Weight, Volume, and Physical Properties of Major Hardwood Species in the Piedmont

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Contents

ABSTRACT

Weight, volume, and physical properties of trees 1 to 20 inches d.b.h. were determined for red maple, sweetgum, sycamore, yellow-poplar, elm, hickory, chestnut oak, scarlet oak, southern red oak, and white oak in the Piedmont of the Southeastern United States. A total of 772 trees were destructively sampled at 16 locations from Virginia to Alabama. Hard hardwoods, soft hardwoods, and individual species equations are presented for predicting green and dry weight and green volume of the total tree above stump and its components by using d.b.h. and total height, d.b.h. and height to a 4-inch top, d.b.h. and saw-log merchantable height, and d.b.h. alone. Average specific gravity, moisture content, and weight per cubic foot of wood, bark, and wood and bark combined are presented for each species by tree size class and component. Bark percentage is also presented for each species by tree size class and component.

Keywords: Biomass, equations, specific gravity, moisture content, bark percentage, weight per cubic foot.

Piedmont hardwood forests can contribute significantly to supplies of solid wood, fiber, and energy wood through improved utilization and forest management. Few data, however, exist on the weight, volume, and physical properties of the total tree and its components for hardwood species of this region.

To meet this need, a southwide study was initiated by the North Carolina State Hardwood Research Cooperative and the USDA Forest Service. The primary objectives of this study were to determine the amount and distribution of biomass in even-aged fully stocked natural stands and to develop equations for estimating the weight and volume of forest stands, individual trees, and tree components. Secondary objectives were to determine the specific gravity, moisture content, and energy potential of southern hardwoods, and to quantify the distribution of nutrients (N, P, K, Ca, and Mg) in individual trees and soils.

This is part of a southwide study conducted in three geographic regions--the Gulf and Atlantic Coastal Plains, Piedmont, and mid-South. The data collected in the Gulf and Atlantic Coastal Plains have been reported in earlier publications (Clark

and others 1983, 1985; Frederick and others 1983; Gower and others 1983; Messina and others 1983). Mid-South data will be presented in later publications.

This Paper presents tree physical properties and green weight, dry weight and green cubic-volume prediction equations for total tree and tree components of 10 species--red maple (Acer rubrum L.), sweetgum (Liquidambar styraciflua L.), sycamore (Platanus occidentalis L.), yellow-poplar (Liriodendron tulipifera L.), elm species (Ulmus spp.), hickory species (Carya spp.) chestnut oak (Quercus prinus L.), scarlet oak (Q. coccinea Muenchh.), southern red oak (Q. falcata Michx.), and white oak (Q. alba L.) sampled in the Piedmont. These species account for 75 percent of the commercial hardwood volume in the Piedmont regions.

Wood and bark specific gravity, moisture content, bark content, and green weight per cubic foot are presented for the total tree and its components by species and tree size classes. Equations are given for estimating the weight and volume of wood, bark, and foliage, wood and bark and wood only in the total tree, total stem, and the saw-log component of the stem. Ratio equations are also included for estimating total stem and saw-log stem weight or volume to any specified top diameter outside bark (d.o.b.).

Procedure

Field

Sixteen 1/10-acre circular biomass plots were sampled in mixed, even-aged hardwood stands on the Piedmont (fig. 1). Four age classes (10, 20, 40, and 60 years) were sampled on two site types:

> Bottom land. Flood plain areas of major drainage systems and adjacent stream margins, predominantly sandy loam to silt loam surface soils.

> Upland (slopes and ridges). Land occupying the large upland interstream divides, predominantly clay to sandy clay loam surface soils.

Age and site combinations were replicated twice. Plots for all ages and site types were randomly located within representative fully stocked stands. Tree data collected on all plots except the 10-year-old plots were used to develop the species equations and properties data reported here. In addition to the fixed-area plots a stratified random sample of three trees per 2-inch class from 6- to 20-inches diameter at breast height (d.b.h.) was sampled at six locations to obtain an even distribution of trees across d.b.h. classes for commercially important species. Figure 1 shows the location of the fixed area and stratified random sample plots.

Data for above-stump total tree and tree component weights and volumes were collected for trees 1 inch d.b.h. and larger. All trees $\geq$ 5.0 inches d.b.h. on the 1/10-acre plots were sampled. At the center of each plot a concentric 1/50-acre subplot was located on which all trees 1.0 to 4.9 inches d.b.h. were sampled.

Means and ranges in age and tree dimensions measured are shown in table 1 for each species and species group sampled. Stump height averaged 0.2 feet for trees 1.0 to 4.9 inches d.b.h., 0.5 feet for trees 5.0 to 10.9 inches d.b.h., and 0.7 feet for trees $\geq$ 11.0 inches d.b.h. Girard form class of the sawtimber-size trees ($\geq$ 11.0 inches d.b.h.) ranged from 66 to 86 and averaged 75 for the soft hardwoods, and ranged from 65 to 91 and averaged 78 for the hard hardwoods.
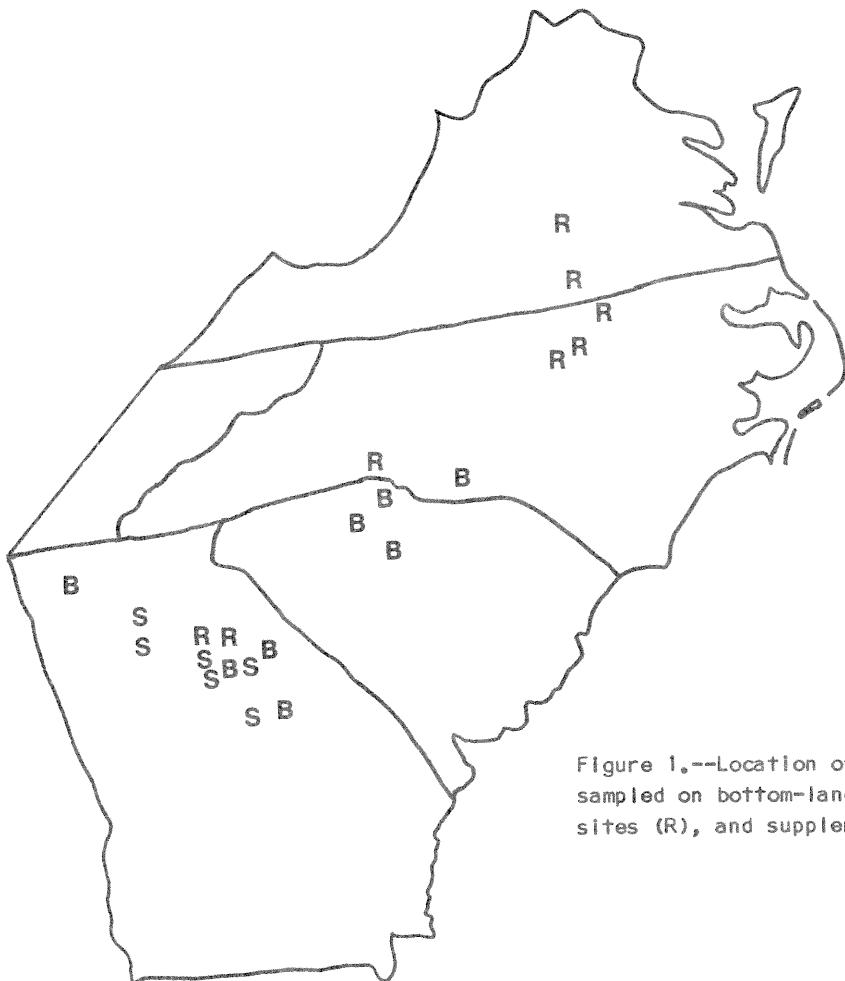
Figure 1.--Location of plots where trees were sampled on bottom-land sites (B), ridge and upland sites (R), and supplemental (S) locations.

Each tree was felled and measured for d.o.b. at 4-foot intervals up the stem. Total height, and height to the saw-log top, 9-, 4-, and 2-inch d.o.b., and base of full live crown were also recorded. Cross-sectional disks of wood and bark were removed from the stem and branches of sample trees for laboratory determination of specific gravity, moisture content, bark percentage, energy value, and nutrient concentration. In all trees > 5.0 inches d.b.h, except sawtimber-quality trees (trees > 11.0 inches d.b.h. with a minimum of one 16-foot grade 3 log), disks were cut at the butt, d.b.h., and quarter-points to the 4-inch d.o.b. top and at the 2-inch top. In sawtimber trees, disks were removed at the butt, at each saw-log bucking point, and at the stem location where d.o.b. measured 9, 4, and 2 inches. For trees less than 5.0 inches d.b.h., three disks per stem were taken--at stump height and at 25 and 75 percent of total stem height.

The branches of each tree were cut from the stem and weighed in four size categories: extra large (> 4.0 inches d.o.b.), large (2.0 to 3.9 inches d.o.b.), medium (0.6 to 1.9 inches d.o.b.), and small (< 0.5 inches d.o.b.). Three cross-sectional disks were cut from randomly selected branches in each size category for analysis in the laboratory. Sample branches were randomly selected and weighed with and without foliage to estimate foliage weight. A subsample of the foliage was taken to determine foliage moisture content.

The stem of each tree was weighed by components (saw logs, pulpwood, and topwood) and the branches of each tree were weighted by size category.

Laboratory

Specific gravity was computed on green volume and ovendry weight. Moisture content was computed on ovendry weight after samples were dried to a constant weight at 215 °F. Percentage of bark was determined from disks and based on the green weight of sample disks. Moisture content, specific gravity, and percentage of bark in stem, branches, and total tree were calculated by weighting disk values in proportion to the volume of the component they represented. Weighted values for moisture content were used to convert component green weights to ovendry weight.

By using species diameter inside bark (d.i.b.) prediction equations developed from d.o.b. and d.i.b. stem disk measurements and the d.o.b. and height measurements taken at 4-foot intervals up the stem of each tree, the volume of wood in the stem to the saw-log, 9-inch, 4-inch, 3-inch, 2-inch, and tip were calculated using Smalian's formula. Green weight per cubic foot of stem bark and branch wood and bark were calculated from weighted values for specific gravity and moisture content with the equation:

$$\text{Green weight per cubic foot} = [1 + \frac{MC}{100}] \cdot (SG) \cdot (C) \tag{1}$$

where: MC = weighted moisture content in percent

SG = weighted specific gravity

C = 62.4 pounds (weight of water per cubic foot)

Cubic-foot volume of stem bark and branch wood and bark were computed by dividing green component weight by its green weight per cubic foot. Cubic-foot volume of stem wood and bark combined was computed by adding the volume of bark to the volume of wood.

Analysis

Regression equations were developed to predict green and dry weight of wood, bark, and foliage and green volume of wood and bark in the total tree above stump, stem from butt to tip, and saw-log stem. Independent variables were: diameter at breast height (D), total height (Th), saw-log merchantable height (Mh), and height to a 4-inch d.o.b. top (H4).

A logarithmic transformation (base 10) was used to obtain a relatively homogeneous variance, which is assumed in regression analysis. Two equations were developed for the d.b.h., d.b.h. and total height, and d.b.h. and height to 4-inch top--one for trees < 11.0 inches d.b.h. and one for trees $\geq$ 11.0 inches d.b.h. The 11-inch point was not the optimum point to shift from one equation to the other for all species or tree components, but it was the most desirable from a practical standpoint. Hardwood trees < 11 inches in diameter are classified as sapling or poletimber, and trees $\geq$ 11 inches are classified as sawtimber. The procedure outlined in Draper and Smith (1981) for fitting two linear equations with a known point of intersection was used to develop the following equations:

$$\log Y_p = a + b \log X + E \tag{2}$$

$$\log Y_s = a + b \log (11^2 H) + c \log (D^2/11^2) + E \tag{3}$$

where: Y_p = predicted component weight or volume for trees

< 11.0 inches d.b.h.

Y_s = predicted component weight or volume for trees

   $\geq$ 11.0 inches d.b.h.

X = D^2, D^2Th, or D^2H4

H = Th or H4

D = d.b.h.

E = experimental error

a,b,c = regression coefficients

The following model was used for developing regression equations based on d.b.h. and saw-log merchantable height:

$$\log Y = a + b \log X_1 + c \log X_2 + E \tag{4}$$

where: Y = predicted component weight or volume

X_1 = D^2

X_2 = Mh

E = experimental error

a,b,c = regression coefficients

When logarithmic estimates are converted back to original units, they are biased downward because the antilogarithm of an estimated mean gives the geometric rather then the arithmetic mean (Cunia 1964). To adjust for this bias, a correction factor was computed and applied to each model by using Baskerville's (1972) procedure. The final equations, including correction factors, were:

$$Y = 10^{\,a + b \log (D^2) + c \log (Mh) + (S^2_{y \cdot x} \log_e 10)/2} \tag{5}$$

$$Y_p = 10^{\,a + b \log (D^2H) + (S^2_{y \cdot x} \log_e 10)/2} \tag{6}$$

$$Y_s = 10^{\,a + b \log (11^2H) + c \log (D^2/11^2) + (S^2_{y \cdot x} \log_e 10)/2} \tag{7}$$

Equations (5), (6), and (7) can be simplified to:

$$Y = a' \, (D^2)^b \, (Mh)^c \tag{8}$$

$$Y_p = a' \, (D^2H)^b \tag{9}$$

$$Y_s = a'' \, (D^2)^b (H)^c \tag{10}$$

where: $a' = 10^{a + (S^2_{y \cdot x} \log_e 10)/2}$

    $a'' = a' \, (11^2)^{b - c}$

$S^2_{y \cdot x}$ = error mean square from regression analysis

Comparison of average deviations (actual minus predicted) by d.b.h. classes and the sums of the squared deviations for the single log-log equation and segmented log-log equation showed that segmented log-log equations (9) and (10) gave the best results for the d.b.h., d.b.h. and total height, and d.b.h. and height to 4-inch top independent variable combinations (Clark and others 1984). Equations (9) and (10) are more complex than a single equation, but the improved accuracy justified their use.

The following exponential ratio equation was used to estimate the proportion of predicted total-stem weight or volume to a specified top d.o.b.:

$$Y_R = e^a \, (d^b \, D^c) \tag{11}$$

where: Y_R = ratio of stem weight or volume to top d.o.b. to predicted total stem

   d = specified stem top diameter in inches

   D = tree diameter at breast height in inches

a,b,c = regression coefficients

   e = base of natural log = 2.71828

The exponential ratio model shown below was developed to estimate a ratio for expanding saw-log stem weight or volume to any d.o.b. top above the saw-log top.

$$Y_R = e^a \left[(Mh)^b \left(\left(1 - \left(\frac{d}{.78D} \right)^2 \right)^2 \right)^c \right] \tag{12}$$

where: Y_R = ratio of stem weight or volume to top d.o.b. to saw-log stem

   Mh = saw-log merchantable height in feet

   d = specified top diameter in inches

   D = tree diameter at breast height in inches

   .78 = constant based on average form class

a,b,c = regression coefficients

   e = 2.71828 (base of natural log)

Results

Physical Properties of Sample Trees

The average specific gravity of wood and bark by tree component is shown in table 2 for individual species, soft hardwoods, hard hardwoods, and all trees combined. The average total-tree wood specific gravity of the soft hardwood species was 0.493 for saplings (1.0 to 4.9 inches d.b.h.), 0.467 for poletimber

(5.0 to 10.9 inches d.b.h.), and 0.465 for sawtimber ($\geq$ 11.0 inches d.b.h.) compared with hard hardwood species, which averaged 0.623 for saplings, 0.608 for poletimber, and 0.618 for sawtimber. Yellow-poplar had the lowest average total-tree wood specific gravity and red maple the highest for the soft hardwoods group. In the hard hardwoods group, elm had the lowest average total-tree wood specific gravity and white oak the highest.

Specific gravity of bark was lower than that of the wood for the soft hardwood species except red maple and sycamore, and for the hard hardwood species except scarlet oak and southern red oak (table 2).

The average moisture content of wood and bark by tree component and size class is shown in table 3 for the species and species groups sampled. Total-tree wood moisture content for the soft hardwoods averaged 97 percent for saplings, 102 percent for poletimber, and 105 percent for sawtimber compared with the hard hardwoods, which averaged 70 percent for saplings, 69 percent for poletimber, and 71 percent for sawtimber. In the soft hardwoods group, sycamore had the highest average total-tree wood moisture content compared with red maple, which had the lowest. In the hard hardwoods group, hickory had the lowest total-tree wood moisture content compared with scarlet oak, which had the highest.

Total-tree average bark moisture content for the soft hardwoods was 107 percent in saplings, 108 percent in poletimber, and 102 percent in sawtimber compared with 102 percent for saplings, 67 percent for poletimber, and 65 percent for sawtimber for the hard hardwood species (table 3).

Table 4 shows the average proportion of bark in the tree, based on green weight of wood and bark, by tree component and size class, for the species sampled. The percentage of stem weight in bark decreased as stem d.b.h. increased. Sycamore had a significantly lower proportion of its stem weight in bark than any of the other species. Yellow-poplar had the highest bark percentage of the soft hardwoods and hickory and chestnut oak had the highest for the hard hardwoods.

The average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component, for saplings, poletimber, and sawtimber are shown in table 5. Because of the soft hardwood and hard hardwood species grouping, the average range of species green weight for cubic foot of wood for the two groups is similar--54 to 66 pounds for the soft hardwoods and 57 to 68 pounds for the hard hardwoods. This is caused by the relatively high moisture content of sweetgum and sycamore in the soft hardwoods group and the low moisture content of hickory in the hard hardwoods group. The average green weight per cubic foot of wood for the soft hardwood species was 60 pounds for poletimber and 61 pounds for sawtimber compared with 64 pounds for poletimber and 66 pounds for sawtimber hard hardwoods.

The average green weight of wood and bark per cubic foot of wood by tree component for saplings, poletimber, and sawtimber-size trees is shown in table 6. The weight of wood and bark per cubic-foot volume of wood is a useful factor for estimating the volume of wood in a tree or its components when weight of wood and bark is known or for estimating green weight of wood and bark when volume of wood is known. The green weight of wood and bark per cubic foot of wood for the total tree averaged 71 pounds for poletimber and 70 pounds for sawtimber soft hardwoods compared with 79 pounds for poletimber and sawtimber hard hardwoods.

The average green weight of wood and bark per cubic foot of wood was highest for branches and decreased with increasing stem diameter (table 6).

Prediction Equations

A series of equations was developed to predict total-tree and tree component weight and volume for each species, the soft hardwood and hard hardwood groups, and all species combined. Equations were developed for predicting the green and dry weight of wood, bark and foliage, wood and bark combined, and wood alone in the above-stump total tree. Stem equations were developed for estimating the green and dry weight of wood and bark combined and wood alone for the total stem. Volume equations were also developed for wood and bark combined and wood alone in the above-stump total tree and total stem.

Since tree height is measured to different top limits by various organizations, equations were developed by using diameter (D) alone and in combination with total height (Th), height to 4-inch top (H4), and merchantable height (Mh) as independent variables. Equation (9) was used to estimate the weight and volume of the total tree and stem for trees 1.0 to 10.9 inches d.b.h., and equation (10) was used for trees ≥ 11.0 inches d.b.h. when D alone, D and Th, or D and H4 were the independent variables.

Equation (8) was used to estimate weight and volume of the total tree and saw-log merchantable stem for trees ≥ 11.0 inches d.b.h. when D and Mh were the independent variables. Equations based on D and Mh were developed only for species sampled sufficiently in the sawtimber diameter classes. Equations were developed for the soft hardwoods, hard hardwoods, and all species, and for sweetgum, sycamore, yellow-poplar, scarlet oak, southern red oak, and white oak.

Equation (11) was used to estimate the proportion of total-stem weight or volume in the stem to any d.o.b. top when stem weight or volume was estimated with D, D and Th, or D and H4 as the independent variables. Equation (12) was used to estimate a ratio for expanding estimated saw-log merchantable-stem weight or volume to any d.o.b. top above the saw-log top when D and Mh were the independent variables.

Equations that use D with Th or D with H4 fit the existing total-tree and total-stem weight and volume data well, based on the criteria of mean square error and absolute deviation of observed from predicted. Equations that use D and Mh fit existing saw-log merchantable-stem weight and volume data well. When average tree height and stem taper are similar to those of our sample trees, the equations with D alone will result in good estimates of the tree weight and volume. When average tree height by d.b.h. class is different from the sample trees, however, the equations that include a height variable should be applied directly or used to develop local weight-volume tables based on D alone.

Regression coefficients for estimating weight and volume are listed below, by independent variable and table number:

Independent variable	Weight	Volume
D alone	tables 7, 8	tables 9, 10
D and Th	tables 11, 12	tables 13, 14
D and H4	tables 15, 16	tables 17, 18
D and Mh	tables 19, 20	tables 21, 22

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In addition to the regression coefficients, tables 7 through 22 contain the coefficients of determination and standard error ($\log_{10}$) for each equation.

Regression coefficients for estimating the proportion of the total-stem weight and volume in the stem to a specified d.o.b. top are given in tables 23 and 24. Table 23 contains coefficients for estimating ratios for stem green and dry weight of wood and bark combined and wood only, and table 24 contains the coefficients for stem volume of wood and bark combined and wood alone. Equation coefficients for expanding estimated saw-log merchantable-stem weight and volume are shown in tables 25 and 26, respectively.

How to Use Prediction Equations

The following examples illustrate how to use the equations in tables 7 through 26 to estimate the weight or volume of the total tree and its components.

This tabulation presents the tree data needed to estimate weight and volume when d.b.h. and Th are measured and equations (9) and (10) are used:

Example of trees < 11.0 inches d.b.h.

D = 10.0 inches

Th = 70 feet

Example of trees ≥ 11.0 inches

D = 14.0 inches

Th = 90 feet

To estimate total-stem wood and bark green weight (Y_{STEMWB}) of a soft hardwood with these dimensions, the following equations would be selected from table 12 and solved as follows:

Trees < 11.0 inches d.b.h.--use equation (9)

$$Y_{STEMWB} = a' (D^2 Th)^b$$

$$= 0.19535 ((10^2) (70))^{0.95420}$$

$$= 0.19535 (7000)^{0.95420}$$

$$= 0.19535 (4,666.51)$$

$$Y_{STEMWB} = 912 \text{ pounds}$$

Trees ≥ 11 inches d.b.h.--use equation (10)

$$Y_{STEMWB} = a'' (D^2)^b (Th)^c$$

$$= 0.13963 (14^2)^{1.02422} (90)^{0.95420}$$

$$= 0.13963 (196)^{1.02422} (90)^{0.95420}$$

$$= 0.13963 (222.73) (73.24)$$

$$Y_{STEMWB} = 2,278 \text{ pounds}$$

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The same mathematical procedure shown above would be used to solve equations (9) or (10) for any of the tree component equations in tables 7 through 22.

