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Research Note No. 2 July 15, 1981

DRAFT

# Volume Tables for Young-growth Mixed Conifers of Northern California

Part I: Volume Tables for Mixed Conifers

Part II: Taper Equations for Mixed Conifers

by

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## Abstract

This paper presents a taper equation developed to describe stem form for young-growth mixed conifers in Northern California based upon the Tarif data. These models can be used to predict upper stem diameters as a function of relative height and DBH. Additionally, these models allow for assessment of scaling diameters used in determining volumes and hence volume tables are compiled using scaling diameters from the taper equation.

This note is comprised of two parts. The first section provides an overview of the project and presents the volume tables arising from the study. The second section is a technical report describing the development of a taper equation and accuracy of the model so chosen.

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## Definition of Variables

| Variable(s) | Definition |
|---|---|
| $b_1, b_2$ | Regression coefficients for the taper equation |
| $c_0, c_1, c_2$ | Regression coefficients for the tree volume equation |
| d | Predicted diameter inside bark (in.) |
| dib | Diameter inside bark (in.) |
| DOB | Diameter outside bark (in.) |
| DBH | Diameter outside bark at breast height (in.) |
| $k_{ij}$ | Bark factor for tree i and species j |
| h | Distance in feet above a one foot stump to some point on the tree bole. |
| H | Total height |
| y=h/H | Relative height above a 1 foot stump |
| x=d/DBH | Relative diameter |
| $\lambda$ | A constant in the taper equation which forces the equation to go through the tip of the tree. |
| ln(x) | Natural logarithm of x |
| exp(x) | 2.7128 raised to the power of x |
| $S_{y.x}$ | Standard deviation of the residuals about the regression of "y" on "x" |
| $R^2$ | Squared multiple correlation coefficient |
| 1/m | allometric constant |

## I. Introduction

This report describes the development of taper equations for the mixed conifer species of Northern California. These species include ponderosa pine (PP), Douglas fir (DF), white fir (WF), red fir (RF), sugar pine (SP) and incense cedar (IC).

Data from stem analysis and dendrometered trees were utilized to characterize stem profile. A subset of the data was selected to develop a flexible taper equation that accurately describes stem form. These equations were then used as a basis for generating cubic foot and board foot volume tables. In all cases a 1 foot stump height is assumed.

As a cautionary note, it should be emphasized that the data used in this report were collected prior to the formation of the current Northern California Forest Yield Cooperative. Thus the design and measurement standards are difficult to assess. None-the-less this report concludes an extensive investigation of taper relationships given the data at hand. Additionally, the tables so presented need to be reviewed to report accuracy over the many height and diameter classes presented. Because the bulk of the data lies approximately between 12 and 30 inches in diameter and 55 to 125 feet in height, it is well to remember that the models were used to fill in the tables (extrapolate) for those values not in the data base (see Appendix A for distribution of trees by size classes). Thus when using tree dimensions not commonly observed in the data base an element of prudence is necessary in interpreting the table values.

General taper equations may be integrated mathematically to produce tree volume tables. However, this approach will not lead to volumes identical to those predicted from tree volume prediction equations. Krumland and Wensel(1978) compared these two approaches in their work with redwood (*Sequoia sempervirens*) and found that the taper-based volume and tree volume predictions were generally within 1-3 per cent of each other when predicting cubic volume to a 5-inch top. For Douglas fir (*Psuedotsuga mensiesii*) the two approaches led to volume differences within 5 per cent of each other.

For this study there was more variability than reported by Krumland and Wensel (1978). For example, excluding trees less than 20 inches DBH, white fir volumes from the taper equation were within 5% of volume equation values for 4 and 6 inch top cubic foot volumes and 6 inch top board foot volumes. However, for 8 inch top board foot volumes these estimates were within 10% of each other. Usually for taller trees within a diameter class taper-based volume estimates were less than volume equation values. However, for shorter trees, this relationship was reversed. Even though this paper addresses solely taper-based volume estimation--coefficients and fit statistics of volume equations are presented in the following section entitled "Summary".

## II. Summary of Results

### A. Taper Equations

The taper equations developed to describe stem form of young-growth mixed conifers in northern California based upon the Tarif data was:

$$d = DBH[b_1 + b_2 \ln (1-\lambda(h/H)^{1/3})] \quad \text{where} \quad \lambda=1-\exp(-b_1/b_2)$$

The coefficients and fit statistics are given in Table 1 for the six species considered.

Table 1. Fit Statistics and Coefficients for the Taper Model

| | Species | | | | | |
|---|---|---|---|---|---|---|
| | PP | DF | RF | WF | SP | IC |
| $b_1$ | 1.01528 | 1.00689 | 1.04533 | 1.04417 | 1.00923 | 1.00035 |
| $b_2$ | 0.31502 | 0.33971 | 0.32970 | 0.33885 | 0.32140 | 0.39311 |
| n | 863 | 897 | 874 | 860 | 897 | 843 |
| $R^2$ | 0.966 | 0.978 | 0.952 | 0.952 | 0.970 | 0.952 |
| $S_{y.x}$ (in.) | 1.438 | 1.271 | 1.700 | 1.534 | 1.653 | 1.909 |

$R^2$ = Squared multiple correlation coefficient
$S_{y.x}$ = Standard deviation of the residuals about the regression of y on x

This model can be used to obtain tree volumes by section as well as whole tree volumes. The volume tables presented herein were generated with these equations.

### B. Volume Equations

An alternative to taper-based volume estimates is the development of volume equations for estimating whole tree volume. These models can not be used to predict volume by section, but should provide slightly better estimates of whole tree volume. The form of these models was:

$$\ln(V) = c_0 + c_1 \ln(DBH) + c_2 \ln(H)$$

where ln = natural logarithm

The tree volume coefficients and fit statistics are given in Table 2 for the six species considered.

Table 2. Fit Statistics and Coefficients for the Volume Equation

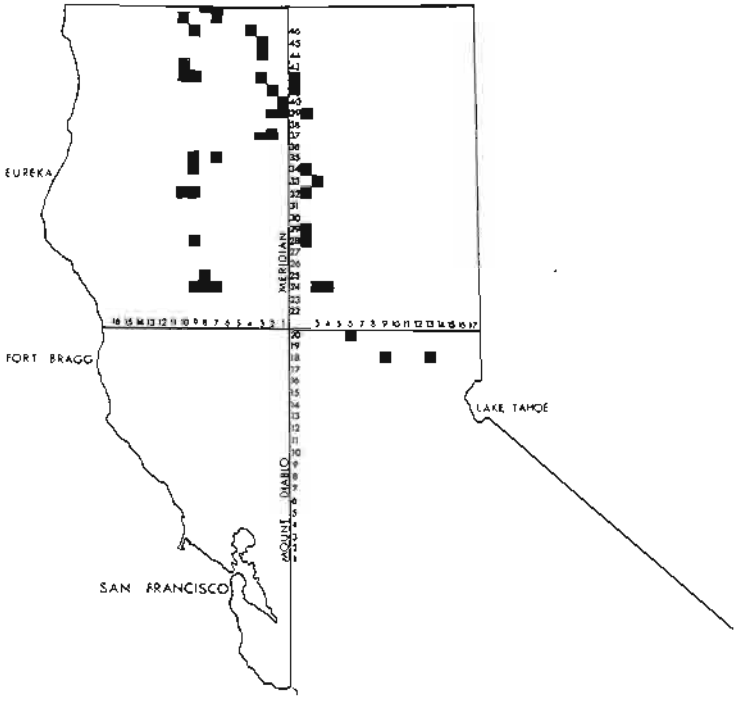
$$\ln(V) = c_0 + c_1 \ln(DBH) + c_2 \ln(H)$$

| | | Species | | | | | |
|---|---|---|---|---|---|---|---|
| | | PP | DF | RF | WF | SP | IC |
| Cubic foot 4" top | $c_0$ | -7.02758 | -6.91677 | -6.06976 | -6.26024 | -6.11915 | -6.09736 |
| | $c_1$ | 2.00793 | 1.80843 | 1.81923 | 1.91602 | 2.11392 | 1.96215 |
| | $c_2$ | 1.15103 | 1.24667 | 1.08233 | 1.05482 | 0.87158 | 0.93515 |
| | $n_2$ | 366 | 209 | 282 | 438 | 144 | 147 |
| | $R^2$ | 0.975 | 0.984 | 0.972 | 0.969 | 0.984 | 0.973 |
| | $S_{y.x}$ (ft.$^3$) | 10.09 | 9.90 | 10.70 | 10.41 | 15.59 | 12.51 |
| Cubic foot 6" top | $c_0$ | -7.33720 | -7.30320 | -6.30562 | -6.53834 | -6.35357 | -6.30316 |
| | $c_1$ | 2.06109 | 1.86768 | 1.87299 | 1.96842 | 2.16405 | 2.02472 |
| | $c_2$ | 1.17817 | 1.28427 | 1.09302 | 1.07653 | 0.88300 | 0.93082 |
| | $n_2$ | 366 | 209 | 282 | 438 | 144 | 147 |
| | $R^2$ | 0.972 | 0.982 | 0.970 | 0.967 | 0.983 | 0.972 |
| | $S_{y.x}$ (ft.$^3$) | 10.65 | 10.52 | 11.14 | 10.80 | 15.79 | 12.98 |
| Board foot 6" top | $c_0$ | -8.02875 | -7.7280 | -6.98885 | -7.11144 | -6.61561 | -7.22152 |
| | $c_1$ | 2.27992 | 1.99763 | 2.03393 | 2.12518 | 2.33570 | 2.21098 |
| | $c_2$ | 1.54771 | 1.65208 | 1.50697 | 1.46681 | 1.18921 | 1.36037 |
| | $n_2$ | 366 | 209 | 282 | 438 | 144 | 147 |
| | $R^2$ | 0.957 | 0.976 | 0.956 | 0.948 | 0.975 | 0.950 |
| | $S_{y.x}$ (bd.ft.) | 82.37 | 74.82 | 84.52 | 85.44 | 123.57 | 104.05 |
| Board foot 8" top | $c_0$ | -8.92085 | -9.0506 | -7.41732 | -7.78667 | -7.0893 | -7.72023 |
| | $c_1$ | 2.48292 | 2.21116 | 2.13713 | 2.32761 | 2.50669 | 2.37975 |
| | $c_2$ | 1.59491 | 1.77806 | 1.52397 | 1.47050 | 1.16265 | 1.33992 |
| | $n_2$ | 366 | 209 | 282 | 438 | 144 | 147 |
| | $R^2$ | 0.938 | 0.957 | 0.946 | 0.935 | 0.965 | 0.944 |
| | $S_{y.x}$ (bd.ft.) | 102.50 | 104.38 | 95.14 | 100.64 | 151.58 | 112.66 |

## III. Data Sources

Data available for this study were from 458 trees felled on temporary plots and 1353 dendrmetered trees in the mixed conifer region of California. This data set is known as the "Tarif" data and was collected between 1975-77. See Figure 1 for location of study plots associated with felled trees.

