the total board-foot volumes by the two methods agreed within 1 or 2 board feet. Board-foot volumes by the Scribner log rule were not calculated.

The output (Fig 1) from the program consisted of a printed table giving the data and calculated volumes for each sample tree and punched-card output concerning all the independent and dependent variables required for subsequent regression analysis.

Data-editing procedures

Considerable effort was expended in ensuing that the data used in subsequent analyses were free of error. Kent's program detected a number of errors either in the original data or in the transcription to punched cards.

Data were processed through the computer program SLREG.[3] This is a simple linear regression analysis program which includes as part of its output a

[3]SLREG was written by M. V. Wiant, Jr., then a graduate student at The Pennsylvania State University.

Figure 1. Example of output from Kent's program.

INDIVIDUAL TREE TALLY SHEET FOR VOLUME TABLE MEASUREMENTS

DBH OB	12.5	TREE SPECIES	BC
TOTAL HEIGHT	83.0	TREE NUMBER	2
HEIGHT TO 4.5 INCH TOP O.B.	62.1	COUNTY	POTTER
		STAND CATEGORY	B1C
HEIGHT FOR SAWLOGS	38.7 (37.0 FEET MERCH)		
FORM CLASS	83.2		

HEIGHT ABOVE GROUND FEET	DOB	DIB
1.0	14.0	13.1
5.1	12.3	11.5
9.2	11.9	11.1
13.2	11.4	10.6
17.3	11.2	10.4
21.4	10.9	10.1
29.5	10.1	9.2
37.7	9.5	8.6
45.8	8.0	7.3
54.0	5.2	4.6

VOLUME BELOW 17.3 FEET HEIGHT (NEWTONS FORMULA - CUBIC FEET)

WITH BARK	WITHOUT BARK
12.81	11.15

VOLUME ABOVE 17.3 FEET HEIGHT (HUBERS FORMULA - CUBIC FEET)

WITH BARK	WITHOUT BARK
17.87	14.89

LAST SECTION AND BRANCH SECTIONS DOB	DIB	LENGTH(FEET)	VOLUME OF LAST SECTION (LENGTH X MIDPOINT B.A.) WITH BARK	WITHOUT BARK
4.7	4.2	4.0	0.48	0.38

BRANCH SECTIONS DOB	DIB	LENGTH(FEET)	VOLUME OF BRANCHES LENGTH X MIDPOINT B.A.) WITH BARK	WITHOUT BARK
5.4	4.8	6.0	0.95	0.75
TOTAL VOLUME(CUBIC FEET)			32.12	27.18

BOARD FOOT VOLUMES

	UPPER END DOB	UPPER END DIB	LOG LENGTH (FEET)	BOARD FOOT VOLUMES
LOG 1	11.2	10.4	16.0	70.6
LOG 2	9.8	8.9	16.0	49.6
LOG 3	9.5	8.5	5.0	11.5

TOTAL TREE VOLUME: 131.7 BD. FT.

scatter diagram of the independent variable plotted against the dependent variable. For editing, D^2H was regressed against cubic-foot volume and board-foot volume; points which deviated widely from the general trend were traced back to the sample tree data. If an error was detected, the data were corrected if feasible; otherwise, the tree was rejected from the sample.

VOLUME PREDICTION MODELS

General consideration

The choice of possible volume-prediction models was influenced by a) a consideration of the general form for the volume of geometric solids, and b) consideration of the vast number of volume-prediction models developed in the past. The general form of a tree stem can be considered as approximately that of the class of regular solids exemplified by the paraboloid, conoid, and neiloid. The volume (V) of these solids can be calculated by

$$V = kD^2H$$

where D = diameter of the circular base,
H = height,
and $k = \pi/2$, $\pi/3$ and $\pi/4$ for the paraboloid, conoid, and neiloid, respectively.

Various factors make this simple model unsuitable for estimating the volume of a tree bole. Firstly, the form of a tree stem is not regular and estimates of k vary widely. Secondly, D is conventionally not measured at the base of the tree but at breast height. Thirdly, the volume required is frequently for a portion of the tree stem (e.g., from a stump height to a fixed upper-diameter limit), rather than for the whole stem. Fourthly, the estimated volume required may be for the merchantable content of the tree (e.g., board feet) and not for the true volume.

Tactics which can be used to improve the form of the model and to overcome these problems are:

1) to add a constant,
2) to add various additional terms in D and H, and
3) to consider the exponents of D and H as being other than 2 and 1, respectively.

A more complete model for the volume of a tree bole could thus be written as

$$V = k_1 + k_2D^{k_3}H^{k_4} + k_5D^{k_6} + k_7H^{k_8}. \quad (1)$$

Of the various "Nonform Class" tree-volume equations described by Spurr (1952), those which have occurred most frequently in the literature of volume tables are:

a) the constant form-factor equation,
$$V = aD^2H; \quad (2)$$
b) the combined-variable equation,
$$V = a + bD^2H; \quad (3)$$
c) the Australian equation,
$$V = a + bD^2H + cD^2 + dH; \text{ and} \quad (4)$$
d) the Schumacher (logarithmic) equation,
$$\log V = a + b \log D + c \log H. \quad (5)$$

All of these can be seen to be special cases, minor variants, or transformations of Equation 1.

As has been pointed out by several workers (Beers 1956; Gibson, Webb 1968; Evert 1969), the fact that the variance of tree bole volume increases with the volume indicates that consideration also should be given to "weighting" the volume to achieve homoscedasticity. For this reason, weighted forms of Equations 1 to 4 also were considered as potential models. (As indicated by Beers, the logarithmic equation [Eqn 5] partially stabilizes the variance through the nature of the transformation.)

Before much work had been done on testing the models against the data, it was obvious that a criterion would have to be determined for selecting the best model.

Criteria of best fit

In a "Working Plan" prepared for this project in 1957,[4] R. J. Hutnik suggested that precision and simplicity should be the criteria used for selecting the best model. Although simplicity of the model itself is not as important in this computer age, as formerly, there are advantages in keeping to a minimum the number of variables requiring field measurements. Since prior work in this project had suggested that Girard form class and site quality were unlikely to be significant variables, further analysis has been concentrated on species, d.b.h.o.b., and the appropriate height variable.

Attention thus focused on criteria for defining "precision" and five criteria were set up. The rankings of the models did vary among the criteria, so ultimately a choice was made on subjective grounds. However, the models selected as "best" were shown to be satisfactory by all criteria.

The first of the five criteria stated that the model should represent the data from which it was derived, as determined by the usual statistical tests; e.g., by the coefficient of determination (R^2), the standard error of estimate, or Furnival's (1961) index of fit if the volume variable had been transformed.

Second, the variables included in the model should be consistent over species.

Third, the absolute values of the proportionate differences between actual volumes and volumes as predicted by the model should be reasonably uniform over the range of data.

Fourth, when the estimated volumes were extrapolated well outside the range of data, the values should be "sensible."

The fifth criterion was that the model should be accurate and consistent in application. Undoubtedly the best test of a model is its applicability in the population in which it is to be used. Thus, the most suitable set of data for testing models would be a representative sample of the population.

If the data collected for deriving the model are from a simple random sample of the population, it might be appropriate to select a random subset of these data for deriving the coefficients of the model and then to

[4]On file, School of Forest Resources, The Pennsylvania State University.

test the model against the remaining data. Frequently, however, data collected for deriving models are highly stratified in order to cover the whole range of variation. Thus, the use of an independent representative test sample is normally preferable.

In the present case, data collected for developing the volume prediction models, because of the restrictions placed on the form of the sample trees, were not representative of the Commonwealth's forest population. Since appropriate independent samples were not available, the test data were simulated from the developmental data. The frequency distributions of the diameters of trees enumerated in Pennsylvania Bureau of Forestry timber sales were calculated by species, the original data and predicted volumes were weighted by these frequencies, and then weighted means calculated. Comparison of the estimated weighted means with the means calculated from the actual volumes, gave a test of the likely behavior of the model under field conditions.

The cubic-foot models

Most of the initial investigation of cubic-foot volume models was conducted on the sample of 286 trees of northern red oak, the most abundant commercial species in the Commonwealth and one that occurs throughout the state.

Simple linear-regression model — From a computer plot of the data (D^2H against V, where D = d.b.h.o.b., H = height to a 4.5-inch d.o.b., and V = volume to 4.5-inch d.o.b. in cubic feet), it was evident that there was a slight curvilinearity and some heteroscedasticity, but less than had been expected. The simple linear-regression model,

$$\hat{V} = 1.893 + 0.002452\ D^2H, \qquad (6)$$

had $R^2 = 0.992$ and standard error of estimate (SEE) of 2.65 cubic feet. Although the fit over all the data was rather good, the difference between observed and expected values increased in the larger-diameter values, probably due to the curvilinearity.

Multiple linear-regression model — In order to test the importance of the curvilinear trend, various transformation and interaction terms of D and H were added to the model and examined by stepwise multiple linear-regression analysis. The only term which gave a significant (at the 5% level of significance) improvement was a term in D, giving the model,

$$\hat{V} = -2.043 + 0.00222\ D^2H + 0.5291\ D. \qquad (7)$$

This gave $R^2 = 0.993$ and SEE = 2.54. This model did give improved prediction in the large-diameter classes.

When the data from other species were subjected to the same stepwise procedure, however, no consistency could be found as to which additional term significantly improved the model. This is undoubtedly due to the high correlations between the variables. In no case did R^2 improve by more than 0.002. For this reason it was decided to confine attention to the single variable equation (i.e., D^2H) and try to improve the model by other means.

Non-linear model — The next step was a consideration of a non-linear model of the form

$$V = b_1 + b_2\ D^{b_3}\ H^{b_4}. \qquad (8)$$

Newnham (1967) had found that this model was consistently better than the simple linear model in estimating total cubic-foot volume of eleven Canadian species. However, he evaluated the coefficients by a two-stage linear-regression model, not by the non-linear method used in this study.

The non-linear model was solved using the computer program NLIN2 developed by Marquardt (1966). This yielded the model,

$$\hat{V} = 0.374 + 0.005177\ D^{1.9066}\ H^{0.8959}, \qquad (9)$$

with an approximate estimated SEE of 2.54. This model gave predicted values close to those given by Equation 7 (within the range of original data) and, because of its greater generality, was considered the best model up to this point.

Weighted linear model — The next task was to find out if weighting the dependent variable (V) to overcome the heteroscedasticity would increase the predictive ability of the model. The most commonly made assumption is that the variance of V increases linearly with $(D^2H)^2$ so that dividing both sides of the equation by D^2H should stabilize the variance (Furnival 1961). The computed equation was

$$\hat{V}/(D^2H) = 0.9394/(D^2H) + 0.002567$$

or

$$\hat{V} = 0.9394 + 0.002567\ D^2H. \qquad (10)$$

Furnival's Index of Fit for this model was 0.66 which, when compared with the 2.65 for the unweighted model, indicates a significant improvement. However, this model gave predicted volumes far too high for large trees and was rejected.

Weighed nonlinear model — Moser and Beers (1969) had found a considerable improvement in Furnival's Index by using a weighted nonlinear model over an unweighted nonlinear one. Their data were a similar set of measurements of Pennsylvania northern red oak, but the model they used was $\hat{V} = b_1\ D^{b_2}\ H^{b_3}$ and not $\hat{V} = b_1 + b_2\ D^{b_3}\ H^{b_4}$. To test whether a similar improvement to the proposed nonlinear model could be achieved, it was first necessary to develop a function that would estimate a set of weights to apply to the set of observed volumes. A modification of a computer program written by B. F. Gibson of the Forests Commission, Victoria, Australia, was used to first calculate the residuals from the unweighted simple linear model, rank them according to their D^2H, group them by tens of observations, and calculate the volume variance for each group. The variances, when plotted against the mid-point D^2H values, were found to describe an upward increasing curve which Moser and Beers had approximated with an exponential function. In the present study, it was found that a

parabolic function fitted much better than the exponential; the relationship being

$$\hat{S}_i^2 = 1.3 + 0.000000023\ (D^2H)_i^2\ (R^2 = 0.948). \quad (11)$$

In the processing of data by NLIN2, the weight to be applied to each observation was calcuated ($W_i = 1/\hat{S}_i^2$) and the least-squares function to be minimized was specified as

$$\Sigma(W_i^{1/2}\ (V_i - b_1 - b_2\ D_i^{b_3}\ H_i^{b_4}))^2.$$

Although the minimization procedure was allowed to run for 75 iterations, the minimum value was not reached. However, the SEE was 0.705 at the 30th iteration and, although decreasing, was still this value (correct to three decimal places) at the 75th. It was obvious from examination of the computer output that small changes in some of the estimated b_i values were being compensated by shifts in the opposite direction by other b_i values. The procedure was terminated at this point, with the equation being

$$\hat{V} = 0.335 + 0.005499\ D^{1.9141}\ H^{0.8763}. \quad (12)$$

The maximum difference between predicted volumes by this model compared with those from the unweighted nonlinear model was 0.4 cubic feet, within the range of original data. This led to an examination of the predicted volumes by Moser and Beers' weighted and unweighted models. Within the range of our data, the maximum difference between their two models was 0.2 percent. For these reasons, the considerable extra work involved in wieghting the nonlinear model did not seem to be justified and this approach was dropped.

Logarithmic model — An alternative approach to the weighting problem is to use the logarithmic equation,

$$\log \hat{V} = b_0 + b_1 \log D + b_2 \log H. \quad (13)$$

This model assumes that the variance of V increases with V, a not inappropriate assumption, as shown above.

This is the model used in the earlier publication of tables (Dress, Borden, Bartoo 1966); their equation being

$$\log_{10} \hat{V} = -2.0709 + 1.954 \log_{10} D + 0.7410 \log_{10} H \quad (14)$$

with estimated SEE of 0.0768.

Using essentially the same data, but computer calculated and edited, the revised equation becomes

$$\log_{10} \hat{V} = -1.8781 + 2.054 \log_{10} D + 0.5708 \log_{10} H \quad (15)$$

with estimated SEE of 0.0383, which incidentally attests to the value of the more rigorous data analysis. Furnival's Index of Fit was calculated as 1.56. Although this model was equally as good as the nonlinear model in predicting the small size-class classes, it was inferior in predicting the volumes of large trees.

The best cubic-foot model — The fact that volume-table models are almost always used solely for point estimation, and rarely for interval estimation, indicates that greater weight should be placed on criteria which are concerned with point rather than interval estimation. Of the five criteria, only the first is concerned with interval estimation.

On the second, third, and fourth criteria, the nonlinear model was the best of those tested. Although it would not give as good results in interval estimation as some of the weighted models, the nonlinear version was superior in prediction, so much so that the testing of the model by the fifth criterion was considered unnecessary.

The most suitable model for cubic-volume prediction was thus found to be the unweighted nonlinear model (Eqn 9). This model had the advantages of simplicity, consistency between species, and good predictive ability, as well as being consistent with the general model for the volume of an appropriately shaped solid.

Volume-prediction model for use with point sampling

It can be easily shown that if a suitable tree-volume-prediction model of the form $\hat{V} = b\ D^2H$ exists, then the volume per acre (V_a) at a point can be estimated by

$$\hat{V}_a = bf \sum^{n} H/0.005454, \quad (16)$$

where the basal area factor (f) determines that n sample trees were included in the point sample (Beers, Miller 1964). This method has been used by the Pennsylvania Bureau of Forestry for the estimation of cubic-foot volume of pulpwood stands.

The model of this type for the northern red oak data was $\hat{V} = 0.002531\ D^2H$. This gave poor predictability in the small-size classes and an attempt was made to overcome this by weighting the dependent variables. The model

$$\hat{V}/D^2H = 0.002614 \text{ or } \hat{V} = 0.002614\ D^2H \quad (17)$$

gave somewhat better predictability in these size classes but was still deemed unsatisfactory.

Since pulpwood stands rarely have trees exceeding 16 inches d.b.h.o.b., a weighted zero-intercept model was derived using a truncated sample of trees less than 16 inches d.b.h. This yielded

$$\hat{V} = 0.00276\ D^2H, \quad (18)$$

the best model to data but still somewhat unsatisfactory.

Some algebraic manipulation of the combined variable equation and of the point-sampling formulae suggests two alternative methods for using the simple linear-regression model (which has performed well in predicting the volume of small trees) in conjuction with point sampling.

Method A

From the tree-volume model we have

$$\hat{V} = a + bD^2H$$
$$= a + bH.B/0.005454,$$

where B = basal area in square feet = 0.005454 D^2.

Summing over N trees per acre and assuming average height,

$$\hat{V}_a = \sum^{N} \hat{V} = \sum^{N} a + b\bar{H} \sum^{N} B/0.005454 .$$

But $\sum^{N} B$ can be estimated by $n.f$ (defined as above). Therefore,

$$\hat{V}_a = Na + b(\sum^{n} H/n)nf/0.005454$$
$$= Na + (bf/0.005454 \sum^{n} H . \quad (19)$$

The method would therefore require an estimate of N = the number of trees per acre. Since a is small (about one), the effect of the first term is small compared with that of the second term and high precision in estimating N would not be required. The estimate of the number of trees per acre might be based on an area as small as a tenth-acre plot.

Method B

$$\hat{V} = a + bD^2H$$
$$= (a/D^2 + bH)D^2$$
$$= (a/D^2 + bh)\ (B/0.005454)$$
$$= (a/(0.005454\ D^2) + bH/0.005454)\ B$$
$$\hat{V}_a = (a/(0.005454\ \bar{D}^2) + b\bar{H}/0.005454) \sum^{N} B$$
$$= (a/(0.005454\ \bar{D}^2) + b\bar{H}/0.005454)\ nf$$
$$= (af/(0.005454\ \bar{D}^2))n + (bf/0.005454) \sum^{n} H$$

The additional information required to use this model is an estimate of the mean diameter squared and of the number of trees included in the sample. The latter is no problem and again less precision is required in estimating the first term than in estimating the second. J. Nelson and K. Hickok[5] of the Pennsylvania Bureau of Forestry found that the mean diameter of pulpwood in state timber sales is reasonably stable and they adopted this method by assuming the $\bar{D}^2$ is a constant equalling 81 and using the weighted combined variable model (Eqn 10 type). This provided slightly better predictability in the small-size classes than did the unweighted model (Table 2).

The board-foot models

As in the case of cubic-foot models, the sample of northern red oak was used for initial investigation of the board-foot volume models. After removing trees which were too small to have sawlog volume, 200 trees remained in the sample.

Simple linear-regression model — A plot of D^2H against V (where D = d.b.h.o.b., H = height to 8.5" d.o.b., and V = board-foot volume International 1/4-inch, to 8.5" d.o.b.) showed little curvilinearity and slight heteroscedasticity. The simple linear-regression model was

$$\hat{V} = 3.8571 + 0.019001\ D^2H \quad (21)$$

with R^2 = 0.982 and SEE = 36.0. This model appeared to fit data over most of the range fairly well.

Modified simple linear-regression model — Bartoo and Hutnik (1962) had used a model of the form $\hat{V} = b(D^2H - 12)$, where H = merchantable height in 8-foot logs, for estimating International 1/4-inch board-foot volume and the correction factor of 12 was graphically determined. With height in feet, the appropriate correction factor is 96 and the model determined for the present sample of northern red oak became

$$\hat{V} = 0.01929\ (D^2H - 96) \quad (22)$$

with R^2 = 0.985 and SEE = 36.1. The estimated values derived were little different from those given by Equation 21, but they did fit somewhat closer in the very-small-diameter classes.

Multiple linear-regression model — The addition of extra terms in D and H to the simple linear-regression model and the subjection of this augmented equation to a stepwise multiple-regression procedure revealed the best model (containing only terms significant at the 5% level) as being

$$\hat{V} = -51.40 + 0.00711\ D^2H + 0.7050\ D^2 + 0.00953\ H^2 \quad (23)$$

with R^2 = 0.988 and SEE = 29.4. As in the case of the cubic-foot models, the additional terms had no generality when tested on other species.

TABLE 2. Cubic-foot volume point-sampling factors.[6]

Species	*J*	*K*
White pine	25.92	36.82
Hemlock	22.30	36.76
Pitch pine	19.15	35.53
Red pine	25.87	38.59
Miscellaneous softwoods	21.07	40.89
Sugar maple	25.60	40.63
Red maple	22.75	39.91
Red oak	21.25	37.65
Black oak	25.80	35.32
Scarlet oak	22.14	38.15
White oak	26.55	36.67
Chestnut oak	19.83	35.82
Yellow birch	25.78	38.99
Sweet birch	25.44	39.75
Beech	28.16	42.76
Ash	17.04	38.58
Basswood	20.73	38.90
Yellow-poplar	22.68	35.92
Aspen	16.03	39.69
Black cherry	22.14	39.03
Miscellaneous hardwoods	25.44	35.83

For use with 10 BA Factor prism and assuming mean d.b.h.o.b. of stand is approximately 9 inches and maximum d.b.h.o.b. is less than about 16 inches.

Cu. ft. volume per acre (excluding bark and branchwood) = (No. of trees included at point x *J*) + (No. of 8-ft. bolts on these trees x *K*)

[5]Personal communication.

[6]The author is indebted to J. Nelson and K. Hickok of the Pennsylvania Bureau of Forestry for the calculation of these factors.

Nonlinear model — The success of the nonlinear model for estimating cubic-foot volume suggested that it be tried here also. Volume was estimated by

$$\hat{V} = -26.69 + 0.1603\ D^{2.039}\ H^{0.4519} \qquad (24)$$

the approximate SEE being 29.5 (R^2 is not computed by NLIN2). Although the SEE suggests a better fit than the simple linear model, the large negative intercept term caused poor prediction in the small-size classes.

Weighted models — The lack of success achieved by weighting in the case of the cubic-foot models, together with the observation from the scatter-plot that the relative heteroscedasticity was no greater in the board-foot volumes than in the cubic-foot volume, indicated that investigation of this technique might be unfruitful. However, a weighted nonlinear model, with weights calculated as for the cubic-foot volume model, was tested. As in the case of the latter, the least-squares function did not converge on a unique solution. After 80 iterations, the SEE was 1.2 and still decreasing. The model at this stage was

$$\hat{V} = -23.50 + 0.1590\ D^{1.877}\ H^{0.5646}. \qquad (25)$$

Although appearing to underestimate the volume of large trees, it is not very different from the unweighted model.

The best board-foot volume model — Because of the greater inherent variability in the board-foot volume than in the cubic-foot volume data, it was more difficult to ascertain which of the various models was better from an overall prediction point of view. In order to test the models against independent representative data, the diameter frequency distributions of northern red oak from 16 Bureau of Forestry sawtimber sales were pooled. This average diameter distribution was applied to the average volumes by diameter classes as calculated for the original sample-tree data and as estimated by the various prediction models. The ranking of the various models by this criterion (in decreasing order) was:

1) combined-variable equation (Eqn 21),
2) Bartoo and Hutnik's model (Eqn 22),
3) unweighted non-linear model (Eqn 24),
4) multiple regression model (Eqn 23), and
5) weighted non-linear model (Eqn 25).

Since the minimum d.b.h. class for sawtimber sales is 12 inches for hardwoods, the correction factor for small-size classes incorporated into the model of Bartoo and Hutnik (Eqn 22) was unimportant. Thus, this positive attribute of the latter model did not compensate for the slight bias introduced by the use of the correction factor. The combined-variable equation (the simple linear-regression model) therefore was considered to be the best model for hardwoods. For conifers, the minimum d.b.h. class measured in sawtimber sales is 10 inches and the over-estimation of volumes in the 10- to 12-inch d.b.h. classes was significant. After exploration of a number of models for white pine and hemlock, it was found that Equation 22 gave best overall results for these two species.

Volume-adjustment factors

Because the models, derived above, estimate the volumes of "superior" trees, some form of adjustment is necessary for estimating the volume of "non-superior" trees. The most frequent causes for reduction in volume are i), excessive forking before the prescribed merchantability limit is reached, i.e., the true merchantable height is less than that indicated by an 8.5-, 6.5-, or 4.5-inch d.o.b. limit; and ii), defective sections within the bole.

This suggests that the volume-adjustment factors should be in the form of percentages of total volume by height sections, and this is, in fact, the method used by the Pennsylvania Bureau of Forestry. A workable hypothesis might be that the ratio of reduced volume to tabulated volume (v/V) is related to the ratio of reduced height to tabulated height (h/H). It was hypothesized that the relationship might also be dependent on d.b.h.o.b. and tree species.

A stepwise multiple-regression procedure was used to evaluate these variables. The relationship between h/H and v/V was found to be curvilinear and the addition of d.b.h. did not significantly (5% level of significance) improve the relationship. Comparisons of scatter-plots of the data for various species did not detect discernible differences, but the curves for cubic-foot volumes and board-foot volumes were appreciably different.

A necessary condition of the relationship between h/H and v/V would be that the curve should pass through the origin and also that $v/V = 1$ when $h/H = 1$. One form of relationship possessing this property was explored by Jensen and Homeyer (1970) in their derivation of a generalized sigmoid curve. With algebraic manipulation to fit their generalized curve to this specific problem, a three-parameter model can be derived of the form

$$v/V = b_1\ (\exp(b_2(1 - h/H)^{b_3}) - 1) + 1. \qquad (26)$$

Data from a range of size classes for three major species — northern red oak, eastern white pine, and black cherry — were subjected to nonlinear least-squares analysis and the resultant models were obtained.

For cubic-foot volume adjustment,

$$\widehat{v/V} = 2.53\ \exp(-0.502(1 - h/H)^{2.26}) - 1.53 \qquad (27)$$

with SEE = 0.043; and for board-foot volume adjustment,

$$\widehat{v/V} = 3.83\ \exp(-0.285(1 - h/H)^{1.66}) - 2.83 \qquad (28)$$

with SEE = 0.055.