To estimate the proportion of total-stem green weight of wood and bark in the stem of a 10-inch d.b.h. tree to a 4-inch d.o.b. top (Y_R), the following soft hardwood ratio regression coefficients would be selected from table 23 and solved by using equation (11) as shown below. The same equation is used for all size trees.

$$Y_R = e^a (d)^b (D)^c$$

$$= 2.71828 \left[-1.73265 (4)^{4.21073} (10)^{-4.28793} \right]$$

$$= 2.71828 \left[-1.73265 (342.86) (0.0000515) \right]$$

$$= 2.71828^{-0.03059}$$

$$Y_R = 0.970$$

Stem weight to 4-inch top $= (Y_{STEMWB}) (Y_R)$

$$= 912 (0.970)$$

Stem weight to 4-inch top $= 885$ pounds

The procedure shown above can be used to estimate the proportion of total stem in the stem to any d.o.b. top by substituting for d in equation (11).

The following tabulation shows the tree data needed to estimate weights and volumes when d.b.h. and Mh are measured and equation (8) is used.

D = 14.0 inches d.b.h.

Mh = 2.0 logs

To use equation (8), Mh must be in feet, thus:

Mh = 33.1 feet = (2.0 logs) (16.3 ft/log) + (0.5 ft for stump)

To estimate the green weight of wood and bark in the saw-log merchantable stem (Y_{SAWWB}) of a soft hardwood tree, by using equation (8) the following regression coefficients would be selected from table 20 and solved as follows:

$$Y_{SAWWB} = a' (D^2)^b (Mh)^c$$

$$= 0.67595 (14^2)^{0.89328} (33.1)^{0.85866}$$

$$= 0.67595 (111.59) (20.18)$$

$$Y_{SAWWB} = 1,522 \text{ pounds}$$

The same mathematical procedure shown above would be used to solve equation (8) for any sawtimber tree component equation in tables 19 through 22.

To estimate a ratio (Y_R) for expanding estimated saw-log merchantable-stem green weight of wood and bark of the previous tree to weight to a 4-inch d.o.b. top, the following soft hardwood ratio equation would be selected from table 25 and solved by using equation (12) as shown below:

$$Y_R = e^{a \left[(Mh)^b \left(\left(1-\left(\frac{d}{.78D}\right)^2\right)^2 \right)^c \right]}$$

$$= 2.71828^{34.56311 \left[(33.1)^{-1.33687} \left(\left(1-\left(\frac{4}{.78(14)}\right)^2\right)^2 \right)^{0.34540} \right]}$$

$$= 2.71828^{34.56311(0.009294)(0.90527)}$$

$$= 2.71828^{0.29080}$$

$$Y_R = 1.337$$

Stem weight to 4-inch top = $(Y_{SAWWB})\ (Y_R)$

$$= 1,522\ (1.337)$$

Stem weight to 4-inch top = 2,035 pounds

The tree components predicted by using the equations provided can be used to calculate additional tree components. For example, to estimate the weight or volume of the crown (branches and topwood) subtract estimated weight of the stem to a specified d.o.b. top from total-tree weight of wood and bark. The weight or volume of bark alone can also be estimated by subtracting component weight or volume of wood from wood and bark.

Similar-size trees may vary in weight and volume because of differences in crown size, stem taper, and weight per cubic foot. Therefore, these equations should be applied only to trees growing in natural, fully stocked stands with tree dimensions and weight per cubic foot similar to the tree sampled.

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TABLES

Table 1.--Mean and range of tree age and measurements, by species and tree size class

Tree size class (inches)	Sample trees	Age		D.b.h.		Total height		Height to 4-inch d.o.b. top		Height to saw-log merchantable top		D.o.b. at saw-log merchantable top	
		Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
	Number			- - Inches - -				- - - Feet - - -				- - Inches - -	
SOFT HARDWOODS													
1.0- 4.9	108	18	3-40	2.8	1.0- 4.9	33	12- 58	10	2-20	--	--	--	--
5.0-10.9	203	36	12-72	7.4	5.0-10.9	61	40- 96	34	10-69	--	--	--	--
>11.0	124	52	33-83	14.8	11.0-20.7	88	70-115	68	47-90	39	8-67	10.0	8.0-14.5
All trees	435	35	3-83	8.4	1.0-20.7	62	12-115	46	2-90	39	8-67	10.0	8.0-14.5
RED MAPLE													
1.0- 4.9	8	23	9-37	2.4	1.0- 4.9	33	15- 57	20	20-20	--	--	--	--
5.0-10.9	16	42	22-72	7.3	5.2-10.7	61	45- 74	36	19-53	--	--	--	--
>11.0	8	59	48-65	13.5	11.2-15.9	75	72- 80	53	48-56	18	17-22	11.1	9.2-14.3
All trees	32	41	9-72	7.6	1.0-15.9	58	15- 80	40	19-56	18	17-22	11.1	9.2-14.3
SWEETGUM													
1.0- 4.9	61	17	6-40	2.8	1.0- 4.9	34	13- 58	7	6- 8	--	--	--	--
5.0-10.9	119	35	16-61	7.2	5.0-10.8	62	42- 96	33	10-69	--	--	--	--
>11.0	56	49	33-83	14.6	11.1-20.7	89	71-107	68	50-88	39	11-62	9.6	8.1-14.4
All trees	236	34	6-83	7.8	1.0-20.7	61	13-107	43	6-88	39	11-62	9.6	8.1-14.4
SYCAMORE													
1.0- 4.9	4	10	3- 16	3.5	1.9- 4.9	44	30- 53	13	9-16	--	--	--	--
5.0-10.9	10	19	12- 32	7.6	5.1- 9.4	58	48- 66	36	16-48	--	--	--	--
>11.0	15	44	34- 59	15.0	11.0-19.5	97	71-115	76	47-90	44	18-64	9.8	9.0-13.0
All trees	29	31	3- 59	10.9	1.9-19.5	76	30-115	56	9-90	44	18-64	9.8	9.0-13.0
YELLOW-POPLAR													
1.0- 4.9	3	32	31- 33	3.5	2.7- 4.6	41	33- 46	--	--	--	--	--	--
5.0-10.9	35	41	15- 63	7.8	5.2-10.5	64	42- 85	40	17-63	--	--	--	--
>11.0	40	61	35- 83	15.3	11.1-20.3	86	70-107	68	54-89	42	17-67	10.0	8.0-14.5
All trees	78	50	15- 83	11.5	2.7-20.3	74	33-107	55	17-89	42	17-67	10.0	8.0-14.5
HARD HARDWOODS													
1.0- 4.9	73	20	7- 39	2.3	1.0- 4.4	27	12- 53	8	6- 9	--	--	--	--
5.0-10.9	165	44	12-105	7.3	5.0-10.9	59	29- 90	34	8-67	--	--	--	--
>11.0	99	71	33-145	14.6	11.0-20.9	77	52- 97	57	34-79	31	14-52	11.6	8.3-18.5
All Trees	338	45	7-145	8.4	1.0-20.9	57	12- 97	42	6-79	31	14-52	11.6	8.3-18.5
ELM													
1.0- 4.0	8	22	13-30	2.0	1.0- 4.8	23	13- 52	12	12-12	--	--	--	--
5.0-10.9	7	39	22-60	8.0	5.8-10.8	61	43- 77	35	12-54	--	--	--	--
>11.0	1	42	42-42	11.2	11.2-11.2	71	71- 71	52	52-52	8	8- 8	10.4	10.4-10.4
All trees	16	29	13-60	5.2	1.0-11.2	43	13- 77	34	12-54	8	8- 8	10.4	10.4-10.4

Table 1.--Mean and range of tree age and measurements, by species and tree size class--Continued

Tree size class (inches)	Sample trees	Age Average	Age Range	D.b.h. Average	D.b.h. Range	Total height Average	Total height Range	Height to 4-inch d.o.b. top Average	Height to 4-inch d.o.b. top Range	Height to saw-log merchantable top Average	Height to saw-log merchantable top Range	D.o.b. at saw-log merchantable top Average	D.o.b. at saw-log merchantable top Range
	Number			- - Inches - -				- - - Feet - - -				- - Inches - -	
HICKORY													
1.0- 4.9	4	19	11- 25	2.2	1.5- 3.9	24	17- 36	--	--	--	--	--	--
5.0-10.9	8	77	45-105	8.2	5.2-10.8	56	45- 68	36	15-50	--	--	--	--
>11.0	10	125	90-145	14.8	11.5-18.5	80	68- 97	57	38-78	27	17-41	13.3	9.0-17.8
All Trees	22	82	11-145	10.1	1.5-18.5	61	17- 97	47	15-78	27	17-41	13.3	9.0-17.8
CHESTNUT OAK													
1.0- 4.9	12	16	7- 39	2.2	1.2- 4.1	30	12- 53	6	6- 6	--	--	--	--
5.0-10.9	22	46	18- 65	6.7	5.0-10.8	56	29- 70	30	12-54	--	--	--	--
>11.0	3	85	83- 90	13.8	12.9-14.6	62	59- 63	46	45-50	25	24-26	11.1	9.4-12.0
All trees	37	41	7- 90	5.8	1.2-14.6	48	12- 70	31	6-54	25	24-26	11.1	9.4-12.0
SCARLET OAK													
5.0-10.9	15	43	29- 56	7.8	5.1-10.9	59	48- 68	35	18-46	--	--	--	--
>11.0	17	62	33- 86	14.2	11.2-18.8	66	53- 72	48	34-57	27	17-41	11.9	9.0-18.5
All trees	32	50	29- 86	11.2	5.1-18.8	63	48- 72	42	18-57	27	17-41	11.9	9.0-18.5
SOUTHERN RED OAK													
1.0- 4.9	2	16	12- 19	2.8	2.3- 3.2	36	30- 43	--	--	--	--	--	--
5.0-10.9	22	22	15- 32	6.9	5.1-10.0	55	41- 81	30	8-58	--	--	--	--
>11.0	24	63	38- 78	14.7	11.0-18.8	80	68- 88	61	49-70	33	14-46	12.0	9.0-18.0
All trees	48	42	12- 78	10.6	2.3-18.8	67	30- 88	46	8-70	33	14-46	12.0	9.0-18.0
WHITE OAK													
1.0- 4.9	15	28	20- 35	3.2	2.1- 4.4	34	15- 45	9	9- 9	--	--	--	--
5.0-10.9	56	43	12- 66	7.5	5.1-10.5	58	47- 76	34	17-50	--	--	--	--
>11.0	39	59	42- 80	15.1	11.2-20.9	77	52- 95	57	34-76	31	15-43	11.4	8.3-15.6
All trees	110	44	12- 80	9.6	2.1-20.9	61	15- 95	43	9-76	31	15-43	11.4	8.3-15.6
ALL SPECIES													
1.0- 4.9	181	19	3- 40	2.6	1.0- 4.9	31	12- 58	10	2-20	--	--	--	--
5.0-10.9	368	39	12-105	7.4	5.0-10.9	60	29- 96	34	8-69	--	--	--	--
>11.0	223	59	33-145	14.7	11.0-20.9	83	52-115	63	34-90	35	8-66	10.7	8.0-18.5
All trees	772	39	3-145	8.4	1.0-20.9	60	12-115	44	2-90	35	8-66	10.7	8.0-18.5

Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont

Tree size class (inches)	Total tree	Stem — Average and standard deviation					Branches
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	
SOFT HARDWOODS							
Wood							
1.0- 4.9	0.492 ± 0.060	--	--	--	--	0.492 ± 0.062	0.493 ± 0.060
5.0-10.9	0.467 ± 0.053	--	--	0.466 ± 0.055	0.470 ± 0.055	0.465 ± 0.054	0.480 ± 0.048
>11.0	0.465 ± 0.035	0.462 ± 0.039	0.473 ± 0.036	0.463 ± 0.037	0.478 ± 0.033	0.464 ± 0.036	0.475 ± 0.030
Bark							
1.0- 4.9	0.394 ± 0.085	--	--	--	--	0.386 ± 0.096	0.427 ± 0.057
5.0-10.9	0.407 ± 0.067	--	--	0.395 ± 0.083	0.427 ± 0.057	0.401 ± 0.076	0.424 ± 0.057
>11.0	0.440 ± 0.073	0.440 ± 0.086	0.454 ± 0.078	0.445 ± 0.082	0.454 ± 0.065	0.445 ± 0.081	0.429 ± 0.068
Wood and Bark							
1.0- 4.9	0.475 ± 0.054	--	--	--	--	0.473 ± 0.056	0.474 ± 0.053
5.0-10.9	0.458 ± 0.048	--	--	0.453 ± 0.050	0.461 ± 0.047	0.457 ± 0.049	0.462 ± 0.046
>11.0	0.461 ± 0.034	0.458 ± 0.039	0.467 ± 0.035	0.459 ± 0.036	0.471 ± 0.032	0.460 ± 0.036	0.459 ± 0.033
RED MAPLE							
Wood							
1.0- 4.9	0.468 ± 0.032	--	--	--	--	0.473 ± 0.033	0.459 ± 0.035
5.0-10.9	0.463 ± 0.019	--	--	0.462 ± 0.020	0.464 ± 0.026	0.462 ± 0.020	0.473 ± 0.028
>11.0	0.524 ± 0.037	0.536 ± 0.035	0.514 ± 0.036	0.526 ± 0.036	0.526 ± 0.040	0.526 ± 0.036	0.519 ± 0.042
Bark							
1.0- 4.9	0.467 ± 0.036	--	--	--	--	0.485 ± 0.029	0.434 ± 0.062
5.0-10.9	0.499 ± 0.042	--	--	0.511 ± 0.046	0.490 ± 0.032	0.506 ± 0.044	0.478 ± 0.041
>11.0	0.512 ± 0.039	0.547 ± 0.045	0.553 ± 0.041	0.551 ± 0.039	0.514 ± 0.045	0.550 ± 0.039	0.453 ± 0.050
Wood and Bark							
1.0- 4.9	0.453 ± 0.027	--	--	--	--	0.475 ± 0.031	0.423 ± 0.046
5.0-10.9	0.468 ± 0.017	--	--	0.466 ± 0.020	0.468 ± 0.024	0.467 ± 0.018	0.474 ± 0.020
>11.0	0.523 ± 0.035	0.537 ± 0.033	0.518 ± 0.033	0.528 ± 0.034	0.524 ± 0.034	0.529 ± 0.033	0.502 ± 0.035

Continued

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Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Average and standard deviation						
		Stem					
	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
SWEETGUM							
Wood							
1.0- 4.9	0.472 ± 0.027	--	--	--	--	0.470 ± 0.029	0.479 ± 0.033
5.0-10.9	0.468 ± 0.028	--	--	0.468 ± 0.032	0.468 ± 0.027	0.466 ± 0.030	0.481 ± 0.025
>11.0	0.479 ± 0.022	0.476 ± 0.024	0.488 ± 0.026	0.477 ± 0.023	0.490 ± 0.022	0.478 ± 0.023	0.490 ± 0.017
Bark							
1.0- 4.9	0.338 ± 0.050	--	--	--	--	0.325 ± 0.054	0.410 ± 0.051
5.0-10.9	0.378 ± 0.055	--	--	0.353 ± 0.069	0.418 ± 0.054	0.366 ± 0.063	0.422 ± 0.035
>11.0	0.441 ± 0.053	0.429 ± 0.071	0.451 ± 0.061	0.440 ± 0.064	0.462 ± 0.038	0.440 ± 0.063	0.440 ± 0.034
Wood and Bark							
1.0- 4.9	0.455 ± 0.021	--	--	--	--	0.446 ± 0.026	0.457 ± 0.029
5.0-10.9	0.455 ± 0.027	--	--	0.448 ± 0.031	0.458 ± 0.027	0.454 ± 0.029	0.463 ± 0.024
>11.0	0.475 ± 0.019	0.471 ± 0.022	0.483 ± 0.025	0.473 ± 0.021	0.484 ± 0.020	0.474 ± 0.021	0.477 ± 0.017
SYCAMORE							
Wood							
1.0- 4.9	0.423 ± 0.036	--	--	--	--	0.423 ± 0.037	0.440 ± 0.054
5.0-10.9	0.459 ± 0.020	--	--	0.457 ± 0.020	0.459 ± 0.023	0.457 ± 0.020	0.468 ± 0.030
>11.0	0.447 ± 0.025	0.450 ± 0.030	0.438 ± 0.017	0.446 ± 0.026	0.451 ± 0.030	0.447 ± 0.025	0.450 ± 0.027
Bark							
1.0- 4.9	0.466 ± 0.043	--	--	--	--	0.467 ± 0.053	0.460 ± 0.043
5.0-10.9	0.504 ± 0.028	--	--	0.517 ± 0.029	0.470 ± 0.044	0.510 ± 0.027	0.488 ± 0.043
>11.0	0.566 ± 0.034	0.581 ± 0.036	0.575 ± 0.048	0.576 ± 0.039	0.558 ± 0.043	0.576 ± 0.039	0.545 ± 0.048
Wood and Bark							
1.0- 4.9	0.426 ± 0.036	--	--	--	--	0.425 ± 0.037	0.445 ± 0.050
5.0-10.9	0.463 ± 0.019	--	--	0.460 ± 0.019	0.460 ± 0.022	0.460 ± 0.019	0.471 ± 0.027
>11.0	0.454 ± 0.023	0.454 ± 0.029	0.444 ± 0.017	0.451 ± 0.025	0.461 ± 0.028	0.452 ± 0.024	0.459 ± 0.026
YELLOW-POPLAR							
Wood							
1.0- 4.9	0.450 ± 0.033	--	--	--	--	0.452 ± 0.038	0.431 ± 0.020
5.0-10.9	0.406 ± 0.027	--	--	0.404 ± 0.031	0.417 ± 0.033	0.403 ± 0.030	0.426 ± 0.020
>11.0	0.444 ± 0.028	0.439 ± 0.031	0.459 ± 0.036	0.442 ± 0.031	0.467 ± 0.030	0.442 ± 0.031	0.457 ± 0.019

Continued

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Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Stem: Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
Bark							
1.0- 4.9	0.400 ± 0.014	--	--	--	--	0.402 ± 0.018	0.393 ± 0.002
5.0-10.9	0.387 ± 0.023	--	--	0.395 ± 0.027	0.389 ± 0.029	0.394 ± 0.026	0.353 ± 0.033
>11.0	0.381 ± 0.030	0.382 ± 0.035	0.398 ± 0.032	0.384 ± 0.034	0.394 ± 0.036	0.384 ± 0.034	0.364 ± 0.038
Wood and Bark							
1.0- 4.9	0.440 ± 0.030	--	--	--	--	0.441 ± 0.028	0.420 ± 0.019
5.0-10.9	0.403 ± 0.024	--	--	0.402 ± 0.028	0.411 ± 0.028	0.401 ± 0.026	0.403 ± 0.017
>11.0	0.434 ± 0.026	0.430 ± 0.029	0.447 ± 0.031	0.433 ± 0.029	0.448 ± 0.026	0.434 ± 0.029	0.429 ± 0.024
HARD HARDWOODS							
Wood							
1.0- 4.9	0.623 ± 0.036	--	--	--	--	0.625 ± 0.036	0.609 ± 0.049
5.0-10.9	0.608 ± 0.045	--	--	0.606 ± 0.047	0.608 ± 0.047	0.605 ± 0.046	0.618 ± 0.049
>11.0	0.618 ± 0.032	0.602 ± 0.039	0.627 ± 0.038	0.605 ± 0.038	0.654 ± 0.034	0.606 ± 0.038	0.654 ± 0.029
Bark							
1.0- 4.9	0.432 ± 0.128	--	--	--	--	0.440 ± 0.145	0.399 ± 0.092
5.0-10.9	0.555 ± 0.057	--	--	0.563 ± 0.069	0.556 ± 0.064	0.563 ± 0.068	0.530 ± 0.056
>11.0	0.593 ± 0.057	0.608 ± 0.066	0.604 ± 0.067	0.607 ± 0.066	0.578 ± 0.060	0.606 ± 0.066	0.573 ± 0.061
Wood and Bark							
1.0- 4.9	0.587 ± 0.032	--	--	--	--	0.592 ± 0.030	0.530 ± 0.065
5.0-10.9	0.598 ± 0.037	--	--	0.598 ± 0.040	0.594 ± 0.038	0.599 ± 0.039	0.588 ± 0.041
>11.0	0.616 ± 0.024	0.603 ± 0.031	0.623 ± 0.029	0.606 ± 0.029	0.633 ± 0.030	0.607 ± 0.030	0.631 ± 0.032
ELM							
Wood							
1.0- 4.9	0.604 ± 0.050	--	--	--	--	0.606 ± 0.055	0.586 ± 0.047
5.0-10.9	0.566 ± 0.034	--	--	0.570 ± 0.044	0.558 ± 0.035	0.566 ± 0.038	0.572 ± 0.028
Bark							
1.0- 4.9	0.382 ± 0.041	--	--	--	--	0.351 ± 0.035	0.440 ± 0.049
5.0-10.9	0.418 ± 0.042	--	--	0.405 ± 0.037	0.401 ± 0.044	0.404 ± 0.038	0.439 ± 0.063
Wood and Bark							
1.0- 4.9	0.579 ± 0.047	--	--	--	--	0.560 ± 0.040	0.571 ± 0.021
5.0-10.9	0.547 ± 0.030	--	--	0.551 ± 0.039	0.522 ± 0.030	0.550 ± 0.033	0.537 ± 0.034

Continued

Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Average and standard deviation						
		Stem					
	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
HICKORY							
Wood							
1.0- 4.9	0.621 ± 0.011	--	--	--	--	0.631 ± 0.011	0.539 ± 0.042
5.0-10.9	0.618 ± 0.037	--	--	0.625 ± 0.039	0.624 ± 0.039	0.624 ± 0.038	0.591 ± 0.044
>11.0	0.641 ± 0.036	0.632 ± 0.037	0.668 ± 0.036	0.638 ± 0.036	0.673 ± 0.040	0.639 ± 0.036	0.647 ± 0.043
Bark							
1.0- 4.9	0.565 ± 0.038	--	--	--	--	0.571 ± 0.039	0.515 ± 0.083
5.0-10.9	0.502 ± 0.044	--	--	0.530 ± 0.029	0.505 ± 0.050	0.530 ± 0.030	0.444 ± 0.049
>11.0	0.530 ± 0.047	0.555 ± 0.050	0.556 ± 0.033	0.554 ± 0.045	0.514 ± 0.049	0.553 ± 0.044	0.488 ± 0.062
Wood and Bark							
1.0- 4.9	0.592 ± 0.000	--	--	--	--	0.613 ± 0.018	0.467 ± 0.000
5.0-10.9	0.591 ± 0.034	--	--	0.603 ± 0.033	0.588 ± 0.033	0.602 ± 0.033	0.532 ± 0.039
>11.0	0.621 ± 0.034	0.620 ± 0.037	0.645 ± 0.033	0.624 ± 0.036	0.631 ± 0.036	0.625 ± 0.036	0.596 ± 0.046
CHESTNUT OAK							
Wood							
1.0- 4.9	0.617 ± 0.032	--	--	--	--	0.623 ± 0.030	0.579 ± 0.053
5.0-10.9	0.618 ± 0.023	--	--	0.623 ± 0.020	0.609 ± 0.037	0.620 ± 0.023	0.602 ± 0.035
>11.0	0.615 ± 0.026	0.608 ± 0.036	0.626 ± 0.033	0.616 ± 0.035	0.618 ± 0.029	0.616 ± 0.034	0.595 ± 0.041
Bark							
1.0- 4.9	0.506 ± 0.036	--	--	--	--	0.509 ± 0.042	0.484 ± 0.020
5.0-10.9	0.549 ± 0.023	--	--	0.567 ± 0.026	0.538 ± 0.032	0.563 ± 0.024	0.477 ± 0.034
>11.0	0.550 ± 0.022	0.581 ± 0.009	0.564 ± 0.013	0.573 ± 0.004	0.526 ± 0.024	0.572 ± 0.004	0.504 ± 0.040
Wood and Bark							
1.0- 4.9	0.591 ± 0.029	--	--	--	--	0.595 ± 0.028	0.544 ± 0.039
5.0-10.9	0.603 ± 0.020	--	--	0.611 ± 0.017	0.590 ± 0.031	0.609 ± 0.021	0.553 ± 0.035
>11.0	0.601 ± 0.018	0.602 ± 0.031	0.612 ± 0.022	0.607 ± 0.027	0.591 ± 0.019	0.608 ± 0.027	0.566 ± 0.033