Figure 1. Location of study plots by township.



Felled tree information was derived from temporary plots chosen equally from five site classes (Dunning (1942) site IA, I, II, III, IV), three stocking levels (poor < 40%; medium 40-70%; good > 70%), and three size classes (7-19 inches DBH; 20-35 in. DBH and > 35 in. DBH). On these sample plots 4 trees were selected for felling and cut into log lengths (16.5 feet). Up to three of the trees selected at a plot could be site trees with the fourth tree chosen restricted to the intermediate or suppressed crown class. Stump height was recorded. At log lengths the following were measured: diameter inside bark, double bark thickness, 10-year radial growth and ring count. Prism counts at the tree and 15 feet in each cardinal direction were performed.

For the dendrometered trees only DBH, total height, species, cumulative height and diameter inside bark were recorded. Because no prism counts were made near dendrometered trees the data could not be stratified by density classes. These trees served as a supplement to the felled trees so as to broaden the geographical base from which the data were drawn. The total number of trees in the sample by species and size are listed in Tables 3 through 8 of Appendix A.

## IV. Methods

A. Bark Factors. The 458 trees felled on temporary plots were used to develop bark factors to convert diameter outside bark (DOB) to diameter inside bark (dib) at breast height. Because DOB and dib were taken at stump height and subsequent log lengths a conversion for DOB and dib at breast height would enable additional data points to be estimated for use in defining stem form. The bark factor of these 458 trees was developed incorporating the three nearest section cuts to breast height. That is:

$$K_{ij} = \frac{\Sigma dib}{\Sigma DOB}$$

where $K_{ij}$ is the bark factor for tree i and species j. And the summation is over section cuts nearest to breast height.

B. Bark Regression Model. A bark regression model was needed for converting DOB to dib for the 1353 dendrometered trees. A regression model was formulated to predict the bark factor as a function of DBH, $DBH^2$, total height and total height squared. Dummy variables were included for each species so that species differences could be taken into account. A stepwise backward elimination preocedure was followed at $\alpha = .10$. The final model selected was:

$$K_{ij} = b_{oi} + b_1 DBH + b_2 H$$

where $b_{oi}$ is a constant term that varies for each species(i).

Fit statistics plus coefficients for the stepwise model as well as the model for each species or species group are given below. Residual plots did not indicate any deficiencies in the model with respect to the factors of diameter or total height. This model was used to generate diameter inside bark estimates at breast height for the 1353 dendrometered

trees described under Data Sources.

The model for each species or species group is given below.

| Species | $b_0$ | $b_1$ | $b_2$ | Fit Statistics |
|---|---|---|---|---|
| (DF, SP, PP) | .85375 | -.000895 | .000392 | $R^2$=0.18 |
| IC | .83138 | -.000895 | .000392 | $S_{y.x}$=0.031 |
| WF | .87459 | -.000895 | .000392 | n = 417 |
| RF | .87670 | -.000895 | .000392 | |

Without any real loss of information the mean values of the bark factors for each species can be used to convert DOB to dib at breast height. These average values are:

| Species | Average Bark Factor |
|---|---|
| DF | 0.8727 |
| PP | 0.8693 |
| SP | 0.8736 |
| WF | 0.8918 |
| RF | 0.8933 |
| IC | 0.8408 |

V. Taper Model

An extensive analysis of the data led to the development of a taper model derived from an S-shaped equation. The model so derived is given as:

$$d = b_1 DBH + b_2 DBH \ln(1 - \lambda(h/H)^{1/3}) \text{ or}$$

$$d = DBH[b_1 + b_2 \ln(1 - \lambda(h/H)^{1/3})] \text{ where}$$

d = predicted diameter inside bark (in.)

$b_1, b_2$ = regression coefficients
$\lambda$ = $1 - \exp(-b_1/b_2)$
h = height above a 1 foot stump
H = total height (ft.)
ln(x)= natural logarithm of x

To illustrate the use of this model let us compute diameter inside bark at log lengths of a ponderosa pine tree of DBH=20 and total height

of 100 feet.

Let $b_1$ = 1.01528 and $b_2$ = .31502, then $\lambda$ = 1-exp(-3.2229) = .96016 and d=dib is equal to $20[1.01528 + 0.31502 \ln(1-.96016(h/100)^{1/3})]$. The results of predicting dib at log lengths are presented below.

| h | h/H | d |
|---|---|---|
| 1.0 | 0.01 | 18.85 |
| 17.5 | 0.175 | 15.45 |
| 34.0 | 0.340 | 13.32 |
| 50.5 | 0.505 | 11.19 |
| 67.0 | 0.670 | 8.75 |
| 83.5 | 0.835 | 5.53 |
| 100.0 | 1.000 | 0.00 |

When evaluated at the base (i.e. for h=0) the predicted diameter is $b_1$DBH giving $b_1$ = (dib at base)/(DBH). Thus $b_1$ is the ratio of dib at the base of the tree to DBH. When evaluated at the tip (i.e. h=H) the predicted diameter is zero. Thus this model is constrained to pass through the tip of the tree.

A. Selection of Data Points

Owing to data storage limitations, regressions were limited to n=900 data points consisting of (h,d) combinations. These points were randomly chosen from all (h,d) points for a particular species. Table 9 shows the proportion of the entire data set utilized. Because data points were randomly chosen from the data set the target value of 900 data points was never exactly met. None the less the sample size ranges from 842 for incense cedar to 896 for Douglas fir and sugar pine.

A random selection scheme for (h,d) pairs was chosen to allow for essentially equal representation from all segments of the taper curve. This contrasts with randomly choosing trees which would have resulted in an increase in the number of points at the base relative to the upper stem since some trees are taller than others and thus there are fewer points in upper regions.

To investigate the effect of choosing randomly from among (h,d) pairs, two data sets for white fir were formed, each of size n=872. That is, two different randomly selected samples were drawn and modelling was done on each. Even though the parameter estimates for the taper equations were slightly different, the volume tables derived from each were virtually identical being within 1-3% of each other in board foot volumes to a 6-inch top.

Table 9. Summary of data used in model construction.

| | PP | DF | RF | WF | SP | IC |
|---|---|---|---|---|---|---|
| Total No. trees in data base | 408 | 262 | 297 | 480 | 197 | 154 |
| Total No. (h,d) pairs in data base | 2974 | 1811 | 2197 | 4725 | 1357 | 1166 |
| No. (h,d) pairs used in model | 863 | 897 | 874 | 860 | 897 | 843 |
| No. trees from which (h,d) pairs are selected | 359 | 244 | 283 | 415 | 167 | 154 |
| % of (h,d) pairs used | 29% | 50% | 40% | 18% | 66% | 72% |

B. Model Fit

The taper model was fit to each of the six species using nonlinear least squares techniques. Coefficients and fit statistics are presented in Table 10. Detailed analysis of bias, standard error and mean absolute deviation are presented in Tables 35 through 40 of part II. In general the models fit quite well and compared favorably with more complex taper models (see section II). The models displayed some slight biases with respect to relative height, but not with respect to total height or DBH classes.

Considering all equations jointly the range in bias relations are as follows:

| Relative height | range in bias (in.)[1/] | Average across species (in.) |
|---|---|---|
| 1'-4.5' | -.08 to 0.66 | 0.17 |
| 4.5'-.1H | -.62 to 0.04 | -0.27 |
| .1H-.2H | -.34 to -.74 | -0.57 |
| .2H-.4H | -.16 to 0.39 | 0.05 |
| .4H-.6H | .04 to 0.43 | 0.26 |
| .6H-.8H | -.33 to +.22 | -0.28 |
| .8H-1.H | -.44 to 0.80 | 0.58 |

These biases although significant are not substantial given the usual level of accuracy in predicting upper stem diameters. Indeed given the fact that one model is used for all height and diameter classes for a given species they performed well.

[1/] Negative values imply overestimates and positive values imply underestimates.

Table 10. Coefficients and fit statistics for the taper equation
$d = DBH[b_1 + b_2 \ln (1-\lambda(h/H)^{1/3})]$ where $\lambda=1-\exp(-b_1/b_2)$

| | Species | | | | | |
|---|---|---|---|---|---|---|
| | PP | DF | RF | WF | SP | IC |
| $b_1$ | 1.01528 | 1.00689 | 1.04533 | 1.04417 | 1.00923 | 1.00035 |
| $b_2$ | 0.31502 | 0.33971 | 0.32970 | 0.33885 | 0.32140 | 0.39311 |
| $n_2$ | 862 | 896 | 873 | 859 | 896 | 842 |
| $R^2$ | 0.966 | 0.978 | 0.952 | 0.952 | 0.970 | 0.952 |
| $S_{y.x}$ | 1.438 | 1.271 | 1.700 | 1.534 | 1.653 | 1.909 |

$R^2$ = Squared multiple correlation coefficient
$S_{y.x}$ = Standard deviation of the residuals about the regression of y on x

## VI. Scaling Routines

### A. Cubic Volume.

Cubic volume can be determined without the use of scaling routines. This is possible because the cubic volume can be determined using a calculus technique know as generating a solid of revolution. The general form is:

$$V = \int_a^b \pi R^2 dh = \int_a^b \pi \left(\frac{d}{2}\right)^2 dh$$

By substituting $d = b_1 DBH + b_2 DBH \ln (1-\lambda (h/H)^{1/3})$ for d and using a change of variables we can obtain an expression for volume that allows for directly determining volume obviating the use of scaling routines (see Appendix B).

### B. Board Foot Volume

For each DBH and height class in the table the taper equation was used to evaluate the stem profile for a specified size class. That is, by specifying DBH and H we can generate stem profile to predict scaling diameters at log lengths. Board foot scale was performed using a 1.0 foot stump and a log length of 16.5 feet which included a 0.5 foot trim allowance.[1/] After predicting scaling diameters for log lengths, volumes for individual logs were determined using the following equation (Bruce and Schumacher, 1950):

$$V = .79d^2 - 2d - 4 \qquad d = \text{d.i.b. at small end of the log}$$

[1/] These specifications were adopted at the October 1980 meeting of the Norther California Forest Yield Cooperative.