These curves fit the data well and the models were accepted. From them, tables of percentage reduction in volume, for reductions of various heights, were prepared (Tables 4 and 7).

Definition of heights and allowance for trim

Reactions to the first edition of these tables have indicated some confusion in the interpretation of the term "merchantable height." Clarification has resulted in

slightly altered volumes in both the cubic- and board-foot tables.[7]

The "H" term — The "*H*" in both cubic-foot and board-foot models is height *from the ground* to the merchantable limit.

Number of bolts — The number of bolts used as a measure of height for the cubic-foot tables is the number of 8-foot 1.5-inch bolts above the 1-foot stump (the extra 1.5-inch or 0.125-foot is a trim allowance). For example, eight bolts correspond to $H = 1 + (8.125 \times 8) = 66.0$ feet. This definition is used in both editions.

Cubic-foot volumes — The cubic-foot volumes as computed by Kent's program (see Fig 1) are total volumes to the merchantable limit. These are the volumes given in the first edition, i.e., they assume no trim allowance. In this edition, a correction has been applied to reduce the volumes slightly to allow for trim. The correction model is as follows:

$$\hat{R} = 0.009013 + 0.24034 \times 10^{-4}(D^2H) - 0.54557 \times 10^{-10}(D^2H)^2,$$

where $\hat{R}$ = reduction in volume due to trim. The model was derived from recalculation of volumes and calculation of the differences (R) for a 10 percent sample of all trees and was not sensitive to species differences. In most cases, this represents a reduction in volume of less than 1 percent.

Number of 16-foot logs — In the first edition, trim allowance was not considered in calculating number of 16-foot logs. This has been corrected in this edition to provide for a 3-inch trim allowance per log so that, for example, four logs correspond to $H = 1 + (16.25 \times 4) = 66.0$ feet. Because of this, volumes are slightly (less than 2%) higher for a given number of logs in this edition than in the first.

Board-foot volumes — The board-foot volumes as computed by Kent's program (see example, Fig 1) do assume a 3-inch trim allowance per 16-foot log, so volumes are now consistent with the definition of number of logs.

The cubic-meter equivalents

The cubic-meter volume tables and adjustment factors were obtained by direct metric conversion of the cubic-foot tables. Heights are in terms of 2.5-meter (8.02025 feet) bolts rather than 8.0 feet. Tables assume the same stump height and trim allowances as used for cubic-foot tables. Diameters and heights are converted to British units, applied to the volume equations, and the result multiplied by 0.0283 to convert cubic feet to cubic meters.

[7]Note that users of the volume tables in equation form will not need to alter their current procedures unless they wish to incorporate the trim allowance for cubic-foot volume estimation.

REFERENCES

Bartoo, R. A., and R. J. Hutnik. 1962. Board-Foot Volume Tables for Timber Tree Species in Pennsylvania. *Pennsylvania State Forest School Res. Paper 30.* 35 pp.

Beers, T. W. 1956. "The Construction of Standard Volume Tables for Red Oak in Pennsylvania." mimeographed, M. S. thesis, School of Forestry, The Pennsylvania State University. 96 pp.

Beers, T. W., and C. I. Miller. 1964. Point Sampling: Research Results, Theory, and Applications. *Indiana Agr. Exp. Sta. Res. Bull.* 786. 56 pp.

Dress, P. E. 1959. "Statistical and Mathematical Applications in the Construction and Adjustment of Standard Cubic-Foot Volume Tables." mimeographed, M. S. thesis, School of Forestry, The Pennsylvania State University. 69 pp.

Evert, F. 1969. Use of form factor in tree-volume estimation. *J. For.* 67(2): 126-128.

Furnival, G. M. 1961. An index for comparing equations used in constructing volume tables. *For. Sci.* 7(4): 337-341.

Gibson, B. F., and A. W. Webb. 1968. Regression methods and models for estimating tree volumes of Alpine Ash regrowth. *Aust. For.* 32(4): 233-242.

Jensen, C. E., and J. W. Homeyer. 1970. Matchacurve-1 for Algebraic Transforms to Describe Sigmoid- or Bell-Shaped Curves. U.S.D.A., Forest Serv., Intermountain Forest and Range Exp. Sta. 22 pp.

Marquardt, D. W. 1966. Least Squares Estimation of Non-linear Parameters. SHARE Program Library No. EID-NLIN2, SDA-3094-01.

Moser, J. W., and T. W. Beers. 1969. Parameter estimation in non-linear volume equations. *J. For.* 67(12): 878-879.

Newnham, R. M. 1967. A modification to the combined-variable formula for computing tree volume. *J. For.* 65(10): 719-720.

Spurr, S. H. 1955. *Forest Inventory.* Ronald Press, New York. 476 pp.

Part 2: APPLICATION

APPLICATION OF TABLES

The following tables provide information needed to estimate the volumes of well-formed trees in merchantable cubic feet, merchantable board feet (International 1/4-inch log rule), and merchantable cubic meters. Well-formed trees may be defined briefly as single-stemmed trees free of major externally evident defects, and having boles which taper regularly to the defined top-diameter limit.

If a tree does not meet this requirement, its volume must be read from the appropriate table and then adjusted by applying a reduction determined by reference to the appropriate volume adjustment factors.

Regression coefficients developed by the procedures described in Part 1, and used in generating the cubic-foot volume tables, and standard errors of estimate (SEE) are listed in Table 3. Adjustment factors for cubic-foot volumes are given in Table 4, while Table 5 gives the cubic-foot volumes referenced by species, d.b.h.o.b., and merchantable height.

Table 6 provides regression coefficients and standard errors for the board-foot volume equations. Board-foot volume adjustment factors are given in Table 7, while the actual board-foot volumes are given in Table 8.

Adjustment factors for cubic-meter volume are provided in Table 9, while the cubic-meter volume tables are given by species in Table 10.

Since these tables are somewhat unconventional, three examples of their use follow.

Example 1 — Determine the volume in board feet (International 1/4-inch) of a well-formed red oak with d.b.h.o.b. of 20.5 inches. Height from (one foot) stump to estimated 8.5-inch d.o.b. is estimated to be three 16-foot logs. For northern red oak, in Table 8, a tree with d.b.h. of 21 inches and a merchantable height of three logs is estimated to yield 421 board feet.

Example 2 — Find the volume of a well-formed white pine in board feet (International 1/4-inch), its d.b.h.o.b. being 22.1 inches and its height to 6.5-inch d.o.b. being estimated as four logs. However, a visible defect at 34 feet will require culling a 4-foot section from the tree.

Referring to Table 8, the volume of a 22-inch, four-log white pine is found to be 493 board feet. Referring to Table 7, the percentage of volume in the 32- to 36-foot section of a four-log tree is 6 percent. The volume must therefore be reduced by 6 percent of 493, or 30 board feet. The estimated volume becomes 463 board feet.

Example 3 — The volume of a red maple in merchantable cubic feet is required. The tree has d.b.h.o.b. of 16.4 inches; its bole tapers regularly to 40 feet above stump (d.o.b. is about 8.5 inches at this point) and then breaks up into branches. The observer must now extend the bole by eye until a point is estimated where the 4.5-inch d.o.b limit would have been reached and estimate the height to this point. Inexperienced observers may wish to apply a constant-taper reduction factor (e.g., 1/2-inch diameter reduction for each 4-foot length) to aid in estimating this point. In this case, the observer estimates the hypothetical merchantable height above stump to be eight 8-foot bolts.

Using Table 5, for red maple, read the hypothetical volume of 43.7 cubic feet by referring to a d.b.h. of 16 inches and a height of eight bolts.

Referring now to Table 4 and entering the table with total merchantable height = eight bolts and reduced height = 40 feet, we find that the percentage reduction to be applied is 4 + 4 + 3 + 2 + 1 = 14 percent or 6.1 cubic feet, so that the actual tree volume is estimated to be 37.6 cubic feet.

Note that if this procedure is not adopted and the table is accessed with d.b.h. = 16 inches and merchantable height = five bolts (40 feet), then the volume would be incorrectly estimated as 28.6 cubic feet, a considerable underestimate.

TABLE 3. Cubic-foot volume equations.

Species	b_1	b_2	b_3	b_4	SEE
White pine	.24366	.0084439	1.8089	.8389	2.97
Hemlock	.43287	.0060469	1.7628	.9409	2.57
Pitch pine	- .22024	.0016867	1.7758	1.2535	3.09
Red pine	1.16440	.0015542	1.6963	1.3280	0.32
Miscellaneous softwoods	.74824	.0043476	1.6839	1.0733	0.79
Sugar maple	- .01357	.0106330	1.7840	.8125	1.89
Red maple	.26611	.0064407	1.7856	.9250	1.26
Red oak	.37396	.0051770	1.9066	.8959	2.54
Black oak	.61087	.0032263	1.8606	1.0297	2.44
Scarlet oak	.32821	.0059015	1.9142	.8626	2.22
White oak	1.01003	.0034952	1.9438	.9558	1.39
Chestnut oak	.38677	.0041631	1.8591	.9653	0.97
Yellow birch	.78557	.0028380	1.8579	1.0912	0.54
Sweet birch	.91367	.0033398	1.9148	1.0059	0.83
Beech	.44979	.0115500	1.9940	.6669	2.33
Ash	.25030	.0064522	1.9692	.8031	1.15
Basswood	.78939	.0041694	2.0134	.8828	1.82
Yellow-poplar	.45025	.0031923	1.7579	1.0938	2.01
Aspen	1.33203	.0007995	1.9616	1.3292	0.49
Black cherry	1.39290	.0021270	2.0076	1.0437	1.26
Miscellaneous hardwoods	1.30540	.0015993	1.6993	1.2919	1.94

$$V = b_1 + b_2 D^{b_3} H^{b_4}$$

TABLE 4. Cubic-foot volume adjustment factors.

Total merchantable height	Percentage of cubic foot volume in 4-foot sections																			
(no. of 8-ft. bolts)	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
2	42	33	20	5																
3	28	26	21	15	8	2														
4	22	20	18	15	12	8	4	1												
5	17	17	15	14	12	10	7	5	3	1										
6	15	14	13	12	11	10	8	7	5	3	2	0								
7	12	12	12	11	10	9	8	7	6	5	3	2	1	0						
8	11	11	10	10	9	9	8	7	6	5	4	4	3	2	1	0				
9	10	9	9	9	9	8	8	7	6	6	5	4	3	3	2	1	1	0		
10	9	9	8	8	8	8	7	7	6	6	5	5	4	3	3	2	2	1	1	0

TABLE 5. Cubic-foot (not including bark and branchwood) volume tables for the commercial forest species of Pennsylvania. Top diameter is 4.5 inches outside bark; merchantable height is height from 1-foot stump to top diameter. Shaded entries represent extent of sample data.

EASTERN WHITE PINE (*Pinus strobus* L.).

D.B.H.	MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT												
(IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.2	1.9	2.6	3.2	3.8	4.3	4.9	5.4	5.9				
6	1.6	2.6	3.5	4.3	5.1	5.9	6.7	7.4	8.2				
7	2.0	3.3	4.5	5.6	6.7	7.7	8.8	9.7	10.7				
8	2.5	4.2	5.7	7.1	8.5	9.8	11.1	12.3	13.6				
9	3.1	5.1	7.0	8.7	10.4	12.1	13.7	15.2	16.7				
10	3.7	6.1	8.4	10.5	12.6	14.5	16.5	18.4	20.2				
11		7.2	9.9	12.4	14.9	17.2	19.5	21.8	24.0	26.1	28.2		
12		8.4	11.5	14.5	17.4	20.1	22.8	25.4	28.0	30.5	33.0		
13		9.7	13.3	16.7	20.0	23.2	26.3	29.4	32.3	35.2	38.1		
14		11.1	15.2	19.1	22.9	26.5	30.1	33.5	36.9	40.3	43.6		
15		12.5	17.2	21.6	25.9	30.0	34.0	37.9	41.8	45.6	49.3		
16		14.0	19.3	24.2	29.0	33.7	38.2	42.6	46.9	51.2	55.4		
17				27.0	32.4	37.6	42.6	47.5	52.4	57.1	61.8	66.4	70.9
18				29.9	35.9	41.6	47.2	52.7	58.0	63.3	68.5	73.6	78.6
19				33.0	39.5	45.9	52.0	58.1	64.0	69.8	75.5	81.1	86.7
20				36.2	43.4	50.3	57.1	63.7	70.2	76.5	82.8	89.0	95.1
21					47.3	54.9	62.3	69.5	76.6	83.6	90.4	97.2	103.8
22					51.5	59.7	67.8	75.6	83.3	90.9	98.3	105.7	112.9
23					55.7	64.7	73.4	81.9	90.3	98.5	106.6	114.5	122.4
24					60.2	69.9	79.3	88.5	97.5	106.3	115.1	123.7	132.2
25					64.8	75.2	85.3	95.2	104.9	114.5	123.9	133.1	142.3
26						80.7	91.6	102.2	112.6	122.9	133.0	142.9	152.7
27						86.4	98.0	109.4	120.6	131.6	142.4	153.0	163.5
28						92.2	104.7	116.8	128.8	140.5	152.0	163.4	174.6
29						98.3	111.5	124.5	137.2	149.7	162.0	174.1	186.1
30						104.5	118.6	132.4	145.9	159.1	172.2	185.1	197.8

EASTERN HEMLOCK (*Tsuga canadensis* (L.) Carr.).

D.B.H.	MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE												
(IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.2	1.9	2.6	3.2	3.8	4.5	5.1	5.7	6.3				
6	1.6	2.5	3.4	4.3	5.1	6.0	6.9	7.7	8.5				
7	1.9	3.1	4.3	5.5	6.6	7.7	8.9	10.0	11.1				
8	2.3	3.8	5.3	6.8	8.3	9.7	11.1	12.5	13.9				
9	2.7	4.6	6.5	8.3	10.1	11.8	13.6	15.3	17.0				
10	3.2	5.5	7.7	9.9	12.0	14.1	16.2	18.3	20.4				
11		6.4	9.0	11.6	14.1	16.6	19.1	21.6	24.0	26.4	28.9		
12		7.4	10.5	13.5	16.4	19.3	22.2	25.1	27.9	30.8	33.6		
13		8.5	12.0	15.4	18.8	22.2	25.5	28.8	32.1	35.3	38.6		
14		9.6	13.6	17.5	21.4	25.2	29.0	32.8	36.5	40.2	43.9		
15		10.8	15.3	19.7	24.1	28.4	32.7	37.0	41.2	45.4	49.5		
16		12.0	17.1	22.1	27.0	31.8	36.6	41.4	46.1	50.8	55.4		
17				24.5	29.9	35.3	40.7	46.0	51.2	56.4	61.6	66.8	71.9
18				27.0	33.1	39.0	44.9	50.8	56.6	62.4	68.1	73.8	79.5
19				29.7	36.3	42.9	49.4	55.8	62.2	68.6	74.9	81.2	87.4
20				32.5	39.7	46.9	54.0	61.1	68.1	75.0	81.9	88.8	95.7
21					43.3	51.1	58.8	66.5	74.1	81.7	89.3	96.7	104.2
22					46.9	55.4	63.8	72.1	80.4	88.7	96.8	105.0	113.1
23					50.7	59.9	69.0	78.0	87.0	95.9	104.7	113.5	122.3
24					54.6	64.5	74.3	84.0	93.7	103.3	112.8	122.3	131.8
25					58.6	69.3	79.8	90.3	100.6	111.0	121.2	131.4	141.6
26						74.2	85.5	96.7	107.8	118.9	129.9	140.8	151.7
27						79.3	91.4	103.3	115.2	127.0	138.8	150.5	162.1
28						84.5	97.4	110.1	122.8	135.4	147.9	160.4	172.8
29						89.9	103.6	117.1	130.6	144.0	157.4	170.6	183.8
30						95.4	109.9	124.3	138.7	152.9	167.0	181.1	195.1

(continued)

Table 5 (cu ft, cont'd)

PITCH PINE (*Pinus rigida* Mill.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	0.2	0.8	1.4	2.1	2.9	3.7	4.5	5.3	6.2				
6	0.4	1.2	2.1	3.1	4.1	5.2	6.3	7.5	8.7				
7	0.6	1.6	2.8	4.1	5.4	6.9	8.4	9.9	11.5				
8	0.8	2.1	3.6	5.2	7.0	8.8	10.6	12.6	14.6				
9	1.1	2.7	4.5	6.5	8.6	10.9	13.2	15.6	18.1				
10	1.4	3.3	5.5	7.9	10.5	13.1	15.9	18.8	21.8				
11		4.0	6.6	9.4	12.4	15.6	18.9	22.3	25.9	29.5	33.3		
12		4.7	7.7	11.0	14.5	18.2	22.1	26.1	30.2	34.5	38.9		
13		5.4	8.9	12.7	16.8	21.1	25.5	30.1	34.9	39.8	44.8		
14		6.2	10.2	14.5	19.2	24.0	29.1	34.4	39.8	45.4	51.2		
15		7.0	11.5	16.5	21.7	27.2	32.9	38.9	45.0	51.4	57.8		
16		7.9	13.0	18.5	24.4	30.5	37.0	43.7	50.5	57.6	64.9		
17				20.6	27.2	34.0	41.2	48.6	56.3	64.2	72.3	80.6	89.0
18				22.8	30.1	37.7	45.6	53.9	62.3	71.1	80.0	89.2	98.6
19				25.2	33.1	41.5	50.2	59.3	68.6	78.3	88.1	98.2	108.5
20				27.6	36.3	45.5	55.1	65.0	75.2	85.7	96.5	107.6	118.9
21					39.6	49.6	60.1	70.9	82.0	93.5	105.3	117.4	129.7
22					43.0	53.9	65.2	77.0	89.1	101.6	114.4	127.5	140.9
23					46.6	58.3	70.6	83.3	96.5	110.0	123.8	138.0	152.4
24					50.3	62.9	76.2	89.9	104.0	118.6	133.5	148.8	164.4
25					54.1	67.7	81.9	96.7	111.9	127.5	143.6	160.0	176.8
26						72.6	87.8	103.7	120.0	136.8	154.0	171.6	189.6
27						77.6	93.9	110.9	128.3	146.3	164.7	183.5	202.8
28						82.8	100.2	118.3	136.9	156.0	175.7	195.8	216.3
29						88.2	106.7	125.9	145.7	166.1	187.0	208.4	230.3
30						93.7	113.3	133.7	154.8	176.4	198.6	221.4	244.6

RED PINE (*Pinus resinosa* Ait.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.6	2.2	2.9	3.7	4.5	5.4	6.3	7.3	8.4				
6	1.8	2.6	3.5	4.6	5.7	6.9	8.2	9.6	11.0				
7	1.9	3.0	4.2	5.6	7.1	8.7	10.3	12.1	13.9				
8	2.1	3.5	5.0	6.7	8.6	10.6	12.7	14.9	17.1				
9	2.4	4.0	5.8	7.9	10.2	12.6	15.2	17.9	20.7				
10	2.6	4.5	6.8	9.3	12.0	14.9	17.9	21.1	24.5				
11		5.1	7.7	10.7	13.9	17.3	20.9	24.6	28.6	32.6	36.8		
12		5.7	8.8	12.2	15.9	19.8	24.0	28.4	32.9	37.6	42.5		
13		6.4	9.9	13.8	18.0	22.6	27.3	32.3	37.5	42.9	48.5		
14		7.1	11.1	15.5	20.3	25.4	30.8	36.5	42.4	48.5	54.9		
15		7.8	12.3	17.3	22.7	28.4	34.5	40.9	47.5	54.4	61.5		
16		8.6	13.6	19.1	25.1	31.6	38.4	45.5	52.9	60.6	68.5		
17				21.1	27.7	34.9	42.4	50.3	58.5	67.0	75.8	84.8	94.2
18				23.1	30.4	38.3	46.6	55.3	64.3	73.7	83.4	93.4	103.6
19				25.2	33.3	41.9	50.9	60.5	70.4	80.6	91.3	102.2	113.5
20				27.4	36.2	45.6	55.5	65.8	76.7	87.9	99.5	111.4	123.7
21					39.2	49.4	60.1	71.4	83.2	95.3	107.9	120.9	134.2
22					42.3	53.3	65.0	77.2	89.9	103.1	116.7	130.7	145.2
23					45.5	57.4	70.0	83.1	96.8	111.1	125.7	140.9	156.4
24					48.8	61.6	75.1	89.3	104.0	119.3	135.1	151.3	168.1
25					52.2	66.0	80.4	95.6	111.4	127.7	144.7	162.1	180.0
26						70.4	85.9	102.1	118.9	136.5	154.5	173.2	192.3
27						75.0	91.5	108.7	126.7	145.4	164.7	184.6	205.0
28						79.7	97.2	115.6	134.7	154.6	175.1	196.2	218.0
29						84.5	103.1	122.6	142.9	164.0	185.8	208.2	231.3
30						89.4	109.1	129.8	151.3	173.6	196.7	220.5	244.9

(continued)

Table 5 (cu ft, cont'd) **MISCELLANEOUS SOFTWOODS.**

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.4	2.1	2.8	3.6	4.3	5.0	5.8	6.6	7.3				
6	1.7	2.6	3.6	4.6	5.6	6.6	7.6	8.7	9.7				
7	2.0	3.2	4.4	5.7	7.0	8.3	9.6	11.0	12.4				
8	2.3	3.8	5.3	6.9	8.6	10.2	11.9	13.6	15.3				
9	2.6	4.4	6.3	8.3	10.3	12.3	14.3	16.4	18.5				
10	3.0	5.2	7.4	9.8	12.1	14.5	17.0	19.4	21.9				
11		5.9	8.6	11.3	14.1	16.9	19.8	22.7	25.6	28.5	31.5		
12		6.7	9.8	13.0	16.2	19.5	22.8	26.1	29.5	32.9	36.3		
13		7.6	11.1	14.8	18.4	22.2	26.0	29.8	33.6	37.5	41.4		
14		8.5	12.5	16.6	20.8	25.0	29.3	33.6	38.0	42.4	46.9		
15		9.5	14.0	18.6	23.3	28.0	32.8	37.7	42.6	47.5	52.5		
16		10.5	15.5	20.6	25.8	31.1	36.5	41.9	47.4	52.9	58.5		
17				22.7	28.5	34.4	40.3	46.3	52.4	58.5	64.7	70.9	77.1
18				25.0	31.3	37.8	44.3	50.9	57.6	64.3	71.1	77.9	84.8
19				27.3	34.2	41.3	48.5	55.7	63.0	70.4	77.8	85.3	92.8
20				29.7	37.3	45.0	52.8	60.7	68.6	76.7	84.8	92.9	101.1
21					40.4	48.8	57.2	65.8	74.4	83.2	91.9	100.8	109.7
22					43.6	52.7	61.8	71.1	80.4	89.9	99.4	108.9	118.6
23					46.9	56.7	66.6	76.6	86.6	96.8	107.0	117.3	127.7
24					50.4	60.8	71.5	82.2	93.0	103.9	114.9	126.0	137.2
25					53.9	65.1	76.5	88.0	99.6	111.3	123.1	134.9	146.9
26						69.5	81.7	93.9	106.3	118.8	131.4	144.1	156.8
27						74.0	87.0	100.0	113.2	126.6	140.0	153.5	167.1
28						78.6	92.4	106.3	120.4	134.5	148.8	163.1	177.6
29						83.4	98.0	112.7	127.6	142.7	157.8	173.0	188.4
30						88.2	103.7	119.3	135.1	151.0	167.0	183.2	199.4

SUGAR MAPLE (*Acer saccharum* Marsh.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.1	1.9	2.6	3.2	3.8	4.4	5.0	5.6	6.1				
6	1.5	2.6	3.6	4.5	5.3	6.2	7.0	7.7	8.5				
7	2.0	3.4	4.7	5.9	7.0	8.1	9.2	10.2	11.2				
8	2.6	4.3	5.9	7.5	8.9	10.3	11.6	12.9	14.2				
9	3.2	5.4	7.3	9.2	11.0	12.7	14.4	16.0	17.6				
10	3.9	6.5	8.9	11.1	13.3	15.3	17.3	19.3	21.2				
11		7.7	10.5	13.2	15.7	18.2	20.5	22.9	25.1	27.3	29.5		
12		9.0	12.3	15.4	18.4	21.2	24.0	26.7	29.3	31.9	34.4		
13		10.4	14.2	17.8	21.2	24.5	27.7	30.8	33.8	36.8	39.7		
14		11.8	16.2	20.3	24.2	27.9	31.6	35.1	38.6	42.0	45.3		
15		13.4	18.3	22.9	27.3	31.6	35.7	39.7	43.7	47.5	51.3		
16		15.0	20.5	25.7	30.7	35.4	40.1	44.6	49.0	53.3	57.5		
17				28.7	34.2	39.5	44.7	49.7	54.6	59.4	64.1	68.8	73.3
18				31.7	37.8	43.7	49.4	55.0	60.4	65.8	71.0	76.1	81.2
19				34.9	41.7	48.2	54.5	60.6	66.6	72.4	78.2	83.8	89.4
20				38.3	45.7	52.8	59.7	66.4	72.9	79.4	85.7	91.9	98.0
21					49.8	57.6	65.1	72.4	79.6	86.6	93.5	100.2	106.9
22					54.1	62.6	70.7	78.7	86.5	94.1	101.6	108.9	116.2
23					58.6	67.7	76.6	85.2	93.6	101.9	109.9	117.9	125.8
24					63.2	73.1	82.6	91.9	101.0	109.9	118.6	127.2	135.7
25					68.0	78.6	88.8	98.8	108.6	118.2	127.6	136.8	145.9
26						84.3	95.3	106.0	116.5	126.8	136.8	146.8	156.5
27						90.1	101.9	113.4	124.6	135.6	146.4	157.0	167.4
28						96.2	108.8	121.0	133.0	144.7	156.2	167.5	178.7
29						102.4	115.8	128.8	141.6	154.1	166.3	178.4	190.2
30						108.8	123.0	136.9	150.4	163.7	176.7	189.5	202.1