Continued

Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Average and standard deviation						
			Stem				
	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
SCARLET OAK							
Wood							
5.0-10.9	0.602 ± 0.018	--	--	0.590 ± 0.021	0.612 ± 0.021	0.591 ± 0.020	0.645 ± 0.008
>11.0	0.592 ± 0.030	0.569 ± 0.040	0.599 ± 0.036	0.573 ± 0.038	0.636 ± 0.033	0.573 ± 0.038	0.641 ± 0.015
Bark							
5.0-10.9	0.602 ± 0.030			0.620 ± 0.035	0.584 ± 0.043	0.615 ± 0.037	0.569 ± 0.010
>11.0	0.621 ± 0.018	0.649 ± 0.029	0.647 ± 0.030	0.648 ± 0.029	0.615 ± 0.021	0.647 ± 0.029	0.587 ± 0.015
Wood and Bark							
5.0-10.9	0.602 ± 0.014			0.594 ± 0.019	0.606 ± 0.017	0.594 ± 0.017	0.622 ± 0.009
>11.0	0.597 ± 0.025	0.579 ± 0.036	0.606 ± 0.032	0.582 ± 0.035	0.631 ± 0.026	0.583 ± 0.035	0.628 ± 0.010
SOUTHERN RED OAK							
Wood							
1.0- 4.9	0.634 ± 0.021			--	--	0.633 ± 0.018	0.637 ± 0.033
5.0-10.9	0.606 ± 0.036			0.604 ± 0.041	0.614 ± 0.026	0.601 ± 0.039	0.648 ± 0.018
>11.0	0.596 ± 0.020	0.572 ± 0.023	0.604 ± 0.024	0.576 ± 0.021	0.653 ± 0.032	0.577 ± 0.021	0.651 ± 0.028
Bark							
1.0- 4.9	0.605 ± 0.088			--	--	0.626 ± 0.112	0.520 ± 0.001
5.0-10.9	0.621 ± 0.052			0.632 ± 0.063	0.636 ± 0.051	0.638 ± 0.059	0.574 ± 0.048
>11.0	0.665 ± 0.034	0.680 ± 0.046	0.675 ± 0.045	0.681 ± 0.044	0.639 ± 0.042	0.680 ± 0.044	0.636 ± 0.027
Wood and Bark							
1.0- 4.9	0.625 ± 0.038			--	--	0.627 ± 0.041	0.599 ± 0.023
5.0-10.9	0.609 ± 0.030			0.608 ± 0.035	0.619 ± 0.026	0.608 ± 0.034	0.624 ± 0.019
>11.0	0.610 ± 0.018	0.588 ± 0.019	0.618 ± 0.022	0.593 ± 0.017	0.649 ± 0.032	0.593 ± 0.017	0.647 ± 0.023
WHITE OAK							
Wood							
1.0- 4.9	0.627 ± 0.024			--	--	0.628 ± 0.024	0.607 ± 0.043
5.0-10.9	0.636 ± 0.029			0.635 ± 0.031	0.635 ± 0.032	0.634 ± 0.030	0.639 ± 0.038
>11.0	0.636 ± 0.021	0.621 ± 0.027	0.643 ± 0.030	0.623 ± 0.027	0.664 ± 0.029	0.624 ± 0.027	0.671 ± 0.015

Continued

Table 2.—Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont—Continued

Tree size class (inches)	Total tree	Stem Butt to 9-inch top	Stem 9-inch to 4-inch top	Stem Butt to 4-inch top	Stem 4-inch to tip	Stem Butt to tip	Branches
Bark							
1.0- 4.9	0.464 ± 0.038	--	--	--	--	0.463 ± 0.038	0.489 ± 0.052
5.0-10.9	0.520 ± 0.035	--	--	0.511 ± 0.045	0.522 ± 0.037	0.511 ± 0.042	0.538 ± 0.052
>11.0	0.568 ± 0.028	0.574 ± 0.045	0.570 ± 0.049	0.572 ± 0.045	0.557 ± 0.038	0.572 ± 0.045	0.566 ± 0.050
Wood and Bark							
1.0- 4.9	--	--	--	--	--	0.595 ± 0.027	--
5.0-10.9	0.617 ± 0.025	--	--	0.615 ± 0.029	0.607 ± 0.025	0.617 ± 0.028	0.607 ± 0.017
>11.0	0.627 ± 0.018	0.616 ± 0.024	0.632 ± 0.026	0.617 ± 0.023	0.633 ± 0.025	0.619 ± 0.023	0.642 ± 0.023
ALL SPECIES							
Wood							
1.0- 4.9	0.534 ± 0.081	--	--	--	--	0.534 ± 0.083	0.530 ± 0.079
5.0-10.9	0.525 ± 0.085	--	--	0.524 ± 0.086	0.527 ± 0.086	0.523 ± 0.086	0.537 ± 0.084
>11.0	0.532 ± 0.083	0.524 ± 0.080	0.541 ± 0.085	0.526 ± 0.080	0.556 ± 0.093	0.526 ± 0.080	0.553 ± 0.094
Bark							
1.0- 4.9	0.406 ± 0.102	--	--	--	--	0.403 ± 0.116	0.418 ± 0.071
5.0-10.9	0.468 ± 0.097	--	--	0.464 ± 0.114	0.480 ± 0.087	0.468 ± 0.108	0.468 ± 0.077
>11.0	0.508 ± 0.101	0.514 ± 0.114	0.520 ± 0.104	0.516 ± 0.110	0.508 ± 0.088	0.516 ± 0.110	0.492 ± 0.097
Wood and Bark							
1.0- 4.9	0.507 ± 0.071	--	--	--	--	0.511 ± 0.074	0.490 ± 0.062
5.0-10.9	0.515 ± 0.082	--	--	0.513 ± 0.085	0.516 ± 0.079	0.515 ± 0.083	0.514 ± 0.076
>11.0	0.529 ± 0.083	0.522 ± 0.080	0.536 ± 0.084	0.524 ± 0.080	0.542 ± 0.086	0.525 ± 0.080	0.535 ± 0.091

Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont

| Tree size class (inches) | Total tree | Stem | | | | | Branches |
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	

- - - - - - - - - - - - - - Percent -

SOFT HARDWOODS

Wood

1.0- 4.9	97 ± 22.4	--	--	--	--	98 ± 23.3	96 ± 20.8
5.0-10.9	102 ± 22.4	--	--	103 ± 24.0	99 ± 22.3	103 ± 23.8	101 ± 18.1
>11.0	105 ± 18.4	107 ± 22.0	100 ± 19.7	106 ± 20.8	98 ± 14.7	106 ± 20.6	101 ± 11.2

Bark

1.0- 4.9	107 ± 23.8	--	--	--	--	106 ± 25.5	118 ± 29.1
5.0-10.9	108 ± 24.5	--	--	103 ± 28.0	117 ± 28.9	105 ± 27.4	127 ± 30.2
>11.0	102 ± 22.5	95 ± 27.3	97 ± 28.4	94 ± 26.1	118 ± 30.3	95 ± 26.0	124 ± 27.6

Wood and Bark

1.0- 4.9	102 ± 19.4	--	--	--	--	99 ± 22.1	105 ± 20.4
5.0-10.9	103 ± 20.4	--	--	102 ± 21.5	102 ± 20.0	103 ± 21.4	109 ± 20.1
>11.0	104 ± 15.5	106 ± 19.1	99 ± 16.8	104 ± 17.9	102 ± 14.3	105 ± 17.8	108 ± 14.1

RED MAPLE

Wood

1.0- 4.9	77 ± 7.9	--	--	--	--	77 ± 7.5	79 ± 9.9
5.0-10.9	77 ± 14.1	--	--	76 ± 15.8	81 ± 13.4	76 ± 15.5	85 ± 10.4
>11.0	66 ± 5.9	63 ± 6.1	63 ± 4.6	63 ± 5.4	70 ± 5.7	63 ± 5.3	76 ± 8.2

Bark

1.0- 4.9	97 ± 7.8	--	--	--	--	95 ± 9.6	99 ± 16.9
5.0-10.9	94 ± 13.2	--	--	91 ± 14.2	101 ± 10.0	93 ± 13.4	94 ± 20.9
>11.0	102 ± 9.3	93 ± 19.3	95 ± 7.3	92 ± 11.3	108 ± 15.7	93 ± 11.4	117 ± 12.8

Wood and Bark

1.0- 4.9	86 ± 2.7	--	--	--	--	80 ± 6.7	89 ± 7.0
5.0-10.9	79 ± 13.1	--	--	77 ± 14.2	83 ± 11.7	78 ± 14.0	87 ± 11.8
>11.0	70 ± 5.7	65 ± 5.1	67 ± 4.4	66 ± 4.8	76 ± 6.5	67 ± 4.7	86 ± 6.5

SWEETGUM

Wood

1.0- 4.9	112 ± 10.0	--	--	--	--	113 ± 11.1	106 ± 17.4
5.0-10.9	113 ± 11.7	--	--	114 ± 13.0	108 ± 14.6	113 ± 12.8	106 ± 10.2
>11.0	111 ± 10.9	115 ± 13.1	104 ± 12.9	113 ± 12.1	97 ± 9.2	112 ± 12.0	101 ± 9.1

Bark

1.0- 4.9	117 ± 23.3	--	--	--	--	116 ± 25.1	132 ± 27.2
5.0-10.9	108 ± 22.3	--	--	102 ± 27.7	115 ± 22.5	104 ± 26.7	128 ± 15.5
>11.0	92 ± 19.6	86 ± 26.6	85 ± 24.5	83 ± 23.0	106 ± 22.9	84 ± 22.9	116 ± 16.0

Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Average and standard deviation						
		Stem						
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches	

- - - - - - - - - - - - - - - - - Percent -

Wood and Bark

1.0- 4.9	86 ± 2.7	--	--	--	--	80 ± 6.7	89 ± 7.0
5.0-10.9	79 ± 13.1	--	--	77 ± 14.2	83 ± 11.7	78 ± 14.0	87 ± 11.8
>11.0	70 ± 5.7	65 ± 5.1	67 ± 4.4	66 ± 4.8	76 ± 6.5	67 ± 4.7	86 ± 6.5

SWEETGUM

Wood

1.0- 4.9	112 ± 10.0	--	--	--	--	113 ± 11.1	106 ± 17.4
5.0-10.9	113 ± 11.7	--	--	114 ± 13.0	108 ± 14.6	113 ± 12.8	106 ± 10.2
>11.0	111 ± 10.9	115 ± 13.1	104 ± 12.9	113 ± 12.1	97 ± 9.2	112 ± 12.0	101 ± 9.1

Bark

1.0- 4.9	117 ± 23.3	--	--	--	--	116 ± 25.1	132 ± 27.2
5.0-10.9	108 ± 22.3	--	--	102 ± 27.7	115 ± 22.5	104 ± 26.7	128 ± 15.5
>11.0	92 ± 19.6	86 ± 26.6	85 ± 24.5	83 ± 23.0	106 ± 22.9	84 ± 22.9	116 ± 16.0

Wood and Bark

1.0- 4.9	112 ± 8.8	--	--	--	--	114 ± 11.1	112 ± 19.1
5.0-10.9	111 ± 10.7	--	--	111 ± 11.8	109 ± 13.0	112 ± 11.9	113 ± 8.6
>11.0	108 ± 8.6	112 ± 10.9	100 ± 10.0	109 ± 9.7	98 ± 9.4	110 ± 10.0	105 ± 9.3

SYCAMORE

Wood

1.0- 4.9	121 ± 20.7	--	--	--	--	121 ± 21.3	118 ± 14.9
5.0-10.9	123 ± 13.7	--	--	125 ± 14.5	121 ± 19.5	124 ± 14.9	116 ± 14.4
>11.0	122 ± 7.6	125 ± 11.6	127 ± 8.7	126 ± 9.7	119 ± 7.5	125 ± 9.2	106 ± 6.3

Bark

1.0- 4.9	116 ± 32.9	--	--	--	--	116 ± 39.4	121 ± 30.7
5.0-10.9	120 ± 15.8	--	--	116 ± 20.2	145 ± 30.6	120 ± 19.4	122 ± 13.2
>11.0	92 ± 6.7	90 ± 9.7	93 ± 10.7	91 ± 9.9	96 ± 23.4	91 ± 9.7	94 ± 9.1

Wood and Bark

1.0- 4.9	121 ± 21.4	--	--	--	--	121 ± 22.2	118 ± 12.0
5.0-10.9	122 ± 13.3	--	--	124 ± 14.4	123 ± 18.9	124 ± 14.7	117 ± 12.2
>11.0	120 ± 7.0	124 ± 11.3	126 ± 8.4	124 ± 9.4	117 ± 7.0	124 ± 8.9	104 ± 5.9

YELLOW-POPLAR

Wood

1.0- 4.9	101 ± 18.9	--	--	--	--	101 ± 19.6	97 ± 5.7
5.0-10.9	99 ± 21.3	--	--	99 ± 23.9	93 ± 20.4	98 ± 23.4	109 ± 10.5
>11.0	97 ± 17.0	96 ± 19.4	91 ± 15.7	96 ± 19.0	97 ± 13.5	96 ± 18.9	106 ± 7.9

Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
		Stem					

- - - - - - - - - - - - - - - - - Percent -

Bark

1.0- 4.9	102 ± 35.6	--	--	--	--	98 ± 38.9	115 ± 33.2
5.0-10.9	67 ± 12.3	--	--	64 ± 14.5	70 ± 13.8	64 ± 13.9	78 ± 14.2
>11.0	65 ± 12.9	61 ± 15.5	62 ± 15.0	61 ± 15.4	68 ± 15.3	61 ± 15.3	71 ± 13.9

Wood and Bark

1.0- 4.9	77 ± 13.9	--	--	--	--	75 ± 12.9	85 ± 13.8
5.0-10.9	68 ± 7.1	--	--	69 ± 8.4	69 ± 7.8	69 ± 8.2	70 ± 7.5
>11.0	69 ± 6.3	73 ± 8.6	67 ± 7.2	72 ± 8.3	64 ± 6.4	72 ± 8.2	63 ± 5.8

ELM

Wood

1.0- 4.9	66 ± 5.9	--	--	--	--	66 ± 7.8	67 ± 4.6
5.0-10.9	76 ± 6.9	--	--	78 ± 8.6	75 ± 5.6	78 ± 7.7	70 ± 7.5

Bark

1.0- 4.9	93 ± 10.0	--	--	--	--	94 ± 12.5	92 ± 16.5
5.0-10.9	87 ± 15.0	--	--	91 ± 24.5	89 ± 20.5	90 ± 21.9	82 ± 10.7

Wood and Bark

1.0- 4.9	71 ± 4.5	--	--	--	--	71 ± 6.0	72 ± 5.7
5.0-10.9	77 ± 6.8	--	--	79 ± 8.2	78 ± 6.6	79 ± 7.1	73 ± 8.3

HICKORY

Wood

1.0- 4.9	61 ± 5.5	--	--	--	--	60 ± 5.9	65 ± 5.3
5.0-10.9	56 ± 6.8	--	--	54 ± 5.6	54 ± 5.4	54 ± 5.4	63 ± 9.4
>11.0	58 ± 7.8	63 ± 8.7	52 ± 4.0	61 ± 8.1	51 ± 4.1	61 ± 8.1	52 ± 8.5

Bark

1.0- 4.9	75 ± 14.5	--	--	--	--	75 ± 14.6	78 ± 16.6
5.0-10.9	85 ± 17.2	--	--	78 ± 15.2	88 ± 20.0	78 ± 14.7	99 ± 15.2
>11.0	81 ± 15.4	76 ± 16.1	75 ± 12.8	76 ± 14.9	88 ± 21.2	76 ± 14.7	89 ± 20.7

Wood and Bark

1.0- 4.9	74 ± 0.0	--	--	--	--	64 ± 8.4	79 ± 0.0
5.0-10.9	63 ± 8.8	--	--	59 ± 6.4	64 ± 8.9	59 ± 6.3	77 ± 12.0
>11.0	62 ± 7.9	65 ± 9.5	57 ± 5.3	64 ± 8.8	60 ± 6.5	63 ± 8.7	64 ± 11.4

Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
			Stem				

- - - - - - - - - - - - - - - - Percent -

CHESTNUT OAK

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	63 ± 5.3	--	--	--	--	62 ± 5.7	69 ± 5.2
5.0-10.9	63 ± 4.6	--	--	63 ± 4.8	63 ± 5.3	63 ± 4.8	63 ± 3.2
>11.0	69 ± 3.6	72 ± 4.0	68 ± 2.4	70 ± 3.3	64 ± 3.2	70 ± 3.3	66 ± 4.9

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	80 ± 16.8	--	--	--	--	76 ± 18.9	100 ± 10.6
5.0-10.9	57 ± 6.9	--	--	49 ± 6.1	63 ± 10.8	51 ± 5.3	90 ± 10.8
>11.0	62 ± 8.9	53 ± 5.9	56 ± 11.6	54 ± 8.7	74 ± 7.1	55 ± 8.6	78 ± 7.0

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	67 ± 8.1	--	--	--	--	65 ± 8.7	81 ± 5.6
5.0-10.9	61 ± 3.4	--	--	60 ± 3.6	62 ± 5.3	60 ± 3.7	73 ± 5.2
>11.0	67 ± 0.8	68 ± 1.8	64 ± 1.3	67 ± 0.5	67 ± 2.1	67 ± 0.8	70 ± 4.8

SCARLET OAK

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
5.0-10.9	74 ± 3.5	--	--	78 ± 5.7	70 ± 2.6	77 ± 5.4	62 ± 0.8
>11.0	79 ± 6.8	85 ± 9.0	77 ± 7.8	85 ± 8.5	67 ± 3.6	84 ± 8.5	65 ± 3.2

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
5.0-10.9	65 ± 5.1	--	--	67 ± 8.9	70 ± 8.8	67 ± 8.5	64 ± 2.3
>11.0	63 ± 5.6	62 ± 8.1	62 ± 7.8	62 ± 7.6	65 ± 7.3	62 ± 7.5	64 ± 5.3

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
5.0-10.9	72 ± 3.4	--	--	76 ± 5.6	70 ± 2.6	76 ± 5.4	63 ± 1.4
>11.0	76 ± 5.9	82 ± 8.1	75 ± 6.7	82 ± 7.6	67 ± 3.1	82 ± 7.6	65 ± 2.9

SOUTHERN RED OAK

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	68 ± 5.7	--	--	--	--	69 ± 5.3	64 ± 7.8
5.0-10.9	71 ± 4.6	--	--	72 ± 5.0	70 ± 6.4	72 ± 4.8	62 ± 5.0
>11.0	74 ± 4.4	81 ± 6.1	73 ± 3.3	80 ± 5.3	64 ± 4.2	79 ± 5.3	60 ± 5.7

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	70 ± 23.1	--	--	--	--	69 ± 26.4	73 ± 7.6
5.0-10.9	61 ± 11.9	--	--	58 ± 12.5	61 ± 10.3	57 ± 11.4	72 ± 12.3
>11.0	53 ± 8.4	50 ± 12.9	49 ± 7.0	50 ± 11.6	56 ± 5.9	50 ± 11.4	58 ± 7.4

Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Stem Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches

- - - - - - - - - - - - - - - - - Percent -

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	69 ± 10.0	--	--	--	--	69 ± 10.2	67 ± 7.9
5.0-10.9	68 ± 5.4	--	--	69 ± 5.6	68 ± 6.7	69 ± 5.5	66 ± 7.4
≥11.0	70 ± 4.1	76 ± 5.3	69 ± 2.8	75 ± 4.7	62 ± 4.2	75 ± 4.6	60 ± 5.5

WHITE OAK

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	64 ± 5.8	--	--	--	--	63 ± 6.0	69 ± 4.7
5.0-10.9	65 ± 3.8	--	--	66 ± 5.0	64 ± 4.0	66 ± 4.9	61 ± 3.4
≥11.0	68 ± 4.6	72 ± 6.4	66 ± 5.8	71 ± 6.3	63 ± 6.1	71 ± 6.2	61 ± 2.1

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	92 ± 15.5	--	--	--	--	91 ± 16.4	100 ± 15.4
5.0-10.9	70 ± 13.8	--	--	68 ± 20.1	71 ± 16.6	68 ± 19.4	78 ± 5.3
≥11.0	67 ± 10.2	62 ± 16.6	64 ± 16.7	63 ± 16.6	69 ± 13.9	63 ± 16.4	74 ± 6.6

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	70 ± 6.9	--	--	--	--	69 ± 7.7	76 ± 6.1
5.0-10.9	65 ± 4.7	--	---	66 ± 6.3	66 ± 6.0	66 ± 6.0	66 ± 2.5
≥11.0	68 ± 4.8	71 ± 6.7	66 ± 6.3	70 ± 6.6	65 ± 7.5	70 ± 6.5	64 ± 2.8

ALL SPECIES

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	89 ± 23.1	--	--	--	--	89 ± 24.1	88 ± 20.9
5.0-10.9	89 ± 24.4	--	--	89 ± 25.3	86 ± 23.5	89 ± 25.1	86 ± 22.9
≥11.0	90 ± 22.4	93 ± 23.8	86 ± 22.2	92 ± 22.9	82 ± 20.8	92 ± 22.9	84 ± 22.0