Top logs less than 16.5 feet were scaled as whole logs and then reduced in volume by a factor of length/16. If the top log was less than 8.5 feet (including trim) the log was assigned a volume of zero.

For example, a 13.7 foot log is considered to have 13/16 of the volume of a whole log whereas a 13.4 foot log contains 12/16 of the whole log volume since it lacks the 6 inch trim requirement of a 13 foot log. The Scribner volume equation was used for scaling diameters of 8 inches and above. For scaling diameters of 6.0 and 7.0 inches the Scribner volume table values of 20.0 and 30.0 board feet, respectively, were used instead of the Scribner volume equation values. This is because the Scribner volume equation is not accurate for trees this small.

## VI. Volume Tables

Volume tables for each species are presented for the following:

A. Cubic foot volume to a 4-inch top (Tables 11-16)
B. Cubic foot volume to a 6-inch top (Tables 17-22)
C. Board foot volume to a 6-inch top (Tables 23-28)
D. Board foot volume to a 8-inch top (Tables 29-34)

## Part II. Taper equations for mixed conifers.

### I. Model Development

Initial plotting of height versus diameter curves for each species revealed a significant variance in diameters at given heights. For this reason transformations were considered to allow for an improved model fit. Demaerschalk ('1971, '1972, '1973) and others (e.g., Max and Burkhart ('1976)) have employed relative height and relative diameter as an effective transform.[1/]. This study models relative diameter as a function of relative height.

Objectives were to develop a simple model (i.e. with few parameters) that could accurately describe stem form. Additionally this equation should be integrable so that cubic foot volumes could be obtained directly, obviating the need for a cubic foot scaling routine.

### II. Choice of model forms

Starting with Behre ('1927) much of the work in this field has centered around describing stem curves as polynomials of order two or greater. For example, Kozak et al ('1968) used a second order polynomial in relative height; Goulding and Murray ('1976) used a fifth order polynomial. The principal weakness of this model type has been the inability to characterize the lower portion of the tree with significant basal swelling (Sterta, '1980). Bruce et al ('1976) used polynomial models with higher powers to represent the swelling that occurs below the basal diameter(DBH).

Alternatively, polynomial regressions with two or more equations can be spliced together to better track stem form. Demaerschalk and Kozak ('1977) joined two functions at the inflection point approximately 20 to 25% from ground level while maintaining continuity at the join points. Although having a small bias at the base, the equations predicted upper stem diameters well. In a similar fashion Max and Burkhart ('1976) used segmented polynomials with two and three submodels to predict taper in loblolly pines. This approach produced essentially unbiased models and did not require specification of where join points occur.

A current consideration proposed by Demaerschalk ('1971, '1972, '1973) and Munro and Demaerschalk ('1974) is that the integrand of the taper equation should be indentical to the prediction from existing volume equations. While it is a goal to have these two predictions as close to one another as possible the solution proposed by Demaerschalk unduly restricts the form of the taper function. In essence it requires that

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1/ Relative height is height above ground/total height and relative diameter in diameter inside bark/DBH.

the integrand of the taper function be equal to a constant. Indeed, the form of equations considered to be compatible (simple function of relative height) is only a very small subset of models that are compatible. This is because any integrable taper function (in relative height) can be made compatible to currently existing volume equations.

Another area of taper research includes functions that inherently have inflection points. Such attempts include use of cosine functions (Alder, 1978) and Bitterlich's (1979) use of trigonometric functions. The work presented in this paper may be placed in this latter category.

## III. Model Derivation

### A. Graphic Derivation

Let $y = A(1-\exp(-cx))^m$ where $y = 1-h/H$ and $x = d/DBH$. This is the integral form of the Chapman-Richards function and can be considered as a model of stem form (Krumland and Wensel (1978)). See Figure 2 for initial set-up. By redefining $y = h/H$ one obtains the traditional stem profile (see Figure 3a). Redefining the base as $a - d/DBH$ forms a mirror image (see Figure 3b).

Figure 2
Chapman-Richards Function

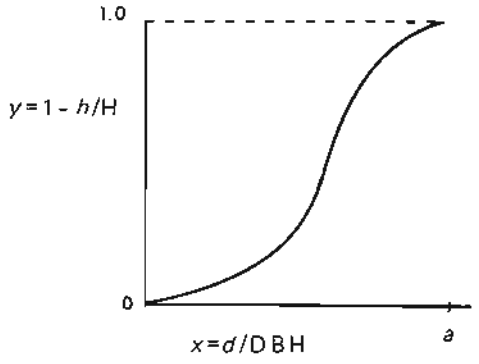



Figure 3a
Stem Profile

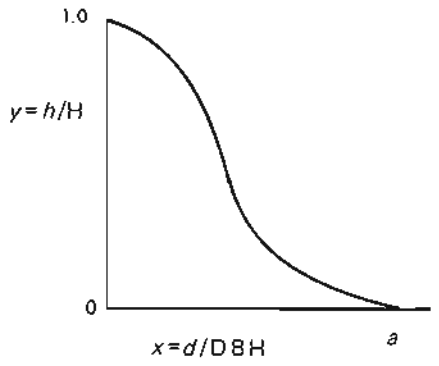
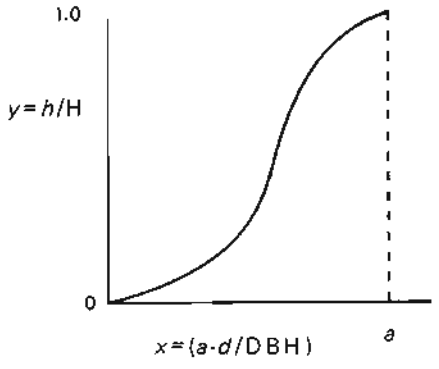



Figure 3b
Stem Profile



B. Mathematical Derivation

Let $y = A(1-\exp(-cx))^m$ where $x = a-d/DBH$, $y = h/H$, d=dib, and a=(dib at stump)/DBH. Solving for x yields:

$$x = -\frac{1}{c}\ln[1 - (y/A)^{1/m}] \qquad [1]$$

or equivalently

$$d = DBH[a + \frac{1}{c}\ln(1 - y/A)^{1/m})] \qquad [2]$$

Letting $c' = \frac{1}{c}$ gives

$$d = DBH[a + c'\ln(1 - (y/A)^{1/m}] \qquad [3]$$

At the top of the tree, the relative height (h/H) should be equal to one and the diameter (d) should be zero. Substituting these values into equation [3] and solving for A we get:

$$A = (1-\exp(-a/c'))^{-m} \qquad [4]$$

C. General Model

Substituting expression[4] into equation[3] and letting $b_1 = a$ and $b_2 = c'$ gives:

$$d = DBH[b_1+b_2\ln(1-(h/H)^{1/m}(1-e^{-b_1/b_2})] \qquad [I]$$

This is the conditioned form of the taper equation that is constrained to go through the tip of the tree.

Preliminary testing of this model with 16-20 inch DBH Ponderosa pine resulted in 1/m = .349 (S.E. = .06). When 1/m was restricted to be 1/3 there was a subsequent drop in $R^2$ of only 0.001. With a larger parameter version of model [I] Krumland and Wensel (1978) reported a 1/m value of .387 for coast redwood (Sequoia sempervirens). These results coupled with the unitegrability of model [I] when m is not an integer led to the fixing of 1/m at 1/3.

$$d = DBH[b_1+b_2\ln[1-\lambda(h/H)^{1/3})] \qquad [II]$$

$$\lambda = 1-\exp(-b_1/b_2)$$

IV. Analysis and Results

A. Comparison with Max and Burkhart's Model

Evaluation of equation [II] against Max and Burkharts (1976) segmented polynomial (termed model [III]) was performed for each species on the same data set used to estimate coefficients for model [II]. Cao,

Burkhart and Max (1980) evaluated several taper equations and found the segmented polynomial to out-perform the others tested when estimating tree diameters at various points along the stem. Demaerschalk's (1973) compatible taper equation ranked last of six tested. Max and Burkharts model (Model III) is given as:

$$d^2 = b_1 DBH^2(h/H - 1) + b_2 DBH^2(h^2/H^2 - 1) \qquad [III]$$

$$+ b_3 DBH^2(a_1 - h/H)^2 I_1 + b_4 DBH^2(a_2 - h/H)^2 I_2$$

where $I_i = 1. \quad h/H \leq a_i; \quad i=1,2$

$I_i = 0. \quad h/H > a_i$

The following criteria were used to evaluate the models in terms of diameters:

1) standard deviation (inches) $\Sigma(d_i - \hat{d}_i)^2/n-1$

2) average bias (inches) $\Sigma(d_i - \hat{d}_i)/n$

3) Mean absolute deviation (inches) $\Sigma|d_i - \hat{d}_i|/n$

where $\hat{d}_i$ is predicted diameter at height $h_i$ and $d_i$ is the actual measurement at this point.

Results are presented in Tables 35 through 40.

Table 35. Statistical evaluation of Models [II] and [III].

Ponderosa Pine

| | Standard Dev.(in.) | | Bias (in.) | | Mean Abs. Dev. (in.) | |
|---|---|---|---|---|---|---|
| | Model | | Model | | Model | |
| Relative height | II | III | II | III | II | III |
| 1.0'-4.5' | 1.08 | 1.04 | -.08 | -0.28 | 0.78 | 0.74 |
| 4.5'-.1 | 0.73 | 0.66 | -0.28 | 0.18 | 0.37 | 0.44 |
| .1 -.2 | 1.44 | 1.40 | -0.53 | -0.07 | 1.08 | 1.09 |
| .2 -.4 | 1.32 | 1.30 | 0.19 | 0.14 | 1.01 | 0.99 |
| .4 -.6 | 1.45 | 1.38 | 0.35 | 0.15 | 1.00 | 0.95 |
| .6 -.8 | 1.56 | 1.52 | -0.25 | -0.07 | 1.20 | 1.12 |
| .8-1.0 | 1.79 | 1.66 | -0.44 | 0.18 | 1.35 | 1.19 |
| Total | 1.41 | 1.35 | -0.10 | 0.04 | 1.01 | 0.96 |

Table 36. Statistical evaluation of model [II] and [III].