(continued)

Table 5 (cu ft, cont'd) **RED MAPLE** (*Acer rubrum* L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.1	1.8	2.5	3.2	3.8	4.5	5.1	5.7	6.3				
6	1.5	2.4	3.4	4.3	5.2	6.1	6.9	7.8	8.7				
7	1.9	3.1	4.4	5.6	6.8	7.9	9.1	10.2	11.3				
8	2.3	3.9	5.5	7.0	8.5	10.0	11.4	12.9	14.3				
9	2.8	4.8	6.7	8.6	10.4	12.2	14.0	15.8	17.6				
10	3.3	5.7	8.0	10.3	12.5	14.7	16.9	19.0	21.2				
11		6.7	9.5	12.2	14.8	17.4	20.0	22.5	25.1	27.6	30.0		
12		7.8	11.0	14.2	17.2	20.3	23.3	26.3	29.2	32.1	35.0		
13		8.9	12.7	16.3	19.9	23.4	26.8	30.3	33.7	37.0	40.4		
14		10.2	14.4	18.6	22.6	26.6	30.6	34.5	38.4	42.2	46.1		
15		11.5	16.3	21.0	25.6	30.1	34.6	39.0	43.4	47.7	52.1		
16		12.8	18.2	23.5	28.6	33.7	38.8	43.7	48.6	53.5	58.4		
17				26.1	31.9	37.6	43.1	48.7	54.2	59.6	65.0	70.4	75.7
18				28.9	35.3	41.6	47.8	53.9	60.0	66.0	72.0	77.9	83.8
19				31.8	38.8	45.7	52.6	59.3	66.0	72.7	79.2	85.8	92.3
20				34.8	42.5	50.1	57.6	65.0	72.3	79.6	86.8	94.0	101.1
21					46.4	54.6	62.8	70.9	78.9	86.8	94.7	102.5	110.3
22					50.4	59.3	68.2	77.0	85.7	94.3	102.9	111.4	119.9
23					54.5	64.2	73.8	83.3	92.7	102.1	111.4	120.6	129.7
24					58.8	69.3	79.6	89.9	100.0	110.1	120.1	130.1	140.0
25					63.2	74.5	85.6	96.7	107.6	118.4	129.2	139.9	150.5
26						79.9	91.8	103.7	115.4	127.0	138.6	150.0	161.4
27						85.4	98.2	110.9	123.4	135.9	148.2	160.5	172.7
28						91.1	104.8	118.3	131.7	145.0	158.1	171.2	184.3
29						97.0	111.5	125.9	140.2	154.3	168.4	182.3	196.2
30						103.0	118.5	133.8	148.9	163.9	178.9	193.7	208.4

NORTHERN RED OAK (*Quercus rubra* L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.2	1.8	2.4	2.9	3.5	4.0	4.6	5.1	5.6				
6	1.5	2.4	3.2	4.0	4.8	5.5	6.3	7.0	7.8				
7	1.9	3.1	4.2	5.2	6.3	7.3	8.3	9.3	10.3				
8	2.3	3.8	5.3	6.7	8.0	9.3	10.6	11.9	13.2				
9	2.8	4.7	6.5	8.2	9.9	11.6	13.2	14.8	16.4				
10	3.4	5.7	7.9	10.0	12.1	14.1	16.1	18.0	20.0				
11		6.7	9.4	11.9	14.4	16.8	19.2	21.5	23.9	26.2	28.4		
12		7.9	11.0	14.0	16.9	19.8	22.6	25.4	28.1	30.8	33.5		
13		9.1	12.7	16.2	19.6	23.0	26.2	29.5	32.7	35.8	38.9		
14		10.5	14.6	18.6	22.6	26.4	30.2	33.9	37.6	41.2	44.8		
15		11.9	16.6	21.2	25.7	30.1	34.4	38.6	42.8	46.9	51.0		
16		13.4	18.7	23.9	29.0	33.9	38.8	43.6	48.4	53.0	57.7		
17				26.8	32.5	38.1	43.5	48.9	54.2	59.5	64.7	69.9	75.0
18				29.9	36.2	42.4	48.5	54.5	60.4	66.3	72.1	77.9	83.6
19				33.1	40.1	47.0	53.7	60.4	67.0	73.5	79.9	86.3	92.6
20				36.4	44.2	51.8	59.2	66.6	73.8	81.0	88.1	95.1	102.1
21					48.4	56.8	64.9	73.0	81.0	88.8	96.6	104.3	112.0
22					52.9	62.0	70.9	79.7	88.4	97.1	105.6	114.0	122.4
23					57.5	67.4	77.2	86.8	96.2	105.6	114.9	124.1	133.2
24					62.4	73.1	83.7	94.1	104.4	114.5	124.6	134.5	144.4
25					67.4	79.0	90.4	101.7	112.8	123.8	134.6	145.4	156.1
26						85.1	97.4	109.5	121.5	133.3	145.1	156.7	168.2
27						91.4	104.7	117.7	130.6	143.3	155.9	168.3	180.7
28						98.0	112.2	126.1	139.9	153.5	167.0	180.4	193.7
29						104.7	119.9	134.8	149.6	164.2	178.6	192.9	207.1
30						111.7	127.9	143.8	159.6	175.1	190.5	205.8	220.9

(continued)

Table 5 (cu ft, cont'd)

BLACK OAK (*Quercus velutina* Lam.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0				
6	1.5	2.3	3.1	3.9	4.8	5.6	6.5	7.3	8.2				
7	1.8	2.8	3.9	5.0	6.2	7.3	8.4	9.5	10.7				
8	2.1	3.5	4.9	6.3	7.7	9.2	10.6	12.1	13.5				
9	2.5	4.2	5.9	7.7	9.5	11.3	13.1	14.9	16.7				
10	2.9	5.0	7.1	9.2	11.4	13.6	15.7	17.9	20.1				
11		5.8	8.3	10.9	13.5	16.1	18.7	21.3	23.9	26.6	29.2		
12		6.7	9.7	12.7	15.7	18.8	21.9	24.9	28.0	31.1	34.2		
13		7.7	11.2	14.6	18.2	21.7	25.3	28.8	32.4	36.0	39.6		
14		8.7	12.7	16.7	20.8	24.8	28.9	33.0	37.1	41.3	45.4		
15		9.9	14.4	18.9	23.5	28.1	32.8	37.5	42.1	46.8	51.5		
16		11.0	16.1	21.3	26.4	31.7	36.9	42.2	47.4	52.7	58.0		
17				23.7	29.5	35.4	41.2	47.1	53.0	59.0	64.9	70.9	76.9
18				26.3	32.8	39.3	45.8	52.3	58.9	65.5	72.1	78.8	85.4
19				29.0	36.2	43.4	50.6	57.8	65.1	72.4	79.7	87.0	94.4
20				31.9	39.7	47.6	55.6	63.5	71.5	79.6	87.6	95.7	103.8
21					43.5	52.1	60.8	69.5	78.3	87.1	95.9	104.7	113.6
22					47.3	56.8	66.2	75.7	85.3	94.9	104.5	114.1	123.8
23					51.4	61.6	71.9	82.2	92.6	103.0	113.5	123.9	134.4
24					55.5	66.6	77.8	89.0	100.2	111.5	122.8	134.1	145.5
25					59.9	71.8	83.9	95.9	108.1	120.2	132.4	144.7	156.9
26						77.2	90.2	103.1	116.2	129.3	142.4	155.6	168.8
27						82.8	96.7	110.6	124.6	138.6	152.7	166.9	181.0
28						88.6	103.4	118.3	133.3	148.3	163.4	178.5	193.7
29						94.5	110.3	126.3	142.3	158.3	174.4	190.5	206.7
30						100.6	117.5	134.5	151.5	168.6	185.7	202.9	220.2

SCARLET OAK (*Quercus coccinea* Muenchh.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.2	1.8	2.4	3.0	3.5	4.0	4.5	5.0	5.5				
6	1.5	2.4	3.3	4.1	4.8	5.6	6.3	7.0	7.7				
7	2.0	3.2	4.3	5.3	6.4	7.4	8.4	9.3	10.3				
8	2.4	4.0	5.4	6.8	8.1	9.4	10.7	11.9	13.2				
9	3.0	4.9	6.7	8.4	10.1	11.7	13.3	14.9	16.4				
10	3.6	5.9	8.1	10.3	12.3	14.3	16.2	18.1	20.0				
11		7.1	9.7	12.2	14.7	17.1	19.4	21.7	24.0	26.2	28.4		
12		8.3	11.4	14.4	17.3	20.1	22.9	25.6	28.2	30.9	33.4		
13		9.6	13.2	16.7	20.1	23.4	26.6	29.8	32.9	35.9	38.9		
14		11.0	15.2	19.2	23.1	26.9	30.6	34.3	37.8	41.3	44.8		
15		12.5	17.3	21.9	26.4	30.7	34.9	39.0	43.1	47.1	51.1		
16		14.1	19.5	24.7	29.8	34.7	39.4	44.1	48.7	53.3	57.8		
17				27.8	33.4	38.9	44.3	49.5	54.7	59.8	64.8	69.8	74.7
18				30.9	37.2	43.3	49.3	55.2	61.0	66.7	72.3	77.8	83.3
19				34.3	41.2	48.0	54.7	61.2	67.6	73.9	80.2	86.3	92.4
20				37.8	45.5	53.0	60.3	67.5	74.6	81.5	88.4	95.2	101.9
21					49.9	58.1	66.2	74.1	81.8	89.5	97.0	104.5	111.8
22					54.5	63.5	72.3	80.9	89.4	97.8	106.0	114.2	122.2
23					59.3	69.1	78.7	88.1	97.3	106.4	115.4	124.3	133.1
24					64.3	75.0	85.4	95.6	105.6	115.5	125.2	134.8	144.4
25					69.5	81.0	92.3	103.3	114.1	124.8	135.4	145.8	156.1
26						87.3	99.4	111.3	123.0	134.5	145.9	157.1	168.2
27						93.8	106.9	119.7	132.2	144.6	156.8	168.9	180.8
28						100.6	114.6	128.3	141.7	155.0	168.1	181.1	193.9
29						107.6	122.5	137.2	151.6	165.8	179.8	193.6	207.3
30						114.7	130.7	146.3	161.7	176.9	191.8	206.6	221.2

(continued)

Table 5 (cu ft, cont'd) **WHITE OAK** (*Quercus alba* L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.7	2.2	2.7	3.3	3.8	4.3	4.8	5.3	5.8				
6	1.9	2.7	3.5	4.2	5.0	5.7	6.5	7.2	7.9				
7	2.3	3.3	4.3	5.4	6.4	7.4	8.4	9.3	10.3				
8	2.6	4.0	5.3	6.7	8.0	9.3	10.5	11.8	13.1				
9	3.1	4.8	6.5	8.1	9.8	11.4	13.0	14.6	16.2				
10	3.5	5.6	7.7	9.7	11.7	13.7	15.7	17.7	19.6				
11		6.6	9.1	11.5	13.9	16.3	18.7	21.1	23.4	25.8	28.1		
12		7.6	10.5	13.4	16.3	19.2	22.0	24.8	27.6	30.4	33.1		
13		8.7	12.1	15.5	18.9	22.2	25.5	28.8	32.0	35.3	38.5		
14		9.9	13.9	17.8	21.7	25.5	29.3	33.1	36.9	40.6	44.3		
15		11.2	15.7	20.2	24.6	29.0	33.4	37.7	42.0	46.3	50.6		
16		12.5	17.7	22.8	27.8	32.8	37.7	42.6	47.5	52.3	57.2		
17				25.5	31.1	36.7	42.3	47.8	53.3	58.8	64.2	69.6	75.0
18				28.4	34.7	40.9	47.1	53.3	59.4	65.6	71.6	77.7	83.7
19				31.4	38.4	45.4	52.2	59.1	65.9	72.7	79.5	86.2	92.9
20				34.6	42.3	50.0	57.6	65.2	72.7	80.2	87.7	95.1	102.6
21					46.4	54.9	63.3	71.6	79.9	88.1	96.3	104.5	112.7
22					50.7	60.0	69.2	78.3	87.3	96.4	105.4	114.3	123.3
23					55.2	65.3	75.3	85.3	95.1	105.0	114.8	124.6	134.3
24					59.9	70.8	81.7	92.5	103.3	114.0	124.6	135.2	145.8
25					64.8	76.6	88.4	100.1	111.7	123.3	134.8	146.3	157.8
26						82.6	95.3	107.9	120.5	133.0	145.5	157.9	170.2
27						88.8	102.5	116.1	129.6	143.1	156.5	169.8	183.1
28						95.3	109.9	124.5	139.0	153.5	167.9	182.2	196.5
29						101.9	117.6	133.3	148.8	164.3	179.7	195.0	210.3
30						108.8	125.6	142.3	158.9	175.4	191.9	208.3	224.6

CHESTNUT OAK (*Quercus prinus* L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.1	1.7	2.2	2.8	3.4	4.0	4.5	5.1	5.6				
6	1.4	2.2	3.0	3.8	4.6	5.4	6.2	7.0	7.7				
7	1.7	2.8	3.9	4.9	6.0	7.1	8.1	9.2	10.2				
8	2.0	3.5	4.8	6.2	7.6	8.9	10.3	11.6	13.0				
9	2.5	4.2	5.9	7.7	9.3	11.0	12.7	14.4	16.0				
10	2.9	5.0	7.1	9.2	11.3	13.3	15.4	17.4	19.4				
11		5.9	8.5	10.9	13.4	15.8	18.3	20.7	23.1	25.5	27.9		
12		6.9	9.9	12.8	15.7	18.6	21.4	24.3	27.1	29.9	32.7		
13		8.0	11.4	14.8	18.1	21.5	24.8	28.1	31.4	34.7	37.9		
14		9.1	13.0	16.9	20.8	24.6	28.4	32.2	36.0	39.7	43.5		
15		10.3	14.7	19.2	23.6	27.9	32.2	36.5	40.8	45.1	49.4		
16		11.5	16.6	21.6	26.5	31.4	36.3	41.1	46.0	50.8	55.6		
17				24.1	29.6	35.1	40.6	46.0	51.4	56.8	62.2	67.5	72.9
18				26.7	32.9	39.0	45.1	51.1	57.1	63.1	69.1	75.1	81.0
19				29.5	36.3	43.1	49.8	56.5	63.1	69.8	76.4	83.0	89.5
20				32.4	39.9	47.4	54.7	62.1	69.4	76.7	84.0	91.2	98.5
21					43.7	51.8	59.9	68.0	76.0	84.0	91.9	99.9	107.8
22					47.6	56.5	65.3	74.1	82.8	91.5	100.2	108.9	117.5
23					51.7	61.3	70.9	80.4	89.9	99.4	108.8	118.2	127.6
24					55.9	66.3	76.7	87.0	97.3	107.5	117.7	127.9	138.1
25					60.3	71.5	82.7	93.8	104.9	116.0	127.0	138.0	148.9
26						76.9	88.9	100.9	112.8	124.7	136.6	148.4	160.2
27						82.5	95.4	108.2	121.0	133.8	146.5	159.2	171.8
28						88.2	102.0	115.8	129.5	143.1	156.7	170.3	183.8
29						94.1	108.9	123.5	138.2	152.7	167.3	181.8	196.2
30						100.2	115.9	131.6	147.1	162.7	178.2	193.6	209.0

(continued)

Table 5 (cu ft, cont'd) **YELLOW BIRCH** (*Betula alleghaniensis* Britton).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.4	2.0	2.7	3.4	4.1	4.8	5.5	6.2	6.9				
6	1.7	2.5	3.5	4.4	5.4	6.4	7.4	8.4	9.4				
7	1.9	3.1	4.3	5.6	6.9	8.2	9.5	10.9	12.3				
8	2.3	3.8	5.3	7.0	8.6	10.3	12.0	13.7	15.5				
9	2.6	4.5	6.5	8.5	10.5	12.6	14.8	16.9	19.1				
10	3.0	5.3	7.7	10.1	12.6	15.2	17.8	20.4	23.1				
11		6.2	9.0	12.0	14.9	18.0	21.1	24.2	27.4	30.6	33.8		
12		7.1	10.5	13.9	17.4	21.0	24.6	28.3	32.0	35.8	39.6		
13		8.2	12.0	16.0	20.1	24.2	28.5	32.7	37.1	41.4	45.8		
14		9.2	13.7	18.3	22.9	27.7	32.5	37.4	42.4	47.4	52.5		
15		10.4	15.5	20.7	26.0	31.4	36.9	42.5	48.1	53.8	59.5		
16		11.6	17.3	23.2	29.2	35.3	41.5	47.8	54.1	60.5	67.0		
17				25.9	32.6	39.4	46.3	53.4	60.5	67.7	74.9	82.2	89.6
18				28.7	36.1	43.7	51.4	59.3	67.2	75.2	83.2	91.4	99.5
19				31.6	39.9	48.3	56.8	65.4	74.2	83.0	91.9	100.9	110.0
20				34.7	43.8	53.0	62.4	71.9	81.5	91.2	101.1	110.9	120.9
21					47.8	58.0	68.2	78.7	89.2	99.8	110.6	121.4	132.3
22					52.1	63.1	74.3	85.7	97.2	108.8	120.5	132.3	144.2
23					56.5	68.5	80.7	93.0	105.5	118.1	130.8	143.6	156.5
24					61.1	74.1	87.2	100.6	114.1	127.7	141.5	155.4	169.4
25					65.8	79.8	94.1	108.5	123.0	137.7	152.6	167.6	182.7
26						85.8	101.1	116.6	132.3	148.1	164.1	180.2	196.4
27						92.0	108.4	125.0	141.8	158.8	175.9	193.2	210.7
28						98.4	115.9	133.7	151.7	169.9	188.2	206.7	225.3
29						105.0	123.7	142.7	161.9	181.3	200.8	220.6	240.5
30						111.7	131.7	151.9	172.3	193.0	213.9	234.9	256.1

SWEET BIRCH (*Betula lenta* L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.6	2.2	2.8	3.4	4.0	4.6	5.2	5.8	6.4				
6	1.9	2.7	3.6	4.4	5.3	6.1	7.0	7.8	8.7				
7	2.2	3.3	4.5	5.6	6.8	7.9	9.1	10.2	11.4				
8	2.5	4.0	5.5	7.0	8.5	9.9	11.4	12.9	14.4				
9	3.0	4.8	6.7	8.5	10.4	12.2	14.1	16.0	17.8				
10	3.4	5.7	7.9	10.2	12.5	14.8	17.0	19.3	21.6				
11		6.6	9.4	12.1	14.8	17.5	20.3	23.0	25.7	28.5	31.2		
12		7.7	10.9	14.1	17.3	20.5	23.8	27.0	30.2	33.5	36.7		
13		8.8	12.5	16.3	20.0	23.8	27.6	31.3	35.1	38.9	42.7		
14		10.0	14.3	18.6	23.0	27.3	31.6	36.0	40.3	44.7	49.0		
15		11.3	16.2	21.1	26.1	31.0	36.0	40.9	45.9	50.8	55.8		
16		12.6	18.2	23.8	29.4	35.0	40.6	46.2	51.8	57.4	63.0		
17				26.6	32.9	39.2	45.5	51.8	58.1	64.4	70.7	77.0	83.3
18				29.6	36.6	43.6	50.6	57.6	64.7	71.7	78.8	85.8	92.9
19				32.7	40.5	48.3	56.0	63.8	71.6	79.4	87.2	95.1	102.9
20				36.0	44.6	53.1	61.7	70.3	78.9	87.5	96.2	104.8	113.4
21					48.8	58.3	67.7	77.1	86.6	96.0	105.5	115.0	124.4
22					53.3	63.6	73.9	84.2	94.6	104.9	115.2	125.6	136.0
23					58.0	69.2	80.4	91.6	102.9	114.1	125.4	136.7	148.0
24					62.8	75.0	87.1	99.3	111.5	123.8	136.0	148.2	160.5
25					67.8	81.0	94.2	107.3	120.5	133.8	147.0	160.2	173.5
26						87.2	101.4	115.7	129.9	144.1	158.4	172.7	186.9
27						93.7	109.0	124.3	139.6	154.9	170.2	185.5	200.9
28						100.4	116.8	133.2	149.6	166.0	182.4	198.9	215.3
29						107.3	124.8	142.4	159.9	177.5	195.1	212.7	230.3
30						114.5	133.2	151.9	170.6	189.3	208.1	226.9	245.7

(continued)

Table 5 (cu ft, cont'd) **AMERICAN BEECH** (*Fagus grandifolia* Ehrh.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.7	2.3	2.9	3.4	3.9	4.3	4.7	5.1	5.4				
6	2.2	3.2	4.0	4.7	5.3	6.0	6.6	7.1	7.6				
7	2.9	4.2	5.2	6.2	7.1	8.0	8.7	9.5	10.2				
8	3.6	5.3	6.7	8.0	9.2	10.2	11.3	12.3	13.2				
9	4.5	6.6	8.4	10.0	11.5	12.8	14.2	15.4	16.6				
10	5.4	8.0	10.2	12.2	14.0	15.7	17.4	18.9	20.4				
11		9.6	12.3	14.7	16.9	18.9	20.9	22.8	24.6	26.3	28.0		
12		11.3	14.5	17.4	20.0	22.5	24.8	27.0	29.1	31.2	33.2		
13		13.2	16.9	20.3	23.4	26.3	29.0	31.6	34.1	36.5	38.8		
14		15.2	19.6	23.5	27.0	30.4	33.5	36.6	39.5	42.2	44.9		
15		17.4	22.4	26.9	31.0	34.8	38.4	41.9	45.2	48.4	51.5		
16		19.8	25.4	30.5	35.1	39.5	43.6	47.6	51.4	55.0	58.5		
17				34.3	39.6	44.5	49.2	53.6	57.9	62.0	66.0	69.9	73.6
18				38.4	44.3	49.9	55.1	60.1	64.8	69.5	73.9	78.2	82.4
19				42.8	49.3	55.5	61.3	66.9	72.2	77.3	82.3	87.1	91.8
20				47.3	54.6	61.4	67.9	74.0	79.9	85.6	91.1	96.4	101.6
21					60.1	67.6	74.7	81.5	88.0	94.3	100.4	106.3	112.0
22					65.9	74.2	82.0	89.4	96.6	103.4	110.1	116.6	122.8
23					72.0	81.0	89.5	97.7	105.5	113.0	120.3	127.3	134.2
24					78.3	88.2	97.4	106.3	114.8	123.0	130.9	138.6	146.1
25					85.0	95.6	105.7	115.3	124.5	133.4	142.0	150.3	158.4
26						103.3	114.2	124.6	134.6	144.2	153.5	162.5	171.3
27						111.4	123.1	134.3	145.1	155.4	165.5	175.2	184.7
28						119.7	132.4	144.4	156.0	167.1	177.9	188.4	198.6
29						128.4	141.9	154.9	167.3	179.2	190.8	202.0	213.0
30						137.3	151.8	165.7	178.9	191.7	204.1	216.2	227.9

WHITE ASH (*Fraxinus americana* L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.1	1.7	2.3	2.8	3.3	3.8	4.2	4.6	5.1				
6	1.5	2.4	3.2	3.9	4.6	5.3	5.9	6.5	7.2				
7	2.0	3.2	4.2	5.2	6.1	7.0	7.9	8.8	9.6				
8	2.5	4.0	5.4	6.7	7.9	9.1	10.2	11.3	12.4				
9	3.1	5.0	6.7	8.4	9.9	11.4	12.8	14.2	15.6				
10	3.8	6.1	8.3	10.2	12.2	14.0	15.8	17.5	19.2				
11		7.3	9.9	12.3	14.6	16.8	19.0	21.0	23.1	25.0	27.0		
12		8.7	11.7	14.6	17.3	19.9	22.5	24.9	27.3	29.7	32.0		
13		10.1	13.7	17.0	20.2	23.3	26.2	29.1	31.9	34.7	37.4		
14		11.6	15.8	19.7	23.3	26.9	30.3	33.7	36.9	40.1	43.2		
15		13.3	18.0	22.5	26.7	30.8	34.7	38.5	42.3	45.9	49.5		
16		15.1	20.4	25.5	30.3	34.9	39.4	43.7	48.0	52.1	56.2		
17				28.7	34.1	39.3	44.3	49.2	54.0	58.7	63.3	67.8	72.2
18				32.1	38.1	44.0	49.6	55.1	60.4	65.7	70.8	75.8	80.8
19				35.7	42.4	48.9	55.1	61.2	67.2	73.0	78.7	84.3	89.9
20				39.4	46.9	54.0	61.0	67.7	74.3	80.8	87.1	93.3	99.4
21					51.6	59.5	67.1	74.5	81.8	88.9	95.8	102.7	109.4
22					56.5	65.2	73.5	81.7	89.6	97.4	105.0	112.5	119.9
23					61.7	71.1	80.2	89.1	97.8	106.3	114.6	122.8	130.8
24					67.0	77.3	87.2	96.9	106.3	115.6	124.6	133.5	142.3
25					72.6	83.7	94.5	105.0	115.2	125.2	135.0	144.7	154.2
26						90.5	102.1	113.4	124.5	135.3	145.9	156.3	166.6
27						97.4	110.0	122.2	134.1	145.7	157.1	168.4	179.4
28						104.6	118.1	131.2	144.0	156.5	168.8	180.9	192.7
29						112.1	126.5	140.6	154.3	167.7	180.9	193.8	206.6
30						119.8	135.3	150.3	165.0	179.3	193.4	207.2	220.8

