CO-OP REDWOOD YIELD RESEARCH PROJECT
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A Collection of Some Red Alder and Tanoak Volume Equations

by

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I. INTRODUCTION

Research Note No. 9 (Krumland and Wensel, 1978) presented a comprehensive collection of volume and taper relationships for coastal conifers. Hardwoods were not included because of lack of data and most cooperators indicated that they were not too concerned with hardwood volumes.

In some situations, however, some estimates of hardwood volumes are needed. This report presents a collection of volume equations for red alder and tanoak, developed by other researchers. Also included are "refitted equations" in the form of the standard volume equation used in Research Note No. 9. The basic procedure was to use the published equations to estimate volumes for different DBH - Height combinations and then refit these generated volumes to the standard model. In some situations, merchantable height was used as the independent variable in the original equation. Total heights were estimated in these cases by adding a constant to the merchantable height equal to the top d.i.b. multiplied by four. Specifed details are described below for each equation.

II THE STANDARD VOLUME MODEL

$$V = b_o D^{b_1} H^{b_2}$$

where V = Volume in cubic feet or Scribner board feet
D = DBH in inches
H = Total height, height to a merchantable top in feet, or number of 16 foot logs to a merchantable top

The coefficients (b_o, b_1, b_2) are derived from published equations. Table 1 and Table 2 present a synopsis of these refitted coefficients for Scribner Board Foot and Cubic Foot Volumes respectively. Detailed information concerning the original equations and conversion specifics can be found in section III.

TABLE 1 (SCRIBNER BOARD FOOT VOLUME COEFFICIENTS)

Tanoak

Height Definition	b_o	b_1	b_2	Merch. Top	Source
Total Height	.00012	1.8596	2.0252	10 inches	F1
Merchantable Ht.	.03429	1.8596	.89796	10 inches	F1
Log Height	.41345	1.8596	.89796	10 inches	F1

Red Alder

Height Definition	b_o	b_1	b_2	Merch. Top	Source
Total Height	.00018	1.8448	2.0316	8 inches	F2
Merchantable Ht.	.03055	1.8448	1.0011	8 inches	F2
Log Height	.49029	1.8448	1.0011	8 inches	F2

TABLE 2 (CUBIC FOOT VOLUME COEFFICIENTS)

Tanoak

Height Definition	b_1	b_1	b_2	Merch. Top	Source
Total Height	.00005	1.9902	1.7121	8 inches	C1
Merchantable Ht.	.00613	1.9902	.75801	8 inches	C1
Log Height	.05014	1.9902	.75801	8 inches	C1
Total Height	.00121	2.0578	1.0245	4 inches	C2
Merchantable Ht.	.00845	2.0578	.61520	4 inches	C2
Log Height	.04652	2.0578	.61520	4 inches	C2

Red Alder

Height Definition	b_o	b_1	b_2	Merch. Top	Source
Total Height	.00356	1.8580	.97016	4 inches	C3
Merchantable Ht.	.02242	1.8580	.58087	4 inches	C3
Log Height	.11222	1.8580	.58087	4 inches	C3

III. SOURCES OF THE PUBLISHED EQUATIONS

SOURCE B1 Table 10, Hornibrook et. al. (1950).

Original Equation and Specifications:

$$\text{Log}_{10}(V) = 1.7747\{\text{Log}_{10}(D)\} + 0.9038\{\text{Log}_{10}(H)\} + 0.0051(F) - 0.8792$$

where V = Scribner board foot volume as utilized but never less than 10 inches
D = DBH in inches
H = Number of 8 foot logs
F = Form class

Conversion Specifics

As this model was based on a form class, average form class by DBH class (Figure 1, Hornibrook, 1950.) was used to generate volumes which were then considered to be the average for the particular DBH - Height combination.

Total heights were estimated as the (Number of 8 foot logs x 8.3) + 40 feet

Merchantable heights were estimated as the (Number of 8 foot logs x 8.3)

Log heights were estimated as the (Number of 8 foot logs)/2.

SOURCE B2 Table 1, Johnson, R.M. et. al. (1949).

Original Equation And Specifications

$$\text{Log}_{10}(V) = 1.8468\{\text{Log}_{10}(D)\} + 1.0090\{\text{Log}_{10}(H)\} - 0.6032$$

where V = Scribner board foot volume between stump and a merchantable top (8 inch minimum)
D = DBH in inches
H = Number of 8 foot logs to a merchantable top

Conversion Specifics

Total Heights were estimated as the (Number of 8 foot logs x 8.3) + 32 feet

Merchantable Heights were estimated as the (Number of 8 foots logs x 8.3)

Log Heights were estimated as the (Number of 8 foot logs)/2.

SOURCE C1 Table 11, Hornibrook et. al. (1950).

Original Equation and Specifications

$$\text{Log}_{10}(V) = 1.8542\{\text{Log}_{10}(D)\} + 0.7644\{\text{Log}_{10}(H)\} + 0.0075(F) - 1.8517$$

where V = Cubic foot volume, excluding bark, of main stem and forks between stump and utilized top.
D = DBH in inches
H = Number of 8 foot logs
F = Form class

Conversion Specifics

Form class conversion, total height, merchantable height and log height estimates for these cubic foot volume equations are the same as the corresponding ones for board

feet.

SOURCE C2 Table1, Wiant H.V. (1965).

Original Equation And Specifications

$$\text{Log}_{10}(V) = -2.9127 + 1.0249\{\text{Log}_{10}(D^2H)\}$$

where V = Cubic foot volume between stump and 4 inch top
D = DBH in inches
H = Total height in feet

Conversion Specifics

Merchantable Heights were estimated as the (Total Height - 16.3 feet)

Log Heights were estimated as the (Total Height - 16.3 feet)/16.

SOURCE C3 Table 4, Johnson, R.M. et. al. (1949).

Original Equation and Specifications

$$\text{Log}_{10}(V) = 1.8618\{\text{Log}_{10}(D)\} + 0.9751\{\text{Log}_{10}(H)\} - 2.4628$$

where V = Cubic foot volume between stump and a 4 inch top
D = DBH in inches
H = Total height in feet

Conversion Specifics

Total height, merchantable height and log height estimates for these cubic foot equations are the same as the corresponding ones for board feet (Source B2).

Literature Cited

Hornibrook, E.M., R.W. Larson, J.J. VanAkkeren and A.A. Hasel.
1950. Board Foot and Cubic Foot Volume Tables For Some California Hardwoods. Forest Research Notes - U.S. Forest Service 67.

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