Douglas Fir

| | Standard Dev.(in.) | | Bias (in.) | | Mean Abs. Dev. (in.) | |
|---|---|---|---|---|---|---|
| | Model | | Model | | Model | |
| Relative height | II | III | II | III | II | III |
| 1.0'-4.5' | 1.10 | 1.07 | 0.15 | -0.22 | 0.69 | 0.76 |
| 4.5'-.1 | 1.07 | 1.05 | -0.23 | -0.18 | 0.70 | 0.71 |
| .1 -.2 | 1.09 | 1.16 | -0.34 | -0.51 | 0.84 | 0.88 |
| .2 -.4 | 1.35 | 1.39 | 0.01 | -0.20 | 0.96 | 0.95 |
| .4 -.6 | 1.27 | 1.26 | 0.22 | 0.17 | 0.94 | 0.93 |
| .6 -.8 | 1.17 | 1.17 | +0.10 | 0.05 | 0.89 | 0.88 |
| .8-1.0 | 1.22 | 1.34 | -0.13 | -0.52 | 0.97 | 1.10 |
| Total | 1.19 | 1.20 | 0.01 | -0.16 | 0.84 | 0.87 |

Table 37. Statistical evaluation of model [II] and [III].

Red Fir

| | Standard Dev.(in.) | | Bias (in.) | | Mean Abs. Dev. (in.) | |
|---|---|---|---|---|---|---|
| | Model | | Model | | Model | |
| Relative height | II | III | II | III | II | III |
| 1.0'-4.5' | 2.40 | 1.89 | 0.66 | -0.22 | 1.53 | 1.27 |
| 4.5'-.1 | 1.29 | 1.04 | -0.62 | 0.09 | 0.79 | 0.80 |
| .1 -.2 | 1.64 | 1.50 | -0.74 | -0.49 | 1.25 | 1.15 |
| .2 -.4 | 1.40 | 1.41 | -0.16 | -0.25 | 1.09 | 1.10 |
| .4 -.6 | 1.36 | 1.35 | 0.25 | -0.03 | 1.10 | 1.09 |
| .6 -.8 | 1.51 | 1.53 | +0.22 | -0.22 | 1.14 | 1.19 |
| .8-1.0 | 1.80 | 1.78 | 0.49 | -0.32 | 1.32 | 1.35 |
| Total | 1.66 | 1.52 | 0.08 | -0.19 | 1.17 | 1.14 |

Table 38. Coefficients and fit statistics for model [II] and [III].

White Fir

| | Standard Error (in.) | | Bias (in.) | | Mean Abs. Dev. (in.) | |
|---|---|---|---|---|---|---|
| | Model | | Model | | Model | |
| Relative height | II | III | II | III | II | III |
| 1.0'-4.5' | 1.47 | 1.18 | 0.04 | -0.11 | 0.92 | 0.73 |
| 4.5'-.1 | 0.82 | 0.76 | -0.29 | 0.20 | 0.46 | 0.58 |
| .1 -.2 | 1.46 | 1.43 | -0.66 | -0.60 | 1.16 | 1.14 |
| .2 -.4 | 1.45 | 1.41 | -0.39 | 0.03 | 1.12 | 1.06 |
| .4 -.6 | 1.35 | 1.32 | -0.28 | -0.17 | 1.09 | 1.06 |
| .6 -.8 | 1.67 | 1.64 | -0.06 | -0.05 | 1.25 | 1.23 |
| .8-1.0 | 1.92 | 1.84 | -0.23 | 0.13 | 1.47 | 1.35 |
| Total | 1.50 | 1.43 | -0.02 | -0.06 | 1.10 | 1.05 |

Table 39. Coefficients and fit statistics for model [II] and [III].

Sugar Pine

| | Standard Error (in.) | | Bias (in.) | | Mean Abs. Dev. (in.) | |
|---|---|---|---|---|---|---|
| | Model | | Model | | Model | |
| Relative height | II | III | II | III | II | III |
| 1.0'-4.5' | 1.35 | 1.12 | 0.02 | -0.11 | 0.96 | 0.79 |
| 4.5'-.1 | 0.88 | 0.80 | -0.26 | 0.26 | 0.51 | 0.66 |
| .1 -.2 | 1.72 | 1.69 | -0.66 | -0.55 | 1.32 | 1.31 |
| .2 -.4 | 1.48 | 1.48 | 0.03 | -0.05 | 1.11 | 1.11 |
| .4 -.6 | 1.76 | 1.78 | 0.43 | 0.47 | 1.29 | 1.30 |
| .6 -.8 | 1.74 | 1.73 | -0.33 | -0.14 | 1.34 | 1.32 |
| .8-1.0 | 1.95 | 1.82 | -0.14 | 0.05 | 1.55 | 1.45 |
| Total | 1.62 | 1.57 | -0.09 | 0.01 | 1.20 | 1.17 |

Table 40. Coefficients and fit statistics for model [II] and [III].

Incense Cedar

| | Standard Error (in.) | | Bias (in.) | | Mean Abs. Dev. (in.) | |
|---|---|---|---|---|---|---|
| | Model | | Model | | Model | |
| Relative height | II | III | II | III | II | III |
| 1.0'-4.5' | 1.66 | 1.67 | 0.18 | -0.19 | 0.94 | 1.05 |
| 4.5'-.1 | 0.95 | 1.00 | 0.04 | 0.23 | 0.71 | 0.84 |
| .1 -.2 | 2.29 | 2.60 | -0.50 | -1.04 | 1.71 | 1.99 |
| .2 -.4 | 1.71 | 1.79 | -0.15 | -0.50 | 1.32 | 1.40 |
| .4 -.6 | 1.82 | 1.89 | 0.04 | -0.10 | 1.40 | 1.47 |
| .6 -.8 | 1.98 | 1.94 | 0.15 | -0.02 | 1.52 | 1.46 |
| .8-1.0 | 2.15 | 2.09 | 0.80 | 0.39 | 1.64 | 1.59 |
| Total | 1.84 | 1.89 | 0.12 | -0.13 | 1.34 | 1.39 |

It is evident that both standard errors and mean absolute deviations are virtually identical for the two models on every region of the tree from the base to the tip with Max and Burkharts model being very slightly lower. There are some differences in biases and direction of bias. Between a 1 foot stump and breast height model (II) generally underpredicts whereas model (III) overpredicts. Between breast height and 2/10 of total height model (II) almost always slightly over predicts. However between 4.5 feet and 1/10 of height model (III) underpredicts and then overpredicts between 1/10 and 2/10 of total height. Between 2/10 and 4/10 of total height Model (II) tends to underpredict with model (III) tending to overpredict. Between 4/10 and 6/10 of total height both models tend to underpredict. In the range of 6/10 and 8/10 of total height both models have a slight tendency to overpredict. In the uppermost region (.8H-1.0H) there is no tendency in the biases. These relationships can be summarized in the following table.

| Relative Height | Model (II) av. bias across all species | Model (III) Burkhart-av. bias across all species |
|---|---|---|
| 1'- 4.5' | .162 range (-.08 to .66) | -.188 range (-.11 to -.28) |
| 4.5'- .1H | -.273 range (-.62 to .04) | .130 range (-.18 to .26) |
| 0.1H- .2H | -.572 range (-.74 to -.34) | -.543 range (-1.04 to -.07) |
| 0.2H- .4H | .050 range (-.16 to .39) | -.138 range (-.50 to .14) |
| 0.4H- .6H | .262 range (.04 to .43) | .082 range (-.17 to .47) |
| 0.6H- .8H | -.028 range (-.33 to +.22) | -.075 range (-.22 to .05) |
| 0.8H-1.0H | .058 range (-.44 to .80) | -.015 range (-.52 to .39) |

## V. Conclusions

In a study by Cao,Burkhart and Max (1980) six taper equations were evaluated with a segmented polynomial (denoted Model III) judged superior in predicting upper stem diameters. The model derived from a

sigmoid equation (Model II) was tested on six conifer species of northern California and compared with Model III. As judged by standard deviation and mean absolute deviation the two models compared closely for all species considered. There were some differences in direction of bias, but the degree of bias was similar for both models although the levels varied considerably by relative height and species. In light of the similarity in performance of these two models, model (II) is deemed preferable since it necessitates estimating only 2 parameters whereas model (III) is a 5 parameter model.

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APPENDIX A.

Numbers of Sample Trees by Size Classes.
Table 3. Distribution of Sample Trees by Size Class.

| DBH | Ponderosa Pine<br>Number of Trees by Size Class<br>Total Height | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | 170 | 190 | |
| <6 | 1 | | | | | | | | | | 1 |
| 6. | | 1 | | | | | | | | | 1 |
| 8. | | 1 | 3 | 1 | | | | | | | 5 |
| 10. | | | 3 | 2 | | | | | | | 5 |
| 12. | | 2 | 7 | 10 | 3 | | | | | | 22 |
| 14. | | | 8 | 8 | 21 | 2 | | | | | 39 |
| 16. | | | 2 | 18 | 32 | 6 | | | | | 58 |
| 18. | | | 1 | 8 | 29 | 9 | | | | | 47 |
| 20. | | | | 1 | 26 | 11 | 1 | | | | 39 |
| 22. | | | | 4 | 17 | 14 | 2 | | | | 37 |
| 24. | | | | 3 | 12 | 18 | 3 | | | | 36 |
| 26. | | | | 1 | 7 | 10 | 3 | 2 | | | 23 |
| 28. | | | | 1 | 5 | 7 | 5 | | | | 18 |
| 30. | | | | | | 5 | 3 | | | | 8 |
| 32. | | | | | 2 | 1 | 2 | 1 | | | 6 |
| 34. | | | | | | 5 | 1 | 2 | | | 8 |
| 36. | | | | | | 2 | 6 | 1 | 3 | | 12 |
| 38. | | | | | 1 | 5 | 1 | 2 | 2 | | 11 |
| 40. | | | | | | | 1 | 1 | | | 2 |
| 42. | | | | | | | 1 | 1 | | | 2 |
| 44. | | | | | | | | 1 | | | 1 |
| 46. | | | | | | | 2 | 1 | | | 3 |
| 48. | | | | | | | | | 1 | | 1 |
| 50. | | | | | | | | | | 1 | 1 |
| 52. | | | | | 1 | | | | | | 1 |
| 58. | | | | | | | | 1 | | | 1 |
| Total | 1 | 4 | 24 | 57 | 156 | 95 | 31 | 13 | 6 | 1 | 388 |

Table 4. Distribution of Sample Trees by Size Class.