(continued)

Table 5 (cu ft, cont'd)

AMERICAN BASSWOOD (*Tilia americana* L.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT												
	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.5	2.1	2.6	3.1	3.6	4.1	4.6	5.0	5.5				
6	1.9	2.7	3.4	4.2	4.9	5.6	6.3	6.9	7.6				
7	2.2	3.4	4.4	5.4	6.4	7.3	8.3	9.2	10.1				
8	2.7	4.1	5.5	6.8	8.1	9.3	10.6	11.8	12.9				
9	3.2	5.0	6.8	8.4	10.1	11.6	13.2	14.7	16.2				
10	3.8	6.1	8.2	10.2	12.2	14.2	16.1	18.0	19.9				
11		7.2	9.8	12.2	14.7	17.0	19.4	21.6	23.9	26.1	28.3		
12		8.4	11.5	14.4	17.3	20.1	22.9	25.6	28.3	31.0	33.6		
13		9.7	13.3	16.8	20.2	23.5	26.8	30.0	33.1	36.2	39.3		
14		11.2	15.4	19.4	23.4	27.2	31.0	34.7	38.3	41.9	45.5		
15		12.7	17.5	22.2	26.7	31.1	35.5	39.7	43.9	48.1	52.2		
16		14.4	19.9	25.2	30.3	35.4	40.3	45.1	49.9	54.6	59.3		
17				28.3	34.2	39.8	45.4	50.9	56.3	61.6	66.9	72.1	77.3
18				31.7	38.2	44.6	50.9	57.0	63.1	69.1	75.0	80.8	86.7
19				35.3	42.5	49.6	56.6	63.5	70.3	76.9	83.5	90.1	96.5
20				39.0	47.1	55.0	62.7	70.3	77.8	85.2	92.5	99.8	107.0
21					51.9	60.6	69.1	77.5	85.8	93.9	102.0	110.0	117.9
22					56.9	66.4	75.8	85.0	94.1	103.1	112.0	120.8	129.5
23					62.1	72.6	82.8	92.9	102.9	112.7	122.4	132.0	141.5
24					67.6	79.0	90.2	101.2	112.0	122.7	133.3	143.8	154.1
25					73.4	85.7	97.9	109.8	121.6	133.2	144.7	156.0	167.3
26						92.7	105.8	118.8	131.5	144.1	156.5	168.8	181.0
27						100.0	114.1	128.1	141.8	155.4	168.8	182.1	195.2
28						107.5	122.8	137.8	152.6	167.2	181.6	195.9	210.0
29						115.3	131.7	147.8	163.7	179.4	194.8	210.2	225.4
30						123.4	141.0	158.2	175.2	192.0	208.6	225.0	241.3

YELLOW-POPLAR (*Liriodendron tulipifera* L.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT												
	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.0	1.6	2.3	2.9	3.6	4.3	5.0	5.7	6.4				
6	1.3	2.1	3.0	3.9	4.8	5.7	6.7	7.7	8.6				
7	1.5	2.6	3.8	4.9	6.2	7.4	8.6	9.9	11.2				
8	1.8	3.2	4.6	6.1	7.7	9.2	10.8	12.4	14.0				
9	2.1	3.8	5.6	7.5	9.3	11.2	13.2	15.2	17.2				
10	2.5	4.5	6.7	8.9	11.1	13.4	15.8	18.2	20.6				
11		5.3	7.8	10.4	13.1	15.8	18.6	21.4	24.2	27.1	30.0		
12		6.1	9.0	12.1	15.2	18.3	21.6	24.8	28.2	31.5	34.9		
13		6.9	10.3	13.8	17.4	21.1	24.8	28.5	32.3	36.2	40.1		
14		7.8	11.7	15.7	19.8	23.9	28.1	32.4	36.8	41.2	45.6		
15		8.8	13.1	17.6	22.2	26.9	31.7	36.6	41.4	46.4	51.4		
16		9.7	14.6	19.7	24.9	30.1	35.5	40.9	46.4	51.9	57.5		
17				21.9	27.6	33.5	39.4	45.4	51.5	57.7	63.9	70.2	76.5
18				24.1	30.5	36.9	43.5	50.2	56.9	63.7	70.6	77.6	84.6
19				26.5	33.5	40.6	47.8	55.1	62.6	70.1	77.6	85.2	92.9
20				28.9	36.6	44.4	52.3	60.3	68.4	76.6	84.9	93.2	101.7
21					39.8	48.3	56.9	65.7	74.5	83.4	92.5	101.6	110.7
22					43.2	52.4	61.7	71.2	80.8	90.5	100.3	110.2	120.1
23					46.6	56.6	66.7	77.0	87.3	97.8	108.4	119.1	129.9
24					50.2	60.9	71.8	82.9	94.1	105.4	116.8	128.3	139.9
25					53.9	65.4	77.2	89.0	101.0	113.2	125.5	137.8	150.3
26						70.1	82.6	95.4	108.2	121.2	134.4	147.6	161.0
27						74.8	88.3	101.9	115.6	129.5	143.6	157.7	172.0
28						79.8	94.1	108.6	123.2	138.1	153.0	168.1	183.4
29						84.8	100.0	115.4	131.0	146.8	162.8	178.8	195.0
30						90.0	106.1	122.5	139.1	155.8	172.7	189.8	207.0

(continued)

Table 5 (cu ft, cont'd)

ASPEN (*Populus* spp. L.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.7	2.1	2.7	3.3	4.0	4.7	5.4	6.2	7.0				
6	1.8	2.5	3.3	4.2	5.1	6.1	7.2	8.3	9.5				
7	2.0	2.9	4.0	5.2	6.4	7.8	9.3	10.8	12.4				
8	2.2	3.4	4.8	6.3	8.0	9.8	11.6	13.6	15.7				
9	2.4	3.9	5.7	7.6	9.7	11.9	14.3	16.8	19.4				
10	2.7	4.5	6.6	9.0	11.6	14.4	17.3	20.4	23.5				
11		5.2	7.7	10.6	13.7	17.1	20.6	24.3	28.1	32.1	36.2		
12		5.9	8.9	12.3	16.0	20.0	24.2	28.5	33.1	37.8	42.7		
13		6.6	10.2	14.2	18.5	23.2	28.0	33.2	38.5	44.0	49.7		
14		7.5	11.6	16.2	21.2	26.6	32.2	38.1	44.3	50.7	57.3		
15		8.4	13.1	18.4	24.1	30.2	36.7	43.5	50.5	57.8	65.4		
16		9.3	14.7	20.7	27.2	34.2	41.5	49.2	57.2	65.5	74.0		
17				23.2	30.5	38.3	46.6	55.2	64.2	73.6	83.2	93.2	103.4
18				25.7	33.9	42.7	51.9	61.6	71.7	82.1	93.0	104.1	115.5
19				28.5	37.6	47.3	57.6	68.4	79.6	91.2	103.2	115.6	128.3
20				31.4	41.4	52.2	63.5	75.4	87.9	100.7	114.0	127.7	141.8
21					45.5	57.3	69.8	82.9	96.5	110.7	125.3	140.4	155.9
22					49.7	62.6	76.3	90.7	105.6	121.2	137.2	153.7	170.7
23					54.1	68.2	83.2	98.8	115.2	132.1	149.6	167.6	186.1
24					58.7	74.1	90.3	107.3	125.1	143.5	162.5	182.1	202.2
25					63.5	80.1	97.7	116.2	135.4	155.3	175.9	197.2	219.0
26						86.4	105.5	125.4	146.1	167.7	189.9	212.8	236.4
27						93.0	113.5	134.9	157.3	180.5	204.4	229.1	254.5
28						99.8	121.8	144.8	168.8	193.7	219.4	246.0	273.2
29						106.8	130.3	155.0	180.8	207.4	235.0	263.4	292.6
30						114.0	139.2	165.6	193.1	221.6	251.1	281.5	312.7

BLACK CHERRY (*Prunus serotina* Ehrh.).

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.9	2.4	2.9	3.5	4.0	4.5	5.1	5.6	6.2				
6	2.2	2.9	3.6	4.4	5.2	5.9	6.7	7.5	8.3				
7	2.4	3.4	4.4	5.5	6.5	7.6	8.6	9.7	10.8				
8	2.8	4.1	5.4	6.7	8.1	9.5	10.9	12.2	13.6				
9	3.1	4.8	6.5	8.2	9.9	11.6	13.4	15.1	16.9				
10	3.5	5.6	7.6	9.8	11.9	14.0	16.2	18.4	20.6				
11		6.5	9.0	11.5	14.1	16.7	19.3	22.0	24.6	27.3	30.0		
12		7.4	10.4	13.5	16.5	19.6	22.8	25.9	29.1	32.2	35.4		
13		8.5	12.0	15.6	19.2	22.8	26.5	30.2	33.9	37.6	41.4		
14		9.6	13.7	17.8	22.0	26.3	30.5	34.8	39.1	43.4	47.8		
15		10.8	15.5	20.3	25.1	30.0	34.8	39.8	44.7	49.7	54.7		
16		12.1	17.5	22.9	28.4	33.9	39.5	45.1	50.7	56.4	62.0		
17				25.7	31.9	38.1	44.4	50.7	57.1	63.5	69.9	76.4	82.8
18				28.6	35.6	42.6	49.6	56.7	63.9	71.0	78.2	85.5	92.7
19				31.8	39.5	47.3	55.2	63.1	71.0	79.0	87.1	95.1	103.2
20				35.1	43.6	52.3	61.0	69.8	78.6	87.5	96.4	105.3	114.3
21					48.0	57.5	67.1	76.8	86.5	96.3	106.1	116.0	125.9
22					52.6	63.0	73.6	84.2	94.9	105.6	116.4	127.2	138.1
23					57.3	68.8	80.3	91.9	103.6	115.4	127.2	139.0	150.9
24					62.3	74.8	87.4	100.0	112.8	125.5	138.4	151.3	164.2
25					67.5	81.1	94.7	108.5	122.3	136.2	150.1	164.1	178.2
26						87.6	102.4	117.2	132.2	147.2	162.3	177.5	192.7
27						94.4	110.3	126.4	142.5	158.7	175.0	191.3	207.7
28						101.5	118.6	135.8	153.2	170.6	188.2	205.7	223.4
29						108.8	127.2	145.7	164.3	183.0	201.8	220.7	239.6
30						116.3	136.0	155.9	175.8	195.8	215.9	236.2	256.4

(continued)

Table 5 (cu ft, cont'd) **MISCELLANEOUS HARDWOODS.**

MERCHANTABLE HEIGHT IN 8-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	1	2	3	4	5	6	7	8	9	10	11	12	13
5	1.7	2.3	2.9	3.6	4.3	5.1	5.9	6.8	7.7				
6	1.9	2.6	3.5	4.4	5.4	6.5	7.6	8.8	10.0				
7	2.0	3.0	4.1	5.3	6.6	8.0	9.5	11.0	12.6				
8	2.2	3.4	4.8	6.4	8.0	9.7	11.6	13.5	15.5				
9	2.4	3.9	5.6	7.5	9.5	11.6	13.8	16.2	18.6				
10	2.7	4.4	6.5	8.7	11.1	13.6	16.3	19.1	22.0				
11		5.0	7.4	10.0	12.8	15.8	18.9	22.2	25.6	29.1	32.7		
12		5.6	8.3	11.4	14.6	18.1	21.7	25.5	29.5	33.5	37.7		
13		6.2	9.3	12.8	16.6	20.5	24.7	29.1	33.6	38.2	43.0		
14		6.8	10.4	14.4	18.6	23.1	27.9	32.8	37.9	43.2	48.6		
15		7.5	11.6	16.0	20.8	25.8	31.2	36.7	42.4	48.4	54.5		
16		8.2	12.7	17.7	23.0	28.7	34.6	40.8	47.2	53.8	60.6		
17				19.5	25.4	31.6	38.2	45.1	52.2	59.5	67.1	74.8	82.8
18				21.3	27.8	34.7	42.0	49.5	57.4	65.4	73.8	82.3	91.1
19				23.3	30.4	38.0	45.9	54.2	62.7	71.6	80.7	90.1	99.7
20				25.2	33.0	41.3	49.9	59.0	68.3	78.0	88.0	98.2	108.7
21					35.8	44.7	54.1	63.9	74.1	84.6	95.4	106.5	117.9
22					38.6	48.3	58.5	69.1	80.1	91.5	103.2	115.2	127.5
23					41.5	52.0	63.0	74.4	86.3	98.5	111.2	124.1	137.4
24					44.5	55.8	67.6	79.9	92.7	105.8	119.4	133.4	147.6
25					47.6	59.7	72.3	85.5	99.2	113.3	127.9	142.8	158.1
26						63.7	77.2	91.3	106.0	121.1	136.6	152.6	169.0
27						67.8	82.3	97.3	112.9	129.0	145.6	162.6	180.1
28						72.1	87.4	103.4	120.0	137.1	154.8	172.9	191.5
29						76.4	92.7	109.7	127.3	145.5	164.2	183.5	203.2
30						80.9	98.1	116.1	134.8	154.0	173.9	194.3	215.2

TABLE 6. Board-foot volume equations.

Species	b_0	b_1	SEE	R^2
White pine	-1.5473	.015473	31.7	.993
Hemlock	-1.4596	.014596	26.8	.989
Pitch pine	-8.7650	.016652	25.6	.964
Miscellaneous softwoods	2.1004	.016583	4.9	.990
Sugar maple	6.2685	.018561	36.7	.977
Red maple	3.1916	.019514	16.4	.982
Red oak	3.8571	.019001	36.0	.982
Black oak	5.5413	.017287	17.7	.990
Scarlet oak	8.9972	.018597	30.2	.972
White oak	1.6115	.018032	26.9	.980
Chestnut oak	5.3365	.016602	10.4	.988
Yellow birch	5.0116	.018606	5.0	.992
Sweet birch	4.9108	.018451	11.1	.980
Beech	21.2024	.017985	24.7	.982
Ash	9.2359	.017288	17.4	.980
Basswood	4.5357	.019424	13.7	.978
Yellow-poplar	15.2830	.016340	23.6	.988
Aspen	0.0917	.020303	2.9	.994
Black cherry	16.0039	.016487	25.9	.971
Miscellaneous hardwoods	4.9092	.016363	23.3	.967

$$V = b_0 + b_1 D^2 H$$

TABLE 7. Board-foot volume adjustment factors.

Total merchantable height	Percentage of board foot volume in 4-foot sections																			
(No. of logs)	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
1	38	29	22	11																
1-1/2	27	21	19	16	12	6														
2	22	16	15	14	12	10	7	3												
2-1/2	18	13	13	12	11	10	9	7	5	2										
3	16	11	11	10	10	9	8	7	6	5	4	2								
3-1/2	15	9	9	9	9	8	8	7	7	6	5	4	3	1						
4	13	8	8	8	8	7	7	7	6	6	5	5	4	3	2	1				
4-1/2	13	7	7	7	7	7	7	6	6	6	5	5	4	4	3	3	2	1		
5	12	7	7	6	6	6	6	6	6	5	5	5	4	4	4	3	3	2	2	1

TABLE 8. Board-foot (International 1/4-inch) volume tables for the commercial forest species of Pennsylvania. Top diameter for hardwoods is 8.5 inches outside bark, for conifers it is 6.5 inches outside bark; merchantable height is height from 1-foot stump to top diameter. Shaded entries represent extent of sample data.

EASTERN WHITE PINE (*Pinus strobus* L.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	7	16	24	32	40	48	56	64	72				
9	10	20	30	40	51	61	71	81	91				
10	13	25	38	50	63	75	88	101	113				
11	16	31	46	61	76	92	107	122	137	152	168		
12	19	37	55	73	91	109	127	146	164	182	200		
13	22	44	65	86	107	129	150	171	192	214	235		
14	26	51	75	100	125	149	174	199	223	248	273		
15	30	59	87	115	143	172	200	228	257	285	313		
16		67	99	131	163	196	228	260	292	324	356	389	421
17		76	112	148	185	221	257	294	330	366	403	439	475
18		85	126	166	207	248	289	329	370	411	452	492	533
19		95	140	186	231	276	322	367	412	458	503	549	594
20		105	156	206	256	306	357	407	457	508	558	608	658
21			172	227	282	338	393	449	504	560	615	671	726
22			188	249	310	371	432	493	554	614	675	736	797
23			206	273	339	406	472	539	605	672	738	805	871
24			225	297	369	442	514	587	659	732	804	876	949
25			244	322	401	480	558	637	715	794	872	951	1030
26				349	434	519	604	689	774	859	944	1029	1114
27				376	468	560	651	743	835	926	1018	1110	1201
28				405	503	602	701	799	898	996	1095	1193	1292
29				434	540	646	752	857	963	1069	1174	1280	1386
30				465	578	691	804	918	1031	1144	1257	1370	1483
31				497	617	738	859	980	1101	1221	1342	1463	1584
32				529	658	787	915	1044	1173	1302	1430	1559	1688
33				563	700	837	974	1111	1247	1384	1521	1658	1795
34				598	743	888	1034	1179	1324	1470	1615	1760	1906
35				633	787	941	1095	1249	1403	1557	1711	1865	2019
36				670	833	996	1159	1322	1485	1648	1811	1974	2137

EASTERN HEMLOCK (*Tsuga canadensis* (L.) Carr.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	7	15	22	30	37	45	53	60	68				
9	9	19	29	38	48	57	67	77	86				
10	12	24	36	47	59	71	83	95	107				
11	15	29	43	58	72	86	101	115	129	144	158		
12	18	35	52	69	86	103	120	137	154	171	188		
13	21	41	61	81	101	121	141	161	181	201	221		
14	25	48	71	94	118	141	164	187	211	234	257		
15	29	55	82	109	135	162	189	215	242	269	295		
16		63	93	124	154	184	215	245	276	306	336	367	397
17		71	106	140	174	208	243	277	311	345	380	414	448
18		80	119	157	195	234	272	311	349	388	426	464	503
19		89	132	175	218	261	303	346	389	432	475	518	560
20		99	147	194	242	289	336	384	431	479	526	574	621
21			162	214	266	319	371	423	476	528	580	633	685
22			178	235	293	350	407	465	522	580	637	694	752
23			194	257	320	383	445	508	571	634	696	759	822
24			212	280	348	417	485	553	622	690	758	827	895
25			230	304	378	452	527	601	675	749	823	897	971
26				329	409	489	570	650	730	810	890	970	1051
27				355	441	528	614	701	787	874	960	1047	1133
28				382	475	568	661	754	847	940	1033	1126	1219
29				410	509	609	709	809	908	1008	1108	1208	1307
30				439	545	652	759	866	972	1079	1186	1292	1399
31				468	582	696	810	924	1038	1152	1266	1380	1494
32				499	621	742	864	985	1106	1228	1349	1471	1592
33				531	660	789	918	1048	1177	1306	1435	1564	1693
34				564	701	838	975	1112	1249	1386	1523	1661	1798
35				598	743	888	1033	1179	1324	1469	1614	1760	1905
36				632	786	940	1093	1247	1401	1554	1708	1862	2016

(continued)

Table 8 (bd ft, cont'd)

PITCH PINE (*Pinus rigida* Mill.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	1	10	18	27	36	44	53	62	70				
9	4	15	25	36	47	58	69	80	91				
10	6	20	33	47	61	74	88	101	115				
11	10	26	42	59	75	91	108	124	141	157	173		
12	13	33	52	72	91	111	130	149	169	188	208		
13	17	40	63	86	108	131	154	177	200	223	246		
14	21	48	74	101	127	154	180	207	233	260	286		
15	25	56	86	117	147	178	208	239	269	299	330		
16		65	99	134	169	203	238	273	307	342	376	411	446
17		74	113	152	192	231	270	309	348	387	426	465	504
18		84	128	172	216	260	303	347	391	435	479	523	567
19		95	144	193	241	290	339	388	437	486	535	583	632
20		106	160	214	268	323	377	431	485	539	593	647	701
21			178	237	297	357	416	476	536	595	655	715	774
22			196	261	327	392	458	523	589	654	720	785	851
23			215	286	358	429	501	573	644	716	787	859	930
24			235	313	390	468	546	624	702	780	858	936	1014
25			255	340	424	509	594	678	763	847	932	1016	1101
26				368	460	551	643	734	826	917	1009	1100	1191
27				398	497	595	694	792	891	990	1088	1187	1286
28				429	535	641	747	853	959	1065	1171	1277	1383
29				460	574	688	802	916	1029	1143	1257	1371	1484
30				493	615	737	859	980	1102	1224	1346	1467	1589
31				527	657	787	917	1047	1177	1307	1437	1567	1698
32				562	701	840	978	1117	1255	1394	1532	1671	1809
33				599	746	893	1041	1188	1335	1483	1630	1777	1925
34				636	793	949	1105	1262	1418	1575	1731	1887	2044
35				675	840	1006	1172	1338	1503	1669	1835	2001	2166
36				714	890	1065	1240	1416	1591	1766	1942	2117	2292

MISCELLANEOUS SOFTWOODS.

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	12	20	29	38	46	55	64	72	81				
9	14	25	36	47	58	69	80	91	102				
10	17	31	44	58	71	85	98	112	125				
11	20	37	53	69	86	102	118	135	151	167	183		
12	24	43	63	82	101	121	140	160	179	199	218		
13	28	50	73	96	119	142	164	187	210	233	255		
14	32	58	85	111	137	164	190	217	243	269	296		
15	36	66	97	127	157	188	218	248	279	309	339		
16		75	110	144	179	213	248	282	317	351	386	420	455
17		85	124	163	202	241	279	318	357	396	435	474	513
18		95	138	182	226	269	313	357	400	444	488	531	575
19		105	154	203	251	300	349	397	446	494	543	592	640
20		117	170	224	278	332	386	440	494	548	602	655	709
21			188	247	307	366	425	485	544	604	663	722	782
22			206	271	336	401	467	532	597	662	727	793	858
23			225	296	367	439	510	581	652	724	795	866	937
24			244	322	400	477	555	633	710	788	865	943	1021
25			265	349	434	518	602	686	770	855	939	1023	1107
26				378	469	560	651	742	833	924	1015	1106	1197
27				407	505	604	702	800	898	996	1095	1193	1291
28				438	543	649	755	860	966	1071	1177	1283	1388
29				469	583	696	809	923	1036	1149	1262	1376	1489
30				502	623	745	866	987	1108	1230	1351	1472	1593
31				536	665	795	924	1054	1183	1313	1442	1572	1701
32				571	709	847	985	1123	1261	1399	1537	1675	1813
33				607	754	901	1047	1194	1341	1487	1634	1781	1928
34				644	800	956	1112	1267	1423	1579	1735	1890	2046
35				683	848	1013	1178	1343	1508	1673	1838	2003	2168
36				722	897	1071	1246	1421	1595	1770	1944	2119	2294

(continued)

Table 8 (bd ft, cont'd) **SUGAR MAPLE** (*Acer saccharum* Marsh.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	17	27	36	46	56	65	75	85	94				
9	20	32	44	57	69	81	93	105	118				
10	23	38	53	68	84	99	114	129	144				
11	27	45	63	82	100	118	136	154	173	191	209		
12	31	52	74	96	118	139	161	183	204	226	248		
13	35	60	86	111	137	162	188	213	239	264	290		
14	39	69	99	128	158	187	217	246	276	305	335		
15	44	78	112	146	180	214	248	282	316	350	384		
16		88	127	165	204	243	281	320	358	397	436	474	513
17		99	142	186	230	273	317	360	404	447	491	535	578
18		110	159	208	257	305	354	403	452	501	550	599	647
19		122	176	231	285	340	394	449	503	557	612	666	721
20		134	195	255	315	376	436	496	557	617	677	738	798
21			214	280	347	413	480	547	613	680	746	813	879
22			234	307	380	453	526	599	672	745	818	891	964
23			255	335	415	495	575	654	734	814	894	973	1053
24			278	364	451	538	625	712	799	886	972	1059	1146
25			301	395	489	583	678	772	866	960	1055	1149	1243
26				427	529	630	732	834	936	1038	1140	1242	1344
27				460	569	679	789	899	1009	1119	1229	1339	1449
28				494	612	730	848	967	1085	1203	1321	1440	1558
29				529	656	783	910	1037	1163	1290	1417	1544	1671
30				566	702	837	973	1109	1245	1380	1516	1652	1787
31				604	749	894	1039	1184	1328	1473	1618	1763	1908
32				643	797	952	1106	1261	1415	1570	1724	1878	2033
33				683	848	1012	1176	1340	1505	1669	1833	1997	2161
34				725	899	1074	1248	1422	1597	1771	1945	2120	2294
35				768	953	1137	1322	1507	1692	1876	2061	2246	2431
36				812	1008	1203	1398	1594	1789	1985	2180	2376	2571

RED MAPLE (*Acer rubrum* L.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	15	25	35	45	55	65	75	86	96				
9	18	30	43	56	69	82	95	108	120				
10	21	37	53	69	84	100	116	132	148				
11	25	44	63	82	101	121	140	159	178	197	217		
12	29	52	74	97	120	143	166	189	211	234	257		
13	33	60	87	114	140	167	194	221	248	274	301		
14	38	69	100	131	162	193	225	256	287	318	349		
15	43	79	115	150	186	222	257	293	329	364	400		
16		89	130	171	211	252	292	333	373	414	455	495	536
17		100	146	192	238	284	330	375	421	467	513	559	605
18		112	164	215	266	318	369	420	472	523	575	626	677
19		125	182	239	296	354	411	468	525	583	640	697	754
20		138	201	265	328	392	455	518	582	645	709	772	835
21			222	291	361	431	501	571	641	711	781	851	921
22			243	320	396	473	550	627	703	780	857	934	1010
23			265	349	433	517	601	685	768	852	936	1020	1104
24			288	380	471	562	654	745	836	928	1019	1110	1202
25			313	412	511	610	709	808	907	1006	1105	1205	1304
26				445	552	659	767	874	981	1088	1195	1303	1410
27				480	595	711	827	942	1058	1173	1289	1404	1520
28				516	640	764	889	1013	1137	1262	1386	1510	1634
29				553	686	820	953	1086	1220	1353	1486	1620	1753
30				592	734	877	1020	1162	1305	1448	1590	1733	1876
31				631	784	936	1089	1241	1393	1546	1698	1850	2003
32				673	835	997	1160	1322	1484	1647	1809	1971	2134
33				715	888	1060	1233	1406	1578	1751	1924	2096	2269
34				759	942	1125	1309	1492	1675	1859	2042	2225	2408
35				804	998	1192	1387	1581	1775	1969	2164	2358	2552
36				850	1056	1261	1467	1672	1878	2083	2289	2494	2700