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	105 ± 28.0	--	--	--	--	103 ± 30.4	117 ± 30.3
5.0-10.9	91 ± 28.7	--	--	87 ± 30.3	98 ± 33.4	88 ± 30.3	107 ± 34.5
≥11.0	85 ± 26.3	80 ± 28.5	82 ± 29.4	80 ± 27.4	96 ± 34.9	80 ± 27.4	101 ± 35.0

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	94 ± 21.2	--	--	--	--	92 ± 22.8	99 ± 20.7
5.0-10.9	89 ± 23.4	--	--	89 ± 24.0	88 ± 23.0	89 ± 24.0	93 ± 25.1
≥11.0	89 ± 21.2	91 ± 22.4	85 ± 20.8	90 ± 21.5	86 ± 22.0	91 ± 21.6	89 ± 24.7

Table 4.--Average proportion of wood and bark green weight in bark, by tree component and size class, for hardwood species in the Piedmont

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
				Average and standard deviation / Stem			

- - - - - - - - - - - - - - Percent -

SOFT HARDWOODS

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	19 ± 5.5	--	--	--	--	17 ± 5.1	30 ± 6.2
5.0-10.9	15 ± 3.4	--	--	12 ± 3.2	20 ± 5.0	13 ± 3.4	29 ± 5.4
>11.0	13 ± 4.1	10 ± 3.9	15 ± 5.5	11 ± 3.9	24 ± 8.4	11 ± 3.9	25 ± 6.5

RED MAPLE

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	20 ± 4.0	--	--	--	--	18 ± 3.0	28 ± 4.7
5.0-10.9	14 ± 1.4	--	--	11 ± 1.6	17 ± 2.4	12 ± 1.7	26 ± 2.9
>11.0	15 ± 1.4	11 ± 1.3	13 ± 1.0	11 ± 1.2	18 ± 1.8	11 ± 1.2	25 ± 2.6

SWEETGUM

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	19 ± 4.3	--	--	--	--	17 ± 4.0	31 ± 4.8
5.0-10.9	15 ± 2.3	--	--	12 ± 2.1	20 ± 4.0	13 ± 2.4	30 ± 3.5
>11.0	12 ± 1.9	9 ± 1.8	15 ± 3.6	10 ± 1.7	26 ± 8.3	10 ± 1.7	26 ± 3.8

SYCAMORE

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	6 ± 1.4	--	--	--	--	6 ± 1.0	30 ± 7.7
5.0-10.9	7 ± 1.3	--	--	5 ± 1.0	8 ± 1.4	6 ± 1.2	17 ± 4.7
>11.0	5 ± 0.7	4 ± 0.6	5 ± 1.0	4 ± 0.6	9 ± 1.9	4 ± 0.6	11 ± 2.7

YELLOW-POPLAR

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	28 ± 1.6	--	--	--	--	25 ± 2.4	51 ± 8.7
5.0-10.9	18 ± 2.6	--	--	16 ± 2.2	24 ± 3.2	17 ± 2.4	31 ± 4.7
>11.0	17 ± 1.8	14 ± 2.3	19 ± 3.4	15 ± 2.2	27 ± 3.3	15 ± 2.2	29 ± 3.4

HARD HARDWOODS

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	20 ± 4.9	--	--	--	--	19 ± 5.3	26 ± 6.7
5.0-10.9	18 ± 4.0	--	--	15 ± 4.2	22 ± 4.7	16 ± 4.1	29 ± 5.2
>11.0	16 ± 3.3	12 ± 3.6	16 ± 4.2	13 ± 3.6	26 ± 4.2	13 ± 3.6	25 ± 3.6

ELM

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	20 ± 5.1	--	--	--	--	18 ± 4.6	28 ± 7.5
5.0-10.9	13 ± 3.6	--	--	8 ± 2.9	19 ± 1.2	10 ± 3.4	23 ± 4.1

HICKORY

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	31 ± 1.9	--	--	--	--	30 ± 1.7	37 ± 2.8
5.0-10.9	27 ± 2.9	--	--	24 ± 2.4	32 ± 3.0	24 ± 2.5	37 ± 3.8
>11.0	21 ± 3.6	17 ± 4.2	20 ± 3.6	17 ± 4.0	27 ± 4.8	17 ± 4.0	30 ± 4.8

CHESTNUT OAK

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	27 ± 3.7	--	--	--	--	25 ± 3.4	38 ± 5.5
5.0-10.9	22 ± 3.0	--	--	19 ± 3.4	25 ± 3.6	20 ± 3.5	37 ± 4.7
>11.0	22 ± 2.4	18 ± 2.4	21 ± 2.8	19 ± 2.5	29 ± 3.4	19 ± 2.5	32 ± 6.1

Continued

Table 4.--Average proportion of wood and bark green weight in bark, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Stem Butt to 9-inch top	Stem 9-inch to 4-inch top	Stem Butt to 4-inch top	Stem 4-inch to tip	Stem Butt to tip	Branches
				Percent			
				SCARLET OAK			
5.0-10.9	17 ± 1.1	--	--	13 ± 1.7	19 ± 1.5	14 ± 1.9	28 ± 3.4
>11.0	16 ± 1.3	13 ± 1.3	14 ± 2.7	13 ± 1.3	22 ± 3.3	13 ± 1.3	22 ± 1.4
				SOUTHERN RED OAK			
1.0- 4.9	24 ± 7.6	--	--	--	--	23 ± 8.7	30 ± 3.0
5.0-10.9	20 ± 2.0	--	--	18 ± 2.5	22 ± 3.2	19 ± 2.1	29 ± 4.2
>11.0	18 ± 2.3	15 ± 2.4	19 ± 3.8	16 ± 2.7	27 ± 2.1	16 ± 2.7	25 ± 1.9
				WHITE OAK			
1.0- 4.9	22 ± 5.5	--	--	--	--	20 ± 5.6	37 ± 3.2
5.0-10.9	17 ± 1.5	--	--	13 ± 1.3	22 ± 3.0	14 ± 1.5	28 ± 2.0
>11.0	14 ± 1.5	10 ± 1.4	13 ± 2.3	10 ± 1.3	27 ± 3.8	10 ± 1.3	24 ± 2.2
				ALL SPECIES			
1.0- 4.9	19 ± 5.4	--	--	--	--	18 ± 5.3	29 ± 6.6
5.0-10.9	16 ± 4.0	--	--	13 ± 4.9	21 ± 3.9	14 ± 3.9	29 ± 5.3
>11.0	15 ± 4.0	11 ± 3.9	15± 5.0	12 ± 3.9	24 ± 6.9	12 ± 3.9	25 ± 5.4

Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont

| Tree size class (inches) | Total tree | Stem | | | | | Branches |
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	
				- - - - - - Pounds per cubic foot - - - - - - - - - - - - - -			

SOFT HARDWOODS

Wood

1.0- 4.9	60 ± 5.9	--	--	--	--	60 ± 6.0	59 ± 7.5
5.0-10.9	60 ± 4.7	--	--	60 ± 5.0	59 ± 5.9	60 ± 4.9	60 ± 4.5
>11.0	61 ± 3.9	61 ± 4.6	61 ± 4.8	61 ± 4.4	58 ± 4.0	61 ± 4.4	60 ± 3.2

Bark

1.0- 4.9	50 ± 9.0	--	--	--	--	49 ± 10.3	59 ± 10.9
5.0-10.9	52 ± 8.0	--	--	50 ± 10.1	57 ± 7.3	51 ± 9.3	59 ± 5.1
>11.0	55 ± 7.3	53 ± 9.5	55 ± 8.2	53 ± 9.1	60 ± 6.0	53 ± 9.0	59 ± 4.8

Wood and Bark

1.0- 4.9	58 ± 4.8	--	--	--	--	58 ± 5.0	59 ± 6.3
5.0-10.9	59 ± 4.0	--	--	58 ± 4.4	59 ± 4.9	58 ± 4.3	59 ± 3.9
>11.0	60 ± 3.8	60 ± 4.5	59 ± 4.4	60 ± 4.3	58 ± 3.4	60 ± 4.3	59 ± 2.9

RED MAPLE

Wood

1.0- 4.9	54 ± 5.5	--	--	--	--	54 ± 5.7	51 ± 4.6
5.0-10.9	55 ± 2.7	--	--	55 ± 3.1	54 ± 3.9	55 ± 3.0	55 ± 4.3
>11.0	55 ± 3.6	55 ± 4.2	52 ± 3.2	54 ± 3.9	55 ± 4.1	54 ± 3.8	57 ± 3.3

Bark

1.0- 4.9	57 ± 4.9	--	--	--	--	59 ± 3.8	54 ± 9.3
5.0-10.9	60 ± 3.4	--	--	61 ± 5.3	61 ± 3.0	61 ± 4.7	57 ± 4.2
>11.0	64 ± 4.2	66 ± 4.7	67 ± 2.8	66 ± 3.8	67 ± 2.2	66 ± 3.7	60 ± 5.1

Wood and Bark

1.0- 4.9	54 ± 4.8	--	--	--	--	55 ± 4.9	52 ± 4.6
5.0-10.9	55 ± 2.4	--	--	55 ± 3.1	55 ± 3.3	55 ± 2.9	55 ± 3.3
>11.0	56 ± 3.4	56 ± 4.0	53 ± 3.1	56 ± 3.6	56 ± 3.8	56 ± 3.6	58 ± 3.3

SWEETGUM

Wood

1.0- 4.9	62 ± 4.6	--	--	--	--	62 ± 4.7	61 ± 6.0
5.0-10.9	62 ± 3.4	--	--	63 ± 3.8	62 ± 4.8	63 ± 3.6	62 ± 3.4
>11.0	63 ± 2.3	63 ± 2.9	63 ± 2.9	63 ± 2.7	59 ± 3.8	63 ± 2.6	61 ± 2.7

Bark

1.0- 4.9	45 ± 7.0	--	--	--	--	44 ± 7.8	59 ± 6.5
5.0-10.9	48 ± 6.0	--	--	44 ± 7.1	55 ± 6.1	46 ± 6.6	60 ± 3.4
>11.0	52 ± 4.6	49 ± 6.4	51 ± 5.6	50 ± 5.9	58 ± 5.0	50 ± 5.8	59 ± 3.4

Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Stem					Branches
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	

- - - - - - - - - - - - - - - - Pounds per cubic foot -

Wood and Bark

1.0- 4.9	58 ± 3.2	--	--	--	--	57 ± 3.5	61 ± 5.4
5.0-10.9	60 ± 3.4	--	--	59 ± 3.8	60 ± 4.1	60 ± 3.6	61 ± 2.9
>11.0	61 ± 2.3	62 ± 3.0	61 ± 2.7	62 ± 2.8	59 ± 3.3	62 ± 2.7	61 ± 2.5

SYCAMORE

Wood

1.0- 4.9	66 ± 5.7	--	--	--	--	67 ± 5.9	56 ± 7.1
5.0-10.9	64 ± 2.3	--	--	64 ± 2.3	65 ± 4.9	64 ± 2.6	63 ± 2.2
>11.0	64 ± 4.2	66 ± 5.0	63 ± 3.9	65 ± 4.6	60 ± 2.8	65 ± 4.6	58 ± 3.2

Bark

1.0- 4.9	63 ± 4.4	--	--	--	--	62 ± 5.3	75 ± 17.5
5.0-10.9	68 ± 2.9	--	--	69 ± 3.4	71 ± 3.3	69 ± 3.1	67 ± 5.0
>11.0	67 ± 2.6	69 ± 2.4	69 ± 2.9	69 ± 2.5	68 ± 5.7	69 ± 2.5	66 ± 5.1

Wood and Bark

1.0- 4.9	66 ± 5.4	--	--	--	--	66 ± 5.7	60 ± 3.3
5.0-10.9	64 ± 2.2	--	--	65 ± 2.2	65 ± 4.7	65 ± 2.6	63 ± 2.4
>11.0	64 ± 4.1	66 ± 4.8	64 ± 3.8	65 ± 4.4	61 ± 2.7	65 ± 4.4	58 ± 3.1

YELLOW-POPLAR

Wood

1.0- 4.9	54 ± 5.3	--	--	--	--	54 ± 5.7	53 ± 2.2
5.0-10.9	56 ± 4.2	--	--	56 ± 4.7	53 ± 4.5	56 ± 4.5	56 ± 3.7
>11.0	58 ± 2.4	58 ± 2.8	59 ± 4.0	58 ± 2.8	58 ± 3.8	58 ± 2.8	59 ± 1.5

Bark

1.0- 4.9	56 ± 2.0	--	--	--	--	55 ± 2.8	57 ± 2.4
5.0-10.9	55 ± 6.0	--	--	55 ± 7.4	59 ± 5.7	55 ± 7.0	58 ± 4.6
>11.0	52 ± 5.4	50 ± 7.0	53 ± 5.6	50 ± 6.7	58 ± 4.8	50 ± 6.6	56 ± 3.4

Wood and Bark

1.0- 4.9	54 ± 3.9	--	--	--	--	54 ± 4.4	55 ± 1.9
5.0-10.9	55 ± 3.8	--	--	56 ± 4.4	54 ± 3.9	55 ± 4.2	56 ± 3.3
>11.0	57 ± 2.3	57 ± 2.5	57 ± 3.8	57 ± 2.6	58 ± 3.2	57 ± 2.6	58 ± 1.5

HARD HARDWOODS

Wood

1.0- 4.9	64 ± 4.7	--	--	--	--	64 ± 4.9	65 ± 6.2
5.0-10.9	64 ± 4.6	--	--	64 ± 5.5	63 ± 5.1	64 ± 5.1	64 ± 3.7
>11.0	66 ± 3.8	66 ± 4.6	67 ± 4.8	66 ± 4.4	66 ± 6.3	66 ± 4.4	66 ± 2.4

Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
				Average and standard deviation — Stem			

- - - - - - - - - - - - - - - Pounds per cubic foot -

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	51 ± 10.6	--	--	--	--	52 ± 10.6	52 ± 12.9
5.0-10.9	57 ± 5.3	--	--	57 ± 6.7	59 ± 6.1	58 ± 6.6	59 ± 4.9
>11.0	60 ± 3.7	61 ± 5.6	61 ± 5.2	61 ± 5.4	60 ± 3.9	61 ± 5.3	60 ± 4.2

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	61 ± 5.2	--	--	--	--	61 ± 4.8	61 ± 8.1
5.0-10.9	63 ± 4.1	--	--	63 ± 5.1	62 ± 4.2	63 ± 4.7	62 ± 3.0
>11.0	65 ± 3.3	65 ± 4.1	66 ± 4.0	66 ± 4.0	64 ± 4.7	66 ± 3.9	64 ± 2.6

ELM

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	63 ± 4.2	--	--	--	--	63 ± 4.3	60 ± 4.7
5.0-10.9	61 ± 1.8	--	--	62 ± 2.8	58 ± 3.3	61 ± 1.9	61 ± 3.0

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	46 ± 6.1	--	--	--	--	43 ± 5.2	53 ± 9.7
5.0-10.9	48 ± 4.9	--	--	49 ± 5.9	47 ± 4.7	48 ± 5.1	50 ± 7.2

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	58 ± 2.6	--	--	--	--	58 ± 3.5	59 ± 3.7
5.0-10.9	59 ± 1.7	--	--	61 ± 2.7	56 ± 3.1	60 ± 1.7	58 ± 3.6

HICKORY

Wood

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	57 ± 1.7	--	--	--	--	57 ± 2.3	52 ± 8.3
5.0-10.9	58 ± 2.2	--	--	58 ± 2.5	54 ± 3.4	58 ± 2.2	60 ± 2.9
>11.0	62 ± 4.2	62 ± 5.4	61 ± 2.3	62 ± 5.0	58 ± 3.8	62 ± 5.0	61 ± 2.2

Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	61 ± 0.8	--	--	--	--	62 ± 0.8	62 ± 4.4
5.0-10.9	57 ± 1.8	--	--	59 ± 2.5	59 ± 1.1	59 ± 2.1	55 ± 2.3
>11.0	59 ± 2.0	60 ± 2.0	61 ± 2.6	61 ± 2.0	60 ± 2.3	60 ± 1.9	56 ± 2.9

Wood and Bark

Tree size class (inches)	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
1.0- 4.9	59 ±. 1.3	--	--	--	--	59 ± 1.8	55 ± 4.6
5.0-10.9	58 ± 1.6	--	--	58 ± 2.2	55 ± 2.3	58 ± 1.9	58 ± 1.8
>11.0	61 ± 3.3	62 ± 4.6	61 ± 1.9	62 ± 4.2	59 ± 3.2	62 ± 4.2	60 ± 2.0

Continued

Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Stem					Branches
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	

- - - - - - - - - - - - - - - Pounds per cubic foot -

CHESTNUT OAK

Wood

1.0- 4.9	60 ± 3.4	--	--	--	--	60 ± 3.5	60 ± 5.0
5.0-10.9	61 ± 2.8	--	--	61 ± 3.1	60 ± 6.7	61 ± 3.0	61 ± 3.3
>11.0	59 ± 2.6	57 ± 3.3	62 ± 3.4	58 ± 3.4	57 ± 2.9	58 ± 3.3	62 ± 2.6

Bark

1.0- 4.9	56 ± 2.8	--	--	--	--	56 ± 3.1	64 ± 12.0
5.0-10.9	53 ± 2.2	--	--	53 ± 2.0	54 ± 2.9	53 ± 2.1	56 ± 3.4
>11.0	55 ± 0.5	56 ± 2.1	55 ± 3.1	55 ± 2.3	56 ± 0.1	55 ± 2.3	55 ± 2.5

Wood and Bark

1.0- 4.9	59 ± 2.7	--	--	--	--	59 ± 2.9	61 ± 3.5
5.0-10.9	59 ± 2.4	--	--	59 ± 2.7	58 ± 4.5	59 ± 2.6	59 ± 3.0
>11.0	58 ± 2.1	57 ± 3.1	60 ± 3.4	58 ± 3.1	57 ± 2.1	58 ± 3.0	59 ± 2.2

SCARLET OAK

Wood

5.0-10.9	68 ± 3.0	--	--	69 ± 3.8	63 ± 2.6	68 ± 3.7	65 ± 0.8
>11.0	66 ± 2.8	66 ± 4.0	69 ± 3.5	67 ± 3.7	69 ± 4.8	67 ± 3.6	66 ± 0.8

Bark

5.0-10.9	62 ± 2.2	--	--	65 ± 2.6	62 ± 3.1	64 ± 2.9	58 ± 0.5
>11.0	63 ± 1.4	66 ± 3.0	66 ± 2.9	66 ± 2.6	63 ± 2.5	65 ± 2.5	60 ± 1.5

Wood and Bark

5.0-10.9	67 ± 2.5	--	--	69 ± 3.5	63 ± 2.4	68 ± 3.4	63 ± 0.6
>11.0	66 ± 2.3	66 ± 3.6	68 ± 3.0	66 ± 3.3	67 ± 3.8	66 ± 3.3	64 ± 0.6

SOUTHERN RED OAK

Wood

1.0- 4.9	61 ± 5.6	--	--	--	--	60 ± 6.3	65 ± 0.3
5.0-10.9	67 ± 2.5	--	--	67 ± 3.5	68 ± 4.1	67 ± 3.0	66 ± 2.1
>11.0	65 ± 4.3	65 ± 5.2	67 ± 5.6	65 ± 5.1	67 ± 8.7	65 ± 5.1	65 ± 1.6

Bark

1.0- 4.9	63 ± 0.2	--	--	--	--	65 ± 1.5	57 ± 3.9
5.0-10.9	62 ± 2.7	--	--	62 ± 4.1	64 ± 4.0	62 ± 4.0	61 ± 2.1
>11.0	63 ± 2.6	64 ± 5.3	63 ± 2.4	64 ± 4.4	63 ± 2.5	64 ± 4.3	63 ± 1.2

Continued

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Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Total tree	Stem Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
			Pounds per cubic foot				
Wood and Bark							
1.0- 4.9	61 ± 4.2	--	--	--	--	61 ± 4.9	62 ± 0.4
5.0-10.9	66 ± 2.1	--	--	66 ± 3.0	67 ± 2.5	66 ± 2.5	64 ± 1.1
>11.0	65 ± 3.7	65 ± 4.8	66 ± 4.5	65 ± 4.6	66 ± 6.0	65 ± 4.6	64 ± 1.1
WHITE OAK							
Wood							
1.0- 4.9	62 ± 5.1	--	--	--	--	62 ± 5.1	64 ± 3.0
5.0-10.9	66 ± 2.9	--	--	67 ± 3.4	65 ± 3.7	67 ± 3.3	64 ± 2.6
>11.0	68 ± 2.1	68 ± 2.8	69 ± 3.6	69 ± 2.7	67 ± 3.8	69 ± 2.7	67 ± 1.2
Bark							
1.0- 4.9	55 ± 3.7	--	--	--	--	55 ± 3.8	59 ± 8.6
5.0-10.9	55 ± 5.7	--	--	53 ± 6.5	55 ± 5.6	53 ± 6.3	60 ± 5.3
>11.0	59 ± 3.9	58 ± 5.4	58 ± 5.6	58 ± 5.3	59 ± 4.3	58 ± 5.3	61 ± 5.5
Wood and Bark							
1.0- 4.9	61 ± 4.6	--	--	--	--	61 ± 4.8	62 ± 3.6
5.0-10.9	64 ± 3.0	--	--	65 ± 3.7	62 ± 3.2	64 ± 3.6	63 ± 1.1
>11.0	67 ± 2.0	67 ± 2.6	68 ± 2.7	67 ± 2.5	64 ± 2.5	67 ± 2.5	66 ± 2.3
ALL SPECIES							
Wood							
1.0- 4.9	62 ± 5.8	--	--	--	--	62 ± 5.8	61 ± 7.6
5.0-10.9	62 ± 5.1	--	--	62 ± 5.6	61 ± 5.9	62 ± 5.4	61 ± 4.6
>11.0	63 ± 4.7	63 ± 5.1	63 ± 5.8	63 ± 5.1	62 ± 6.4	63 ± 5.1	62 ± 4.2
Bark							
1.0- 4.9	50 ± 9.5	--	--	--	--	50 ± 10.4	57 ± 11.9
5.0-10.9	54 ± 7.5	--	--	53 ± 9.7	57 ± 6.9	54 ± 9.0	59 ± 5.0
>11.0	57 ± 6.6	56 ± 8.9	58 ± 7.6	56 ± 8.5	60 ± 5.2	57 ± 8.4	59 ± 4.6
Wood and Bark							
1.0- 4.9	59 ± 5.1	--	--	--	--	59 ± 5.1	60 ± 6.9
5.0-10.9	60 ± 4.6	--	--	60 ± 5.3	60 ± 4.9	60 ± 5.0	60 ± 3.8
>11.0	62 ± 4.5	62 ± 5.1	62 ± 5.4	62 ± 5.0	61 ± 5.0	62 ± 5.0	61 ± 3.8

Table 6.--Average green weight of wood and bark per cubic foot of wood, by tree component and size class, for hardwood species in the Piedmont