| DBH | Douglas Fir<br>Number of Trees by Size Class<br>Total Height | | | | | | | | | | Row Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | 170 | 190 | |
| <6 | 1 | | | | | | | | | | 1 |
| 6. | | 2 | | | | | | | | | 2 |
| 8. | | 1 | 11 | 2 | | | | | | | 14 |
| 10. | | | 12 | 4 | 2 | | | | | | 18 |
| 12. | | | 5 | 9 | 1 | | | | | | 15 |
| 14. | | | 1 | 16 | 9 | 2 | | | | | 28 |
| 16. | | | 3 | 8 | 11 | | | | | | 22 |
| 18. | | | 1 | 3 | 5 | 13 | 2 | | | | 24 |
| 20. | | | | | 5 | 3 | 2 | 1 | | | 11 |
| 22. | | | | | 7 | 12 | | | | | 19 |
| 24. | | | | | 6 | 8 | 2 | | | | 16 |
| 26. | | | | | 3 | 3 | 5 | 1 | 1 | | 13 |
| 28. | | | | | 1 | 4 | 4 | 1 | | | 10 |
| 30. | | | | | 1 | 2 | 2 | 2 | | | 7 |
| 32. | | | | | | 2 | 6 | | 2 | | 10 |
| 34. | | | | | 2 | 2 | 4 | 4 | | | 12 |
| 36. | | | | | 1 | | 3 | 2 | | | 6 |
| 38. | | | | | | | 1 | 1 | | | 2 |
| 40. | | | | | | | 1 | | | | 1 |
| 42. | | | | | | 1 | 1 | 3 | | 1 | 6 |
| 44. | | | | | | | 2 | | 1 | | 3 |
| 46. | | | | | | | 1 | 2 | 1 | | 4 |
| 54. | | | | | | | 1 | | | | 1 |
| Total | 1 | 3 | 33 | 42 | 54 | 52 | 37 | 17 | 5 | 1 | 245 |

Table 5. Distribution of Sample Trees by Size Class.

| DBH | Red Fir<br>Number of Trees by Size Class<br>Total Height | | | | | | | | | Row Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | 170 | |
| <8 | 1 | | | | | | | | | 1 |
| 8. | | | 1 | | | | | | | 1 |
| 10. | | | 1 | | | | | | | 1 |
| 12. | | | 3 | 3 | 2 | | | | | 8 |
| 14. | | 2 | 7 | 11 | 6 | | | | | 26 |
| 16. | | 1 | 14 | 9 | 13 | 2 | | | | 39 |
| 18. | | | 5 | 8 | 7 | 2 | | | | 22 |
| 20. | | | 1 | 9 | 13 | 9 | | | | 32 |
| 22. | | | 2 | 9 | 14 | 5 | 3 | | | 33 |
| 24. | | | | 7 | 14 | 5 | | | | 26 |
| 26. | | | | 2 | 13 | 4 | | | | 19 |
| 28. | | | | 4 | 4 | 9 | 1 | | | 18 |
| 30. | | | | 2 | 5 | 10 | 1 | | | 18 |
| 32. | | | | 1 | 4 | 1 | 2 | | | 8 |
| 34. | | | | | 5 | 3 | 3 | | | 11 |
| 36. | | | | | 2 | 2 | 2 | 1 | | 7 |
| 38. | | | | 1 | 2 | 4 | 2 | 1 | | 10 |
| 40. | | | | | 2 | | 1 | | | 3 |
| 42. | | | | | | 2 | 1 | | | 3 |
| 44. | | | | | 1 | | | | | 1 |
| 48. | | | | | | | | 1 | 1 | 2 |
| Total | 1 | 3 | 34 | 66 | 107 | 58 | 16 | 3 | 1 | 289 |

Table 6. Distribution of Sample Trees by Size Class.

| White Fir | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DBH | Number of Trees by Size Class Total Height | | | | | | | | Row Total |
| | 10 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | |
| <6 | 1 | 1 | | | | | | | 2 |
| 6. | | 2 | 2 | | | | | | 4 |
| 8. | | 3 | 5 | | | | | | 8 |
| 10. | | | 4 | 5 | | | | | 9 |
| 12. | | | 3 | 10 | 3 | | | | 16 |
| 14. | | | 10 | 19 | 6 | | | | 35 |
| 16. | | | 5 | 18 | 18 | 1 | | | 42 |
| 18. | | | 4 | 16 | 30 | 7 | | | 57 |
| 20. | | | 1 | 4 | 40 | 11 | 2 | | 58 |
| 22. | | | 1 | 7 | 38 | 12 | | | 58 |
| 24. | | | | 2 | 19 | 25 | | 1 | 47 |
| 26. | | | | | 14 | 20 | 7 | | 41 |
| 28. | | | | | 3 | 15 | 4 | 2 | 24 |
| 30. | | | | | 3 | 11 | 7 | | 21 |
| 32. | | | | | 1 | 10 | 7 | | 18 |
| 34. | | | | | 1 | 3 | 6 | 4 | 14 |
| 36. | | | | | | 2 | | 1 | 3 |
| 38. | | | | | | 2 | 1 | | 3 |
| 40. | | | | | | 1 | 1 | | 2 |
| 42. | | | | | | | 1 | | 1 |
| 44. | | | | | | | 2 | | 2 |
| 46. | | | | | | 1 | | | 1 |
| Total | 1 | 6 | 35 | 81 | 176 | 121 | 38 | 8 | 466 |

Table 7. Distribution of Sample Trees by Size Class.

| Sugar Pine | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DBH | Number of Trees by Size Class Total Height | | | | | | | | | Row Total |
| | 10 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | 170 | |
| <8 | 1 | | | | | | | | | 1 |
| 8. | | 2 | 3 | | | | | | | 5 |
| 10. | | | 5 | | | | | | | 5 |
| 12. | | | 4 | 6 | | | | | | 10 |
| 14. | | | 4 | 6 | | | | | | 10 |
| 16. | | | 1 | 3 | 4 | | | | | 8 |
| 18. | | | | 5 | 4 | 1 | | | | 10 |
| 20. | | | | 1 | 12 | 1 | | | | 14 |
| 22. | | | | 2 | 3 | 2 | 1 | | | 8 |
| 24. | | | | 1 | 1 | 2 | 2 | | | 6 |
| 26. | | | | | 8 | 4 | 2 | | | 14 |
| 28. | | | | | 3 | 8 | 2 | 1 | | 14 |
| 30. | | | | | 2 | 2 | | | | 4 |
| 32. | | | | | 1 | 4 | 2 | 1 | 1 | 9 |
| 34. | | | | | | 6 | 7 | 4 | | 17 |
| 36. | | | | | | 1 | 2 | 2 | | 5 |
| 38. | | | | | | | | 4 | | 4 |
| 40. | | | | | | 2 | 2 | 1 | | 5 |
| 42. | | | | | | 2 | 4 | 2 | | 8 |
| 44. | | | | | | | 2 | 1 | | 3 |
| 46. | | | | | | | | 1 | | 1 |
| 48. | | | | | | | | 2 | 1 | 3 |
| 50. | | | | | | | | 2 | | 2 |
| 52. | | | | | | | | 2 | | 2 |
| 54. | | | | | | | 2 | | | 2 |
| 56. | | | | | | | | 1 | | 1 |
| Total | 1 | 2 | 17 | 24 | 38 | 35 | 28 | 24 | 2 | 171 |

Table 8. Distribution of Sample Trees by Size Class.

| | Incense Cedar | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DBH | Number of Trees by Size Class Total Height | | | | | | | | Row Total |
| | 10 | 30 | 50 | 70 | 90 | 110 | 130 | 150 | |
| <6 | 1 | | | | | | | | 1 |
| 6. | 1 | | 1 | | | | | | 2 |
| 8. | | 1 | 1 | | | | | | 2 |
| 10. | | | 3 | | | | | | 3 |
| 12. | | | | 1 | | | | | 1 |
| 14. | | | 5 | 3 | | | | | 8 |
| 16. | | 2 | 4 | 3 | | | | | 9 |
| 18. | | | 5 | 6 | 1 | | | | 12 |
| 20. | | | 1 | 4 | 3 | | | | 8 |
| 22. | | | 4 | 4 | 4 | 1 | | | 13 |
| 24. | | | 3 | 6 | 8 | 1 | | | 18 |
| 26. | | | 1 | | 5 | 1 | | | 7 |
| 28. | | | 1 | 3 | 10 | 3 | | | 17 |
| 30. | | | | 3 | 5 | 2 | | | 10 |
| 32. | | | | | 3 | 1 | | | 4 |
| 34. | | | | 2 | 3 | 3 | 3 | 1 | 12 |
| 36. | | | | | | 3 | | | 3 |
| 38. | | | | | 5 | 3 | | | 8 |
| 40. | | | | | 1 | 2 | | | 3 |
| 42. | | | | | | | 2 | | 2 |
| 44. | | | | | | 1 | 2 | | 3 |
| 46. | | | | | | | 1 | | 1 |
| 48. | | | | | 1 | | | | 1 |
| 50. | | | | | | 2 | 1 | | 3 |
| 52. | | | | | | | 2 | | 2 |
| 54. | | | | | | | 1 | | 1 |
| 64. | | | | | | | 1 | | 1 |
| Total | 2 | 3 | 29 | 35 | 49 | 23 | 13 | 1 | 155 |

APPENDIX B .

The integral form of equation (II) for use in direct evaluation of cubic foot contents to any height.

Let $D$ = DBH

$H$ = Total height

$h_u$ = height to top point in the upper stem.

$h_b$ = height to some base point (not necessarily the stump)

$h$ = height to some point in the stem between h and $h_b$.