(continued)

Table 8 (bd ft, cont'd)

NORTHERN RED OAK (*Quercus rubra* L.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT												
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	15	25	35	45	54	64	74	84	94				
9	18	30	43	55	68	80	93	105	118				
10	21	37	52	68	83	98	114	129	145				
11	25	44	62	81	100	118	137	156	174	193	212		
12	29	51	73	96	118	140	162	184	207	229	251		
13	33	59	85	111	138	164	190	216	242	268	294		
14	38	68	98	129	159	189	219	250	280	310	340		
15	43	78	112	147	182	217	251	286	321	355	390		
16		88	127	167	206	246	285	325	364	404	443	483	523
17		99	143	188	232	277	322	366	411	456	500	545	589
18		110	160	210	260	310	360	410	460	510	560	610	660
19		122	178	234	289	345	401	457	512	568	624	680	735
20		135	197	258	320	382	444	505	567	629	691	752	814
21			216	285	353	421	489	557	625	693	761	829	897
22			237	312	387	461	536	611	686	760	835	910	984
23			259	341	422	504	586	667	749	831	912	994	1076
24			282	371	459	548	637	726	815	904	993	1082	1171
25			305	402	498	595	691	788	884	981	1077	1174	1270
26				434	539	643	747	852	956	1060	1165	1269	1373
27				468	580	693	806	918	1031	1143	1256	1368	1481
28				503	624	745	866	987	1108	1229	1350	1471	1592
29				539	669	799	929	1059	1188	1318	1448	1578	1708
30				577	716	855	994	1133	1271	1410	1549	1688	1827
31				616	764	912	1061	1209	1357	1506	1654	1802	1951
32				656	814	972	1130	1288	1446	1604	1762	1920	2078
33				697	865	1033	1201	1370	1538	1706	1874	2042	2210
34				740	918	1097	1275	1454	1632	1810	1989	2167	2346
35				784	973	1162	1351	1540	1729	1918	2107	2297	2486
36				829	1029	1229	1429	1629	1829	2029	2229	2429	2630

BLACK OAK (*Quercus velutina* Lam.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT												
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	16	25	34	43	52	61	70	79	88				
9	18	30	41	52	64	75	87	98	109				
10	21	35	49	63	77	92	106	120	134				
11	25	42	59	76	93	110	127	144	161	178	195		
12	28	48	69	89	109	129	150	170	190	210	231		
13	32	56	80	103	127	151	175	198	222	246	270		
14	36	64	92	119	147	174	202	229	257	284	312		
15	41	73	104	136	167	199	231	262	294	325	357		
16		82	118	154	190	226	262	298	334	370	405	441	477
17		92	132	173	213	254	295	335	376	416	457	498	538
18		102	148	193	239	284	330	375	421	466	512	557	603
19		113	164	215	265	316	367	417	468	519	570	620	671
20		125	181	237	293	350	406	462	518	574	630	687	743
21			199	261	323	385	447	509	571	633	695	756	818
22			218	286	354	422	490	558	626	694	762	830	898
23			238	312	386	460	535	609	683	758	832	906	981
24			258	339	420	501	582	663	744	825	905	986	1067
25			280	367	455	543	631	719	806	894	982	1070	1158
26				397	492	587	682	777	872	967	1062	1157	1252
27				428	530	633	735	837	940	1042	1144	1247	1349
28				460	570	680	790	900	1010	1120	1230	1341	1451
29				493	611	729	847	965	1083	1201	1319	1438	1556
30				527	653	780	906	1032	1159	1285	1412	1538	1664
31				562	697	832	967	1102	1237	1372	1507	1642	1777
32				599	742	886	1030	1174	1318	1462	1605	1749	1893
33				636	789	942	1095	1248	1401	1554	1707	1860	2013
34				675	837	1000	1162	1324	1487	1649	1812	1974	2136
35				715	887	1059	1231	1403	1575	1747	1919	2091	2263
36				756	938	1120	1302	1484	1666	1848	2030	2212	2394

(continued)

Table 8 (bd ft, cont'd) **SCARLET OAK** (*Quercus coccinea* Muenchh.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	20	30	39	49	59	68	78	88	97				
9	23	35	47	59	72	84	96	108	121				
10	26	41	56	71	86	102	117	132	147				
11	30	48	66	84	103	121	139	158	176	194	212		
12	33	55	77	99	120	142	164	186	208	229	251		
13	38	63	89	114	140	165	191	216	242	268	293		
14	42	72	101	131	161	190	220	250	279	309	338		
15	47	81	115	149	183	217	251	285	319	353	387		
16		91	130	168	207	246	285	323	362	401	439	478	517
17		102	145	189	233	276	320	364	407	451	495	538	582
18		113	162	211	260	309	358	407	456	505	554	603	651
19		125	179	234	288	343	398	452	507	561	616	670	725
20		137	198	258	319	379	440	500	560	621	681	742	802
21			217	284	350	417	484	550	617	684	750	817	883
22			237	311	384	457	530	603	676	749	822	896	969
23			259	339	418	498	578	658	738	818	898	978	1058
24			281	368	455	542	629	716	803	890	977	1064	1151
25			304	398	493	587	682	776	871	965	1059	1154	1248
26				430	532	634	737	839	941	1043	1145	1247	1349
27				463	573	683	794	904	1014	1124	1234	1344	1455
28				497	616	734	853	971	1090	1208	1327	1445	1564
29				533	660	787	914	1041	1168	1295	1422	1550	1677
30				570	706	842	978	1114	1250	1386	1522	1658	1794
31				608	753	898	1043	1189	1334	1479	1624	1769	1915
32				647	802	956	1111	1266	1421	1575	1730	1885	2039
33				687	852	1017	1181	1346	1510	1675	1839	2004	2168
34				729	904	1079	1253	1428	1603	1777	1952	2127	2301
35				772	957	1142	1327	1513	1698	1883	2068	2253	2438
36				816	1012	1208	1404	1600	1796	1991	2187	2383	2579

WHITE OAK (*Quercus alba* L.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	12	22	31	40	50	59	68	78	87				
9	15	27	39	51	62	74	86	98	110				
10	18	33	47	62	77	91	106	121	135				
11	22	39	57	75	92	110	128	146	163	181	199		
12	25	46	68	89	110	131	152	173	194	215	236		
13	29	54	79	104	128	153	178	203	228	252	277		
14	34	63	91	120	149	177	206	235	264	292	321		
15	39	72	105	138	170	203	236	269	302	335	368		
16		81	119	156	194	231	269	306	344	381	419	456	494
17		92	134	176	219	261	303	346	388	430	473	515	557
18		102	150	197	245	292	340	387	435	482	530	577	625
19		114	167	220	273	325	378	431	484	537	590	643	696
20		126	185	243	302	360	419	478	536	595	653	712	771
21			203	268	333	397	462	526	591	656	720	785	850
22			223	294	365	436	507	578	649	719	790	861	932
23			244	321	399	476	554	631	709	786	864	941	1019
24			265	350	434	518	603	687	772	856	940	1025	1109
25			288	379	471	562	654	745	837	929	1020	1112	1203
26				410	509	608	707	806	905	1004	1103	1202	1301
27				442	549	656	762	869	976	1083	1190	1296	1403
28				475	590	705	820	935	1050	1164	1279	1394	1509
29				510	633	756	879	1002	1126	1249	1372	1495	1619
30				545	677	809	941	1073	1205	1336	1468	1600	1732
31				582	723	864	1005	1145	1286	1427	1568	1708	1849
32				620	770	920	1070	1220	1370	1520	1670	1820	1970
33				659	819	979	1138	1298	1457	1617	1776	1936	2095
34				700	869	1039	1208	1377	1547	1716	1885	2055	2224
35				742	921	1101	1280	1459	1639	1818	1998	2177	2357
36				784	974	1164	1354	1544	1734	1924	2114	2304	2493

(continued)

Table 8 (bd ft, cont'd)

CHESTNUT OAK (*Quercus prinus* L.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT												
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	15	24	32	41	50	58	67	75	84				
9	18	29	39	50	61	72	83	94	105				
10	20	34	47	61	74	88	101	115	128				
11	24	40	56	73	89	105	122	138	154	171	187		
12	27	47	66	85	105	124	144	163	183	202	221		
13	31	54	77	99	122	145	168	191	213	236	259		
14	35	61	88	114	141	167	194	220	247	273	299		
15	39	70	100	130	161	191	222	252	282	313	343		
16		79	113	148	182	217	251	286	320	355	389	424	459
17		88	127	166	205	244	283	322	361	400	439	478	517
18		98	142	186	229	273	317	360	404	448	491	535	579
19		109	157	206	255	304	352	401	450	498	547	596	644
20		120	174	228	282	336	390	444	498	552	605	659	713
21			191	251	310	370	429	489	548	608	667	727	786
22			209	275	340	405	470	536	601	666	732	797	862
23			228	300	371	442	514	585	656	728	799	870	942
24			248	326	403	481	559	636	714	792	870	947	1025
25			269	353	437	522	606	690	774	859	943	1027	1112
26				381	472	564	655	746	837	928	1020	1111	1202
27				411	509	607	706	804	902	1001	1099	1197	1296
28				441	547	653	759	864	970	1076	1182	1287	1393
29				473	587	700	813	927	1040	1154	1267	1381	1494
30				506	627	749	870	991	1113	1234	1356	1477	1599
31				540	669	799	929	1058	1188	1318	1447	1577	1706
32				575	713	851	989	1127	1265	1404	1542	1680	1818
33				611	758	905	1052	1199	1345	1492	1639	1786	1933
34				648	804	960	1116	1272	1428	1584	1740	1896	2052
35				687	852	1017	1182	1348	1513	1678	1843	2009	2174
36				726	901	1076	1251	1425	1600	1775	1950	2125	2300

YELLOW BIRCH (*Betula alleghaniensis* Britton).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT												
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	16	26	35	45	55	64	74	84	93				
9	19	31	43	55	68	80	92	104	117				
10	22	37	52	67	82	98	113	128	143				
11	26	44	62	80	99	117	135	154	172	190	208		
12	29	51	73	95	117	138	160	182	204	225	247		
13	34	59	85	110	136	161	187	213	238	264	289		
14	38	68	98	127	157	186	216	246	275	305	335		
15	43	77	111	145	179	213	247	281	315	349	383		
16		87	126	165	203	242	281	319	358	397	435	474	513
17		98	141	185	229	273	316	360	404	447	491	535	578
18		109	158	207	256	305	354	403	452	501	550	599	648
19		121	175	230	285	339	394	448	503	557	612	667	721
20		133	194	254	315	375	436	496	557	617	678	738	799
21			213	280	347	413	480	547	613	680	747	813	880
22			234	307	380	453	526	599	673	746	819	892	965
23			255	335	415	495	575	655	735	815	895	975	1054
24			277	364	451	538	625	712	799	886	974	1061	1148
25			300	395	489	584	678	773	867	961	1056	1150	1245
26				426	529	631	733	835	937	1040	1142	1244	1346
27				459	570	680	790	900	1010	1121	1231	1341	1451
28				494	612	731	849	968	1086	1205	1323	1442	1560
29				529	656	783	911	1038	1165	1292	1419	1546	1673
30				566	702	838	974	1110	1246	1382	1518	1654	1790
31				604	749	895	1040	1185	1330	1476	1621	1766	1912
32				643	798	953	1108	1262	1417	1572	1727	1882	2036
33				684	848	1013	1178	1342	1507	1672	1836	2001	2165
34				726	900	1075	1250	1425	1599	1774	1949	2124	2298
35				769	954	1139	1324	1509	1694	1880	2065	2250	2435
36				813	1009	1205	1401	1596	1792	1988	2184	2380	2576

(continued)

Table 8 (bd ft, cont'd) **SWEET BIRCH** (*Betula lenta* L.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	16	25	35	44	54	64	73	83	92				
9	19	31	43	55	67	79	91	104	116				
10	22	37	52	67	82	97	112	127	142				
11	25	43	62	80	98	116	134	152	170	189	207		
12	29	51	72	94	116	137	159	180	202	223	245		
13	33	59	84	109	135	160	185	211	236	261	287		
14	38	67	97	126	155	185	214	244	273	302	332		
15	43	77	110	144	178	211	245	279	313	346	380		
16		86	125	163	202	240	278	317	355	393	432	470	509
17		97	140	184	227	270	314	357	400	443	487	530	573
18		108	157	205	254	302	351	399	448	497	545	594	642
19		120	174	228	282	336	390	445	499	553	607	661	715
20		132	192	252	312	372	432	492	552	612	672	732	792
21			211	277	344	410	476	542	608	674	740	806	873
22			232	304	377	449	522	594	667	739	812	885	957
23			253	332	411	490	570	649	728	808	887	966	1046
24			275	361	447	534	620	706	793	879	965	1052	1138
25			298	391	485	579	672	766	860	953	1047	1141	1234
26				423	524	625	727	828	929	1031	1132	1233	1335
27				456	565	674	783	893	1002	1111	1221	1330	1439
28				490	607	725	842	960	1077	1195	1312	1430	1547
29				525	651	777	903	1029	1155	1281	1407	1533	1659
30				561	696	831	966	1101	1236	1371	1506	1641	1776
31				599	743	887	1031	1175	1319	1463	1607	1751	1896
32				638	791	945	1098	1252	1405	1559	1712	1866	2019
33				678	841	1005	1168	1331	1494	1658	1821	1984	2147
34				719	893	1066	1239	1413	1586	1759	1933	2106	2279
35				762	946	1129	1313	1497	1680	1864	2048	2231	2415
36				806	1000	1195	1389	1583	1777	1972	2166	2360	2555

AMERICAN BEECH (*Fagus grandifolia* Ehrh.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	32	41	50	60	69	78	88	97	107				
9	34	46	58	70	82	94	106	117	129				
10	38	52	67	81	96	111	125	140	155				
11	41	59	76	94	112	129	147	165	183	200	218		
12	45	66	87	108	129	150	171	192	213	234	255		
13	49	74	98	123	148	172	197	222	247	271	296		
14	53	82	111	139	168	197	225	254	282	311	340		
15	58	91	124	157	190	223	255	288	321	354	387		
16		101	138	175	213	250	288	325	362	400	437	475	512
17		111	153	195	238	280	322	364	406	449	491	533	575
18		122	169	216	264	311	358	406	453	500	548	595	643
19		133	186	239	291	344	397	450	502	555	608	661	713
20		145	204	262	321	379	438	496	554	613	671	730	788
21			222	287	351	416	480	545	609	674	738	802	867
22			242	313	384	454	525	596	666	737	808	879	949
23			263	340	417	495	572	649	726	804	881	958	1036
24			284	368	452	537	621	705	789	873	957	1042	1126
25			306	398	489	580	672	763	854	946	1037	1128	1220
26				428	527	626	725	824	922	1021	1120	1219	1318
27				460	567	673	780	887	993	1100	1206	1313	1419
28				494	608	723	837	952	1066	1181	1296	1410	1525
29				528	651	774	897	1019	1142	1265	1388	1511	1634
30				563	695	826	958	1090	1221	1353	1484	1616	1747
31				600	741	881	1021	1162	1302	1443	1583	1724	1864
32				638	788	937	1087	1237	1386	1536	1686	1835	1985
33				677	836	996	1155	1314	1473	1632	1791	1950	2110
34				718	887	1056	1224	1393	1562	1731	1900	2069	2238
35				759	938	1117	1296	1475	1654	1833	2012	2191	2370
36				802	991	1181	1370	1560	1749	1938	2128	2317	2506

(continued)

Table 8 (bd ft, cont'd)

WHITE ASH (*Fraxinus americana* L.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	19	28	37	46	55	64	73	82	91				
9	22	33	45	56	68	79	90	102	113				
10	25	39	53	67	81	95	109	123	137				
11	28	45	62	79	96	113	130	147	164	181	198		
12	32	52	72	93	113	133	153	174	194	214	234		
13	36	60	83	107	131	155	178	202	226	250	273		
14	40	68	95	123	150	178	205	233	260	288	315		
15	45	76	108	140	171	203	234	266	298	329	361		
16		86	122	157	193	229	265	301	337	373	409	445	481
17		95	136	177	217	258	298	339	380	420	461	501	542
18		106	151	197	242	288	333	379	424	470	515	561	606
19		117	168	218	269	320	370	421	472	523	573	624	675
20		129	185	241	297	353	409	466	522	578	634	690	747
21			203	265	327	389	450	512	574	636	698	760	822
22			222	290	358	426	493	561	629	697	765	833	901
23			241	316	390	464	539	613	687	761	836	910	984
24			262	343	424	505	586	666	747	828	909	990	1071
25			283	371	459	547	635	722	810	898	986	1074	1161
26				401	496	591	686	781	876	970	1065	1160	1255
27				431	534	636	739	841	943	1046	1148	1251	1353
28				463	573	684	794	904	1014	1124	1234	1344	1454
29				496	614	733	851	969	1087	1205	1323	1441	1559
30				530	657	783	910	1036	1163	1289	1415	1542	1668
31				566	701	836	971	1106	1241	1376	1511	1646	1781
32				602	746	890	1034	1178	1321	1465	1609	1753	1897
33				640	793	946	1099	1252	1405	1558	1711	1864	2017
34				679	841	1003	1166	1328	1491	1653	1815	1978	2140
35				719	891	1063	1235	1407	1579	1751	1923	2095	2267
36				760	942	1124	1306	1488	1670	1852	2034	2216	2398

AMERICAN BASSWOOD (*Tilia americana* L.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	16	26	36	46	56	66	76	87	97				
9	19	32	44	57	70	83	96	108	121				
10	22	38	54	70	85	101	117	133	149				
11	26	45	64	83	102	121	141	160	179	198	217		
12	30	53	76	98	121	144	166	189	212	235	257		
13	34	61	88	115	141	168	195	221	248	275	301		
14	39	70	101	132	163	194	225	256	287	318	349		
15	44	80	115	151	186	222	257	293	328	364	400		
16		90	131	171	212	252	292	333	373	414	454	494	535
17		101	147	193	238	284	329	375	421	466	512	557	603
18		113	164	215	266	318	369	420	471	522	573	624	676
19		125	182	239	296	353	410	467	524	581	638	695	752
20		139	202	265	328	391	454	517	580	644	707	770	833
21			222	291	361	431	500	570	639	709	779	848	918
22			243	319	396	472	549	625	701	778	854	931	1007
23			265	349	432	516	599	683	766	850	933	1017	1100
24			288	379	470	561	652	743	834	925	1016	1107	1197
25			313	411	510	609	707	806	904	1003	1102	1200	1299
26				444	551	658	764	871	978	1085	1191	1298	1405
27				479	594	709	824	939	1054	1169	1284	1399	1514
28				515	638	762	886	1010	1133	1257	1381	1505	1628
29				552	685	817	950	1083	1215	1348	1481	1614	1746
30				590	732	874	1016	1158	1300	1442	1584	1726	1869
31				630	782	933	1085	1237	1388	1540	1692	1843	1995
32				671	832	994	1156	1317	1479	1641	1802	1964	2125
33				713	885	1057	1229	1401	1572	1744	1916	2088	2260
34				757	939	1122	1304	1487	1669	1851	2034	2216	2399
35				802	995	1188	1382	1575	1768	1962	2155	2348	2542
36				848	1052	1257	1461	1666	1871	2075	2280	2484	2689

(continued)

Table 8 (bd ft, cont'd) **YELLOW-POPLAR** (*Liriodendron tulipifera* L.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT												
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	25	33	42	50	59	67	76	84	93				
9	27	38	49	60	70	81	92	103	113				
10	30	43	57	70	83	97	110	123	136				
11	33	49	65	82	98	114	130	146	162	178	194		
12	37	56	75	94	113	132	151	171	190	209	228		
13	40	63	85	108	130	153	175	198	220	242	265		
14	45	71	97	123	149	175	201	227	253	279	305		
15	49	79	109	138	168	198	228	258	288	318	348		
16		87	121	155	189	223	257	291	325	359	393	427	461
17		97	135	173	212	250	289	327	365	404	442	480	519
18		107	150	193	236	279	322	365	408	451	494	537	580
19		117	165	213	261	309	357	405	453	500	548	596	644
20		128	181	234	287	340	394	447	500	553	606	659	712
21			198	257	315	374	432	491	549	608	667	725	784
22			216	280	344	409	473	537	602	666	730	794	859
23			235	305	375	445	516	586	656	726	796	867	937
24			254	331	407	484	560	636	713	789	866	942	1019
25			274	357	440	523	606	689	772	855	938	1021	1104
26				385	475	565	655	744	834	924	1014	1103	1193
27				414	511	608	705	801	898	995	1092	1189	1285
28				444	549	653	757	861	965	1069	1173	1277	1381
29				476	587	699	811	922	1034	1146	1257	1369	1481
30				508	627	747	866	986	1105	1225	1344	1464	1583
31				541	669	796	924	1052	1179	1307	1434	1562	1690
32				576	712	848	984	1120	1256	1392	1527	1663	1799
33				611	756	901	1045	1190	1334	1479	1623	1768	1913
34				648	802	955	1108	1262	1415	1569	1722	1876	2029
35				686	848	1011	1174	1336	1499	1662	1824	1987	2150
36				725	897	1069	1241	1413	1585	1757	1929	2101	2273

ASPEN (*Populus* spp. L.).

D.B.H. (IN)	MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT												
	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	12	23	33	44	54	65	75	86	96				
9	15	28	42	55	69	82	95	109	122				
10	19	35	52	68	85	101	118	134	151				
11	23	42	62	82	102	122	142	162	182	202	222		
12	27	51	74	98	122	146	169	193	217	241	264		
13	31	59	87	115	143	171	199	227	254	282	310		
14	36	69	101	133	166	198	230	263	295	327	360		
15	42	79	116	153	190	227	264	302	339	376	413		
16		90	132	174	216	259	301	343	385	428	470	512	554
17		101	149	197	244	292	340	387	435	483	530	578	626
18		114	167	220	274	327	381	434	488	541	595	648	701
19		127	186	246	305	365	424	484	543	603	662	722	782
20		140	206	272	338	404	470	536	602	668	734	800	866
21			227	300	373	446	518	591	664	737	809	882	955
22			249	329	409	489	569	649	728	808	888	968	1048
23			273	360	447	534	622	709	796	883	971	1058	1145
24			297	392	487	582	677	772	867	962	1057	1152	1247
25			322	425	528	631	734	838	941	1044	1147	1250	1353
26				460	571	683	794	906	1017	1129	1240	1352	1464
27				496	616	736	857	977	1097	1217	1338	1458	1578
28				533	663	792	921	1051	1180	1309	1439	1568	1697
29				572	711	850	988	1127	1266	1404	1543	1682	1821
30				612	761	909	1058	1206	1355	1503	1651	1800	1948
31				654	812	971	1129	1288	1446	1605	1763	1922	2080
32				697	865	1034	1203	1372	1541	1710	1879	2048	2217
33				741	920	1100	1280	1459	1639	1819	1998	2178	2358
34				786	977	1168	1358	1549	1740	1931	2121	2312	2503
35				833	1035	1237	1440	1642	1844	2046	2248	2450	2652
36				882	1095	1309	1523	1737	1951	2164	2378	2592	2806

(continued)

Table 8 (bd ft, cont'd) **BLACK CHERRY** (*Prunus serotina* Ehrh.).

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	26	34	43	51	60	68	77	86	94				
9	28	39	50	61	72	82	93	104	115				
10	31	44	58	71	85	98	111	125	138				
11	34	50	67	83	99	115	131	148	164	180	196		
12	38	57	76	96	115	134	153	173	192	211	231		
13	41	64	87	109	132	155	177	200	223	245	268		
14	45	72	98	124	151	177	203	229	256	282	308		
15	50	80	110	140	170	201	231	261	291	321	351		
16		89	123	157	192	226	260	295	329	363	397	432	466
17		98	137	176	214	253	292	330	369	408	447	485	524
18		108	152	195	238	282	325	369	412	455	499	542	586
19		119	167	215	264	312	360	409	457	506	554	602	651
20		130	183	237	291	344	398	451	505	558	612	666	719
21			200	260	319	378	437	496	555	614	673	732	791
22			218	283	348	413	478	543	607	672	737	802	867
23			237	308	379	450	521	592	662	733	804	875	946
24			257	334	411	488	566	643	720	797	874	951	1029
25			277	361	445	529	612	696	780	864	947	1031	1115
26				389	480	570	661	752	842	933	1023	1114	1204
27				419	516	614	712	809	907	1005	1102	1200	1298
28				449	554	659	764	869	974	1079	1184	1289	1394
29				481	593	706	818	931	1044	1156	1269	1382	1494
30				513	634	754	875	995	1116	1236	1357	1478	1598
31				547	676	804	933	1062	1190	1319	1448	1577	1705
32				582	719	856	993	1130	1267	1405	1542	1679	1816
33				617	763	909	1055	1201	1347	1493	1639	1785	1930
34				654	809	964	1119	1274	1429	1584	1738	1893	2048
35				693	857	1021	1185	1349	1513	1677	1841	2005	2169
36				732	905	1079	1253	1426	1600	1773	1947	2121	2294

MISCELLANEOUS HARDWOODS.