Tree size class (inches)	Average and standard deviation						
		Stem					
	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
— — — — — — — — — — — — — Pounds per cubic foot —							
SOFT HARDWOODS							
1.0- 4.9	74 ± 5.4	--	--	--	--	73 ± 5.5	85 ± 10.4
5.0-10.9	71 ± 5.1	--	--	69 ± 5.1	74 ± 6.9	69 ± 5.2	84 ± 8.2
>11.0	70 ± 3.8	68 ± 4.0	71 ± 6.1	69 ± 4.0	77 ± 9.4	69 ± 4.0	80 ± 7.5
RED MAPLE							
1.0- 4.9	67 ± 4.1	--	--	--	--	66 ± 4.5	71 ± 6.3
5.0-10.9	64 ± 3.4	--	--	62 ± 3.8	66 ± 4.7	62 ± 3.8	73 ± 7.0
>11.0	64 ± 4.6	62 ± 5.3	60 ± 4.4	61 ± 4.9	66 ± 5.6	62 ± 4.9	76 ± 5.0
SWEETGUM							
1.0- 4.9	76 ± 3.8	--	--	--	--	75 ± 4.0	90 ± 8.5
5.0-10.9	73 ± 4.0	--	--	71 ± 4.1	77 ± 6.0	72 ± 4.1	89 ± 5.4
>11.0	72 ± 2.7	70 ± 3.1	74 ± 4.4	70 ± 2.9	80 ± 9.4	70 ± 2.9	83 ± 4.7
SYCAMORE							
1.0- 4.9	71 ± 6.3	--	--	--	--	71 ± 6.2	80 ± 5.1
5.0-10.9	69 ± 1.9	--	--	68 ± 2.0	70 ± 4.7	68 ± 2.2	75 ± 3.9
>11.0	67 ± 4.4	68 ± 5.0	66 ± 4.4	68 ± 4.6	66 ± 2.7	68 ± 4.6	65 ± 4.8
YELLOW-POPLAR							
1.0- 4.9	75 ± 7.2	--	--	--	--	72 ± 5.5	91 ± 9.0
5.0-10.9	68 ± 4.6	--	--	66 ± 4.9	71 ± 6.2	67 ± 4.7	82 ± 8.3
>11.0	70 ± 2.9	68 ± 3.1	73 ± 4.9	69 ± 3.1	80 ± 6.1	69 ± 3.1	83 ± 4.1
HARD HARDWOODS							
1.0- 4.9	81 ± 4.7	--	--	--	--	79 ± 5.1	88 ± 6.9
5.0-10.9	79 ± 6.1	--	--	76 ± 6.7	81 ± 6.4	77 ± 6.3	90 ± 7.7
>11.0	79 ± 3.5	75 ± 4.0	80 ± 5.0	76 ± 4.0	89 ± 8.3	76 ± 4.0	87 ± 3.2
ELM							
1.0- 4.9	79 ± 4.7	--	--	--	--	77 ± 5.3	85 ± 9.5
5.0-10.9	70 ± 4.4	--	--	68 ± 4.2	73 ± 3.9	68 ± 4.1	79 ± 6.8
HICKORY							
1.0- 4.9	83 ± 0.6	--	--	--	--	83 ± 1.4	83 ± 9.9
5.0-10.9	81 ± 4.9	--	--	76 ± 2.7	79 ± 2.9	77 ± 2.7	96 ± 6.9
>11.0	78 ± 3.7	75 ± 4.2	76 ± 1.8	75 ± 3.7	80 ± 2.3	75 ± 3.6	88 ± 4.6
CHESTNUT OAK							
1.0- 4.9	82 ± 1.9	--	--	--	--	80 ± 2.0	98 ± 4.4
5.0-10.9	78 ± 2.8	--	--	76 ± 3.2	80 ± 8.6	76 ± 3.1	97 ± 7.6
>11.0	76 ± 1.0	70 ± 2.1	79 ± 1.5	72 ± 2.1	80 ± 5.8	72 ± 2.1	90 ± 4.7

Continued

Table 6.--Average green weight of wood and bark per cubic foot of wood, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class (inches)	Average and standard deviation						
		Stem					
	Total tree	Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches
			- - - - - - - - - - - - - Pounds per cubic foot -					
SCARLET OAK							
5.0-10.9	81 ± 3.1	--	--	80 ± 3.4	78 ± 3.1	79 ± 3.3	90 ± 4.3
>11.0	79 ± 3.2	76 ± 4.1	80 ± 3.1	76 ± 3.8	88 ± 4.5	77 ± 3.7	85 ± 1.7
SOUTHERN RED OAK							
1.0- 4.9	80 ± 0.6	--	--	--	--	78 ± 0.6	93 ± 3.6
5.0-10.9	84 ± 2.9	--.	--	82 ± 3.7	88 ± 8.1	83 ± 3.7	93 ± 7.7
>11.0	80 ± 4.5	76 ± 5.2	83 ± 6.5	78 ± 5.3	92 ± 12.3	78 ± 5.4	87 ± 2.3
WHITE OAK							
1.0- 4.9	79 ± 1.8	--	--	--	--	78 ± 1.4	102 ± 4.3
5.0-10.9	80 ± 3.8	--	--	77 ± 3.8	83 ± 5.3	78 ± 3.8	89 ± 4.3
>11.0	79 ± 2.4	76 ± 2.8	80 ± 4.0	76 ± 2.7	91 ± 4.9	76 ± 2.7	89 ± 2.3
ALL SPECIES							
1.0- 4.9	76 ± 6.0	--	--	--	--	75 ± 6.1	86 ± 9.5
5.0-10.9	74 ± 6.7	--	--	72 ± 6.8	77 ± 7.5	72 ± 6.7	87 ± 8.5
>11.0	74 ± 5.6	71 ± 5.3	75 ± 7.0	72 ± 5.4	82 ± 10.6	72 ± 5.4	83 ± 7.0

Table 7.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R^2)	Standard error[3] $(S_{y.x})$	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]				
		a'	b	a"	b			
TOTAL-TREE WOOD, BARK, AND FOLIAGE								
Soft Hardwoods	Green	3.73782	1.24651	3.72881	1.24702	0.99	0.0743	435
	Dry	1.84450	1.24271	1.79335	1.24857	0.99	0.0859	435
Red maple	Green	5.36391	1.15934	6.98338	1.10433	0.99	0.0617	32
	Dry	2.79850	1.17348	2.67230	1.18311	0.99	0.0616	32
Sweetgum	Green	3.52244	1.25422	2.73784	1.30676	0.99	0.0660	236
	Dry	1.59389	1.26123	1.11956	1.33488	0.99	0.0691	236
Sycamore	Green	3.45877	1.29420	5.69330	1.19029	0.98	0.0914	29
	Dry	1.57573	1.29005	2.51502	1.19256	0.98	0.0903	29
Yellow-poplar	Green	5.34413	1.16528	3.86208	1.23301	0.99	0.0563	78
	Dry	2.26626	1.19993	2.07889	1.21792	0.99	0.0569	78
Hard Hardwoods	Green	4.37384	1.24797	3.77719	1.27855	0.99	0.0831	338
	Dry	2.33125	1.27239	2.65719	1.24510	0.99	0.0832	338
Elm species	Green	3.55150	1.29029	--	--	0.99	0.1089	16
	Dry	2.17565	1.24810	--	--	0.98	0.1497	16
Hickory species	Green	3.91388	1.25991	2.07847	1.39188	0.99	0.0875	22
	Dry	2.28678	1.26943	1.45618	1.36354	0.99	0.0817	22
Chestnut oak	Green	3.58393	1.26451	--	--	0.98	0.1001	37
	Dry	2.07216	1.27407	--	--	0.99	0.0952	37
Scarlet oak	Green	7.67883	1.12892	5.18502	1.21080	0.98	0.0584	32
	Dry	4.62402	1.11826	3.25755	1.19130	0.97	0.0619	32
South. red oak	Green	4.16110	1.24480	3.59805	1.27512	0.99	0.0619	48
	Dry	2.30252	1.25795	2.23731	1.26394	0.99	0.0658	48

Table 7.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

TOTAL-TREE WOOD AND BARK

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R^2)	Standard error[3] ($S_{y \cdot x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]				
		a'	b	a"	b			
White oak	Green	3.77906	1.28582	4.12381	1.26762	0.99	0.0628	110
	Dry	2.17051	1.29463	2.75327	1.24504	0.99	0.0639	110
All Species	Green	4.02178	1.24683	3.77086	1.26026	0.99	0.0858	773
	Dry	2.07266	1.25582	2.17269	1.24599	0.98	0.1127	773
Soft Hardwoods	Green	3.45441	1.25662	3.56126	1.25027	0.99	0.0735	435
	Dry	1.76000	1.24794	1.70240	1.25488	0.99	0.0858	435
Red maple	Green	4.67742	1.18264	8.54253	1.05705	0.99	0.0644	32
	Dry	2.57712	1.18599	3.05746	1.15035	0.99	0.0644	32
Sweetgum	Green	3.27747	1.26281	2.52632	1.31709	0.99	0.0656	236
	Dry	1.53102	1.26483	1.02343	1.34881	0.99	0.0700	236
Sycamore	Green	3.45375	1.28604	5.53455	1.18772	0.98	0.0896	29
	Dry	1.59196	1.28224	2.49193	1.18881	0.98	0.0892	29
Yellow-poplar	Green	4.85459	1.17925	3.70384	1.23567	0.99	0.0565	78
	Dry	2.15905	1.20611	1.99365	1.22273	0.99	0.0577	78
Hard Hardwoods	Green	3.94158	1.26290	3.78872	1.27115	0.99	0.0816	338
	Dry	2.19726	1.27902	2.63110	1.24145	0.99	0.0824	338
Elm species	Green	3.24468	1.30218	--	--	0.99	0.1080	16
	Dry	2.04282	1.25462	--	--	0.98	0.1487	16
Hickory species	Green	3.54512	1.27159	1.96464	1.39467	0.99	0.0849	22
	Dry	2.12752	1.27670	1.40563	1.36312	0.99	0.0809	22
Chestnut oak	Green	3.36285	1.26827	--	--	0.99	0.0953	37
	Dry	1.97742	1.27701	--	--	0.99	0.0919	37

Continued

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Table 7.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]				
		a'	b	a"	b			
Scarlet oak	Green	6.97167	1.14034	5.08292	1.20623	0.98	0.0513	32
	Dry	4.29269	1.12622	3.29755	1.18121	0.98	0.0557	32
South. red oak	Green	3.79154	1.25816	3.65002	1.26610	0.99	0.0650	48
	Dry	2.16190	1.26622	2.24331	1.25852	0.99	0.0674	48
White oak	Green	3.59943	1.28743	3.83734	1.27409	0.99	0.0624	110
	Dry	2.10740	1.29427	2.61564	1.24922	0.99	0.0636	110
All Species	Green	3.67241	1.25923	3.68006	1.25879	0.99	0.0840	773
	Dry	1.96533	1.26171	2.09786	1.24810	0.98	0.1113	773
TOTAL-TREE WOOD								
Soft Hardwoods	Green	2.69151	1.27896	3.09999	1.24950	0.99	0.0783	435
	Dry	1.40258	1.26551	1.50675	1.25057	0.99	0.0898	435
Red maple	Green	3.59496	1.21112	10.15858	0.99452	0.99	0.0685	32
	Dry	2.00850	1.21442	3.30769	1.11040	0.99	0.0683	32
Sweetgum	Green	2.53317	1.28762	2.11801	1.32495	0.99	0.0690	236
	Dry	1.21586	1.28167	0.86858	1.35180	0.99	0.0737	236
Sycamore	Green	3.18226	1.29035	4.93410	1.19890	0.98	0.0917	29
	Dry	1.46669	1.28586	2.28758	1.19318	0.98	0.0914	29
Yellow-poplar	Green	3.21823	1.22820	3.20054	1.22935	0.99	0.0567	78
	Dry	1.49256	1.25062	1.83348	1.20772	0.99	0.0597	78
Hard Hardwoods	Green	3.07161	1.27581	2.83843	1.29227	0.99	0.0903	338
	Dry	1.79309	1.28120	2.00363	1.25805	0.99	0.0904	338
Elm Species	Green	2.47940	1.33256	--	--	0.99	0.1060	16
	Dry	1.61626	1.27640	--	--	0.98	0.1500	16

Continued

Table 7.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]				
		a'	b	a"	b			
Hickory species	Green	2.39541	1.29158	0.95325	1.48372	0.99	0.0801	22
	Dry	1.47448	1.30237	0.80484	1.42846	0.99	0.0812	22
Chestnut oak	Green	2.38060	1.29596	-	-	0.98	0.1038	37
	Dry	1.47803	1.29164	-	-	0.98	0.1052	37
Scarlet oak	Green	5.64242	1.14657	3.91334	1.22288	0.98	0.0514	32
	Dry	3.58160	1.12404	2.65478	1.18648	0.98	0.0569	32
South. red oak	Green	2.69921	1.28577	2.75307	1.28165	0.99	0.0686	48
	Dry	1.60609	1.28082	1.75184	1.26271	0.98	0.0701	48
White oak	Green	2.61921	1.32022	3.09258	1.28557	0.99	0.0646	110
	Dry	1.62310	1.31548	2.16091	1.25531	0.99	0.0655	110
All Species	Green	2.86050	1.27724	2.99656	1.26756	0.99	0.0877	773
	Dry	1.58099	1.27211	1.72982	1.25335	0.98	0.1114	773

[1]Trees < 11.0 inches d.b.h.

$Y = a'(D^2)^b$

[2]Trees > 11.0 inches d.b.h.

$Y = a''(D^2)^b$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
a', a", b = regression coefficients

[3]$\log_{10}$ form

Table 8.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R^2)	Standard error[3] ($S_{y \cdot x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]				
		a'	b	a"	b			
TOTAL-STEM WOOD AND BARK								
Soft Hardwoods	Green	2.88400	1.26739	4.62115	1.16908	0.99	0.0760	435
	Dry	1.46664	1.25919	2.23750	1.17111	0.99	0.0848	435
Red maple	Green	3.43213	1.21974	36.05579	0.72933	0.99	0.0830	32
	Dry	1.89307	1.22502	11.29115	0.85265	0.99	0.0856	32
Sweetgum	Green	2.84702	1.26986	3.92363	1.20252	0.99	0.0666	236
	Dry	1.31287	1.27472	1.68638	1.22252	0.99	0.0720	236
Sycamore	Green	3.85492	1.21745	3.47106	1.23933	0.98	0.0889	29
	Dry	1.80787	1.20679	1.52656	1.24206	0.98	0.0887	29
Yellow-poplar	Green	4.16189	1.18760	4.74211	1.16039	0.98	0.0602	78
	Dry	1.83937	1.21873	2.61846	1.14509	0.98	0.0594	78
Hard Hardwoods	Green	3.26545	1.25704	7.84482	1.07428	0.99	0.0787	338
	Dry	1.84449	1.27009	6.03182	1.02303	0.99	0.0816	338
Elm species	Green	2.50952	1.28580	--	--	0.99	0.1114	16
	Dry	1.63763	1.21880	--	--	0.98	0.1575	16
Hickory species	Green	3.21191	1.22618	2.06379	1.31841	0.99	0.0683	22
	Dry	1.97528	1.23186	1.72985	1.25953	0.99	0.0708	22
Chestnut oak	Green	2.91108	1.25815	--	--	0.99	0.0918	37
	Dry	1.74635	1.26402	--	--	0.99	0.0904	37
Scarlet oak	Green	7.30927	1.06838	7.07711	1.07511	0.99	0.0430	32
	Dry	4.55975	1.04716	4.96382	1.02946	0.99	0.0402	32
South. red oak	Green	3.42543	1.24413	8.29811	1.05964	0.98	0.0769	48
	Dry	1.96985	1.24888	5.74409	1.02572	0.98	0.0789	48
White oak	Green	3.94053	1.20929	4.92392	1.16284	0.99	0.0629	110
	Dry	2.33238	1.21371	3.62486	1.12177	0.99	0.0652	110

Table 8.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R²)	Standard error[3] (S_y.x)	No. of trees sampled
		Trees <11.0 in d.b.h.[1]		Trees >11.0 in d.b.h.[2]				
		a'	b	a''	b			
All Species	Green	3.05596	1.26193	5.72003	1.13122	0.99	0.0789	773
	Dry	1.63740	1.26316	3.40599	1.11043	0.98	0.0992	773
					TOTAL-STEM WOOD			
Soft Hardwoods	Green	2.29553	1.28964	3.93834	1.17708	0.99	0.0803	435
	Dry	1.19593	1.27529	1.93202	1.17527	0.99	0.0882	435
Red maple	Green	2.71814	1.24661	37.16936	0.70123	0.99	0.0847	32
	Dry	1.54154	1.24764	11.01055	0.83768	0.99	0.0859	32
Sweetgum	Green	2.23375	1.29553	3.17921	1.22194	0.99	0.0699	236
	Dry	1.06049	1.29157	1.38257	1.23627	0.99	0.0749	236
Sycamore	Green	3.57651	1.22324	3.15518	1.24938	0.98	0.0900	29
	Dry	1.67801	1.21177	1.42020	1.24655	0.98	0.0897	29
Yellow-poplar	Green	2.92832	1.22727	3.88793	1.16817	0.98	0.0598	78
	Dry	1.34294	1.25372	2.28931	1.14250	0.98	0.0602	78
Hard Hardwoods	Green	2.55430	1.27648	5.93585	1.10065	0.99	0.0867	338
	Dry	1.50661	1.27832	4.62594	1.04441	0.99	0.0884	338
Elm species	Green	1.99983	1.31513	--	--	0.99	0.1116	16
	Dry	1.35944	1.23738	--	--	0.98	0.1588	16
Hickory species	Green	2.16113	1.25706	0.99368	1.41907	0.99	0.0698	22
	Dry	1.34563	1.26652	0.95566	1.33788	0.99	0.0740	22
Chestnut oak	Green	2.10341	1.28826	--	--	0.98	0.1018	37
	Dry	1.31709	1.28164	--	--	0.98	0.1036	37
Scarlet oak	Green	5.86508	1.08429	5.87333	1.08399	0.99	0.0440	32
	Dry	3.77556	1.05401	4.34532	1.05401	0.99	0.0407	32
South. red oak	Green	2.47712	1.27276	6.05373	1.08643	0.98	0.0785	48
	Dry	1.48494	1.26384	4.35351	1.03956	0.98	0.0797	48

Continued

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Table 3.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

Species or species group	Weight green or dry	Regression equation coefficients Trees < 11.0 in d.b.h.[1] a'	b	Trees > 11.0 in d.b.h.[2] a"	b	Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
White oak	Green	2.83704	1.25375	4.14649	1.17462	0.99	0.0671	110
	Dry	1.77828	1.24515	3.07673	1.13084	0.99	0.0687	110
All Species	Green	2.41288	1.28299	4.63505	1.14686	0.99	0.0839	773
	Dry	1.33502	1.27564	2.78765	1.12212	0.98	0.1005	773

[1]Trees < 11.0 inches d.b.h.

$Y = a'(D^2)^b$

[2]Trees > 11.0 inches d.b.h.

$Y = a''(D^2)^b$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
a', a", b = regression coefficients

[3]$\log_{10}$ form

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Table 9.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont using d.b.h. as the independent variable

Species or species group	Volume wood & bark or wood only	Regression equation coefficients Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]		Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		a'	b	a"	b			
TOTAL TREE								
Soft Hardwoods	Wd&Bk	0.06133	1.24731	0.06577	1.23275	0.99	0.0761	435
	Wood	0.04528	1.27576	0.05456	1.23689	0.99	0.0796	435
Red maple	Wd&Bk	0.08902	1.16798	0.15339	1.04783	0.99	0.0545	32
	Wood	0.06925	1.19637	0.18274	0.99405	0.99	0.0542	32
Sweetgum	Wd&Bk	0.05777	1.25093	0.05074	1.27799	0.99	0.0644	236
	Wood	0.04174	1.28099	0.03627	1.31030	0.99	0.0678	236
Sycamore	Wd&Bk	0.04866	1.31311	0.11283	1.13773	0.98	0.0868	29
	Wood	0.04437	1.32068	0.10270	1.14566	0.98	0.0887	29
Yellow-poplar	Wd&Bk	0.09562	1.15688	0.06793	1.22818	0.98	0.0590	78
	Wood	0.06617	1.19490	0.06550	1.19703	0.99	0.0551	78
Hard Hardwoods	Wd&Bk	0.06449	1.25435	0.07088	1.23465	0.99	0.0784	338
	Wood	0.04778	1.27429	0.05220	1.25584	0.99	0.0830	338
Elm Species	Wd&Bk	0.05579	1.30112	--	--	0.99	0.1107	16
	Wood	0.03880	1.34482	--	--	0.99	0.1045	16
Hickory species	Wd&Bk	0.06089	1.27111	0.05047	1.31025	0.99	0.0802	22
	Wood	0.04188	1.28532	0.02537	1.38625	0.99	0.0695	22
Chestnut oak	Wd&Bk	0.05722	1.26048	--	--	0.99	0.0842	37
	Wood	0.04025	1.28301	--	--	0.99	0.0921	37
Scarlet oak	Wd&Bk	0.10028	1.15114	0.07664	1.20721	0.99	0.0475	32
	Wood	0.07922	1.16019	0.05809	1.22490	0.99	0.0461	32
South. red oak	Wd&Bk	0.06334	1.23586	0.04628	1.30129	0.99	0.0637	48
	Wood	0.04568	1.25697	0.03162	1.33367	0.99	0.0649	48

Continued

Table 9.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

Species or species group	Volume wood & bark or wood only	Regression equation coefficients				Coefficient of determination (R^2)	Standard error[3] ($S_{y \cdot x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees ≥ 11.0 in d.b.h.[2]				
		a'	b	a"	b			
White oak	Wd&Bk	0.06322	1.25707	0.06375	1.25535	0.99	0.0609	110
	Wood	0.04497	1.28857	0.04809	1.27460	0.99	0.0606	110
All Species	Wd&Bk	0.06272	1.25045	0.06812	1.23323	0.99	0.0787	773
	Wood	0.04639	1.27498	0.05360	1.24488	0.99	0.0817	773

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2)^b$$

[2]Trees ≥ 11.0 inches d.b.h.

$$Y = a''(D^2)^b$$

Where: Y = component volume in cubic feet
  D = tree d.b.h. in inches
  a', a", b = regression coefficients

[3]$\log_{10}$ form

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Table 10.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable

TOTAL STEM

Species or species group	Volume wood & bark or wood only	Regression equation coefficients Trees < 11.0 in d.b.h.[1] a'	b	Trees > 11.0 in d.b.h.[2] a"	b	Coefficient of determination (R²)	Standard error[3] (Sy.x)	No. of trees sampled
Soft Hardwoods	Wd&Bk	0.05122	1.25830	0.09012	1.14049	0.99	0.0758	435
	Wood	0.03847	1.28688	0.07226	1.15544	0.99	0.0780	435
Red maple	Wd&Bk	0.06336	1.21217	0.66306	0.72257	0.99	0.0684	32
	Wood	0.05114	1.23716	0.65278	0.70613	0.99	0.0673	32
Sweetgum	Wd&Bk	0.04986	1.26029	0.08756	1.14285	0.99	0.0662	236
	Wood	0.03652	1.29093	0.05882	1.19153	0.99	0.0682	236
Sycamore	Wd&Bk	0.05459	1.24104	0.07330	1.17957	0.98	0.0852	29
	Wood	0.05013	1.24991	0.06810	1.18604	0.98	0.0858	29
Yellow-poplar	Wd&Bk	0.08183	1.16608	0.08798	1.50960	0.98	0.0648	78
	Wood	0.06001	1.19469	0.07990	1.13499	0.98	0.0598	78
Hard Hardwoods	Wd&Bk	0.05376	1.24627	0.14796	1.03514	0.99	0.0778	338
	Wood	0.04021	1.27213	0.10886	1.06448	0.99	0.0823	338
Elm species	Wd&Bk	0.04369	1.27843	--	--	0.99	0.1099	16
	Wood	0.03127	1.32648	--	--	0.99	0.1081	16
Hickory species	Wd&Bk	0.05484	1.22724	0.06012	1.20805	0.99	0.0646	22
	Wood	0.03771	1.25407	0.03115	1.29395	0.99	0.0617	22
Chestnut oak	Wd&Bk	0.04993	1.24922	--	--	0.99	0.0813	37
	Wood	0.03565	1.27559	--	--	0.99	0.0894	37
Scarlet oak	Wd&Bk	0.10646	1.07358	0.10101	1.08455	0.98	0.0488	32
	Wood	0.08287	1.09534	0.08420	1.09203	0.98	0.0488	32
South. red oak	Wd&Bk	0.05764	1.21902	0.10204	1.09994	0.98	0.0741	48
	Wood	0.04290	1.23743	0.06547	1.14927	0.98	0.0720	48

Continued

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Table 10.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable

Species or species group	Volume wood & bark or wood only	Regression equation coefficients Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]		Coefficient of determination (R^2)	Standard error[3] ($S_{y \cdot x}$)	No. of trees sampled
		a'	b	a"	b			
White oak	Wd&Bk	0.07001	1.17560	0.08321	1.13957	0.99	0.0620	110
	Wood	0.04919	1.21908	0.06392	1.16447	0.99	0.0637	110
All Species	Wd&Bk	0.05245	1.25226	0.10979	1.09820	0.99	0.0771	773
	Wood	0.03933	1.27963	0.08489	1.11920	0.99	0.0804	773

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b$$

Where: Y = component volume in cubic feet
D = tree d.b.h. in inches
a', a", b = regression coefficients

[3]$\log_{10}$ form

Table 11.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R²)	Standard error[3] (S_y·x)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
TOTAL-TREE WOOD, BARK, AND FOLIAGE									
Soft Hardwoods	Green	0.26936	0.93662	0.11762	1.10939	0.93662	0.99	0.0624	435
	Dry	0.13490	0.93309	0.05689	1.11312	0.93309	0.99	0.0793	435
Red maple	Green	0.39183	0.89196	0.10150	1.17362	0.89196	0.99	0.0571	32
	Dry	0.19766	0.90302	0.03697	1.25258	0.90302	0.99	0.0553	32
Sweetgum	Green	0.25462	0.93830	0.07753	1.18624	0.93830	0.99	0.0572	236
	Dry	0.11357	0.94351	0.03107	1.21330	0.94351	0.99	0.0609	236
Sycamore	Green	0.13562	1.03417	0.35092	0.83594	1.03417	0.99	0.0623	29
	Dry	0.06195	1.03171	0.15708	0.83771	1.03171	0.99	0.0580	29
Yellow-poplar	Green	0.30167	0.92608	0.15034	1.07131	0.92608	0.99	0.0421	78
	Dry	0.12309	0.94820	0.07267	1.05809	0.94820	0.99	0.0509	78
Hard Hardwoods	Green	0.34177	0.93392	0.07063	1.26268	0.93392	0.99	0.0770	338
	Dry	0.17320	0.95225	0.04598	1.22878	0.95225	0.99	0.0765	338
Elm species	Green	0.28983	0.94931	-	-	-	0.99	0.0877	16
	Dry	0.19128	0.91936	-	-	-	0.99	0.1304	16
Hickory species	Green	0.32136	0.94256	0.07871	1.23589	0.94256	0.99	0.0784	22
	Dry	0.18315	0.95030	0.05406	1.20474	0.95030	0.99	0.0677	22
Chestnut oak	Green	0.20469	0.98361	-	-	-	0.99	0.0679	37
	Dry	0.11665	0.99033	-	-	-	0.99	0.0668	37
Scarlet oak	Green	0.34542	0.94737	0.10278	1.20014	0.94737	0.97	0.0696	32
	Dry	0.21669	0.93708	0.06694	1.18201	0.93708	0.96	0.0732	32
South. red oak	Green	0.30456	0.94228	0.10284	1.16866	0.94228	0.99	0.0457	48
	Dry	0.16220	0.95348	0.06195	1.15418	0.95348	0.99	0.0476	48

Table 11.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R²)	Standard error[3] (S$_{y \cdot x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
White oak	Green	0.24019	0.98258	0.10382	1.15748	0.98258	0.99	0.0526	110
	Dry	0.13493	0.98969	0.06771	1.13346	0.98969	0.99	0.0525	110
All Species	Green	0.30645	0.93307	0.09434	1.17874	0.93307	0.99	0.0864	773
	Dry	0.15769	0.93800	0.05216	1.16867	0.93800	0.98	0.1197	773

TOTAL-TREE WOOD AND BARK

Species or species group	Weight green or dry	a'	b	a"	b	c	R²	S$_{y \cdot x}$	No. of trees
Soft Hardwoods	Green	0.24306	0.94449	0.10946	1.11083	0.94449	0.99	0.0595	435
	Dry	0.12693	0.93728	0.05332	1.11815	0.93728	0.99	0.0779	435
Red maple	Green	0.32214	0.91052	0.11496	1.12538	0.91052	0.99	0.0541	32
	Dry	0.17603	0.91317	0.04068	1.21861	0.91317	0.99	0.0534	32
Sweetgum	Green	0.23205	0.94503	0.06999	1.19494	0.94503	0.99	0.0548	236
	Dry	0.10300	0.94648	0.02818	1.22662	0.94648	0.99	0.0603	236
Sycamore	Green	0.13774	1.02804	0.34788	0.83485	1.02804	0.99	0.0587	29
	Dry	0.06368	1.02573	0.15849	0.83560	1.02573	0.99	0.0558	29
Yellow-poplar	Green	0.26330	0.93782	0.13885	1.07125	0.93782	0.99	0.0409	78
	Dry	0.11509	0.95352	0.06855	1.06155	0.95352	0.99	0.0511	78
Hard Hardwoods	Green	0.29779	0.94543	0.06774	1.25419	0.94543	0.99	0.0731	338
	Dry	0.16065	0.95747	0.04467	1.22435	0.95747	0.99	0.0740	338
Elm species	Green	0.25810	0.95874	-	-	-	0.99	0.0833	16
	Dry	0.17690	0.92435	-	-	-	0.99	0.1272	16
Hickory species	Green	0.28410	0.95141	0.07224	1.23694	0.95141	0.99	0.0747	22
	Dry	0.16922	0.95583	0.05168	1.20316	0.95583	0.99	0.0659	22
Chestnut oak	Green	0.19171	0.98587	-	-	-	0.99	0.0667	37
	Dry	0.11122	0.99205	-	-	-	0.99	0.0673	37

Table 11.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y \cdot x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
Scarlet oak	Green	0.29820	0.95918	0.09697	1.19341	0.95918	0.97	0.0623	32
	Dry	0.19339	0.94580	0.06601	1.16994	0.94580	0.97	0.0668	32
South. red oak	Green	0.26488	0.95457	0.10144	1.15471	0.95457	0.99	0.0442	48
	Dry	0.14786	0.96117	0.06106	1.14557	0.96117	0.99	0.0462	48
White oak	Green	0.22734	0.98415	0.09632	1.16321	0.98415	0.99	0.0510	110
	Dry	0.13069	0.98979	0.06451	1.13699	0.98979	0.99	0.0509	110
All Species	Green	0.27176	0.94274	0.08903	1.17543	0.94274	0.99	0.0827	773
	Dry	0.14724	0.94275	0.04964	1.16948	0.94275	0.98	0.1171	773
TOTAL-TREE WOOD									
Soft Hardwoods	Green	0.17980	0.96177	0.08990	1.10631	0.96177	0.99	0.0618	435
	Dry	0.09703	0.95097	0.04511	1.11065	0.95097	0.99	0.0796	435
Red maple	Green	0.23096	0.93295	0.12402	1.06261	0.93295	0.99	0.0536	32
	Dry	0.12808	0.93549	0.03989	1.17871	0.93549	0.99	0.0534	32
Sweetgum	Green	0.16922	0.96425	0.05500	1.19861	0.96425	0.99	0.0541	236
	Dry	0.08213	0.95995	0.02297	1.22561	0.95995	0.99	0.0592	236
Sycamore	Green	0.12507	1.03190	0.30789	0.84406	1.03190	0.99	0.0603	29
	Dry	0.05797	1.02895	0.14459	0.83837	1.02895	0.99	0.0578	29
Yellow-poplar	Green	0.15548	0.97611	0.10454	1.05888	0.97611	0.99	0.0409	78
	Dry	0.07235	0.98718	0.05550	1.04247	0.98718	0.99	0.0551	78
Hard Hardwoods	Green	0.22486	0.95562	0.04892	1.27369	0.95562	0.99	0.0796	338
	Dry	0.12984	0.95964	0.03394	1.23943	0.95964	0.99	0.0798	338
Elm species	Green	0.18592	0.98109	--	--	--	0.99	0.0798	16
	Dry	0.13407	0.94042	--	--	--	0.99	0.1277	16

Continued

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Table 11.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R²)	Standard error[3] (S_y.x)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
Hickory species	Green	0.18370	0.96680	0.03339	1.32235	0.96680	0.99	0.0658	22
	Dry	0.11002	0.97549	0.02756	1.26413	0.97549	0.99	0.0624	22
Chestnut oak	Green	0.12608	1.00846	—	—	—	0.99	0.0678	37
	Dry	0.07904	1.00511	—	—	—	0.99	0.0702	37
Scarlet oak	Green	0.23667	0.96469	0.07307	1.20974	0.96469	0.98	0.0623	32
	Dry	0.16244	0.94389	0.05354	1.17531	0.94389	0.97	0.0679	32
South. red oak	Green	0.17607	0.97670	0.07110	0.16576	0.97670	0.99	0.0454	48
	Dry	0.10609	0.97270	0.04584	1.14767	0.97270	0.99	0.0484	48
White oak	Green	0.15297	1.01011	0.07099	1.17020	1.01011	0.99	0.0498	110
	Dry	0.09539	1.00695	0.05039	1.14000	1.00695	0.99	0.0494	110
All Species	Green	0.20242	0.95702	0.06917	1.18091	0.95702	0.99	0.0825	773
	Dry	0.11508	0.95131	0.03994	1.17198	0.95131	0.98	0.1144	773

[1]Trees < 11.0 inches d.b.h.

$Y = a'(D^2Th)^b$

[2]Trees > 11.0 inches d.b.h.

$Y = a''(D^2)^b (Th)^c$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
Th = tree total height in feet
a', a", b, c = regression coefficients

[3]log₁₀ form

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Table 12.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R²)	Standard error[3] (S_y.x)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
TOTAL-STEM WOOD AND BARK									
Soft Hardwoods	Green	0.19535	0.95420	0.13963	1.02422	0.95420	0.99	0.0509	435
	Dry	0.10185	0.94724	0.06873	1.02926	0.94724	0.99	0.0684	435
Red maple	Green	0.21176	0.94169	0.43801	0.79014	0.94169	0.99	0.0533	32
	Dry	0.11548	0.94569	0.13444	0.91400	0.94569	0.99	0.0576	32
Sweetgum	Green	0.19644	0.95126	0.10744	1.07709	0.95126	0.99	0.0493	236
	Dry	0.08995	0.95479	0.04550	1.09690	0.95479	0.99	0.0569	236
Sycamore	Green	0.17930	0.97530	0.25566	0.90132	0.97530	0.99	0.0546	29
	Dry	0.08576	0.96758	0.11551	0.90547	0.96758	0.99	0.0522	29
Yellow-poplar	Green	0.21276	0.94890	0.17525	0.98934	0.94890	0.99	0.0374	78
	Dry	0.09197	0.96733	0.08760	0.97748	0.96733	0.99	0.0469	78
Hard Hardwoods	Green	0.24539	0.94286	0.14508	1.05244	0.94286	0.99	0.0571	338
	Dry	0.13483	0.95272	0.10708	1.00078	0.95272	0.99	0.0601	338
Elm species	Green	0.20468	0.94722	--	--	--	0.99	0.0803	16
	Dry	0.15080	0.89866	--	--	--	0.98	0.1323	16
Hickory species	Green	0.28068	0.91782	0.08565	1.16531	0.91782	0.99	0.0530	22
	Dry	0.16939	0.92285	0.07118	1.10362	0.92285	0.99	0.0494	22
Chestnut oak	Green	0.16876	0.97862	--	--	--	0.99	0.0560	37
	Dry	0.10073	0.98236	--	--	--	0.99	0.0619	37
Scarlet oak	Green	0.31737	0.92003	0.17574	1.04328	0.92003	0.99	0.0313	32
	Dry	0.21155	0.90130	0.13262	0.99868	0.90130	0.99	0.0286	32
South. red oak	Green	0.22863	0.95279	0.25013	0.93404	0.95279	0.99	0.0411	48
	Dry	0.12912	0.95733	0.17157	0.89806	0.95733	0.99	0.0419	48

Continued

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Table 12.—Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] $(S_{y \cdot x})$	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
TOTAL-STEM WOOD									
White oak	Green	0.28438	0.92842	0.15775	1.05130	0.92842	0.99	0.0384	110
	Dry	0.16565	0.93256	0.11510	1.00847	0.93256	0.99	0.0388	110
All Species	Green	0.21945	0.94735	0.14017	1.04082	0.94735	0.99	0.0621	773
	Dry	0.11931	0.94646	0.08196	1.02475	0.94646	0.99	0.0948	773
Soft Hardwoods	Green	0.14783	0.97129	0.11218	1.02882	0.97129	0.99	0.0537	435
	Dry	0.08088	0.95972	0.05756	1.03064	0.95972	0.99	0.0701	435
Red maple	Green	0.15758	0.96251	0.40998	0.76313	0.96251	0.99	0.0535	32
	Dry	0.08935	0.96308	0.12067	0.90043	0.96308	0.99	0.0575	32
Sweetgum	Green	0.14562	0.97102	0.08131	1.09252	0.97102	0.99	0.0491	236
	Dry	0.06962	0.96819	0.03581	1.10684	0.96819	0.99	0.0551	236
Sycamore	Green	0.16388	0.97998	0.22955	0.90971	0.97998	0.99	0.0560	29
	Dry	0.07862	0.97153	0.10630	0.90864	0.97153	0.99	0.0537	29
Yellow-poplar	Green	0.13679	0.97952	0.12839	0.99272	0.97952	0.99	0.0371	78
	Dry	0.06279	0.99292	0.06915	0.97278	0.99292	0.99	0.0507	78
Hard Hardwoods	Green	0.18378	0.95779	0.10349	1.07753	0.95779	0.99	0.0647	338
	Dry	0.10787	0.95928	0.08026	1.02094	0.95928	0.99	0.0660	338
Elm species	Green	0.15438	0.96864	--	--	--	0.99	0.0819	16
	Dry	0.12080	0.91229	--	--	--	0.98	0.1338	16
Hickory species	Green	0.17701	0.94126	0.03816	1.26121	0.94126	0.99	0.0512	22
	Dry	0.10742	0.94905	0.03601	1.17696	0.94905	0.99	0.0504	22
Chestnut oak	Green	0.11276	1.00300	--	--	--	0.99	0.0601	37
	Dry	0.07167	0.99785	--	--	--	0.99	0.0635	37

Continued

Table 12.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees $\geq$ 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
Scarlet oak	Green	0.24677	0.93195	0.13788	1.05333	0.93195	0.99	0.0348	32
	Dry	0.17482	0.90509	0.11322	0.99567	0.90509	0.99	0.0323	32
South. red oak	Green	0.15553	0.97454	0.16818	0.95824	0.97454	0.99	0.0422	48
	Dry	0.09471	0.96816	0.12429	0.91149	0.96816	0.99	0.0439	48
White oak	Green	0.18544	0.96281	0.11717	1.05853	0.96281	0.99	0.0418	110
	Dry	0.11755	0.95707	0.08949	1.01394	0.95707	0.99	0.0414	110
All Species	Green	0.16495	0.96370	0.10722	1.05352	0.96370	0.99	0.0642	773
	Dry	0.09425	0.95642	0.06497	1.03400	0.95642	0.99	0.0934	773

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2Th)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (Th)^c$$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
Th = tree total height in feet
a', a'', b, c = regression coefficients

[3]$\log_{10}$ form

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Table 13.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables

Species or species group	Volume wood & bark or wood only	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
TOTAL TREE									
Soft Hardwoods	Wd&Bk	0.00441	0.93725	0.00207	1.09497	0.93725	0.99	0.0644	435
	Wood	0.00305	0.95911	0.00159	1.09472	0.95911	0.99	0.0651	435
Red maple	Wd&Bk	0.00640	0.89829	0.00222	1.11877	0.89829	0.99	0.0522	32
	Wood	0.00466	0.92037	0.00232	1.06582	0.92037	0.99	0.0492	32
Sweetgum	Wd&Bk	0.00421	0.93574	0.00145	1.15807	0.93574	0.99	0.0562	236
	Wood	0.00284	0.95883	0.00096	1.18585	0.95883	0.99	0.0558	236
Sycamore	Wd&Bk	0.00181	1.04965	0.00669	0.77750	1.04965	0.99	0.0528	29
	Wood	0.00162	1.05601	0.00600	0.78277	1.05601	0.99	0.0541	29
Yellow-poplar	Wd&Bk	0.00536	0.92262	0.00272	1.06368	0.92262	0.99	0.0404	78
	Wood	0.00342	0.95142	0.00236	1.02900	0.95142	0.99	0.0360	78
Hard Hardwoods	Wd&Bk	0.00495	0.93914	0.00130	1.21748	0.93914	0.99	0.0690	338
	Wood	0.00350	0.95472	0.00091	1.23664	0.95472	0.99	0.0698	338
Elm species	Wd&Bk	0.00445	0.95789	--	--	--	0.99	0.0880	16
	Wood	0.00284	0.99024	--	--	--	0.99	0.0749	16
Hickory species	Wd&Bk	0.00491	0.95048	0.00185	1.15410	0.95048	0.99	0.0731	22
	Wood	0.00327	0.96187	0.00092	1.22727	0.96187	0.99	0.0578	22
Chestnut oak	Wd&Bk	0.00338	0.97813	--	--	--	0.99	0.0678	37
	Wood	0.00223	0.99671	--	--	--	0.99	0.0673	37
Scarlet oak	Wd&Bk	0.00407	0.97092	0.00141	1.19181	0.97092	0.98	0.0572	32
	Wood	0.00310	0.97972	0.00104	1.20829	0.97972	0.98	0.0551	32
South. red oak	Wd&Bk	0.00466	0.93718	0.00137	1.19269	0.93718	0.99	0.0445	48
	Wood	0.00320	0.95379	0.00088	1.22217	0.95379	0.99	0.0438	48

Table 13.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Volume wood & bark or wood only	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{Y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
White oak	Wd&Bk	0.00428	0.96050	0.00174	1.14789	0.96050	0.99	0.0512	110
	Wood	0.00283	0.98528	0.00120	1.16313	0.98528	0.99	0.0478	110
All Species	Wd&Bk	0.00470	0.93676	0.00170	1.14888	0.93676	0.99	0.0741	773
	Wood	0.00328	0.95591	0.00125	1.15683	0.95591	0.99	0.0728	773

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 Th)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b(Th)^c$$

Where: Y = component volume in cubic feet
D = tree d.b.h. in inches
Th = tree total height in feet
a', a", b, c = regression coefficients

[3]$\log_{10}$ form

Table 14.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables

Species or species group	Volume wood & bark or wood only	Regression equation coefficients						Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]						
		a'	b	a"	b	c				
TOTAL STEM										
Soft Hardwoods	Wd&Bk	0.00355	0.94695	0.00278	0.99773	0.94695		0.99	0.0542	435
	Wood	0.00250	0.96882	0.00207	1.00852	0.96882		0.99	0.0534	435
Red maple	Wd&Bk	0.00402	0.93484	0.00817	0.78674	0.93484		0.99	0.0417	32
	Wood	0.00307	0.95401	0.00734	0.77199	0.95401		0.99	0.0396	32
Sweetgum	Wd&Bk	0.00354	0.94353	0.00245	1.01987	0.94353		0.99	0.0530	236
	Wood	0.00242	0.96703	0.00152	1.06405	0.96703		0.99	0.0509	236
Sycamore	Wd&Bk	0.00240	0.99364	0.00512	0.83607	0.99364		0.99	0.0487	29
	Wood	0.00216	1.00062	0.00466	0.84031	1.00062		0.99	0.0495	29
Yellow-poplar	Wd&Bk	0.00430	0.93475	0.00347	0.97925	0.93475		0.99	0.0400	78
	Wood	0.00298	0.95568	0.00290	0.96153	0.95568		0.99	0.0340	78
Hard Hardwoods	Wd&Bk	0.00412	0.93494	0.00284	1.01304	0.93494		0.99	0.0551	338
	Wood	0.00291	0.95482	0.00193	1.04062	0.95482		0.99	0.0564	338
Elm species	Wd&Bk	0.00362	0.94165	-	-	-		0.99	0.0809	16
	Wood	0.00236	0.97704	-	-	-		0.99	0.0757	16
Hickory species	Wd&Bk	0.00481	0.91795	0.00248	1.05655	0.91795		0.99	0.0539	22
	Wood	0.00313	0.93829	0.00120	1.13843	0.93829		0.99	0.0472	22
Chestnut oak	Wd&Bk	0.00301	0.96996	-	-	-		0.99	0.0588	37
	Wood	0.00200	0.99149	-	-	-		0.99	0.0584	37
Scarlet oak	Wd&Bk	0.00437	0.92917	0.00247	1.04824	0.92917		0.99	0.0327	32
	Wood	0.00323	0.94668	0.00191	1.05621	0.94668		0.99	0.0337	32
South. red oak	Wd&Bk	0.00409	0.93293	0.00329	0.97797	0.93293		0.99	0.0398	48
	Wood	0.00294	0.94612	0.00200	1.02702	0.94612		0.99	0.0368	48