$\lambda = 1 - \exp(-b_1/b_2)$

$q = 1 - \lambda(h/H)^{1/3}$

$K_1 = .00545\ b_1^2 DBH^2$

$K_2 = .00545\ 2b_1 b_2 DBH^2$

$K_3 = .00545\ b_2^2 DBH^2$

$a = h_b$

$b = h_u$

$a' = a/H = h_b/H$

$b' = b/H = h_u/H$

$a'' = 1 - K(a')^{1/3}$

$b'' = 1 - K(b')^{1/3}$

$d = DBH[b_1 + b_2 \ln(1 - \lambda(h/H)^{1/3})]$

Then volume is given as:

$$V = \int_a^b .00545\ d^2(h)dh = K_1 H[b' - a']$$

$$+ K_2 H[-\frac{3}{K^3}]\ [q \ln(q) - q - q^2 \ln(q) + \frac{q^2}{2} + \frac{q^3}{3} \ln(q) - \frac{q^3}{9}]\Big|_a^b$$

$$+ K_3 H[-\frac{3}{K^3}]\ [\frac{q^3 \ln^2(q)}{3} - q^2 \ln^2(q) + q \ln^2(q) - \frac{2}{9}q^3 \ln(q)$$

$$+ q^2 \ln(q) - 2q \ln(q) + \frac{2}{27}q^3 - \frac{q^2}{2} + 2q]\Big|_a^b$$

# APPENDIX C. VOLUME TABLES


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TABLE II

Gross cubic-foot volume table to a 1 ft. stump -- 4 inch top

Northern California Forest Yield Cooperative

ponderosa pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 10 | 4 | 6 | 8 | 10 | 11 | 13 | 15 | 17 | 18 | 20 | 22 | 24 | 25 | 27 | 29 | 31 | 32 | 34 | 36 | 38 |
| 12 | 7 | 9 | 12 | 14 | 17 | 20 | 22 | 25 | 28 | 30 | 33 | 35 | 38 | 41 | 43 | 46 | 48 | 51 | 54 | 56 |
| 14 | 9 | 13 | 17 | 20 | 24 | 27 | 31 | 35 | 38 | 42 | 45 | 49 | 53 | 56 | 60 | 63 | 67 | 71 | 74 | 78 |
| 16 | 12 | 17 | 22 | 27 | 31 | 36 | 41 | 46 | 50 | 55 | 60 | 64 | 69 | 74 | 79 | 83 | 88 | 93 | 98 | 102 |
| 18 | 16 | 22 | 28 | 34 | 40 | 46 | 52 | 58 | 64 | 70 | 76 | 82 | 88 | 94 | 100 | 106 | 112 | 118 | 124 | 130 |
| 20 | 20 | 27 | 35 | 42 | 50 | 57 | 64 | 72 | 79 | 87 | 94 | 102 | 109 | 116 | 124 | 131 | 139 | 146 | 154 | 161 |
| 22 | 24 | 33 | 42 | 51 | 60 | 69 | 78 | 87 | 96 | 105 | 114 | 123 | 132 | 141 | 150 | 159 | 168 | 177 | 186 | 195 |
| 24 | 29 | 40 | 50 | 61 | 72 | 82 | 93 | 104 | 115 | 125 | 136 | 147 | 158 | 168 | 179 | 190 | 200 | 211 | 222 | 233 |
| 26 | 34 | 47 | 59 | 72 | 84 | 97 | 110 | 122 | 135 | 147 | 160 | 173 | 185 | 198 | 210 | 223 | 235 | 248 | 261 | 273 |
| 28 | 40 | 54 | 69 | 83 | 98 | 113 | 127 | 142 | 156 | 171 | 186 | 200 | 215 | 229 | 244 | 259 | 273 | 288 | 303 | 317 |
| 30 | 46 | 62 | 79 | 96 | 113 | 129 | 146 | 163 | 180 | 196 | 213 | 230 | 247 | 264 | 280 | 297 | 314 | 331 | 347 | 364 |
| 32 | 52 | 71 | 90 | 109 | 128 | 147 | 166 | 185 | 205 | 224 | 243 | 262 | 281 | 300 | 319 | 338 | 357 | 376 | 396 | 415 |
| 34 | 59 | 80 | 102 | 123 | 145 | 166 | 188 | 209 | 231 | 253 | 274 | 296 | 317 | 339 | 360 | 382 | 404 | 425 | 447 | 468 |
| 36 | 66 | 90 | 114 | 138 | 162 | 187 | 211 | 235 | 259 | 283 | 307 | 332 | 356 | 380 | 404 | 428 | 453 | 477 | 501 | 525 |
| 38 | 74 | 100 | 127 | 154 | 181 | 208 | 235 | 262 | 289 | 316 | 343 | 370 | 397 | 423 | 450 | 477 | 504 | 531 | 558 | 585 |
| 40 | 82 | 111 | 141 | 171 | 201 | 231 | 260 | 290 | 320 | 350 | 380 | 410 | 439 | 469 | 499 | 529 | 559 | 589 | 619 | 648 |
| 42 | 90 | 123 | 156 | 188 | 221 | 254 | 287 | 320 | 353 | 386 | 419 | 452 | 485 | 518 | 550 | 583 | 616 | 649 | 682 | 715 |
| 44 | 99 | 135 | 171 | 207 | 243 | 279 | 315 | 351 | 387 | 424 | 460 | 496 | 532 | 568 | 604 | 640 | 676 | 713 | 749 | 785 |
| 46 | 108 | 147 | 187 | 226 | 266 | 305 | 345 | 384 | 423 | 463 | 502 | 542 | 581 | 621 | 660 | 700 | 739 | 779 | 818 | 858 |
| 48 | 118 | 161 | 203 | 246 | 289 | 332 | 375 | 418 | 461 | 504 | 547 | 590 | 633 | 676 | 719 | 762 | 805 | 848 | 891 | 934 |
| 50 | 128 | 174 | 221 | 267 | 314 | 361 | 407 | 454 | 500 | 547 | 594 | 640 | 687 | 734 | 780 | 827 | 874 | 920 | 967 | 1014 |
| 52 | 138 | 188 | 239 | 289 | 340 | 390 | 440 | 491 | 541 | 592 | 642 | 693 | 743 | 794 | 844 | 895 | 945 | 996 | 1046 | 1097 |
| 54 | 149 | 203 | 258 | 312 | 366 | 421 | 475 | 529 | 584 | 638 | 693 | 747 | 802 | 856 | 910 | 965 | 1019 | 1074 | 1128 | 1183 |
| 56 | 160 | 219 | 277 | 335 | 394 | 452 | 511 | 569 | 628 | 686 | 745 | 804 | 862 | 921 | 979 | 1038 | 1096 | 1155 | 1213 | 1272 |
| 58 | 172 | 235 | 297 | 360 | 423 | 485 | 548 | 611 | 674 | 736 | 799 | 862 | 925 | 988 | 1050 | 1113 | 1176 | 1239 | 1302 | 1364 |
| 60 | 184 | 251 | 318 | 385 | 452 | 519 | 587 | 654 | 721 | 788 | 855 | 923 | 990 | 1057 | 1124 | 1191 | 1259 | 1326 | 1393 | 1460 |

TABLE 12

Gross cubic-foot volume table to a 1 ft. stump -- 4 inch top

Northern California Forest Yield Cooperative

incense cedar

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 12 | 13 | 13 | 14 | 15 | 16 | 17 |
| 10 | 3 | 5 | 6 | 7 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 20 | 21 | 22 | 24 | 25 | 27 | 28 | 29 |
| 12 | 5 | 7 | 9 | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 45 |
| 14 | 7 | 10 | 13 | 16 | 19 | 22 | 25 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | 50 | 53 | 56 | 59 | 62 |
| 16 | 10 | 14 | 17 | 21 | 25 | 29 | 33 | 36 | 40 | 44 | 48 | 52 | 55 | 59 | 63 | 67 | 71 | 74 | 78 | 82 |
| 18 | 13 | 17 | 22 | 27 | 32 | 37 | 42 | 46 | 51 | 56 | 61 | 66 | 71 | 75 | 80 | 85 | 90 | 95 | 100 | 105 |
| 20 | 16 | 22 | 28 | 34 | 40 | 46 | 52 | 58 | 64 | 70 | 76 | 82 | 88 | 94 | 100 | 106 | 112 | 118 | 124 | 130 |
| 22 | 19 | 26 | 34 | 41 | 48 | 55 | 63 | 70 | 77 | 85 | 92 | 99 | 106 | 114 | 121 | 128 | 135 | 143 | 150 | 157 |
| 24 | 23 | 32 | 40 | 49 | 58 | 66 | 75 | 84 | 92 | 101 | 110 | 118 | 127 | 136 | 144 | 153 | 162 | 170 | 179 | 188 |
| 26 | 27 | 37 | 47 | 58 | 68 | 78 | 88 | 98 | 108 | 119 | 129 | 139 | 149 | 159 | 170 | 180 | 190 | 200 | 210 | 220 |
| 28 | 32 | 43 | 55 | 67 | 79 | 90 | 102 | 114 | 126 | 138 | 150 | 161 | 173 | 185 | 197 | 209 | 220 | 232 | 244 | 256 |
| 30 | 36 | 50 | 63 | 77 | 90 | 104 | 118 | 131 | 145 | 158 | 172 | 185 | 199 | 213 | 226 | 240 | 253 | 267 | 280 | 294 |
| 32 | 41 | 57 | 72 | 88 | 103 | 118 | 134 | 149 | 165 | 180 | 196 | 211 | 227 | 242 | 257 | 273 | 288 | 304 | 319 | 335 |
| 34 | 47 | 64 | 82 | 99 | 116 | 134 | 151 | 169 | 186 | 204 | 221 | 238 | 256 | 273 | 291 | 308 | 326 | 343 | 361 | 378 |
| 36 | 53 | 72 | 91 | 111 | 131 | 150 | 170 | 189 | 209 | 228 | 248 | 267 | 287 | 307 | 326 | 346 | 365 | 385 | 405 | 424 |
| 38 | 59 | 80 | 102 | 124 | 146 | 167 | 189 | 211 | 233 | 255 | 276 | 298 | 320 | 342 | 364 | 385 | 407 | 429 | 451 | 473 |
| 40 | 65 | 89 | 113 | 137 | 161 | 186 | 210 | 234 | 258 | 282 | 306 | 330 | 355 | 379 | 403 | 427 | 451 | 476 | 500 | 524 |
| 42 | 72 | 98 | 125 | 151 | 178 | 205 | 231 | 258 | 284 | 311 | 338 | 364 | 391 | 418 | 444 | 471 | 498 | 524 | 551 | 578 |
| 44 | 79 | 108 | 137 | 166 | 195 | 225 | 254 | 283 | 312 | 342 | 371 | 400 | 429 | 459 | 488 | 517 | 546 | 576 | 605 | 634 |
| 46 | 86 | 118 | 150 | 182 | 214 | 246 | 278 | 309 | 341 | 373 | 405 | 437 | 469 | 501 | 533 | 565 | 597 | 629 | 661 | 693 |
| 48 | 94 | 128 | 163 | 198 | 233 | 267 | 302 | 337 | 372 | 407 | 441 | 476 | 511 | 546 | 581 | 616 | 650 | 685 | 720 | 755 |
| 50 | 102 | 139 | 177 | 215 | 253 | 290 | 328 | 366 | 404 | 441 | 479 | 517 | 555 | 592 | 630 | 668 | 706 | 744 | 781 | 819 |
| 52 | 110 | 151 | 192 | 232 | 273 | 314 | 355 | 396 | 437 | 477 | 518 | 559 | 600 | 641 | 682 | 723 | 764 | 804 | 845 | 886 |
| 54 | 119 | 163 | 207 | 251 | 295 | 339 | 383 | 427 | 471 | 515 | 559 | 603 | 647 | 691 | 735 | 779 | 823 | 868 | 912 | 956 |
| 56 | 128 | 175 | 222 | 270 | 317 | 364 | 412 | 459 | 506 | 554 | 601 | 649 | 696 | 743 | 791 | 838 | 886 | 933 | 981 | 1028 |
| 58 | 137 | 188 | 239 | 289 | 340 | 391 | 442 | 492 | 543 | 594 | 645 | 696 | 747 | 798 | 848 | 899 | 950 | 1001 | 1052 | 1103 |
| 60 | 147 | 201 | 255 | 310 | 364 | 418 | 473 | 527 | 581 | 636 | 690 | 745 | 799 | 854 | 908 | 962 | 1017 | 1071 | 1126 | 1180 |