MERCHANTABLE HEIGHT IN 16-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (IN)	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5
8	14	23	31	40	48	57	66	74	83				
9	17	28	39	49	60	71	82	92	103				
10	20	33	46	60	73	86	100	113	126				
11	23	39	55	71	87	103	119	136	152	168	184		
12	26	46	65	84	103	122	141	160	180	199	218		
13	30	53	75	98	120	142	165	187	210	232	255		
14	34	60	86	112	138	164	190	217	243	269	295		
15	38	68	98	128	158	188	218	248	278	308	338		
16		77	111	145	179	213	247	281	315	349	383	417	451
17		86	125	163	202	240	279	317	355	394	432	471	509
18		96	139	182	226	269	312	355	398	441	484	527	570
19		107	155	203	251	299	347	395	443	491	539	587	635
20		118	171	224	277	330	384	437	490	543	596	649	703
21			188	247	305	364	422	481	540	598	657	716	774
22			206	270	335	399	463	528	592	656	721	785	849
23			225	295	365	435	506	576	646	717	787	857	928
24			244	321	397	474	550	627	703	780	857	933	1010
25			264	347	431	514	597	680	763	846	929	1012	1095
26				375	465	555	645	735	825	915	1004	1094	1184
27				404	501	598	695	792	889	986	1083	1180	1277
28				435	539	643	747	851	956	1060	1164	1268	1373
29				466	578	689	801	913	1025	1137	1248	1360	1472
30				498	618	737	857	977	1096	1216	1336	1455	1575
31				532	659	787	915	1043	1170	1298	1426	1554	1681
32				566	702	838	974	1111	1247	1383	1519	1655	1791
33				602	747	891	1036	1181	1326	1470	1615	1760	1905
34				638	792	946	1099	1253	1407	1560	1714	1868	2021
35				676	839	1002	1165	1328	1490	1653	1816	1979	2142
36				715	887	1060	1232	1404	1577	1749	1921	2093	2266

(continued)

TABLE 9. Cubic-meter volume adjustment factors.

Total merchantable height (no. of 2.5-m bolts)	Percentage of cubic meter volume in 1-meter sections																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
2	34	29	21	13	3																									
3	23	21	19	15	12	7	3																							
4	17	17	15	14	12	9	8	5	2	1																				
5	14	13	13	12	11	10	8	7	5	4	2	1																		
6	12	11	11	10	10	9	8	7	6	6	4	3	2	1																
7	10	10	9	9	9	8	8	7	6	6	5	4	3	3	1	2														
8	9	8	9	8	8	7	7	7	6	6	5	4	4	4	3	2	1	1	1											
9	8	7	8	7	7	7	7	6	6	5	6	4	5	3	4	2	3	2	1	1	1									
10	7	7	7	6	7	6	6	6	6	5	5	5	4	4	3	4	3	2	2	2	1	1	1							
11	6	7	6	6	6	6	5	6	5	5	5	5	4	4	4	3	3	3	2	2	2	2	1	1	0	1				
12	6	6	5	6	5	6	5	5	5	5	5	4	4	4	4	3	4	2	3	3	2	2	1	2	1	1	0	1		
13	5	6	5	5	5	5	5	5	5	4	5	4	4	4	4	3	3	3	3	3	2	2	2	2	1	2	1	1	0	1

TABLE 10. Cubic-meter (not including bark and branchwood) volume tables for the commercial forest species of Pennsylvania. Top diameter is 11.4 cm outside bark; merchantable height is height from 30-cm stump to top diameter. Extent of sample data can be inferred from Table 5.

EASTERN WHITE PINE (*Pinus strobus* L.).

D.B.H.	MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT												
(CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11				
12	0.03	0.05	0.07	0.08	0.10	0.11	0.13	0.14	0.16				
14	0.04	0.06	0.09	0.11	0.13	0.15	0.17	0.19	0.20				
16	0.05	0.08	0.11	0.14	0.16	0.19	0.21	0.23	0.26				
18	0.06	0.10	0.13	0.17	0.20	0.23	0.26	0.29	0.32				
20	0.07	0.12	0.16	0.20	0.24	0.27	0.31	0.35	0.38	0.42	0.45		
22	0.08	0.14	0.19	0.24	0.28	0.33	0.37	0.41	0.45	0.49	0.53		
24	0.10	0.16	0.22	0.27	0.33	0.38	0.43	0.48	0.53	0.58	0.62		
26	0.11	0.18	0.25	0.32	0.38	0.44	0.50	0.55	0.61	0.66	0.72		
28	0.13	0.21	0.29	0.36	0.43	0.50	0.57	0.63	0.70	0.76	0.82		
30		0.24	0.32	0.41	0.49	0.56	0.64	0.71	0.79	0.86	0.93	1.00	1.06
32		0.26	0.36	0.46	0.55	0.63	0.72	0.80	0.88	0.96	1.04	1.12	1.20
34		0.29	0.40	0.51	0.61	0.71	0.80	0.89	0.98	1.07	1.16	1.25	1.33
36		0.33	0.45	0.56	0.68	0.78	0.89	0.99	1.09	1.19	1.29	1.38	1.48
38		0.36	0.49	0.62	0.74	0.86	0.98	1.09	1.20	1.31	1.42	1.52	1.63
40				0.68	0.82	0.95	1.07	1.20	1.32	1.44	1.56	1.67	1.79
42				0.74	0.89	1.03	1.17	1.31	1.44	1.57	1.70	1.82	1.95
44				0.81	0.97	1.12	1.27	1.42	1.57	1.71	1.85	1.98	2.12
46				0.87	1.05	1.22	1.38	1.54	1.70	1.85	2.00	2.15	2.30
48				0.94	1.13	1.31	1.49	1.66	1.83	2.00	2.16	2.32	2.48
50					1.22	1.41	1.60	1.79	1.97	2.15	2.33	2.50	2.67
52					1.31	1.52	1.72	1.92	2.11	2.31	2.50	2.68	2.87
54					1.40	1.62	1.84	2.05	2.26	2.47	2.67	2.87	3.07
56					1.49	1.73	1.97	2.19	2.42	2.64	2.85	3.07	3.28
58					1.59	1.85	2.09	2.34	2.58	2.81	3.04	3.27	3.49
60						1.96	2.23	2.48	2.74	2.99	3.23	3.47	3.71
62						2.08	2.36	2.64	2.90	3.17	3.43	3.68	3.94
64						2.20	2.50	2.79	3.08	3.36	3.63	3.90	4.17
66						2.33	2.64	2.95	3.25	3.55	3.84	4.13	4.41
68						2.46	2.79	3.11	3.43	3.74	4.05	4.35	4.65
70						2.59	2.94	3.28	3.62	3.95	4.27	4.59	4.90
72						2.72	3.09	3.45	3.80	4.15	4.49	4.83	5.16
74						2.86	3.25	3.63	4.00	4.36	4.72	5.07	5.42
76						3.00	3.41	3.81	4.20	4.58	4.95	5.32	5.69
78						3.15	3.57	3.99	4.40	4.80	5.19	5.58	5.97

Table 10 (cu cm, cont'd)

EASTERN HEMLOCK (*Tsuga canadensis* (L.)Carr.).

10	0.03	0.04	0.05	0.07	0.08	0.09	0.10	0.11	0.12				
12	0.03	0.05	0.07	0.09	0.10	0.12	0.13	0.15	0.17				
14	0.04	0.06	0.09	0.11	0.13	0.15	0.17	0.19	0.21				
16	0.05	0.08	0.11	0.13	0.16	0.19	0.21	0.24	0.27				
18	0.06	0.09	0.13	0.16	0.20	0.23	0.26	0.29	0.33				
20	0.06	0.11	0.15	0.19	0.23	0.27	0.31	0.35	0.39	0.43	0.47		
22	0.07	0.13	0.18	0.22	0.27	0.32	0.37	0.41	0.46	0.51	0.55		
24	0.08	0.14	0.20	0.26	0.32	0.37	0.43	0.48	0.54	0.59	0.64		
26	0.10	0.16	0.23	0.30	0.36	0.43	0.49	0.55	0.61	0.68	0.74		
28	0.11	0.19	0.26	0.34	0.41	0.48	0.56	0.63	0.70	0.77	0.84		
30		0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.95	1.02	1.10
32		0.23	0.33	0.42	0.52	0.61	0.70	0.79	0.88	0.97	1.06	1.15	1.23
34		0.26	0.36	0.47	0.57	0.68	0.78	0.88	0.98	1.08	1.18	1.27	1.37
36		0.28	0.40	0.52	0.63	0.75	0.86	0.97	1.08	1.19	1.30	1.41	1.52
38		0.31	0.44	0.57	0.69	0.82	0.94	1.07	1.19	1.31	1.43	1.55	1.67
40				0.62	0.76	0.90	1.03	1.17	1.30	1.43	1.56	1.69	1.82
42				0.68	0.83	0.98	1.12	1.27	1.41	1.56	1.70	1.84	1.99
44				0.73	0.90	1.06	1.22	1.38	1.53	1.69	1.85	2.00	2.15
46				0.79	0.97	1.14	1.32	1.49	1.66	1.83	1.99	2.16	2.33
48				0.85	1.04	1.23	1.42	1.60	1.79	1.97	2.15	2.33	2.51
50					1.12	1.32	1.52	1.72	1.92	2.11	2.31	2.50	2.70
52					1.20	1.41	1.63	1.84	2.05	2.26	2.47	2.68	2.89
54					1.28	1.51	1.74	1.97	2.19	2.42	2.64	2.86	3.09
56					1.36	1.61	1.86	2.10	2.34	2.58	2.82	3.05	3.29
58					1.45	1.71	1.97	2.23	2.49	2.74	3.00	3.25	3.50
60						1.82	2.09	2.37	2.64	2.91	3.18	3.45	3.71
62						1.92	2.22	2.51	2.80	3.08	3.37	3.65	3.93
64						2.03	2.34	2.65	2.96	3.26	3.56	3.86	4.16
66						2.15	2.47	2.80	3.12	3.44	3.76	4.07	4.39
68						2.26	2.61	2.95	3.29	3.63	3.96	4.29	4.63
70						2.38	2.74	3.10	3.46	3.82	4.17	4.52	4.87
72						2.50	2.88	3.26	3.64	4.01	4.38	4.75	5.12
74						2.62	3.02	3.42	3.82	4.21	4.60	4.98	5.37
76						2.75	3.17	3.59	4.00	4.41	4.82	5.22	5.63
78						2.88	3.32	3.75	4.19	4.62	5.04	5.47	5.89

(continued)

Table 10 (cu cm, cont'd) **PITCH PINE** (*Pinus rigida* Mill.).

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.00	0.01	0.03	0.04	0.05	0.07	0.08	0.10	0.12				
12	0.01	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16				
14	0.01	0.03	0.05	0.08	0.10	0.13	0.16	0.19	0.22				
16	0.01	0.04	0.07	0.10	0.13	0.17	0.20	0.24	0.28				
18	0.02	0.05	0.08	0.12	0.16	0.21	0.25	0.30	0.34				
20	0.02	0.06	0.10	0.15	0.20	0.25	0.30	0.36	0.41	0.47	0.53		
22	0.03	0.07	0.12	0.18	0.24	0.30	0.36	0.42	0.49	0.56	0.63		
24	0.04	0.09	0.14	0.21	0.28	0.35	0.42	0.50	0.58	0.66	0.74		
26	0.04	0.10	0.17	0.24	0.32	0.40	0.49	0.57	0.66	0.76	0.85		
28	0.05	0.12	0.19	0.28	0.36	0.46	0.55	0.65	0.76	0.87	0.98		
30		0.13	0.22	0.31	0.41	0.52	0.63	0.74	0.86	0.98	1.10	1.23	1.36
32		0.15	0.25	0.35	0.46	0.58	0.70	0.83	0.96	1.10	1.24	1.38	1.52
34		0.17	0.27	0.39	0.52	0.65	0.78	0.93	1.07	1.22	1.38	1.54	1.70
36		0.18	0.30	0.43	0.57	0.72	0.87	1.03	1.19	1.36	1.53	1.70	1.88
38		0.20	0.34	0.48	0.63	0.79	0.96	1.13	1.31	1.49	1.68	1.87	2.07
40				0.52	0.69	0.87	1.05	1.24	1.43	1.64	1.84	2.05	2.27
42				0.57	0.75	0.95	1.14	1.35	1.56	1.78	2.01	2.24	2.47
44				0.62	0.82	1.03	1.24	1.47	1.70	1.94	2.18	2.43	2.69
46				0.67	0.89	1.11	1.35	1.59	1.84	2.10	2.36	2.63	2.91
48				0.73	0.96	1.20	1.45	1.71	1.99	2.26	2.55	2.84	3.14
50					1.03	1.29	1.56	1.84	2.13	2.43	2.74	3.05	3.37
52					1.10	1.38	1.68	1.98	2.29	2.61	2.94	3.27	3.62
54					1.18	1.48	1.79	2.11	2.45	2.79	3.14	3.50	3.87
56					1.26	1.58	1.91	2.26	2.61	2.98	3.35	3.74	4.13
58					1.34	1.68	2.04	2.40	2.78	3.17	3.57	3.98	4.39
60						1.79	2.16	2.55	2.95	3.37	3.79	4.22	4.67
62						1.89	2.29	2.70	3.13	3.57	4.02	4.48	4.95
64						2.00	2.43	2.86	3.31	3.78	4.25	4.74	5.24
66						2.12	2.56	3.02	3.50	3.99	4.49	5.01	5.53
68						2.23	2.70	3.19	3.69	4.21	4.74	5.28	5.83
70						2.35	2.84	3.36	3.89	4.43	4.99	5.56	6.14
72						2.47	2.99	3.53	4.08	4.66	5.24	5.84	6.46
74						2.59	3.14	3.71	4.29	4.89	5.51	6.14	6.78
76						2.72	3.29	3.89	4.50	5.13	5.77	6.43	7.11
78						2.85	3.45	4.07	4.71	5.37	6.05	6.74	7.44

RED PINE (*Pinus resinosa* Ait.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.04	0.05	0.07	0.08	0.10	0.12	0.13	0.15	0.17				
12	0.04	0.06	0.08	0.10	0.12	0.15	0.17	0.20	0.22				
14	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.25	0.28				
16	0.05	0.08	0.11	0.14	0.18	0.22	0.26	0.30	0.34				
18	0.06	0.09	0.12	0.16	0.21	0.26	0.31	0.36	0.41				
20	0.06	0.10	0.14	0.19	0.24	0.30	0.36	0.42	0.49	0.56	0.63		
22	0.07	0.11	0.16	0.22	0.28	0.35	0.42	0.49	0.57	0.65	0.73		
24	0.07	0.12	0.18	0.25	0.32	0.40	0.48	0.56	0.65	0.74	0.84		
26	0.08	0.13	0.20	0.28	0.36	0.45	0.54	0.64	0.74	0.85	0.96		
28	0.08	0.15	0.23	0.31	0.41	0.51	0.61	0.72	0.84	0.96	1.08		
30		0.16	0.25	0.35	0.45	0.56	0.68	0.81	0.94	1.07	1.21	1.35	1.50
32		0.18	0.27	0.38	0.50	0.63	0.76	0.90	1.04	1.19	1.35	1.51	1.67
34		0.19	0.30	0.42	0.55	0.69	0.84	0.99	1.15	1.32	1.49	1.67	1.85
36		0.21	0.33	0.46	0.60	0.76	0.92	1.09	1.26	1.45	1.64	1.83	2.03
38		0.23	0.36	0.50	0.66	0.83	1.00	1.19	1.38	1.58	1.79	2.00	2.22
40				0.54	0.72	0.90	1.09	1.29	1.51	1.72	1.95	2.18	2.42
42				0.59	0.77	0.97	1.18	1.40	1.63	1.87	2.12	2.37	2.63
44				0.63	0.84	1.05	1.28	1.52	1.76	2.02	2.29	2.56	2.84
46				0.68	0.90	1.13	1.37	1.63	1.90	2.18	2.46	2.76	3.06
48				0.73	0.96	1.21	1.48	1.75	2.04	2.34	2.64	2.96	3.29
50					1.03	1.30	1.58	1.87	2.18	2.50	2.83	3.17	3.52
52					1.10	1.38	1.68	2.00	2.33	2.67	3.02	3.39	3.76
54					1.17	1.47	1.79	2.13	2.48	2.85	3.22	3.61	4.01
56					1.24	1.56	1.91	2.26	2.64	3.02	3.42	3.84	4.26
58					1.31	1.66	2.02	2.40	2.80	3.21	3.63	4.07	4.52
60						1.75	2.14	2.54	2.96	3.40	3.85	4.31	4.79
62						1.85	2.26	2.68	3.13	3.59	4.06	4.55	5.06
64						1.95	2.38	2.83	3.30	3.79	4.29	4.80	5.34
66						2.06	2.51	2.98	3.47	3.99	4.51	5.06	5.62
68						2.16	2.64	3.13	3.65	4.19	4.75	5.32	5.91
70						2.27	2.77	3.29	3.84	4.40	4.99	5.59	6.21
72						2.38	2.90	3.45	4.02	4.61	5.23	5.86	6.51
74						2.49	3.04	3.61	4.21	4.83	5.48	6.14	6.82
76						2.60	3.18	3.78	4.40	5.06	5.73	6.42	7.13
78						2.72	3.32	3.95	4.60	5.28	5.98	6.71	7.45

(continued)

Table 10 (cu cm, cont'd) **MISCELLANEOUS SOFTWOODS.**

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.03	0.05	0.06	0.08	0.09	0.10	0.12	0.13	0.15				
12	0.04	0.06	0.08	0.10	0.11	0.13	0.15	0.17	0.20				
14	0.04	0.07	0.09	0.12	0.14	0.17	0.19	0.22	0.25				
16	0.05	0.08	0.11	0.14	0.17	0.21	0.24	0.27	0.30				
18	0.06	0.09	0.13	0.17	0.21	0.25	0.29	0.33	0.37				
20	0.06	0.11	0.15	0.20	0.24	0.29	0.34	0.38	0.43	0.48	0.53		
22	0.07	0.12	0.17	0.23	0.28	0.34	0.39	0.45	0.50	0.56	0.62		
24	0.08	0.14	0.20	0.26	0.32	0.39	0.45	0.51	0.58	0.65	0.71		
26	0.09	0.15	0.22	0.29	0.37	0.44	0.51	0.59	0.66	0.74	0.81		
28	0.10	0.17	0.25	0.33	0.41	0.49	0.58	0.66	0.75	0.83	0.92		
30		0.19	0.28	0.37	0.46	0.55	0.64	0.74	0.83	0.93	1.03	1.13	1.22
32		0.21	0.31	0.41	0.51	0.61	0.72	0.82	0.93	1.04	1.14	1.25	1.36
34		0.23	0.34	0.45	0.56	0.68	0.79	0.91	1.03	1.14	1.26	1.38	1.51
36		0.25	0.37	0.49	0.62	0.74	0.87	1.00	1.13	1.26	1.39	1.52	1.66
38		0.27	0.40	0.54	0.67	0.81	0.95	1.09	1.23	1.38	1.52	1.66	1.81
40				0.58	0.73	0.88	1.03	1.19	1.34	1.50	1.65	1.81	1.97
42				0.63	0.79	0.95	1.12	1.29	1.45	1.62	1.79	1.97	2.14
44				0.68	0.85	1.03	1.21	1.39	1.57	1.75	1.94	2.12	2.31
46				0.73	0.92	1.11	1.30	1.50	1.69	1.89	2.09	2.29	2.49
48				0.78	0.99	1.19	1.40	1.60	1.81	2.03	2.24	2.46	2.67
50					1.05	1.27	1.49	1.72	1.94	2.17	2.40	2.63	2.86
52					1.12	1.36	1.59	1.83	2.07	2.32	2.56	2.81	3.06
54					1.20	1.45	1.70	1.95	2.21	2.47	2.73	2.99	3.25
56					1.27	1.54	1.80	2.07	2.35	2.62	2.90	3.18	3.46
58					1.35	1.63	1.91	2.20	2.49	2.78	3.07	3.37	3.67
60						1.72	2.02	2.33	2.63	2.94	3.25	3.57	3.88
62						1.82	2.14	2.46	2.78	3.11	3.44	3.77	4.10
64						1.92	2.25	2.59	2.93	3.28	3.62	3.97	4.33
66						2.02	2.37	2.73	3.09	3.45	3.82	4.18	4.55
68						2.12	2.49	2.87	3.24	3.63	4.01	4.40	4.79
70						2.23	2.61	3.01	3.41	3.81	4.21	4.62	5.03
72						2.33	2.74	3.15	3.57	3.99	4.41	4.84	5.27
74						2.44	2.87	3.30	3.74	4.18	4.62	5.07	5.52
76						2.55	3.00	3.45	3.91	4.37	4.83	5.30	5.77
78						2.67	3.13	3.61	4.08	4.56	5.05	5.54	6.03

SUGAR MAPLE (*Acer saccharum* Marsh.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.02	0.03	0.05	0.06	0.07	0.08	0.09	0.11	0.12				
12	0.03	0.05	0.07	0.08	0.10	0.12	0.13	0.15	0.16				
14	0.04	0.06	0.09	0.11	0.13	0.15	0.17	0.19	0.21				
16	0.05	0.08	0.11	0.14	0.17	0.19	0.22	0.24	0.27				
18	0.06	0.10	0.14	0.17	0.21	0.24	0.27	0.30	0.33				
20	0.07	0.12	0.17	0.21	0.25	0.29	0.33	0.36	0.40	0.43	0.47		
22	0.09	0.14	0.20	0.25	0.30	0.34	0.39	0.43	0.47	0.52	0.56		
24	0.10	0.17	0.23	0.29	0.35	0.40	0.45	0.50	0.55	0.60	0.65		
26	0.12	0.19	0.27	0.33	0.40	0.46	0.52	0.58	0.64	0.69	0.75		
28	0.13	0.22	0.30	0.38	0.46	0.53	0.60	0.66	0.73	0.79	0.86		
30		0.25	0.34	0.43	0.52	0.60	0.67	0.75	0.82	0.90	0.97	1.04	1.11
32		0.28	0.39	0.48	0.58	0.67	0.76	0.84	0.92	1.01	1.09	1.16	1.24
34		0.31	0.43	0.54	0.64	0.74	0.84	0.94	1.03	1.12	1.21	1.30	1.38
36		0.35	0.48	0.60	0.71	0.82	0.93	1.04	1.14	1.24	1.34	1.44	1.53
38		0.38	0.53	0.66	0.79	0.91	1.03	1.14	1.26	1.37	1.47	1.58	1.69
40				0.72	0.86	1.00	1.13	1.25	1.38	1.50	1.62	1.73	1.85
42				0.79	0.94	1.09	1.23	1.37	1.50	1.63	1.76	1.89	2.02
44				0.86	1.02	1.18	1.33	1.48	1.63	1.77	1.92	2.05	2.19
46				0.93	1.10	1.28	1.44	1.61	1.76	1.92	2.07	2.22	2.37
48				1.00	1.19	1.38	1.56	1.73	1.90	2.07	2.24	2.40	2.56
50					1.28	1.48	1.68	1.86	2.05	2.23	2.41	2.58	2.75
52					1.37	1.59	1.80	2.00	2.20	2.39	2.58	2.77	2.95
54					1.47	1.70	1.92	2.14	2.35	2.56	2.76	2.96	3.16
56					1.57	1.81	2.05	2.28	2.51	2.73	2.94	3.16	3.37
58					1.67	1.93	2.18	2.43	2.67	2.90	3.13	3.36	3.59
60						2.05	2.32	2.58	2.84	3.09	3.33	3.57	3.81
62						2.17	2.46	2.74	3.01	3.27	3.53	3.79	4.04
64						2.30	2.60	2.89	3.18	3.46	3.74	4.01	4.27
66						2.43	2.75	3.06	3.36	3.66	3.95	4.23	4.52
68						2.56	2.90	3.23	3.54	3.86	4.16	4.47	4.76
70						2.70	3.05	3.40	3.73	4.06	4.39	4.70	5.02
72						2.84	3.21	3.57	3.93	4.27	4.61	4.95	5.28
74						2.98	3.37	3.75	4.12	4.49	4.84	5.19	5.54
76						3.13	3.54	3.93	4.32	4.70	5.08	5.45	5.81
78						3.28	3.70	4.12	4.53	4.93	5.32	5.71	6.09

(continued)

Table 10 (cu cm, cont'd) **RED MAPLE** (*Acer rubrum* L.).