Continued

Table 14.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Volume wood & bark or wood only	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y \cdot x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
White oak	Wd&Bk	0.00544	0.90256	0.00293	1.03114	0.90256	0.99	0.0387	110
	Wood	0.00347	0.93596	0.00199	1.05198	0.93596	0.99	0.0392	110
All Species	Wd&Bk	0.00382	0.94065	0.00278	1.00702	0.94065	0.99	0.0561	773
	Wood	0.00269	0.96170	0.00199	1.02470	0.96170	0.99	0.0558	773

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 Th)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (Th)^c$$

Where: Y = component volume in cubic feet
D = tree d.b.h. in inches
Th = tree total height in feet
a', a'', b, c = regression coefficients

[3]$\log_{10}$ form

Table 15.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] $(S_{y.x})$	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
				TOTAL-TREE WOOD, BARK, AND FOLIAGE					
Soft Hardwoods	Green	2.90893	0.69841	0.39234	1.11616	0.69841	0.99	0.0538	327
	Dry	1.36096	0.70330	0.19732	1.10597	0.70330	0.98	0.0690	327
Red maple	Green	2.51894	0.71200	0.19554	1.24493	0.71200	0.98	0.0546	24
	Dry	1.35267	0.71551	0.06773	1.33988	0.71551	0.98	0.0559	24
Sweetgum	Green	3.15804	0.68557	0.28003	1.19077	0.68557	0.99	0.0514	175
	Dry	1.38655	0.69333	0.11550	1.21156	0.69333	0.98	0.0587	175
Sycamore	Green	1.32693	0.80787	0.92610	0.88286	0.80787	0.98	0.0581	25
	Dry	0.61941	0.80286	0.40948	0.88915	0.80286	0.98	0.0614	25
Yellow-poplar	Green	2.63970	0.70663	0.38692	1.10702	0.70663	0.99	0.0446	75
	Dry	1.09600	0.72761	0.19264	1.09014	0.72761	0.99	0.0496	75
Hard Hardwoods	Green	2.67031	0.73383	0.22449	1.25015	0.73383	0.98	0.0711	264
	Dry	1.49934	0.73995	0.14185	1.23164	0.73995	0.98	0.0711	264
Elm species	Green	2.39030	0.74495	--	--	--	0.97	0.0633	8
	Dry	2.53891	0.65095	--	--	--	0.84	0.1347	8
Hickory species	Green	2.17151	0.76148	0.22393	1.23520	0.76148	0.97	0.0840	18
	Dry	1.52681	0.74343	0.14348	1.23652	0.74343	0.97	0.0797	18
Chestnut oak	Green	1.92030	0.76073	--	--	--	0.96	0.0686	25
	Dry	1.14467	0.76155	--	--	--	0.97	0.0637	25
Scarlet oak	Green	3.26248	0.72175	0.26987	1.24143	0.72175	0.96	0.0783	32
	Dry	2.02272	0.71235	0.17335	1.22465	0.71235	0.95	0.0825	32
South. red oak	Green	4.08240	0.67268	0.24070	1.26297	0.67268	0.98	0.0608	46
	Dry	2.13886	0.68665	0.15024	1.24042	0.68665	0.99	0.0603	46

Continued

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Table 15.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients Trees < 11.0 in d.b.h.[1] a'	b	Trees > 11.0 in d.b.h.[2] a"	b	c	Coefficient of determination (R²)	Standard error[3] (S_{y.x})	No. of trees sampled
White oak	Green	1.95422	0.77781	0.29380	1.17291	0.77781	0.99	0.0519	94
	Dry	1.15404	0.77896	0.19005	1.15507	0.77896	0.99	0.0515	94
All Species	Green	2.98907	0.70662	0.31019	1.17903	0.70662	0.97	0.0795	591
	Dry	1.61049	0.70631	0.17278	1.17178	0.70631	0.94	0.1145	591

TOTAL-TREE WOOD AND BARK

Species or species group	Weight green or dry	Trees < 11.0 in d.b.h.[1] a'	b	Trees > 11.0 in d.b.h.[2] a"	b	c	Coefficient of determination (R²)	Standard error[3] (S_{y.x})	No. of trees sampled
Soft Hardwoods	Green	2.61299	0.70726	0.36877	1.11555	0.70726	0.99	0.0532	327
	Dry	1.26350	0.70948	0.18696	1.10790	0.70948	0.98	0.0691	327
Red maple	Green	2.30326	0.71766	0.20565	1.22141	0.71766	0.98	0.0504	24
	Dry	1.26326	0.71999	0.07217	1.31686	0.71999	0.98	0.0540	24
Sweetgum	Green	2.79700	0.69641	0.26066	1.19124	0.69641	0.99	0.0521	175
	Dry	1.26765	0.70156	0.10813	1.21483	0.70156	0.98	0.0596	175
Sycamore	Green	1.40524	0.79610	0.88179	0.89326	0.79610	0.98	0.0565	25
	Dry	0.65686	0.79263	0.40134	0.89536	0.79263	0.98	0.0605	25
Yellow-poplar	Green	2.34770	0.71667	0.36267	1.10611	0.71667	0.99	0.0440	75
	Dry	1.03606	0.73186	0.18283	1.09355	0.73186	0.99	0.0503	75
Hard Hardwoods	Green	2.38269	0.74303	0.21752	1.24215	0.74303	0.98	0.0676	264
	Dry	1.38345	0.74616	0.13961	1.22438	0.74616	0.98	0.0683	264
Elm species	Green	2.31863	0.74394	-	-	-	0.97	0.0623	8
	Dry	2.55494	0.64640	-	-	-	0.83	0.1372	8
Hickory species	Green	2.29392	0.74850	0.19491	1.26259	0.74850	0.97	0.0821	18
	Dry	1.57814	0.73516	0.13234	1.25199	0.73516	0.97	0.0788	18
Chestnut oak	Green	1.76370	0.76580	-	-	-	0.97	0.0664	25
	Dry	1.07594	0.76527	-	-	-	0.97	0.0623	25

Continued

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Table 15.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R²)	Standard error[3] (S_y·x)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
Scarlet oak	Green	2.87006	0.73186	0.25836	1.23392	0.73186	0.97	0.0711	32
	Dry	1.82832	0.71997	0.17283	1.21183	0.71997	0.96	0.0762	32
South. red oak	Green	3.53643	0.68629	0.24601	1.24209	0.68629	0.99	0.0578	46
	Dry	1.94108	0.69542	0.15151	1.22721	0.69542	0.99	0.0583	46
White oak	Green	1.89162	0.77657	0.27041	1.18219	0.77657	0.99	0.0501	94
	Dry	1.13847	0.77668	0.17921	1.16220	0.77668	0.99	0.0502	94
All Species	Green	2.67321	0.71577	0.29531	1.17513	0.71577	0.97	0.0772	591
	Dry	1.48730	0.71273	0.16628	1.16959	0.71273	0.94	0.1126	591

TOTAL-TREE WOOD

Species or species group	Weight green or dry	a'	b	a"	b	c	(R²)	(S_y·x)	No. of trees sampled
Soft Hardwoods	Green	1.99542	0.72157	0.30841	1.11091	0.72157	0.98	0.0576	327
	Dry	0.99364	0.72040	0.16015	1.10099	0.72040	0.97	0.0723	327
Red maple	Green	1.88383	0.72444	0.20926	1.18265	0.72444	0.98	0.0473	24
	Dry	1.03086	0.72875	0.06680	1.29935	0.72875	0.98	0.0530	24
Sweetgum	Green	2.08952	0.71391	0.21264	1.19039	0.71391	0.99	0.0524	175
	Dry	0.98670	0.71310	0.09031	1.21169	0.71310	0.98	0.0610	175
Sycamore	Green	1.15994	0.81178	0.80826	0.88711	0.81178	0.98	0.0575	25
	Dry	0.54228	0.80795	0.37989	0.88216	0.80795	0.98	0.0611	25
Yellow-poplar	Green	1.68845	0.73275	0.27766	1.10916	0.73275	0.99	0.0441	75
	Dry	0.79714	0.74243	0.14921	1.09183	0.74243	0.98	0.0530	75
Hard Hardwoods	Green	1.74483	0.75788	0.16471	1.25002	0.75788	0.98	0.0720	264
	Dry	1.02838	0.75937	0.11252	1.22074	0.75937	0.97	0.0736	264
Elm species	Green	1.73930	0.76245	--	--	--	0.98	0.0508	8
	Dry	2.19806	0.64650	--	--	--	0.84	0.1331	8

Continued

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Table 15.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
Hickory species	Green	1.39474	0.77236	0.09270	1.33767	0.77236	0.98	0.0768	18
	Dry	0.91832	0.76974	0.07464	1.29310	0.76974	0.97	0.0779	18
Chestnut oak	Green	1.32870	0.77192	-	-	-	0.96	0.0703	25
	Dry	0.84404	0.76625	-	-	-	0.96	0.0707	25
Scarlet oak	Green	2.30200	0.73638	0.19592	1.25012	0.73638	0.97	0.0709	32
	Dry	1.53103	0.71834	0.13986	1.21733	0.71834	0.96	0.0773	32
South. red oak	Green	2.52502	0.70064	0.17384	1.25859	0.70064	0.99	0.0592	46
	Dry	1.47845	0.69999	0.11256	1.23698	0.69999	0.99	0.0606	46
White oak	Green	1.40995	0.79088	0.19790	1.20032	0.79088	0.99	0.0489	94
	Dry	0.89393	0.78533	0.13813	1.17472	0.78533	0.99	0.0486	94
All Species	Green	1.98507	0.73131	0.23687	1.17460	0.73131	0.97	0.0768	591
	Dry	1.12708	0.72574	0.13862	1.16272	0.72574	0.94	0.1090	591

[1] Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 H4)^b$$

[2] Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (H4)^c$$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
H4 = tree height to 4-inch top in feet
a', a", b, c = regression coefficients

[3] $\log_{10}$ form

Table 16.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R²)	Standard error[3] (Sy.x)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
TOTAL-STEM WOOD AND BARK									
Soft Hardwoods	Green	2.29156	0.70545	0.42879	1.05493	0.70545	0.99	0.0465	327
	Dry	1.12653	0.70556	0.21669	1.04929	0.70556	0.98	0.0613	327
Red maple	Green	2.22532	0.69908	0.53744	0.99535	0.69908	0.99	0.0322	24
	Dry	1.22695	0.70207	0.16335	1.12252	0.70207	0.98	0.0493	24
Sweetgum	Green	2.50069	0.69517	0.36891	1.09422	0.69517	0.99	0.0494	175
	Dry	1.13379	0.70024	0.15884	1.11005	0.70024	0.98	0.0575	175
Sycamore	Green	1.57648	0.75799	0.59202	0.96221	0.75799	0.99	0.0517	25
	Dry	0.76574	0.74827	0.26378	0.97049	0.74827	0.98	0.0573	25
Yellow-poplar	Green	1.82487	0.73310	0.47036	0.47036	0.73310	0.99	0.0415	75
	Dry	0.80991	0.74909	0.24003	1.00267	0.74909	0.99	0.0465	75
Hard Hardwoods	Green	2.16281	0.72694	0.41701	1.07017	0.72694	0.99	0.0483	264
	Dry	1.26025	0.72959	0.30008	1.02881	0.72959	0.99	0.0498	264
Elm species	Green	2.12287	0.71366	--	--	--	0.99	0.0140	8
	Dry	3.08884	0.57354	--	--	--	0.83	0.1255	8
Hickory species	Green	2.69454	0.69078	0.20666	1.22623	0.69078	0.99	0.0470	18
	Dry	1.86830	0.67878	0.16406	1.18601	0.67878	0.99	0.0497	18
Chestnut oak	Green	1.86199	0.73296	--	--	--	0.98	0.0447	25
	Dry	1.16418	0.73030	--	--	--	0.99	0.0421	25
Scarlet oak	Green	2.59832	0.71047	0.45824	1.07229	0.71047	0.99	0.0323	32
	Dry	1.68022	0.69448	0.33798	1.02888	0.69448	0.99	0.0326	32
South. red oak	Green	2.89546	0.69112	0.62603	1.01046	0.69112	0.99	0.0504	46
	Dry	1.60781	0.69805	0.43698	0.96970	0.69805	0.99	0.0498	46

Table 16.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
White oak	Green	1.85973	0.74792	0.43602	1.05037	0.74792	0.99	0.0376	94
	Dry	1.13819	0.74596	0.31297	1.01517	0.74596	0.99	0.0390	94
All Species	Green	2.30521	0.71114	0.42329	1.06454	0.71114	0.98	0.0537	591
	Dry	1.28716	0.70695	0.24850	1.04991	0.70695	0.96	0.0864	591
TOTAL STEM WOOD									
Soft Hardwoods	Green	1.78632	0.71990	0.35353	1.05769	0.71990	0.99	0.0503	327
	Dry	0.90284	0.71634	0.18369	1.04836	0.71634	0.98	0.0634	327
Red maple	Green	1.80821	0.70999	0.49709	0.97925	0.70999	0.99	0.0294	24
	Dry	1.00466	0.71340	0.14684	1.11439	0.71340	0.98	0.0498	24
Sweetgum	Green	1.89662	0.71354	0.29324	1.10281	0.71354	0.99	0.0501	175
	Dry	0.89637	0.71212	0.12940	1.11570	0.71212	0.98	0.0587	175
Sycamore	Green	1.35267	0.77065	0.54812	0.95902	0.77065	0.99	0.0520	25
	Dry	0.65137	0.76164	0.25165	0.95995	0.76164	0.98	0.0569	25
Yellow-poplar	Green	1.37047	0.74627	0.34989	1.03095	0.74627	0.99	0.0416	75
	Dry	0.64459	0.75718	0.19106	1.01074	0.75718	0.99	0.0491	75
Hard Hardwoods	Green	1.59092	0.74533	0.31390	1.08375	0.74533	0.98	0.0563	264
	Dry	0.93691	0.74626	0.24016	1.03011	0.74626	0.98	0.0580	264
Elm species	Green	1.62361	0.73497	--	--	--	0.99	0.0262	8
	Dry	2.73257	0.57503	--	--	--	0.83	0.1251	8
Hickory species	Green	1.61589	0.72179	0.09578	1.31097	0.72179	0.99	0.0493	18
	Dry	1.08255	0.71766	0.08801	1.24095	0.71766	0.99	0.0524	18
Chestnut oak	Green	1.40117	0.74325	--	--	--	0.98	0.0495	25
	Dry	0.90514	0.73521	--	--	--	0.98	0.0501	25

Continued

Table 16.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
Scarlet oak	Green	2.08324	0.71926	0.36368	1.08321	0.71926	0.99	0.0364	32
	Dry	1.40851	0.69671	0.28924	1.02680	0.69671	0.99	0.0370	32
South. red oak	Green	2.15610	0.70264	0.41914	1.04416	0.70264	0.99	0.0520	46
	Dry	1.26835	0.70020	0.31034	0.99375	0.70020	0.99	0.0522	46
White oak	Green	1.36641	0.76901	0.32466	1.06868	0.76901	0.99	0.0409	94
	Dry	0.87703	0.76125	0.24278	1.02906	0.76125	0.99	0.0410	94
All Species	Green	1.74130	0.72798	0.33623	1.07091	0.72798	0.98	0.0568	591
	Dry	0.98977	0.72110	0.20564	1.04875	0.72110	0.96	0.0850	590

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 H4)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (H4)^c$$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
H4 = tree height to 4-inch top in feet
a', a", b, c = regression coefficients

[3]$\log_{10}$ form

Table 17.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables

Species or species group	Volume wood & bark or wood only	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
TOTAL TREE									
Soft Hardwoods	Wd&Bk	0.04446	0.70786	0.00723	1.08651	0.70786	0.99	0.0520	327
	Wood	0.03116	0.72981	0.00593	1.07591	0.72981	0.99	0.0525	327
Red maple	Wd&Bk	0.03705	0.73314	0.00508	1.14743	0.73314	0.98	0.0504	24
	Wood	0.03028	0.74178	0.00509	1.11338	0.74178	0.98	0.0477	24
Sweetgum	Wd&Bk	0.04903	0.69063	0.00534	1.15293	0.69063	0.99	0.0493	175
	Wood	0.03303	0.71611	0.00390	1.16140	0.71611	0.99	0.0491	175
Sycamore	Wd&Bk	0.02214	0.79638	0.01592	0.86513	0.79638	0.98	0.0585	25
	Wood	0.01845	0.81137	0.01472	0.85844	0.81137	0.98	0.0590	25
Yellow-poplar	Wd&Bk	0.04631	0.70449	0.00699	1.09877	0.70449	0.99	0.0418	74
	Wood	0.03560	0.71187	0.00608	1.08041	0.71187	0.99	0.0356	74
Hard Hardwoods	Wd&Bk	0.03763	0.74279	0.00420	1.19992	0.74279	0.98	0.0627	264
	Wood	0.02681	0.75856	0.00303	1.21303	0.75856	0.98	0.0651	264
Elm species	Wd&Bk	0.03373	0.76474	--	--	--	0.96	0.0695	8
	Wood	0.02450	0.78253	--	--	--	0.98	0.0509	8
Hickory species	Wd&Bk	0.04393	0.73463	0.00480	1.19614	0.73463	0.97	0.0800	18
	Wood	0.02599	0.76123	0.00247	1.25199	0.76123	0.98	0.0688	18
Chestnut oak	Wd&Bk	0.02745	0.77407	--	--	--	0.97	0.0631	25
	Wood	0.01999	0.78134	--	--	--	0.97	0.0669	25
Scarlet oak	Wd&Bk	0.04061	0.73977	0.00380	1.23403	0.73977	0.97	0.0678	32
	Wood	0.03151	0.74693	0.00282	1.25037	0.74693	0.97	0.0659	32
South. red oak	Wd&Bk	0.05657	0.67994	0.00336	1.26862	0.67994	0.99	0.0579	46
	Wood	0.04024	0.69298	0.00220	1.29892	0.69298	0.99	0.0585	46

Continued

Table 17.—Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark cobmined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued

Species or species group	Volume wood & bark or wood only	Regression equation coefficients						Coefficient of determination (R²)	Standard error[3] (S_y.x)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]						
		a'	b	a''	b	c				
White oak	Wd&Bk	0.02975	0.77467	0.00516	1.13999	0.77467	0.99	0.0476	94
	Wood	0.02127	0.79077	0.00358	1.16247	0.79077	0.99	0.0445	94
All Species	Wd&Bk	0.04300	0.71848	0.00576	1.13779	0.71848	0.98	0.0652	591
	Wood	0.03013	0.73856	0.00447	1.13649	0.73856	0.98	0.0641	591

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 H4)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (H4)^c$$

Where: Y = component volume in cubic feet
  D = tree d.b.h. in inches
  H4 = tree height to 4-inch top in feet
a', a'', b, c = regression coefficients

[3]$\log_{10}$ form

Table 18.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables

Species or species group	Volume wood & bark or wood only	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] ($S_{y.x}$)	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
		TOTAL STEM							
Soft Hardwoods	Wd&Bk	0.03907	0.70612	0.00887	1.01517	0.70612	0.99	0.0461	327
	Wood	0.02773	0.72879	0.00710	1.01304	0.72879	0.99	0.0434	327
Red maple	Wd&Bk	0.03279	0.72602	0.01353	0.91057	0.72602	0.99	0.0282	24
	Wood	0.02656	0.73901	0.01235	0.89862	0.73901	0.99	0.0260	24
Sweetgum	Wd&Bk	0.04392	0.68974	0.00827	1.03783	0.68974	0.99	0.0481	175
	Wood	0.02981	0.71653	0.00576	1.05919	0.71653	0.99	0.0478	175
Sycamore	Wd&Bk	0.02603	0.75115	0.01091	0.93239	0.75115	0.99	0.0513	25
	Wood	0.02258	0.76287	0.01021	0.92846	0.76287	0.99	0.0508	25
Yellow-poplar	Wd&Bk	0.03569	0.72218	0.00917	1.00549	0.72218	0.99	0.0420	75
	Wood	0.02864	0.72644	0.00770	1.00040	0.72644	0.99	0.0349	75
Hard Hardwoods	Wd&Bk	0.03434	0.72578	0.00825	1.02317	0.72578	0.99	0.0445	264
	Wood	0.02465	0.74494	0.00582	1.04584	0.74494	0.99	0.0497	264
Elm species	Wd&Bk	0.03122	0.73147	--	--	--	0.99	0.0174	8
	Wood	0.02290	0.75482	--	--	--	0.99	0.0281	8
Hickory species	Wd&Bk	0.05130	0.67784	0.00580	1.13323	0.67784	0.99	0.0484	18
	Wood	0.02948	0.71470	0.00296	1.19380	0.71470	0.99	0.0452	18
Chestnut oak	Wd&Bk	0.02915	0.74106	--	--	--	0.98	0.0462	25
	Wood	0.02092	0.75438	--	--	--	0.98	0.0487	25
Scarlet oak	Wd&Bk	0.03696	0.71620	0.00649	1.07908	0.71620	0.99	0.0360	32
	Wood	0.02850	0.72923	0.00510	1.08817	0.72923	0.99	0.0378	32
South. red oak	Wd&Bk	0.04688	0.68265	0.00832	1.04325	0.68265	0.99	0.0494	46
	Wood	0.03539	0.69066	0.00504	1.09694	0.69066	0.99	0.0487	46

Table 18.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued

Species or species group	Volume wood & bark or wood only	Regression equation coefficients					Coefficient of determination (R^2)	Standard error[3] $(S_{y \cdot x})$	No. of trees sampled
		Trees < 11.0 in d.b.h.[1]		Trees > 11.0 in d.b.h.[2]					
		a'	b	a"	b	c			
White oak	Wd&Bk	0.03008	0.74210	0.00848	1.00605	0.74210	0.99	0.0348	94
	Wood	0.02110	0.76553	0.00583	1.03378	0.76553	0.99	0.0359	94
All Species	Wd&Bk	0.03725	0.71359	0.00861	1.01890	0.71359	0.99	0.0460	591
	Wood	0.02650	0.73508	0.00654	1.02694	0.73508	0.99	0.0466	591

[1]Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 H4)^b$$

[2]Trees $\geq$ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (H4)^c$$

Where: Y = component volume in cubic feet
D = tree d.b.h. in inches
$H4$ = tree height to 4-inch top in feet
a', a'', b, c = regression coefficients

[3]$\log_{10}$ form

Table 19.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables

Species or species group	Weight green or dry	Regression equation coefficients [1]			Coefficient of determination (R^2)	Standard error [2] ($S_{y \cdot x}$)	No. of trees sampled
		a	b	c			