TABLE 13

Gross cubic-foot volume table to a 1 ft. stump -- 4 inch top

Northern California Forest Yield Cooperative

white fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 3 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 21 | 22 | 23 |
| 10 | 4 | 6 | 8 | 10 | 12 | 13 | 15 | 17 | 19 | 21 | 22 | 24 | 26 | 28 | 30 | 31 | 33 | 35 | 37 | 39 |
| 12 | 7 | 9 | 12 | 15 | 17 | 20 | 23 | 25 | 28 | 31 | 33 | 36 | 39 | 41 | 44 | 47 | 49 | 52 | 55 | 57 |
| 14 | 10 | 13 | 17 | 21 | 24 | 28 | 32 | 35 | 39 | 43 | 46 | 50 | 54 | 57 | 61 | 65 | 68 | 72 | 76 | 79 |
| 16 | 13 | 18 | 22 | 27 | 32 | 37 | 42 | 46 | 51 | 56 | 61 | 66 | 71 | 75 | 80 | 85 | 90 | 95 | 100 | 104 |
| 18 | 16 | 22 | 29 | 35 | 41 | 47 | 53 | 59 | 65 | 71 | 78 | 84 | 90 | 96 | 102 | 108 | 114 | 121 | 127 | 133 |
| 20 | 20 | 28 | 35 | 43 | 51 | 58 | 66 | 73 | 81 | 89 | 96 | 104 | 111 | 119 | 126 | 134 | 142 | 149 | 157 | 164 |
| 22 | 25 | 34 | 43 | 52 | 61 | 71 | 80 | 89 | 98 | 107 | 117 | 126 | 135 | 144 | 153 | 163 | 172 | 181 | 190 | 199 |
| 24 | 30 | 40 | 51 | 62 | 73 | 84 | 95 | 106 | 117 | 128 | 139 | 150 | 161 | 172 | 183 | 194 | 205 | 216 | 227 | 238 |
| 26 | 35 | 48 | 60 | 73 | 86 | 99 | 112 | 125 | 138 | 150 | 163 | 176 | 189 | 202 | 215 | 228 | 240 | 253 | 266 | 279 |
| 28 | 40 | 55 | 70 | 85 | 100 | 115 | 130 | 145 | 160 | 175 | 189 | 204 | 219 | 234 | 249 | 264 | 279 | 294 | 309 | 324 |
| 30 | 46 | 64 | 81 | 98 | 115 | 132 | 149 | 166 | 183 | 201 | 218 | 235 | 252 | 269 | 286 | 303 | 321 | 338 | 355 | 372 |
| 32 | 53 | 72 | 92 | 111 | 131 | 150 | 170 | 189 | 209 | 228 | 248 | 267 | 287 | 306 | 326 | 345 | 365 | 384 | 404 | 423 |
| 34 | 60 | 82 | 104 | 126 | 148 | 170 | 192 | 214 | 236 | 258 | 280 | 302 | 324 | 346 | 368 | 390 | 412 | 434 | 456 | 478 |
| 36 | 67 | 92 | 116 | 141 | 166 | 190 | 215 | 240 | 264 | 289 | 314 | 339 | 363 | 388 | 413 | 437 | 462 | 487 | 511 | 536 |
| 38 | 75 | 102 | 130 | 157 | 185 | 212 | 240 | 267 | 295 | 322 | 350 | 377 | 405 | 432 | 460 | 487 | 515 | 542 | 570 | 598 |
| 40 | 83 | 113 | 144 | 174 | 205 | 235 | 266 | 296 | 327 | 357 | 388 | 418 | 449 | 479 | 510 | 540 | 571 | 601 | 632 | 662 |
| 42 | 92 | 125 | 159 | 192 | 226 | 259 | 293 | 327 | 360 | 394 | 427 | 461 | 495 | 528 | 562 | 596 | 629 | 663 | 697 | 730 |
| 44 | 101 | 137 | 174 | 211 | 248 | 285 | 322 | 359 | 395 | 432 | 469 | 506 | 543 | 580 | 617 | 654 | 691 | 728 | 765 | 801 |
| 46 | 110 | 150 | 190 | 231 | 271 | 311 | 352 | 392 | 432 | 473 | 513 | 553 | 594 | 634 | 674 | 715 | 755 | 795 | 836 | 876 |
| 48 | 120 | 164 | 207 | 251 | 295 | 339 | 383 | 427 | 471 | 515 | 559 | 602 | 646 | 690 | 734 | 778 | 822 | 866 | 910 | 954 |
| 50 | 130 | 178 | 225 | 273 | 320 | 368 | 416 | 463 | 511 | 558 | 606 | 654 | 701 | 749 | 797 | 844 | 892 | 940 | 988 | 1035 |
| 52 | 141 | 192 | 244 | 295 | 346 | 398 | 450 | 501 | 553 | 604 | 656 | 707 | 759 | 810 | 862 | 913 | 965 | 1017 | 1068 | 1120 |
| 54 | 152 | 207 | 263 | 318 | 374 | 429 | 485 | 540 | 596 | 652 | 707 | 763 | 818 | 874 | 930 | 985 | 1041 | 1096 | 1152 | 1208 |
| 56 | 163 | 223 | 283 | 342 | 402 | 462 | 521 | 581 | 641 | 701 | 761 | 820 | 880 | 940 | 1000 | 1060 | 1119 | 1179 | 1239 | 1299 |
| 58 | 175 | 239 | 303 | 367 | 431 | 495 | 559 | 624 | 688 | 752 | 816 | 880 | 944 | 1008 | 1072 | 1137 | 1201 | 1265 | 1329 | 1393 |
| 60 | 188 | 256 | 324 | 393 | 462 | 530 | 599 | 667 | 736 | 805 | 873 | 942 | 1010 | 1079 | 1148 | 1216 | 1285 | 1354 | 1422 | 1491 |

TABLE 14

Gross cubic-foot volume table to a 1 ft. stump -- 4 inch top

Northern California Forest Yield Cooperative

Douglas fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 10 | 4 | 5 | 7 | 9 | 10 | 12 | 13 | 15 | 17 | 18 | 20 | 21 | 23 | 25 | 26 | 28 | 30 | 31 | 33 | 34 |
| 12 | 6 | 8 | 11 | 13 | 16 | 18 | 20 | 23 | 25 | 28 | 30 | 32 | 35 | 37 | 39 | 42 | 44 | 47 | 49 | 51 |
| 14 | 9 | 12 | 15 | 18 | 22 | 25 | 28 | 32 | 35 | 38 | 42 | 45 | 48 | 51 | 55 | 58 | 61 | 65 | 68 | 71 |
| 16 | 11 | 16 | 20 | 24 | 29 | 33 | 37 | 42 | 46 | 50 | 55 | 59 | 64 | 68 | 72 | 77 | 81 | 85 | 90 | 94 |
| 18 | 15 | 20 | 26 | 31 | 37 | 42 | 48 | 53 | 59 | 64 | 70 | 75 | 81 | 86 | 92 | 97 | 103 | 108 | 114 | 120 |
| 20 | 18 | 25 | 32 | 39 | 45 | 52 | 59 | 66 | 73 | 80 | 87 | 93 | 100 | 107 | 114 | 121 | 128 | 134 | 141 | 148 |
| 22 | 22 | 30 | 39 | 47 | 55 | 64 | 72 | 80 | 88 | 97 | 105 | 113 | 122 | 130 | 138 | 146 | 155 | 163 | 171 | 180 |
| 24 | 27 | 36 | 46 | 56 | 66 | 76 | 86 | 96 | 105 | 115 | 125 | 135 | 145 | 155 | 165 | 175 | 184 | 194 | 204 | 214 |
| 26 | 31 | 43 | 54 | 66 | 78 | 89 | 101 | 112 | 124 | 135 | 147 | 159 | 170 | 182 | 193 | 205 | 217 | 228 | 240 | 252 |
| 28 | 36 | 50 | 63 | 77 | 90 | 103 | 117 | 130 | 144 | 157 | 171 | 184 | 198 | 211 | 225 | 238 | 252 | 265 | 278 | 292 |
| 30 | 42 | 57 | 73 | 88 | 103 | 119 | 134 | 150 | 165 | 181 | 196 | 212 | 227 | 243 | 258 | 273 | 289 | 304 | 320 | 335 |
| 32 | 48 | 65 | 83 | 100 | 118 | 135 | 153 | 171 | 188 | 206 | 223 | 241 | 259 | 276 | 294 | 311 | 329 | 347 | 364 | 382 |
| 34 | 54 | 74 | 93 | 113 | 133 | 153 | 173 | 193 | 213 | 232 | 252 | 272 | 292 | 312 | 332 | 352 | 371 | 391 | 411 | 431 |
| 36 | 60 | 83 | 105 | 127 | 149 | 172 | 194 | 216 | 238 | 261 | 283 | 305 | 327 | 350 | 372 | 394 | 417 | 439 | 461 | 483 |
| 38 | 67 | 92 | 117 | 142 | 166 | 191 | 216 | 241 | 266 | 291 | 315 | 340 | 365 | 390 | 415 | 439 | 464 | 489 | 514 | 539 |
| 40 | 75 | 102 | 130 | 157 | 184 | 212 | 239 | 267 | 294 | 322 | 349 | 377 | 405 | 432 | 460 | 487 | 515 | 542 | 570 | 597 |
| 42 | 82 | 113 | 143 | 173 | 203 | 234 | 264 | 294 | 325 | 355 | 385 | 416 | 446 | 476 | 507 | 537 | 567 | 598 | 628 | 658 |
| 44 | 91 | 124 | 157 | 190 | 223 | 257 | 290 | 323 | 356 | 390 | 423 | 456 | 490 | 523 | 556 | 590 | 623 | 656 | 689 | 723 |
| 46 | 99 | 135 | 172 | 208 | 244 | 281 | 317 | 353 | 390 | 426 | 462 | 499 | 535 | 572 | 608 | 644 | 681 | 717 | 754 | 790 |
| 48 | 108 | 147 | 187 | 226 | 266 | 306 | 345 | 385 | 424 | 464 | 504 | 543 | 583 | 623 | 662 | 702 | 741 | 781 | 821 | 860 |
| 50 | 117 | 160 | 203 | 246 | 289 | 332 | 375 | 418 | 461 | 504 | 547 | 590 | 633 | 676 | 719 | 762 | 805 | 848 | 891 | 934 |
| 52 | 127 | 173 | 219 | 266 | 312 | 359 | 405 | 452 | 498 | 545 | 591 | 638 | 684 | 731 | 777 | 824 | 870 | 917 | 963 | 1010 |
| 54 | 137 | 187 | 237 | 287 | 337 | 387 | 437 | 487 | 537 | 587 | 638 | 688 | 738 | 788 | 838 | 888 | 939 | 989 | 1039 | 1089 |
| 56 | 147 | 201 | 255 | 308 | 362 | 416 | 470 | 524 | 578 | 632 | 686 | 740 | 794 | 848 | 902 | 956 | 1009 | 1063 | 1117 | 1171 |
| 58 | 158 | 215 | 273 | 331 | 389 | 446 | 504 | 562 | 620 | 678 | 736 | 794 | 851 | 909 | 967 | 1025 | 1083 | 1141 | 1199 | 1257 |
| 60 | 169 | 231 | 292 | 354 | 416 | 478 | 540 | 602 | 663 | 725 | 787 | 849 | 911 | 973 | 1035 | 1097 | 1159 | 1221 | 1283 | 1345 |