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.02	0.04	0.05	0.06	0.07	0.09	0.10	0.11	0.12				
12	0.03	0.05	0.07	0.08	0.10	0.12	0.13	0.15	0.17				
14	0.04	0.06	0.08	0.11	0.13	0.15	0.17	0.20	0.22				
16	0.05	0.08	0.11	0.13	0.16	0.19	0.22	0.25	0.27				
18	0.05	0.09	0.13	0.16	0.20	0.23	0.27	0.30	0.34				
20	0.06	0.11	0.15	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.48		
22	0.07	0.13	0.18	0.23	0.28	0.33	0.38	0.43	0.48	0.52	0.57		
24	0.09	0.15	0.21	0.27	0.33	0.39	0.44	0.50	0.55	0.61	0.67		
26	0.10	0.17	0.24	0.31	0.38	0.44	0.51	0.57	0.64	0.70	0.77		
28	0.11	0.19	0.27	0.35	0.43	0.51	0.58	0.65	0.73	0.80	0.87		
30		0.22	0.31	0.40	0.49	0.57	0.66	0.74	0.82	0.90	0.99	1.07	1.15
32		0.24	0.35	0.45	0.54	0.64	0.73	0.83	0.92	1.01	1.11	1.20	1.29
34		0.27	0.39	0.50	0.61	0.71	0.82	0.92	1.03	1.13	1.23	1.33	1.43
36		0.30	0.43	0.55	0.67	0.79	0.91	1.02	1.14	1.25	1.36	1.48	1.59
38		0.33	0.47	0.60	0.74	0.87	1.00	1.12	1.25	1.38	1.50	1.62	1.75
40				0.66	0.81	0.95	1.09	1.23	1.37	1.51	1.64	1.78	1.91
42				0.72	0.88	1.04	1.19	1.34	1.49	1.64	1.79	1.94	2.09
44				0.78	0.95	1.12	1.29	1.46	1.62	1.79	1.95	2.11	2.27
46				0.85	1.03	1.22	1.40	1.58	1.76	1.93	2.11	2.28	2.45
48				0.91	1.11	1.31	1.51	1.70	1.89	2.08	2.27	2.46	2.65
50					1.20	1.41	1.62	1.83	2.04	2.24	2.44	2.65	2.85
52					1.28	1.51	1.74	1.96	2.18	2.40	2.62	2.84	3.05
54					1.37	1.62	1.86	2.10	2.33	2.57	2.80	3.04	3.27
56					1.46	1.72	1.98	2.24	2.49	2.74	2.99	3.24	3.48
58					1.56	1.84	2.11	2.38	2.65	2.92	3.18	3.45	3.71
60						1.95	2.24	2.53	2.82	3.10	3.38	3.66	3.94
62						2.07	2.38	2.68	2.99	3.29	3.59	3.88	4.18
64						2.19	2.51	2.84	3.16	3.48	3.79	4.11	4.42
66						2.31	2.66	3.00	3.34	3.67	4.01	4.34	4.67
68						2.44	2.80	3.16	3.52	3.88	4.23	4.58	4.93
70						2.56	2.95	3.33	3.71	4.08	4.45	4.82	5.19
72						2.70	3.10	3.50	3.90	4.29	4.68	5.07	5.46
74						2.83	3.26	3.68	4.09	4.51	4.92	5.32	5.73
76						2.97	3.41	3.86	4.29	4.73	5.16	5.58	6.01
78						3.11	3.58	4.04	4.50	4.95	5.40	5.85	6.29

NORTHERN RED OAK (*Quercus rubra* L.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11				
12	0.03	0.05	0.06	0.08	0.09	0.11	0.12	0.13	0.15				
14	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.17	0.19				
16	0.05	0.07	0.10	0.13	0.15	0.17	0.20	0.22	0.25				
18	0.06	0.09	0.12	0.15	0.19	0.22	0.25	0.28	0.30				
20	0.07	0.11	0.15	0.19	0.22	0.26	0.30	0.33	0.37	0.40	0.44		
22	0.08	0.13	0.18	0.22	0.27	0.31	0.36	0.40	0.44	0.48	0.53		
24	0.09	0.15	0.21	0.26	0.31	0.37	0.42	0.47	0.52	0.57	0.62		
26	0.10	0.17	0.24	0.30	0.36	0.43	0.49	0.54	0.60	0.66	0.72		
28	0.11	0.20	0.27	0.35	0.42	0.49	0.56	0.63	0.69	0.76	0.83		
30		0.22	0.31	0.39	0.47	0.56	0.63	0.71	0.79	0.86	0.94	1.01	1.09
32		0.25	0.35	0.44	0.54	0.63	0.72	0.80	0.89	0.98	1.06	1.15	1.23
34		0.28	0.39	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.19	1.29	1.38
36		0.31	0.43	0.55	0.67	0.78	0.89	1.00	1.11	1.22	1.33	1.43	1.54
38		0.34	0.48	0.61	0.74	0.87	0.99	1.11	1.23	1.35	1.47	1.59	1.70
40				0.67	0.81	0.95	1.09	1.22	1.36	1.49	1.62	1.75	1.88
42				0.74	0.89	1.05	1.20	1.34	1.49	1.63	1.78	1.92	2.06
44				0.80	0.97	1.14	1.31	1.47	1.63	1.78	1.94	2.09	2.25
46				0.87	1.06	1.24	1.42	1.60	1.77	1.94	2.11	2.28	2.45
48				0.95	1.15	1.34	1.54	1.73	1.92	2.10	2.29	2.47	2.65
50					1.24	1.45	1.66	1.87	2.07	2.27	2.47	2.67	2.87
52					1.34	1.57	1.79	2.01	2.23	2.45	2.66	2.88	3.09
54					1.43	1.68	1.92	2.16	2.40	2.63	2.86	3.09	3.32
56					1.54	1.80	2.06	2.32	2.57	2.82	3.07	3.31	3.56
58					1.64	1.92	2.20	2.48	2.75	3.01	3.28	3.54	3.80
60						2.05	2.35	2.64	2.93	3.22	3.50	3.78	4.05
62						2.18	2.50	2.81	3.12	3.42	3.72	4.02	4.32
64						2.32	2.66	2.99	3.31	3.64	3.95	4.27	4.58
66						2.46	2.82	3.17	3.51	3.85	4.19	4.53	4.86
68						2.60	2.98	3.35	3.72	4.08	4.44	4.79	5.15
70						2.75	3.15	3.54	3.93	4.31	4.69	5.07	5.44
72						2.90	3.32	3.74	4.14	4.55	4.95	5.35	5.74
74						3.06	3.50	3.94	4.37	4.79	5.21	5.63	6.05
76						3.22	3.68	4.14	4.59	5.04	5.49	5.93	6.36
78						3.38	3.87	4.35	4.83	5.30	5.76	6.23	6.69

(continued)

Table 10 (cu cm, cont'd) **BLACK OAK** (*Quercus velutina* Lam.).

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.11	0.12				
12	0.03	0.05	0.06	0.08	0.09	0.11	0.13	0.14	0.16				
14	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20				
16	0.04	0.07	0.10	0.12	0.15	0.18	0.20	0.23	0.26				
18	0.05	0.08	0.12	0.15	0.18	0.22	0.25	0.28	0.32				
20	0.06	0.10	0.14	0.18	0.22	0.26	0.30	0.34	0.38	0.42	0.46		
22	0.07	0.11	0.16	0.21	0.26	0.31	0.35	0.40	0.45	0.50	0.55		
24	0.08	0.13	0.19	0.24	0.30	0.36	0.41	0.47	0.53	0.59	0.64		
26	0.09	0.15	0.21	0.28	0.34	0.41	0.48	0.54	0.61	0.68	0.74		
28	0.10	0.17	0.24	0.32	0.39	0.47	0.54	0.62	0.70	0.77	0.85		
30		0.19	0.27	0.36	0.44	0.53	0.62	0.70	0.79	0.88	0.97	1.05	1.14
32		0.21	0.31	0.40	0.50	0.60	0.69	0.79	0.89	0.99	1.09	1.19	1.29
34		0.23	0.34	0.45	0.56	0.66	0.77	0.88	0.99	1.10	1.21	1.33	1.44
36		0.26	0.38	0.50	0.62	0.74	0.86	0.98	1.10	1.23	1.35	1.47	1.60
38		0.28	0.41	0.55	0.68	0.81	0.95	1.08	1.22	1.35	1.49	1.63	1.76
40				0.60	0.75	0.89	1.04	1.19	1.34	1.49	1.64	1.79	1.94
42				0.65	0.81	0.98	1.14	1.30	1.46	1.63	1.79	1.96	2.12
44				0.71	0.89	1.06	1.24	1.42	1.59	1.77	1.95	2.13	2.31
46				0.77	0.96	1.15	1.34	1.54	1.73	1.92	2.12	2.31	2.51
48				0.83	1.04	1.25	1.45	1.66	1.87	2.08	2.29	2.50	2.71
50					1.12	1.34	1.57	1.79	2.02	2.24	2.47	2.70	2.93
52					1.20	1.44	1.68	1.93	2.17	2.41	2.66	2.90	3.15
54					1.29	1.55	1.80	2.06	2.32	2.59	2.85	3.11	3.37
56					1.38	1.65	1.93	2.21	2.49	2.77	3.05	3.33	3.61
58					1.47	1.76	2.06	2.36	2.65	2.95	3.25	3.55	3.85
60						1.88	2.19	2.51	2.82	3.14	3.46	3.78	4.10
62						1.99	2.33	2.66	3.00	3.34	3.68	4.02	4.36
64						2.12	2.47	2.83	3.18	3.54	3.90	4.26	4.62
66						2.24	2.61	2.99	3.37	3.75	4.13	4.51	4.90
68						2.37	2.76	3.16	3.56	3.96	4.37	4.77	5.17
70						2.50	2.91	3.34	3.76	4.18	4.61	5.03	5.46
72						2.63	3.07	3.51	3.96	4.41	4.85	5.30	5.75
74						2.77	3.23	3.70	4.17	4.64	5.11	5.58	6.05
76						2.91	3.39	3.88	4.38	4.87	5.37	5.86	6.36
78						3.05	3.56	4.08	4.59	5.11	5.63	6.15	6.68

SCARLET OAK (*Quercus coccinea* Muenchh.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.02	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.10				
12	0.03	0.05	0.06	0.08	0.09	0.11	0.12	0.13	0.14				
14	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.17	0.19				
16	0.05	0.08	0.10	0.13	0.15	0.18	0.20	0.22	0.24				
18	0.06	0.09	0.13	0.16	0.19	0.22	0.25	0.28	0.30				
20	0.07	0.11	0.15	0.19	0.23	0.26	0.30	0.34	0.37	0.40	0.44		
22	0.08	0.13	0.18	0.23	0.27	0.32	0.36	0.40	0.44	0.48	0.52		
24	0.09	0.15	0.21	0.27	0.32	0.37	0.42	0.47	0.52	0.57	0.62		
26	0.11	0.18	0.25	0.31	0.37	0.43	0.49	0.55	0.60	0.66	0.72		
28	0.12	0.20	0.28	0.36	0.43	0.50	0.56	0.63	0.70	0.76	0.82		
30		0.23	0.32	0.40	0.49	0.56	0.64	0.72	0.79	0.87	0.94	1.01	1.08
32		0.26	0.36	0.46	0.55	0.64	0.73	0.81	0.90	0.98	1.06	1.14	1.22
34		0.29	0.40	0.51	0.61	0.71	0.81	0.91	1.00	1.10	1.19	1.28	1.37
36		0.32	0.45	0.57	0.68	0.80	0.91	1.01	1.12	1.22	1.33	1.43	1.53
38		0.36	0.50	0.63	0.76	0.88	1.00	1.12	1.24	1.36	1.47	1.58	1.69
40				0.69	0.84	0.97	1.11	1.24	1.37	1.49	1.62	1.74	1.87
42				0.76	0.92	1.07	1.21	1.36	1.50	1.64	1.78	1.91	2.05
44				0.83	1.00	1.17	1.33	1.48	1.64	1.79	1.94	2.09	2.24
46				0.90	1.09	1.27	1.44	1.62	1.78	1.95	2.12	2.28	2.44
48				0.98	1.18	1.37	1.56	1.75	1.93	2.12	2.29	2.47	2.64
50					1.28	1.49	1.69	1.89	2.09	2.29	2.48	2.67	2.86
52					1.37	1.60	1.82	2.04	2.25	2.46	2.67	2.88	3.08
54					1.48	1.72	1.96	2.19	2.42	2.65	2.87	3.09	3.31
56					1.58	1.84	2.10	2.35	2.60	2.84	3.08	3.32	3.55
58					1.69	1.97	2.24	2.51	2.78	3.04	3.29	3.55	3.80
60						2.10	2.39	2.68	2.96	3.24	3.51	3.78	4.05
62						2.24	2.55	2.85	3.15	3.45	3.74	4.03	4.31
64						2.38	2.71	3.03	3.35	3.66	3.97	4.28	4.58
66						2.52	2.87	3.22	3.55	3.89	4.21	4.54	4.86
68						2.67	3.04	3.40	3.76	4.11	4.46	4.81	5.15
70						2.82	3.21	3.60	3.98	4.35	4.72	5.08	5.44
72						2.98	3.39	3.80	4.20	4.59	4.98	5.36	5.74
74						3.14	3.57	4.00	4.42	4.84	5.25	5.65	6.05
76						3.30	3.76	4.21	4.65	5.09	5.52	5.95	6.37
78						3.47	3.95	4.42	4.89	5.35	5.80	6.25	6.69

(continued)

Table 10 (cu cm, cont'd) **WHITE OAK** (*Quercus alba* L.).

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12				
12	0.05	0.06	0.07	0.09	0.10	0.11	0.13	0.14	0.15				
14	0.05	0.07	0.09	0.11	0.13	0.14	0.16	0.18	0.20				
16	0.06	0.08	0.11	0.13	0.16	0.18	0.20	0.23	0.25				
18	0.07	0.10	0.13	0.16	0.19	0.22	0.25	0.28	0.31				
20	0.07	0.11	0.15	0.19	0.22	0.26	0.30	0.33	0.37	0.40	0.44		
22	0.08	0.13	0.17	0.22	0.26	0.31	0.35	0.39	0.44	0.48	0.52		
24	0.09	0.15	0.20	0.25	0.31	0.36	0.41	0.46	0.51	0.56	0.61		
26	0.10	0.17	0.23	0.29	0.35	0.41	0.47	0.53	0.59	0.65	0.71		
28	0.12	0.19	0.26	0.33	0.40	0.47	0.54	0.61	0.68	0.75	0.82		
30		0.21	0.30	0.38	0.46	0.54	0.62	0.70	0.78	0.85	0.93	1.01	1.09
32		0.24	0.33	0.42	0.52	0.61	0.70	0.79	0.87	0.96	1.05	1.14	1.23
34		0.26	0.37	0.47	0.58	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38
36		0.29	0.41	0.53	0.64	0.76	0.87	0.98	1.09	1.20	1.31	1.43	1.54
38		0.32	0.45	0.58	0.71	0.84	0.96	1.09	1.21	1.33	1.46	1.58	1.70
40				0.64	0.78	0.92	1.06	1.20	1.33	1.47	1.61	1.74	1.88
42				0.70	0.86	1.01	1.16	1.31	1.46	1.61	1.76	1.91	2.06
44				0.76	0.93	1.10	1.27	1.44	1.60	1.76	1.93	2.09	2.25
46				0.83	1.02	1.20	1.38	1.56	1.74	1.92	2.10	2.28	2.46
48				0.90	1.10	1.30	1.50	1.69	1.89	2.09	2.28	2.47	2.66
50					1.19	1.41	1.62	1.83	2.04	2.26	2.47	2.67	2.88
52					1.28	1.51	1.75	1.98	2.20	2.43	2.66	2.88	3.11
54					1.38	1.63	1.88	2.12	2.37	2.61	2.86	3.10	3.34
56					1.48	1.74	2.01	2.28	2.54	2.80	3.07	3.33	3.59
58					1.58	1.87	2.15	2.44	2.72	3.00	3.28	3.56	3.84
60						1.99	2.30	2.60	2.90	3.20	3.50	3.80	4.10
62						2.12	2.45	2.77	3.09	3.41	3.73	4.05	4.37
64						2.25	2.60	2.94	3.29	3.63	3.97	4.31	4.64
66						2.39	2.76	3.12	3.49	3.85	4.21	4.57	4.93
68						2.53	2.92	3.31	3.69	4.08	4.46	4.84	5.22
70						2.68	3.09	3.50	3.91	4.31	4.72	5.12	5.52
72						2.83	3.26	3.69	4.13	4.55	4.98	5.41	5.83
74						2.98	3.44	3.90	4.35	4.80	5.25	5.70	6.15
76						3.14	3.62	4.10	4.58	5.06	5.53	6.00	6.48
78						3.30	3.81	4.31	4.82	5.32	5.82	6.32	6.81

CHESTNUT OAK (*Quercus prinus* L.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.02	0.03	0.05	0.06	0.07	0.08	0.09	0.10	0.11				
12	0.03	0.04	0.06	0.07	0.09	0.10	0.12	0.13	0.15				
14	0.03	0.06	0.08	0.10	0.12	0.13	0.15	0.17	0.19				
16	0.04	0.07	0.09	0.12	0.14	0.17	0.19	0.22	0.24				
18	0.05	0.08	0.11	0.15	0.18	0.21	0.24	0.27	0.30				
20	0.06	0.10	0.14	0.18	0.21	0.25	0.29	0.33	0.36	0.40	0.44		
22	0.07	0.11	0.16	0.21	0.25	0.30	0.34	0.39	0.43	0.48	0.52		
24	0.08	0.13	0.19	0.24	0.30	0.35	0.40	0.45	0.51	0.56	0.61		
26	0.09	0.15	0.22	0.28	0.34	0.40	0.46	0.53	0.59	0.65	0.71		
28	0.10	0.17	0.25	0.32	0.39	0.46	0.53	0.60	0.67	0.74	0.81		
30		0.19	0.28	0.36	0.44	0.52	0.60	0.68	0.76	0.84	0.92	1.00	1.08
32		0.22	0.31	0.40	0.50	0.59	0.68	0.77	0.86	0.95	1.04	1.13	1.22
34		0.24	0.35	0.45	0.55	0.66	0.76	0.86	0.96	1.06	1.16	1.26	1.36
36		0.27	0.39	0.50	0.62	0.73	0.84	0.95	1.07	1.18	1.29	1.40	1.51
38		0.30	0.43	0.55	0.68	0.80	0.93	1.05	1.18	1.30	1.42	1.55	1.67
40				0.61	0.75	0.88	1.02	1.16	1.29	1.43	1.56	1.70	1.83
42				0.66	0.82	0.97	1.12	1.27	1.42	1.56	1.71	1.86	2.01
44				0.72	0.89	1.05	1.22	1.38	1.54	1.70	1.87	2.03	2.19
46				0.78	0.96	1.14	1.32	1.50	1.67	1.85	2.03	2.20	2.38
48				0.85	1.04	1.24	1.43	1.62	1.81	2.00	2.19	2.38	2.57
50					1.12	1.33	1.54	1.75	1.95	2.16	2.36	2.57	2.77
52					1.21	1.43	1.66	1.88	2.10	2.32	2.54	2.76	2.98
54					1.29	1.54	1.78	2.01	2.25	2.49	2.73	2.96	3.20
56					1.38	1.64	1.90	2.16	2.41	2.66	2.92	3.17	3.42
58					1.48	1.75	2.03	2.30	2.57	2.84	3.11	3.38	3.65
60						1.87	2.16	2.45	2.74	3.03	3.31	3.60	3.89
62						1.98	2.29	2.60	2.91	3.22	3.52	3.83	4.13
64						2.10	2.43	2.76	3.09	3.41	3.74	4.06	4.38
66						2.23	2.57	2.92	3.27	3.61	3.95	4.30	4.64
68						2.35	2.72	3.09	3.45	3.82	4.18	4.54	4.90
70						2.48	2.87	3.26	3.64	4.03	4.41	4.79	5.17
72						2.61	3.02	3.43	3.84	4.24	4.65	5.05	5.45
74						2.75	3.18	3.61	4.04	4.47	4.89	5.31	5.74
76						2.89	3.34	3.80	4.24	4.69	5.14	5.58	6.03
78						3.03	3.51	3.98	4.45	4.92	5.39	5.86	6.33

(continued)

Table 10 (cu cm, cont'd) **YELLOW BIRCH** (*Betula alleghaniensis* Britton).

D.B.H. (CM)	MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT												
	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.03	0.05	0.06	0.07	0.08	0.10	0.11	0.12	0.14				
12	0.04	0.05	0.07	0.09	0.11	0.13	0.14	0.16	0.18				
14	0.04	0.07	0.09	0.11	0.14	0.16	0.19	0.21	0.24				
16	0.05	0.08	0.11	0.14	0.17	0.20	0.23	0.26	0.30				
18	0.06	0.09	0.13	0.17	0.20	0.24	0.28	0.32	0.36				
20	0.06	0.11	0.15	0.20	0.24	0.29	0.34	0.39	0.44	0.49	0.54		
22	0.07	0.12	0.18	0.23	0.29	0.34	0.40	0.46	0.52	0.58	0.64		
24	0.08	0.14	0.20	0.27	0.33	0.40	0.47	0.54	0.61	0.68	0.75		
26	0.09	0.16	0.23	0.31	0.38	0.46	0.54	0.62	0.70	0.78	0.86		
28	0.10	0.18	0.26	0.35	0.44	0.52	0.61	0.71	0.80	0.89	0.99		
30		0.20	0.30	0.39	0.49	0.59	0.70	0.80	0.90	1.01	1.12	1.23	1.34
32		0.22	0.33	0.44	0.55	0.67	0.78	0.90	1.02	1.14	1.26	1.38	1.50
34		0.25	0.37	0.49	0.61	0.74	0.87	1.00	1.14	1.27	1.41	1.54	1.68
36		0.27	0.41	0.54	0.68	0.82	0.97	1.11	1.26	1.41	1.56	1.71	1.86
38		0.30	0.45	0.60	0.75	0.91	1.07	1.23	1.39	1.56	1.72	1.89	2.06
40				0.65	0.82	1.00	1.17	1.35	1.53	1.71	1.89	2.08	2.26
42				0.71	0.90	1.09	1.28	1.47	1.67	1.87	2.07	2.27	2.48
44				0.78	0.98	1.18	1.39	1.61	1.82	2.04	2.25	2.47	2.70
46				0.84	1.06	1.28	1.51	1.74	1.97	2.21	2.45	2.69	2.93
48				0.91	1.15	1.39	1.63	1.88	2.14	2.39	2.65	2.91	3.17
50					1.24	1.50	1.76	2.03	2.30	2.58	2.85	3.13	3.41
52					1.33	1.61	1.89	2.18	2.47	2.77	3.07	3.37	3.67
54					1.42	1.72	2.03	2.34	2.65	2.97	3.29	3.61	3.94
56					1.52	1.84	2.17	2.50	2.84	3.18	3.52	3.86	4.21
58					1.62	1.96	2.31	2.67	3.03	3.39	3.75	4.12	4.49
60						2.09	2.46	2.84	3.22	3.61	4.00	4.39	4.78
62						2.22	2.62	3.02	3.42	3.83	4.24	4.66	5.08
64						2.35	2.77	3.20	3.63	4.06	4.50	4.94	5.39
66						2.49	2.94	3.39	3.84	4.30	4.77	5.23	5.71
68						2.63	3.10	3.58	4.06	4.55	5.04	5.53	6.03
70						2.78	3.27	3.77	4.28	4.80	5.31	5.84	6.36
72						2.93	3.45	3.98	4.51	5.05	5.60	6.15	6.70
74						3.08	3.63	4.18	4.75	5.32	5.89	6.47	7.05
76						3.23	3.81	4.39	4.99	5.58	6.19	6.80	7.41
78						3.39	4.00	4.61	5.23	5.86	6.49	7.13	7.78

SWEET BIRCH (*Betula lenta* L.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.13				
12	0.04	0.06	0.07	0.09	0.11	0.12	0.14	0.15	0.17				
14	0.05	0.07	0.09	0.11	0.13	0.15	0.18	0.20	0.22				
16	0.06	0.08	0.11	0.14	0.16	0.19	0.22	0.25	0.27				
18	0.06	0.10	0.13	0.17	0.20	0.23	0.27	0.30	0.34				
20	0.07	0.11	0.15	0.20	0.24	0.28	0.32	0.36	0.41	0.45	0.49		
22	0.08	0.13	0.18	0.23	0.28	0.33	0.38	0.43	0.48	0.53	0.58		
24	0.09	0.15	0.21	0.27	0.33	0.39	0.45	0.50	0.56	0.62	0.68		
26	0.10	0.17	0.24	0.31	0.38	0.45	0.52	0.58	0.65	0.72	0.79		
28	0.11	0.19	0.27	0.35	0.43	0.51	0.59	0.67	0.75	0.83	0.91		
30		0.22	0.31	0.40	0.49	0.58	0.67	0.76	0.85	0.94	1.03	1.13	1.22
32		0.24	0.34	0.45	0.55	0.65	0.75	0.86	0.96	1.06	1.17	1.27	1.37
34		0.27	0.38	0.50	0.61	0.73	0.84	0.96	1.08	1.19	1.31	1.42	1.54
36		0.30	0.42	0.55	0.68	0.81	0.94	1.07	1.20	1.33	1.46	1.58	1.71
38		0.32	0.47	0.61	0.75	0.89	1.04	1.18	1.32	1.47	1.61	1.75	1.90
40				0.67	0.83	0.98	1.14	1.30	1.46	1.62	1.77	1.93	2.09
42				0.73	0.91	1.08	1.25	1.42	1.60	1.77	1.95	2.12	2.29
44				0.80	0.99	1.18	1.37	1.56	1.75	1.93	2.12	2.31	2.51
46				0.87	1.07	1.28	1.48	1.69	1.90	2.10	2.31	2.52	2.73
48				0.94	1.16	1.39	1.61	1.83	2.06	2.28	2.51	2.73	2.95
50					1.25	1.50	1.74	1.98	2.22	2.46	2.71	2.95	3.19
52					1.35	1.61	1.87	2.13	2.39	2.65	2.92	3.18	3.44
54					1.45	1.73	2.01	2.29	2.57	2.85	3.13	3.41	3.70
56					1.55	1.85	2.15	2.45	2.75	3.06	3.36	3.66	3.96
58					1.66	1.98	2.30	2.62	2.94	3.27	3.59	3.91	4.23
60						2.11	2.45	2.80	3.14	3.48	3.83	4.17	4.52
62						2.25	2.61	2.98	3.34	3.71	4.07	4.44	4.81
64						2.38	2.77	3.16	3.55	3.94	4.33	4.72	5.11
66						2.53	2.94	3.35	3.76	4.18	4.59	5.00	5.42
68						2.67	3.11	3.55	3.98	4.42	4.86	5.30	5.74
70						2.83	3.29	3.75	4.21	4.67	5.14	5.60	6.06
72						2.98	3.47	3.95	4.44	4.93	5.42	5.91	6.40
74						3.14	3.65	4.17	4.68	5.20	5.71	6.23	6.74
76						3.30	3.84	4.38	4.92	5.47	6.01	6.55	7.09
78						3.47	4.04	4.61	5.17	5.74	6.31	6.88	7.45

(continued)

Table 10 (cu cm, cont'd) **AMERICAN BEECH** (*Fagus grandifolia* Ehrh.).