TOTAL-TREE WOOD, BARK, AND FOLIAGE

Species or species group	Weight green or dry	a	b	c	R^2	$S_{y \cdot x}$	No. of trees sampled
Soft Hardwoods	Green	6.16340	1.06181	0.14075	0.88	0.0657	123
	Dry	3.30431	1.10629	0.04676	0.86	0.0685	123
Sweetgum	Green	4.82876	1.12408	0.11727	0.91	0.0552	56
	Dry	3.08628	1.12057	0.14936	0.90	0.0600	56
Sycamore	Green	39.67031	0.55215	0.41342	0.86	0.0657	15
	Dry	20.92329	0.49255	0.45743	0.83	0.0734	15
Yellow-poplar	Green	3.69070	1.12441	0.17196	0.92	0.0585	40
	Dry	2.27508	1.15141	0.07477	0.90	0.0627	40
Hard Hardwoods	Green	2.71418	1.25757	0.12847	0.88	0.0660	98
	Dry	1.74397	1.24211	0.12634	0.87	0.0697	98
Scarlet oak	Green	5.14653	1.25279	-0.06827	0.97	0.0348	16
	Dry	4.51906	1.22648	-0.15867	0.96	0.0399	16
South. red oak	Green	5.74229	1.13955	0.07902	0.92	0.0502	24
	Dry	3.42939	1.13834	0.07467	0.91	0.0531	24
White oak	Green	1.63124	1.39157	0.06708	0.93	0.0555	38
	Dry	1.06912	1.37123	0.06905	0.92	0.0597	38
All Species	Green	4.90783	1.19288	0.02969	0.84	0.0766	221
	Dry	3.31791	1.23516	-0.10229	0.74	0.1022	221

TOTAL-TREE WOOD AND BARK

Species or species group	Weight green or dry	a	b	c	R^2	$S_{y \cdot x}$	No. of trees sampled
Soft Hardwoods	Green	5.93717	1.05516	0.15325	0.88	0.0652	123
	Dry	3.16814	1.10332	0.05787	0.87	0.0682	123
Sweetgum	Green	4.80892	1.11113	0.13135	0.91	0.0557	56
	Dry	2.04258	1.11675	0.15718	0.90	0.0603	56
Sycamore	Green	36.02956	0.55628	0.42159	0.86	0.0667	15
	Dry	19.40042	0.49456	0.46638	0.83	0.0741	15
Yellow-poplar	Green	3.70426	1.11862	0.17242	0.92	0.0579	40
	Dry	2.23925	1.15166	0.07463	0.90	0.0629	40
Hard Hardwoods	Green	2.63369	1.24969	0.13904	0.88	0.0656	98
	Dry	1.68788	1.23604	0.13690	0.87	0.0690	98
Scarlet oak	Green	4.34704	1.24727	-0.02093	0.97	0.0320	16
	Dry	3.97479	1.21788	-0.11805	0.96	0.0371	16

Table 19.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients [1] a	b	c	Coefficient of determination (R^2)	Standard error [2] ($S_{y \cdot x}$)	No. of trees sampled
South. red oak	Green	5.81860	1.12812	0.08277	0.92	0.0497	24
	Dry	3.45717	1.13251	0.07353	0.92	0.0519	24
White oak	Green	1.56640	1.38649	0.07660	0.94	0.0547	38
	Dry	1.01472	1.36833	0.08063	0.93	0.0584	38
All Species	Green	4.71974	1.18466	0.04426	0.84	0.0755	221
	Dry	3.17469	1.22898	-0.08704	0.74	0.1005	221
TOTAL-TREE WOOD							
Soft Hardwoods	Green	5.33812	1.03469	0.17425	0.85	0.0735	123
	Dry	2.95691	1.08784	0.06027	0.85	0.0722	123
Sweetgum	Green	4.26547	1.10159	0.14174	0.91	0.0566	56
	Dry	1.85726	1.11531	0.14506	0.90	0.0612	56
Sycamore	Green	34.88147	0.55564	0.41726	0.85	0.0685	15
	Dry	18.88130	0.49271	0.46035	0.82	0.0769	15
Yellow-poplar	Green	2.84055	1.14182	0.16022	0.92	0.0577	40
	Dry	1.85316	1.18335	0.03324	0.90	0.0615	40
Hard Hardwoods	Green	1.91965	1.25217	0.17663	0.86	0.0721	98
	Dry	1.27266	1.23388	0.17000	0.84	0.0779	98
Scarlet oak	Green	3.07600	1.25572	0.01875	0.97	0.0321	16
	Dry	3.12229	1.21079	-0.08963	0.96	0.0376	16
South. red oak	Green	4.00847	1.13728	0.11847	0.91	0.0544	24
	Dry	2.41552	1.12809	0.11878	0.90	0.0582	24
White oak	Green	1.30013	1.38510	0.08872	0.93	0.0557	38
	Dry	0.87537	1.36221	0.08849	0.92	0.0590	38
All Species	Green	3.89404	1.16792	0.07993	0.83	0.0798	221
	Dry	2.72403	1.20958	-0.06022	0.74	0.0998	221

[1] $Y = a(D^2)^b (Mh)^c$

Where: Y = component weight in pounds
      D = tree d.b.h. in inches
    Mh = tree saw-log merchantable height in feet
  a,b,c = regression coefficients

[2] $\log_{10}$ form

Table 20.--Regression equations for estimating green and dry weight of saw-log merchantable-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables

Species or species group	Weight green or dry	Regression equation coefficients [1]			Coefficient of determination (R^2)	Standard error [2] ($S_{y.x}$)	No. of trees sampled
		a	b	c			
SAW-LOG STEM WOOD AND BARK							
Soft Hardwoods	Green	0.67595	0.89328	0.85866	0.97	0.0430	123
	Dry	0.36620	0.94121	0.75877	0.96	0.0522	123
Sweetgum	Green	0.65236	0.96221	0.77262	0.97	0.0441	56
	Dry	0.28174	0.95355	0.81101	0.96	0.0476	56
Sycamore	Green	1.38050	0.75171	0.87234	0.97	0.0469	15
	Dry	0.73990	0.66517	0.95000	0.97	0.0537	15
Yellow-poplar	Green	0.55649	0.94770	0.82697	0.98	0.0362	40
	Dry	0.33553	0.98999	0.71972	0.96	0.0479	40
Hard Hardwoods	Green	0.38692	1.08711	0.76368	0.97	0.0368	98
	Dry	0.25507	1.05649	0.77399	0.96	0.0400	98
Scarlet oak	Green	0.28236	1.16022	0.76264	0.98	0.0274	16
	Dry	0.29759	1.10027	0.66135	0.97	0.0299	16
South. red oak	Green	0.49344	1.00035	0.80825	0.98	0.0328	24
	Dry	0.29400	0.98681	0.81718	0.98	0.0360	24
White oak	Green	0.35004	1.11465	0.75103	0.98	0.0288	38
	Dry	0.23828	1.07714	0.76684	0.98	0.0317	38
All Species	Green	0.55409	1.02467	0.73488	0.95	0.0520	221
	Dry	0.38056	1.05605	0.61383	0.88	0.0800	221
SAW-LOG STEM WOOD							
Soft Hardwoods	Green	0.61760	0.89024	0.85859	0.97	0.0487	123
	Dry	0.35161	0.93806	0.74302	0.96	0.0527	123
Sweetgum	Green	0.59993	0.96725	0.76266	0.97	0.0441	56
	Dry	0.26906	0.96144	0.78172	0.96	0.0472	56
Sycamore	Green	1.31571	0.75985	0.86343	0.97	0.0489	15
	Dry	0.70847	0.67292	0.93861	0.96	0.0566	15
Yellow-poplar	Green	0.42342	0.99036	0.79729	0.98	0.0379	40
	Dry	0.27854	1.04004	0.65748	0.96	0.0492	40
Hard Hardwoods	Green	0.29767	1.09847	0.78450	0.95	0.0467	98
	Dry	0.20003	1.06247	0.79412	0.93	0.0535	98

Table 20.--Regression equations for estimating green and dry weight of saw-log merchantable-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients[1]			Coefficient of determination (R^2)	Standard error[2] ($S_{y.x}$)	No. tree samp
		a	b	c			
Scarlet oak	Green	0.23242	1.16362	0.77546	0.98	0.0315	16
	Dry	0.27482	1.08420	0.66505	0.97	0.0340	16
South. red oak	Green	0.36379	1.00704	0.83888	0.97	0.0371	24
	Dry	0.21906	0.97487	0.86472	0.97	0.0412	24
White oak	Green	0.31177	1.12038	0.74633	0.98	0.0315	38
	Dry	0.21647	1.08001	0.75892	0.98	0.0340	38
All Species	Green	0.47426	1.02196	0.74970	0.95	0.0557	221
	Dry	0.33963	1.04751	0.62258	0.89	0.0785	221

[1] $Y = a(D^2)^b(Mh)^c$

Where: Y = component weight in pounds
D = tree d.b.h. in inches
Mh = tree saw-log merchantable height in feet
a,b,c = regression coefficients

[2] $\log_{10}$ form

Table 21.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables

Species or species group	Volume wood & bark or wood only	Regression equation coefficients [1]			Coefficient of determination (R^2)	Standard error [2] ($S_{y \cdot x}$)	No. of trees sampled
		a	b	c			
		TOTAL TREE					
Soft Hardwoods	Wd&Bk	0.10552	1.05509	0.13692	0.89	0.0626	23
	Wood	0.09583	1.03585	0.14745	0.88	0.0656	123
Sweetgum	Wd&Bk	0.09775	1.01130	0.21776	0.91	0.0557	56
	Wood	0.08117	1.01485	0.21996	0.91	0.0558	56
Sycamore	Wd&Bk	0.78170	0.52890	0.37297	0.87	0.0596	15
	Wood	0.76002	0.52710	0.36990	0.86	0.0611	15
Yellow-poplar	Wd&Bk	0.06004	1.08702	0.24020	0.92	0.0589	40
	Wood	0.05114	1.09195	0.21951	0.93	0.0539	40
Hard Hardwoods	Wd&Bk	0.05063	1.22643	0.10976	0.89	0.0620	98
	Wood	0.03736	1.22635	0.14310	0.88	0.0640	98
Scarlet oak	Wd&Bk	0.08119	1.22826	-0.05300	0.99	0.0224	16
	Wood	0.05943	1.22990	-0.01528	0.99	0.0204	16
South. red oak	Wd&Bk	0.10323	1.15006	0.00785	0.95	0.0398	24
	Wood	0.07019	1.16638	0.03432	0.95	0.0404	24
White oak	Wd&Bk	0.02510	1.36610	0.08975	0.93	0.0550	38
	Wood	0.02019	1.36957	0.09664	0.93	0.0549	38
All Species	Wd&Bk	0.08168	1.15697	0.06573	0.88	0.0654	221
	Wood	0.06856	1.13968	0.09215	0.87	0.0668	221

[1] $Y = a(D^2)^b(Mh)^c$

Where:
- Y = component volume in cubic feet
- D = tree d.b.h. in inches
- Mh = saw-log merchantable height in feet
- a,b,c = regression coefficients

[2] $\log_{10}$ form

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Table 22.--Regression equations for estimating cubic-foot volume of saw-log merchantable-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables

Species or species group	Volume wood & bark or wood only	Regression equation coefficients [1]			Coefficient of determination (R^2)	Standard error[2] ($S_{y.x}$)	Number trees sampled (N)
		a	b	c			
				SAW-LOG STEM			
Soft Hardwoods	Wd&Bk	0.01266	0.88987	0.83274	0.97	0.0431	121
	Wood	0.01179	0.89346	0.81166	0.98	0.0388	121
Sweetgum	Wd&Bk	0.01485	0.79949	0.91861	0.96	0.0434	55
	Wood	0.01307	0.84055	0.86088	0.97	0.0424	55
Sycamore	Wd&Bk	0.02732	0.71993	0.85113	0.99	0.0316	15
	Wood	0.02618	0.72769	0.84192	0.99	0.0329	15
Yellow-poplar	Wd&Bk	0.01022	0.90924	0.87248	0.98	0.0362	40
	Wood	0.00871	0.94012	0.82258	0.98	0.0339	40
Hard Hardwoods	Wd&Bk	0.00874	1.04386	0.71872	0.97	0.0340	96
	Wood	0.00631	1.06217	0.74366	0.97	0.0365	96
Scarlet oak	Wd&Bk	0.00519	1.14668	0.72612	0.98	0.0258	16
	Wood	0.00457	1.14295	0.73007	0.98	0.0268	16
South. red oak	Wd&Bk	0.01310	1.01034	0.63959	0.98	0.0262	22
	Wood	0.00702	1.04172	0.72127	0.98	0.0277	22
White oak	Wd&Bk	0.00574	1.07881	0.77957	0.98	0.0279	38
	Wood	0.00496	1.09295	0.76519	0.98	0.0293	38
All Species	Wd&Bk	0.01076	0.98684	0.73947	0.96	0.0421	217
	Wood	0.00905	0.98897	0.74695	0.97	0.0398	217

[1] $Y = a(D^2)^b(Mh)^c$

Where: Y = component volume in cubic feet
        D = tree d.b.h. in inches
        Mh = saw-log merchantable height in feet
        a,b,c = regression coefficients

[2] $\log_{10}$ form

Table 23.--Regression coefficients for estimating above-stump stem weight to a specified d.o.b. top diameter as a proportion of total-stem weight for hardwood species in the Piedmont

Species	Regression equation and coefficients[1] $Y_R = e^{a}(d)^{b}(D)^{c}$					
	Green weight			Dry weight		
	a	b	c	a	b	c
WOOD AND BARK						
Soft Hardwoods	-1.73265	4.21073	-4.28793	-1.61846	4.16572	-4.21583
Red maple	-0.80857	4.37677	-4.10402	-0.76750	4.32891	-4.04315
Sweetgum	-1.88706	4.09280	-4.20271	-1.70312	4.00522	-4.07778
Sycamore	-2.31104	4.80579	-4.88417	-2.30869	4.75038	-4.83810
Yellow-poplar	-1.72938	3.99726	-4.17198	-1.76210	4.04115	-4.21537
Hard Hardwoods	-2.61988	3.92928	-4.33719	-2.48096	3.90016	-4.28540
Elm	-5.22488	4.41024	-4.91101	-1.85693	4.17785	-4.19195
Hickory	-9.21973	4.07639	-5.02575	-8.75055	4.05001	-4.97494
Chestnut oak	-1.26318	4.69218	-4.69208	-1.21241	4.73014	-4.70501
Scarlet oak	-4.43019	3.68458	-4.45247	-4.07170	3.59590	-4.33080
South. red oak	-2.08555	3.49897	-3.80231	-1.99820	3.47308	-3.75484
White oak	-1.99440	3.91077	-4.20029	-1.91277	3.93041	-4.19809
All Species	-2.25900	4.00280	-4.27579	-2.10544	3.94825	-4.19553
WOOD ONLY						
Soft Hardwoods	-1.64304	4.32869	-4.38440	-1.55017	4.23574	-4.27228
Red maple	-0.76381	4.44935	-4.15466	-0.73261	4.36080	-4.05919
Sweetgum	-1.80721	4.20995	-4.30469	-1.65108	4.08554	-4.15193
Sycamore	-2.25912	4.86204	-4.92667	-2.28046	4.80799	-4.88602
Yellow-poplar	-1.64012	4.11183	-4.26807	-1.71038	4.11441	-4.28158
Hard Hardwoods	-2.62600	4.03635	-4.44620	-2.49497	3.99040	-4.37918
Elm	-5.21153	4.60413	-5.10528	-0.56432	3.52387	-3.07702
Hickory	-9.20982	4.13856	-5.09267	-8.62935	4.08077	-5.00432
Chestnut oak	-1.23570	4.86497	-4.85131	-1.19487	4.87213	-4.83716
Scarlet oak	-4.47632	3.79397	-4.56449	-4.08401	3.68907	-4.42364
South. red oak	-2.16525	3.56959	-3.89161	-2.07378	3.53706	-3.83789
White oak	-1.90161	4.04669	-4.31434	-1.85655	4.04282	-4.29760
All Species	-2.21362	4.11130	-4.37739	-2.06611	4.02166	-4.26466

[1]Where: Y_R = stem weight to top d.o.b./total-stem weight ratio
  d = stem specified top d.o.b. in inches
  D = tree d.b.h. in inches
  a,b,c = regression coefficients
  e = 2.71828 (base of log E)

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Table 24.--Regression coefficients for estimating above-stump stem volume to a specified d.o.b. top diameter as a proportion of total-stem volume for hardwood species in the Piedmont

| Species | Regression equation and coefficients[1] $Y_R = e^a(d)^b(D)^c$ | | | | | |
| | Wood and bark | | | Wood only | | |
	a	b	c	a	b	c
Soft Hardwoods	-1.65202	4.16510	-4.23243	-1.17897	4.26410	-4.18729
Red maple	-0.63491	4.07791	-3.74763	-0.72033	4.38479	-4.07700
Sweetgum	-1.71771	4.08636	-4.16133	-1.09648	4.18535	-4.06573
Sycamore	-2.51196	4.72070	-4.84581	-1.47346	4.87589	-4.76297
Yellow-poplar	-1.76181	3.97649	-4.16652	-1.58270	4.11066	-4.25600
Hard Hardwoods	-2.69221	3.89875	-4.32412	-1.58802	3.89439	-4.10976
Elm	-5.53946	4.23262	-4.74180	-2.34516	4.07233	-4.26508
Hickory	-9.21460	4.04604	-4.99672	-9.06779	4.18420	-5.12879
Chestnut oak	-1.38721	4.89309	-4.91657	-1.37476	5.16760	-5.17706
Scarlet oak	-4.61107	3.52799	-4.33254	-4.63561	3.61479	-4.42350
South. red oak	-2.20401	3.43172	-3.77125	-1.47631	3.48332	-3.66336
White oak	-2.17082	3.89490	-4.21939	-1.47760	4.03096	-4.19762
All Species	-2.21693	3.94846	-4.22458	-1.40712	4.02485	-4.10951

[1]Where: Y_R = stem volume to top d.o.b./total-stem volume ratio

d = stem specified top d.o.b. in inches

D = tree d.b.h. in inches

a,b,c = regression coefficients

e = 2.71828 (base of log E)

Table 25.--Regression coefficients for estimating stem weight to a specified d.o.b. top diameter as a proportion of saw-log stem weight for hardwood species in the Piedmont

Ratio equation and coefficients[1]

$$Y_R = e^{a(Mh)^b} \left(\left(1-\left(\frac{d}{.78D}\right)^2\right)^2\right)^c$$

Species	Green weight			Dry weight		
	a	b	c	a	b	c

WOOD AND BARK

Species	a	b	c	a	b	c
Soft Hardwoods	34.56311	-1.33687	0.34540	36.21735	-1.34421	0.34571
Sweetgum	22.04668	-1.20280	0.38433	26.47795	-1.24399	0.37862
Sycamore	7.67301	-0.86241	0.34220	10.50581	-0.94737	0.33595
Yellow-poplar	39.47929	-1.42104	0.35509	53.62409	-1.50445	0.34681
Hard Hardwoods	22.66546	-1.26307	0.36865	24.38559	-1.28056	0.37474
Scarlet oak	31.73326	-1.46549	0.36536	40.61327	-1.53417	0.38247
South. red oak	12.89559	-1.07185	0.34506	15.08843	-1.11120	0.35535
White oak	27.61815	-1.33589	0.34312	30.11002	-1.35715	0.35120
All Species	29.74533	-1.31912	0.35749	31.51398	-1.33074	0.36034

WOOD ONLY

Species	a	b	c	a	b	c
Soft Hardwoods	35.62364	-1.35443	0.34231	37.33020	-1.36146	0.34311
Sweetgum	22.10232	-1.21539	0.38254	26.88392	-1.26047	0.37755
Sycamore	7.28473	-0.85025	0.34122	10.05026	-0.93713	0.33558
Yellow-poplar	39.90690	-1.43386	0.35307	53.66090	-1.51241	0.34454
Hard Hardwoods	22.47899	-1.26624	0.36449	22.69238	-1.26472	0.36656
Scarlet oak	30.44735	-1.45626	0.36327	29.27276	-1.43826	0.36488
South. red oak	12.83823	-1.07783	0.34287	13.33679	-1.08426	0.34322
White oak	27.40217	-1.33931	0.33906	27.27263	-1.33482	0.33971
All Species	30.20095	-1.33096	0.35380	31.29464	-1.33593	0.35547

[1]Where: Y_R = ratio of stem weight or volume to top d.o.b. saw-log stem

Mh = saw-log merchantable height in feet

d = stem specified top diameter in inches

D = tree d.b.h. in inches

.78 = constant based on average form class

a,b,c = regression coefficients

e = 2.71828 (base of log E)

Table 26.--Regression coefficients for estimating stem volume to a specified d.o.b. top diameter as a proportion of saw-log stem volume for hardwood species in the Piedmont

Species	Ratio equation and coefficients[1] $Y_R = e^{a(Mh)^b} \left(\left(1 - \left(\frac{d}{.78D} \right)^2 \right)^2 \right)^c$					
	Wood and bark			Wood only		
	a	b	c	a	b	c
Soft Hardwoods	30.25414	-1.30210	0.35021	30.74283	-1.31681	0.34772
Sweetgum	18.57750	-1.15490	0.38851	18.42347	-1.16620	0.38709
Sycamore	7.50334	-0.86564	0.34172	7.01438	-0.85009	0.33987
Yellow-poplar	32.37729	-1.37255	0.36225	31.45762	-1.37480	0.36010
Hard Hardwoods	21.59218	-1.25535	0.37171	21.07918	-1.25541	0.36717
Scarlet oak	32.87656	-1.48776	0.36335	29.65145	-1.46143	0.36113
South. red oak	10.39703	-1.01780	0.34439	10.16607	-1.02040	0.34157
White oak	27.13415	-1.33679	0.34275	26.38838	-1.33583	0.33833
All Species	26.87548	-1.29436	0.36165	26.90075	-1.30344	0.35830

[1]Where: Y_R = ratio of stem weight or volume to top d.o.b. saw-log stem

Mh = saw-log merchantable height in feet

d = stem specified top diameter in inches

D = tree d.b.h. in inches

.78 = constant based on average form class

a,b,c = regression coefficients

e = 2.71828 (base of log E)

The weight, volume, and physical properties of trees 1 to 20
inches d.b.h. were determined for red maple, sweetgum, sycamore,
yellow-poplar, elm, hickory, chestnut oak, scarlet oak, southern
red oak, and white oak in the Piedmont. Hard hardwoods, soft
hardwoods, and individual species equations are presented for
predicting green and dry weight and green volume of the total tree
above stump and its components by using d.b.h. and total height,
d.b.h. and height to a 4-inch top, d.b.h. and saw-log merchantable
height, and d.b.h. alone. Average specific gravity, moisture
content, and weight per cubic foot of wood, bark, and wood and
bark combined are presented for each species by tree size class
and component. Bark percentage is also presented for each species
by tree size class and component.