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.03	0.05	0.06	0.07	0.07	0.08	0.09	0.10	0.10				
12	0.04	0.06	0.08	0.09	0.10	0.11	0.12	0.13	0.14				
14	0.06	0.08	0.10	0.12	0.13	0.15	0.16	0.17	0.19				
16	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.22	0.24				
18	0.08	0.12	0.15	0.18	0.21	0.23	0.26	0.28	0.30				
20	0.10	0.15	0.19	0.22	0.26	0.29	0.31	0.34	0.37	0.39	0.42		
22	0.12	0.18	0.22	0.27	0.31	0.34	0.38	0.41	0.44	0.47	0.50		
24	0.14	0.21	0.26	0.31	0.36	0.41	0.45	0.49	0.53	0.56	0.60		
26	0.16	0.24	0.31	0.37	0.42	0.47	0.52	0.57	0.61	0.66	0.70		
28	0.19	0.28	0.35	0.42	0.49	0.55	0.60	0.66	0.71	0.76	0.81		
30		0.32	0.40	0.48	0.56	0.63	0.69	0.75	0.81	0.87	0.92	0.98	1.03
32		0.36	0.46	0.55	0.63	0.71	0.78	0.85	0.92	0.99	1.05	1.11	1.17
34		0.40	0.52	0.62	0.71	0.80	0.88	0.96	1.04	1.11	1.18	1.25	1.32
36		0.45	0.58	0.69	0.80	0.90	0.99	1.08	1.16	1.25	1.32	1.40	1.48
38		0.50	0.64	0.77	0.89	1.00	1.10	1.20	1.29	1.39	1.47	1.56	1.64
40				0.85	0.98	1.10	1.22	1.33	1.43	1.53	1.63	1.73	1.82
42				0.94	1.08	1.21	1.34	1.46	1.58	1.69	1.80	1.90	2.00
44				1.03	1.18	1.33	1.47	1.60	1.73	1.85	1.97	2.09	2.20
46				1.12	1.29	1.45	1.60	1.75	1.89	2.02	2.15	2.28	2.40
48				1.22	1.40	1.58	1.75	1.90	2.05	2.20	2.34	2.48	2.61
50					1.52	1.71	1.89	2.06	2.23	2.39	2.54	2.69	2.83
52					1.64	1.85	2.04	2.23	2.41	2.58	2.75	2.91	3.06
54					1.77	1.99	2.20	2.40	2.60	2.78	2.96	3.13	3.30
56					1.90	2.14	2.37	2.58	2.79	2.99	3.18	3.37	3.55
58					2.04	2.30	2.54	2.77	2.99	3.21	3.41	3.61	3.81
60						2.46	2.72	2.96	3.20	3.43	3.65	3.86	4.07
62						2.62	2.90	3.16	3.42	3.66	3.90	4.12	4.35
64						2.79	3.09	3.37	3.64	3.90	4.15	4.39	4.63
66						2.97	3.28	3.58	3.87	4.14	4.41	4.67	4.92
68						3.15	3.48	3.80	4.11	4.40	4.68	4.96	5.23
70						3.34	3.69	4.03	4.35	4.66	4.96	5.25	5.54
72						3.53	3.90	4.26	4.60	4.93	5.25	5.56	5.86
74						3.73	4.12	4.50	4.86	5.21	5.54	5.87	6.19
76						3.93	4.35	4.74	5.12	5.49	5.84	6.19	6.52
78						4.14	4.58	4.99	5.39	5.78	6.15	6.52	6.87

WHITE ASH (*Fraxinus americana* L.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.09				
12	0.03	0.05	0.06	0.07	0.09	0.10	0.11	0.12	0.13				
14	0.04	0.06	0.08	0.10	0.11	0.13	0.15	0.16	0.18				
16	0.05	0.08	0.10	0.12	0.15	0.17	0.19	0.21	0.23				
18	0.06	0.09	0.12	0.15	0.18	0.21	0.23	0.26	0.28				
20	0.07	0.11	0.15	0.19	0.22	0.25	0.29	0.32	0.35	0.38	0.41		
22	0.08	0.13	0.18	0.22	0.27	0.31	0.34	0.38	0.42	0.45	0.49		
24	0.10	0.16	0.21	0.27	0.31	0.36	0.41	0.45	0.50	0.54	0.58		
26	0.11	0.18	0.25	0.31	0.37	0.42	0.48	0.53	0.58	0.63	0.68		
28	0.13	0.21	0.29	0.36	0.42	0.49	0.55	0.61	0.67	0.73	0.78		
30		0.24	0.33	0.41	0.48	0.56	0.63	0.70	0.76	0.83	0.90	0.96	1.02
32		0.27	0.37	0.46	0.55	0.63	0.71	0.79	0.87	0.94	1.02	1.09	1.16
34		0.31	0.42	0.52	0.62	0.71	0.80	0.89	0.98	1.06	1.14	1.22	1.30
36		0.34	0.47	0.58	0.69	0.80	0.90	1.00	1.09	1.19	1.28	1.37	1.46
38		0.38	0.52	0.65	0.77	0.88	1.00	1.11	1.21	1.32	1.42	1.52	1.62
40				0.71	0.85	0.98	1.10	1.22	1.34	1.46	1.57	1.68	1.79
42				0.78	0.93	1.07	1.21	1.35	1.48	1.61	1.73	1.85	1.97
44				0.86	1.02	1.18	1.33	1.47	1.62	1.76	1.90	2.03	2.16
46				0.94	1.11	1.28	1.45	1.61	1.77	1.92	2.07	2.22	2.36
48				1.02	1.21	1.40	1.58	1.75	1.92	2.09	2.25	2.41	2.57
50					1.31	1.51	1.71	1.90	2.08	2.26	2.44	2.61	2.78
52					1.42	1.63	1.84	2.05	2.25	2.44	2.63	2.82	3.00
54					1.53	1.76	1.98	2.20	2.42	2.63	2.84	3.04	3.24
56					1.64	1.89	2.13	2.37	2.60	2.82	3.05	3.26	3.48
58					1.75	2.02	2.28	2.54	2.78	3.03	3.26	3.50	3.73
60						2.16	2.44	2.71	2.98	3.23	3.49	3.74	3.98
62						2.31	2.60	2.89	3.17	3.45	3.72	3.99	4.25
64						2.46	2.77	3.08	3.38	3.67	3.96	4.24	4.52
66						2.61	2.94	3.27	3.59	3.90	4.21	4.51	4.80
68						2.77	3.12	3.47	3.81	4.14	4.46	4.78	5.10
70						2.93	3.31	3.67	4.03	4.38	4.72	5.06	5.39
72						3.09	3.49	3.88	4.26	4.63	4.99	5.35	5.70
74						3.27	3.69	4.10	4.50	4.89	5.27	5.65	6.02
76						3.44	3.89	4.32	4.74	5.15	5.56	5.95	6.34
78						3.62	4.09	4.54	4.99	5.42	5.85	6.27	6.68

(continued)

Table 10 (cu cm, cont'd) **AMERICAN BASSWOOD** (*Tilia americana* L.).

D.B.H. (CM)	MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT												
	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.04	0.05	0.05	0.06	0.07	0.08	0.09	0.10	0.11				
12	0.04	0.06	0.07	0.08	0.10	0.11	0.12	0.13	0.14				
14	0.05	0.07	0.09	0.10	0.12	0.14	0.16	0.17	0.19				
16	0.06	0.08	0.11	0.13	0.15	0.18	0.20	0.22	0.24				
18	0.07	0.10	0.13	0.16	0.19	0.22	0.24	0.27	0.30				
20	0.08	0.12	0.15	0.19	0.23	0.26	0.30	0.33	0.36	0.40	0.43		
22	0.09	0.14	0.18	0.23	0.27	0.31	0.35	0.39	0.44	0.47	0.51		
24	0.10	0.16	0.21	0.27	0.32	0.37	0.42	0.47	0.51	0.56	0.61		
26	0.11	0.18	0.25	0.31	0.37	0.43	0.49	0.54	0.60	0.66	0.71		
28	0.13	0.21	0.28	0.36	0.43	0.49	0.56	0.63	0.69	0.76	0.82		
30		0.24	0.32	0.40	0.49	0.56	0.64	0.72	0.79	0.87	0.94	1.01	1.09
32		0.26	0.36	0.46	0.55	0.64	0.73	0.82	0.90	0.99	1.07	1.15	1.23
34		0.30	0.41	0.51	0.62	0.72	0.82	0.92	1.01	1.11	1.20	1.30	1.39
36		0.33	0.45	0.57	0.69	0.81	0.92	1.03	1.14	1.24	1.35	1.45	1.56
38		0.37	0.50	0.64	0.77	0.90	1.02	1.14	1.26	1.38	1.50	1.62	1.73
40				0.71	0.85	0.99	1.13	1.27	1.40	1.53	1.66	1.79	1.92
42				0.78	0.94	1.09	1.24	1.39	1.54	1.69	1.83	1.97	2.12
44				0.85	1.02	1.20	1.36	1.53	1.69	1.85	2.01	2.17	2.32
46				0.93	1.12	1.31	1.49	1.67	1.85	2.02	2.20	2.37	2.54
48				1.01	1.22	1.42	1.62	1.82	2.01	2.20	2.39	2.58	2.76
50					1.32	1.54	1.76	1.97	2.18	2.39	2.59	2.80	3.00
52					1.43	1.67	1.90	2.13	2.36	2.58	2.80	3.02	3.24
54					1.54	1.79	2.05	2.30	2.54	2.79	3.02	3.26	3.50
56					1.65	1.93	2.20	2.47	2.73	3.00	3.25	3.51	3.76
58					1.77	2.07	2.36	2.65	2.93	3.21	3.49	3.76	4.04
60						2.21	2.53	2.84	3.14	3.44	3.74	4.03	4.32
62						2.36	2.70	3.03	3.35	3.67	3.99	4.30	4.61
64						2.52	2.88	3.23	3.57	3.91	4.25	4.59	4.92
66						2.68	3.06	3.43	3.80	4.16	4.52	4.88	5.23
68						2.84	3.25	3.64	4.03	4.42	4.80	5.18	5.55
70						3.01	3.44	3.86	4.27	4.68	5.09	5.49	5.89
72						3.19	3.64	4.08	4.52	4.96	5.38	5.81	6.23
74						3.37	3.84	4.32	4.78	5.24	5.69	6.14	6.58
76						3.55	4.06	4.55	5.04	5.52	6.00	6.48	6.94
78						3.74	4.27	4.80	5.31	5.82	6.32	6.82	7.32

YELLOW-POPLAR (*Liriodendron tulipifera* L.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.02	0.04	0.05	0.06	0.07	0.09	0.10	0.11	0.13				
12	0.03	0.04	0.06	0.08	0.10	0.11	0.13	0.15	0.17				
14	0.03	0.05	0.08	0.10	0.12	0.15	0.17	0.19	0.22				
16	0.04	0.07	0.09	0.12	0.15	0.18	0.21	0.24	0.27				
18	0.04	0.08	0.11	0.15	0.18	0.22	0.26	0.29	0.33				
20	0.05	0.09	0.13	0.17	0.22	0.26	0.31	0.35	0.40	0.44	0.49		
22	0.06	0.10	0.15	0.20	0.25	0.31	0.36	0.41	0.47	0.52	0.58		
24	0.07	0.12	0.18	0.23	0.29	0.35	0.42	0.48	0.54	0.61	0.67		
26	0.07	0.14	0.20	0.27	0.34	0.41	0.48	0.55	0.62	0.70	0.77		
28	0.08	0.15	0.23	0.30	0.38	0.46	0.54	0.62	0.71	0.79	0.88		
30		0.17	0.25	0.34	0.43	0.52	0.61	0.70	0.80	0.89	0.99	1.08	1.18
32		0.19	0.28	0.38	0.48	0.58	0.68	0.79	0.89	1.00	1.10	1.21	1.32
34		0.21	0.31	0.42	0.53	0.64	0.76	0.87	0.99	1.11	1.23	1.35	1.47
36		0.23	0.35	0.46	0.59	0.71	0.84	0.96	1.09	1.22	1.35	1.49	1.62
38		0.25	0.38	0.51	0.64	0.78	0.92	1.06	1.20	1.34	1.49	1.63	1.78
40				0.56	0.70	0.85	1.00	1.16	1.31	1.47	1.63	1.79	1.95
42				0.61	0.76	0.93	1.09	1.26	1.43	1.60	1.77	1.94	2.12
44				0.66	0.83	1.00	1.18	1.36	1.55	1.73	1.92	2.11	2.30
46				0.71	0.89	1.09	1.28	1.47	1.67	1.87	2.08	2.28	2.49
48				0.76	0.96	1.17	1.38	1.59	1.80	2.02	2.24	2.46	2.68
50					1.03	1.25	1.48	1.71	1.93	2.17	2.40	2.64	2.88
52					1.11	1.34	1.58	1.83	2.07	2.32	2.57	2.82	3.08
54					1.18	1.43	1.69	1.95	2.21	2.48	2.75	3.02	3.29
56					1.26	1.53	1.80	2.08	2.36	2.64	2.93	3.22	3.51
58					1.34	1.62	1.91	2.21	2.51	2.81	3.11	3.42	3.73
60						1.72	2.03	2.34	2.66	2.98	3.30	3.63	3.96
62						1.82	2.15	2.48	2.82	3.16	3.50	3.84	4.19
64						1.93	2.27	2.62	2.98	3.34	3.70	4.06	4.43
66						2.03	2.40	2.77	3.14	3.52	3.90	4.29	4.68
68						2.14	2.53	2.92	3.31	3.71	4.11	4.52	4.93
70						2.26	2.66	3.07	3.49	3.90	4.33	4.76	5.19
72						2.37	2.79	3.23	3.66	4.10	4.55	5.00	5.45
74						2.49	2.93	3.38	3.84	4.30	4.77	5.24	5.72
76						2.60	3.07	3.55	4.03	4.51	5.00	5.49	5.99
78						2.73	3.21	3.71	4.21	4.72	5.23	5.75	6.27

(continued)

Table 10 (cu cm, cont'd)

ASPEN (*Populus* spp. L.).

D.B.H. (CM)	MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT												
	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.04	0.05	0.06	0.07	0.09	0.10	0.11	0.13	0.14				
12	0.05	0.06	0.07	0.09	0.11	0.13	0.14	0.17	0.19				
14	0.05	0.07	0.09	0.11	0.13	0.16	0.18	0.21	0.24				
16	0.05	0.08	0.10	0.13	0.16	0.19	0.23	0.26	0.30				
18	0.06	0.08	0.12	0.15	0.19	0.23	0.28	0.32	0.37				
20	0.06	0.10	0.13	0.18	0.23	0.28	0.33	0.39	0.44	0.50	0.57		
22	0.07	0.11	0.15	0.21	0.26	0.33	0.39	0.46	0.53	0.60	0.68		
24	0.07	0.12	0.18	0.24	0.31	0.38	0.46	0.54	0.62	0.71	0.79		
26	0.08	0.13	0.20	0.27	0.35	0.44	0.53	0.62	0.72	0.82	0.92		
28	0.09	0.15	0.23	0.31	0.40	0.50	0.60	0.71	0.82	0.94	1.06		
30		0.17	0.25	0.35	0.45	0.57	0.68	0.81	0.94	1.07	1.21	1.35	1.50
32		0.18	0.28	0.39	0.51	0.64	0.77	0.91	1.06	1.21	1.37	1.53	1.70
34		0.20	0.31	0.44	0.57	0.71	0.87	1.02	1.19	1.36	1.54	1.72	1.91
36		0.22	0.35	0.48	0.63	0.79	0.96	1.14	1.33	1.52	1.71	1.92	2.13
38		0.24	0.38	0.53	0.70	0.88	1.07	1.26	1.47	1.68	1.90	2.13	2.36
40				0.59	0.77	0.97	1.18	1.39	1.62	1.86	2.10	2.35	2.61
42				0.64	0.84	1.06	1.29	1.53	1.78	2.04	2.31	2.58	2.87
44				0.70	0.92	1.16	1.41	1.67	1.95	2.23	2.52	2.83	3.14
46				0.76	1.00	1.26	1.54	1.82	2.12	2.43	2.75	3.08	3.42
48				0.82	1.09	1.37	1.67	1.98	2.30	2.64	2.99	3.34	3.71
50					1.17	1.48	1.80	2.14	2.49	2.86	3.23	3.62	4.02
52					1.27	1.59	1.94	2.31	2.69	3.08	3.49	3.91	4.34
54					1.36	1.71	2.09	2.48	2.89	3.31	3.75	4.20	4.67
56					1.46	1.84	2.24	2.66	3.10	3.56	4.03	4.51	5.01
58					1.56	1.97	2.40	2.85	3.32	3.81	4.31	4.83	5.37
60						2.10	2.56	3.04	3.55	4.07	4.61	5.16	5.73
62						2.24	2.73	3.24	3.78	4.34	4.91	5.50	6.11
64						2.38	2.90	3.45	4.02	4.61	5.22	5.85	6.50
66						2.52	3.08	3.66	4.27	4.90	5.55	6.22	6.91
68						2.67	3.26	3.88	4.52	5.19	5.88	6.59	7.32
70						2.83	3.45	4.11	4.79	5.49	6.22	6.97	7.75
72						2.99	3.65	4.34	5.06	5.80	6.57	7.37	8.19
74						3.15	3.85	4.57	5.33	6.12	6.94	7.77	8.64
76						3.32	4.05	4.82	5.62	6.45	7.31	8.19	9.10
78						3.49	4.26	5.07	5.91	6.78	7.69	8.62	9.57

BLACK CHERRY (*Prunus serotina* Ehrh.).

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.12				
12	0.05	0.07	0.08	0.09	0.11	0.12	0.13	0.15	0.16				
14	0.06	0.08	0.09	0.11	0.13	0.15	0.17	0.19	0.21				
16	0.06	0.09	0.11	0.14	0.16	0.18	0.21	0.23	0.26				
18	0.07	0.10	0.13	0.16	0.19	0.22	0.25	0.29	0.32				
20	0.08	0.11	0.15	0.19	0.23	0.27	0.31	0.34	0.38	0.42	0.46		
22	0.09	0.13	0.18	0.22	0.27	0.31	0.36	0.41	0.46	0.50	0.55		
24	0.09	0.15	0.20	0.26	0.31	0.37	0.42	0.48	0.54	0.59	0.65		
26	0.10	0.17	0.23	0.29	0.36	0.42	0.49	0.56	0.62	0.69	0.76		
28	0.12	0.19	0.26	0.33	0.41	0.49	0.56	0.64	0.72	0.79	0.87		
30		0.21	0.29	0.38	0.47	0.55	0.64	0.73	0.82	0.91	1.00	1.09	1.18
32		0.23	0.33	0.43	0.52	0.62	0.72	0.82	0.93	1.03	1.13	1.23	1.34
34		0.26	0.37	0.48	0.59	0.70	0.81	0.93	1.04	1.16	1.27	1.39	1.50
36		0.28	0.41	0.53	0.65	0.78	0.91	1.03	1.16	1.29	1.42	1.55	1.68
38		0.31	0.45	0.59	0.72	0.86	1.01	1.15	1.29	1.43	1.58	1.72	1.87
40				0.64	0.80	0.95	1.11	1.27	1.43	1.59	1.75	1.91	2.07
42				0.71	0.88	1.05	1.22	1.39	1.57	1.75	1.92	2.10	2.28
44				0.77	0.96	1.15	1.34	1.53	1.72	1.91	2.11	2.30	2.50
46				0.84	1.04	1.25	1.46	1.67	1.88	2.09	2.30	2.51	2.73
48				0.91	1.13	1.36	1.58	1.81	2.04	2.27	2.50	2.73	2.97
50					1.23	1.47	1.72	1.96	2.21	2.46	2.71	2.96	3.22
52					1.33	1.59	1.85	2.12	2.39	2.66	2.93	3.20	3.48
54					1.43	1.71	2.00	2.28	2.57	2.87	3.16	3.45	3.75
56					1.53	1.84	2.15	2.46	2.77	3.08	3.39	3.71	4.03
58					1.64	1.97	2.30	2.63	2.97	3.30	3.64	3.98	4.32
60						2.10	2.46	2.81	3.17	3.53	3.89	4.26	4.62
62						2.25	2.62	3.00	3.39	3.77	4.16	4.54	4.93
64						2.39	2.79	3.20	3.61	4.02	4.43	4.84	5.26
66						2.54	2.97	3.40	3.83	4.27	4.71	5.15	5.59
68						2.69	3.15	3.61	4.07	4.53	5.00	5.46	5.93
70						2.85	3.34	3.82	4.31	4.80	5.29	5.79	6.29
72						3.02	3.53	4.04	4.56	5.08	5.60	6.12	6.65
74						3.19	3.73	4.27	4.81	5.36	5.91	6.47	7.02
76						3.36	3.93	4.50	5.08	5.66	6.24	6.82	7.41
78						3.54	4.14	4.74	5.35	5.96	6.57	7.19	7.80

(continued)

Table 10 (cu cm, cont'd) **MISCELLANEOUS HARDWOODS.**

MERCHANTABLE HEIGHT IN 2.5-FOOT BOLTS ABOVE STUMP HEIGHT

D.B.H. (CM)	1	2	3	4	5	6	7	8	9	10	11	12	13
10	0.04	0.06	0.07	0.08	0.10	0.11	0.13	0.14	0.16				
12	0.05	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.21				
14	0.05	0.07	0.09	0.12	0.14	0.17	0.20	0.23	0.26				
16	0.05	0.08	0.11	0.14	0.17	0.20	0.24	0.27	0.31				
18	0.06	0.09	0.12	0.16	0.20	0.24	0.28	0.33	0.37				
20	0.06	0.10	0.14	0.18	0.23	0.28	0.33	0.38	0.44	0.50	0.56		
22	0.07	0.11	0.15	0.21	0.26	0.32	0.38	0.44	0.51	0.58	0.65		
24	0.07	0.12	0.17	0.23	0.30	0.36	0.43	0.51	0.59	0.66	0.75		
26	0.08	0.13	0.19	0.26	0.33	0.41	0.49	0.58	0.67	0.76	0.85		
28	0.08	0.14	0.21	0.29	0.37	0.46	0.55	0.65	0.75	0.85	0.96		
30		0.16	0.24	0.32	0.42	0.51	0.62	0.73	0.84	0.95	1.07	1.19	1.32
32		0.17	0.26	0.36	0.46	0.57	0.69	0.81	0.93	1.06	1.19	1.33	1.47
34		0.19	0.28	0.39	0.51	0.63	0.76	0.89	1.03	1.17	1.32	1.47	1.62
36		0.20	0.31	0.43	0.55	0.69	0.83	0.98	1.13	1.29	1.45	1.61	1.79
38		0.22	0.33	0.46	0.60	0.75	0.91	1.07	1.23	1.41	1.58	1.77	1.95
40				0.50	0.65	0.82	0.98	1.16	1.34	1.53	1.72	1.92	2.13
42				0.54	0.71	0.88	1.07	1.26	1.45	1.66	1.87	2.09	2.31
44				0.58	0.76	0.95	1.15	1.36	1.57	1.79	2.02	2.25	2.49
46				0.63	0.82	1.02	1.24	1.46	1.69	1.93	2.18	2.43	2.69
48				0.67	0.88	1.10	1.33	1.57	1.82	2.07	2.34	2.61	2.89
50					0.94	1.17	1.42	1.68	1.94	2.22	2.50	2.79	3.09
52					1.00	1.25	1.52	1.79	2.07	2.37	2.67	2.98	3.30
54					1.07	1.33	1.61	1.91	2.21	2.52	2.85	3.18	3.52
56					1.13	1.42	1.71	2.03	2.35	2.68	3.03	3.38	3.74
58					1.20	1.50	1.82	2.15	2.49	2.84	3.21	3.58	3.97
60						1.59	1.92	2.27	2.64	3.01	3.40	3.79	4.20
62						1.68	2.03	2.40	2.78	3.18	3.59	4.01	4.44
64						1.77	2.14	2.53	2.94	3.36	3.79	4.23	4.68
66						1.86	2.25	2.67	3.09	3.53	3.99	4.45	4.93
68						1.95	2.37	2.80	3.25	3.72	4.19	4.68	5.19
70						2.05	2.49	2.94	3.41	3.90	4.40	4.92	5.45
72						2.15	2.61	3.08	3.58	4.09	4.62	5.16	5.71
74						2.25	2.73	3.23	3.75	4.28	4.84	5.40	5.98
76						2.35	2.85	3.38	3.92	4.48	5.06	5.65	6.26
78						2.46	2.98	3.53	4.10	4.68	5.29	5.91	6.54

This publication is available in other media on request.

Issued in furtherance of Cooperative Extension Work, Acts of Congress May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture and the Pennsylvania Legislature. L.F. Hood, Director of Cooperative Extension, The Pennsylvania State University.

R.5M494 U.Ed. 82-1024