TABLE 15

Gross cubic-foot volume table to a 1 ft. stump -- 4 inch top

Northern California Forest Yield Cooperative

red fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 10 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 19 | 21 | 23 | 25 | 27 | 29 | 30 | 32 | 34 | 36 | 38 | 40 |
| 12 | 7 | 10 | 12 | 15 | 18 | 21 | 23 | 26 | 29 | 32 | 34 | 37 | 40 | 43 | 45 | 48 | 51 | 54 | 56 | 59 |
| 14 | 10 | 14 | 17 | 21 | 25 | 29 | 32 | 36 | 40 | 44 | 47 | 51 | 55 | 59 | 63 | 66 | 70 | 74 | 78 | 81 |
| 16 | 13 | 18 | 23 | 28 | 33 | 38 | 43 | 48 | 53 | 58 | 63 | 68 | 72 | 77 | 82 | 87 | 92 | 97 | 102 | 107 |
| 18 | 17 | 23 | 29 | 36 | 42 | 48 | 54 | 61 | 67 | 73 | 80 | 86 | 92 | 98 | 105 | 111 | 117 | 124 | 130 | 136 |
| 20 | 21 | 29 | 36 | 44 | 52 | 60 | 67 | 75 | 83 | 91 | 99 | 106 | 114 | 122 | 130 | 137 | 145 | 153 | 161 | 169 |
| 22 | 25 | 35 | 44 | 54 | 63 | 72 | 82 | 91 | 101 | 110 | 120 | 129 | 138 | 148 | 157 | 167 | 176 | 186 | 195 | 204 |
| 24 | 30 | 42 | 53 | 64 | 75 | 86 | 98 | 109 | 120 | 131 | 142 | 154 | 165 | 176 | 187 | 199 | 210 | 221 | 232 | 244 |
| 26 | 36 | 49 | 62 | 75 | 88 | 101 | 115 | 128 | 141 | 154 | 167 | 181 | 194 | 207 | 220 | 233 | 246 | 260 | 273 | 286 |
| 28 | 41 | 57 | 72 | 87 | 103 | 118 | 133 | 148 | 164 | 179 | 194 | 210 | 225 | 240 | 255 | 271 | 286 | 301 | 317 | 332 |
| 30 | 48 | 65 | 83 | 100 | 118 | 135 | 153 | 170 | 188 | 206 | 223 | 241 | 258 | 276 | 293 | 311 | 329 | 346 | 364 | 381 |
| 32 | 54 | 74 | 94 | 114 | 134 | 154 | 174 | 194 | 214 | 234 | 254 | 274 | 294 | 314 | 334 | 354 | 374 | 394 | 414 | 434 |
| 34 | 61 | 84 | 106 | 129 | 152 | 174 | 197 | 219 | 242 | 264 | 287 | 309 | 332 | 355 | 377 | 400 | 422 | 445 | 467 | 490 |
| 36 | 69 | 94 | 119 | 145 | 170 | 195 | 221 | 246 | 271 | 296 | 322 | 347 | 372 | 398 | 423 | 448 | 474 | 499 | 524 | 550 |
| 38 | 77 | 105 | 133 | 161 | 189 | 218 | 246 | 274 | 302 | 330 | 359 | 387 | 415 | 443 | 471 | 500 | 528 | 556 | 584 | 612 |
| 40 | 85 | 116 | 148 | 179 | 210 | 241 | 272 | 304 | 335 | 366 | 397 | 429 | 460 | 491 | 522 | 554 | 585 | 616 | 647 | 679 |
| 42 | 94 | 128 | 163 | 197 | 232 | 266 | 300 | 335 | 369 | 404 | 438 | 473 | 507 | 542 | 576 | 610 | 645 | 679 | 714 | 748 |
| 44 | 103 | 141 | 179 | 216 | 254 | 292 | 330 | 368 | 405 | 443 | 481 | 519 | 557 | 594 | 632 | 670 | 708 | 746 | 784 | 821 |
| 46 | 113 | 154 | 195 | 237 | 278 | 319 | 361 | 402 | 443 | 484 | 526 | 567 | 608 | 650 | 691 | 732 | 774 | 815 | 857 | 898 |
| 48 | 123 | 168 | 213 | 258 | 303 | 348 | 393 | 438 | 483 | 528 | 573 | 618 | 663 | 708 | 753 | 798 | 843 | 888 | 933 | 978 |
| 50 | 134 | 182 | 231 | 280 | 328 | 377 | 426 | 475 | 524 | 573 | 621 | 670 | 719 | 768 | 817 | 866 | 914 | 963 | 1012 | 1061 |
| 52 | 145 | 197 | 250 | 303 | 355 | 408 | 461 | 514 | 566 | 619 | 672 | 725 | 778 | 831 | 883 | 936 | 989 | 1042 | 1095 | 1148 |
| 54 | 156 | 213 | 269 | 326 | 383 | 440 | 497 | 554 | 611 | 668 | 725 | 782 | 839 | 896 | 953 | 1010 | 1067 | 1124 | 1181 | 1238 |
| 56 | 168 | 229 | 290 | 351 | 412 | 473 | 535 | 596 | 657 | 718 | 780 | 841 | 902 | 963 | 1025 | 1086 | 1147 | 1209 | 1270 | 1331 |
| 58 | 180 | 245 | 311 | 377 | 442 | 508 | 574 | 639 | 705 | 771 | 836 | 902 | 968 | 1034 | 1099 | 1165 | 1231 | 1296 | 1362 | 1428 |
| 60 | 193 | 263 | 333 | 403 | 473 | 544 | 614 | 684 | 754 | 825 | 895 | 965 | 1036 | 1106 | 1176 | 1247 | 1317 | 1387 | 1458 | 1528 |

TABLE 16

Gross cubic-foot volume table to a 1 ft. stump -- 4 inch top

Northern California Forest Yield Cooperative

sugar pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 10 | 4 | 6 | 8 | 9 | 11 | 13 | 14 | 16 | 18 | 19 | 21 | 23 | 24 | 26 | 28 | 30 | 31 | 33 | 35 | 36 |
| 12 | 6 | 9 | 11 | 14 | 16 | 19 | 22 | 24 | 27 | 29 | 32 | 34 | 37 | 39 | 42 | 44 | 47 | 49 | 52 | 54 |
| 14 | 9 | 13 | 16 | 19 | 23 | 26 | 30 | 33 | 37 | 40 | 44 | 47 | 51 | 54 | 58 | 61 | 65 | 68 | 72 | 75 |
| 16 | 12 | 17 | 21 | 26 | 30 | 35 | 39 | 44 | 49 | 53 | 58 | 62 | 67 | 71 | 76 | 81 | 85 | 90 | 94 | 99 |
| 18 | 15 | 21 | 27 | 33 | 39 | 44 | 50 | 56 | 62 | 68 | 74 | 79 | 85 | 91 | 97 | 103 | 108 | 114 | 120 | 126 |
| 20 | 19 | 26 | 34 | 41 | 48 | 55 | 62 | 69 | 77 | 84 | 91 | 98 | 105 | 113 | 120 | 127 | 134 | 141 | 149 | 156 |
| 22 | 23 | 32 | 41 | 49 | 58 | 67 | 76 | 84 | 93 | 102 | 110 | 119 | 128 | 137 | 145 | 154 | 163 | 171 | 180 | 189 |
| 24 | 28 | 38 | 49 | 59 | 69 | 80 | 90 | 101 | 111 | 121 | 132 | 142 | 152 | 163 | 173 | 184 | 194 | 204 | 215 | 225 |
| 26 | 33 | 45 | 57 | 69 | 82 | 94 | 106 | 118 | 130 | 143 | 155 | 167 | 179 | 191 | 204 | 216 | 228 | 240 | 252 | 265 |
| 28 | 38 | 52 | 67 | 81 | 95 | 109 | 123 | 137 | 151 | 165 | 180 | 194 | 208 | 222 | 236 | 250 | 265 | 279 | 293 | 307 |
| 30 | 44 | 60 | 76 | 93 | 109 | 125 | 141 | 158 | 174 | 190 | 206 | 223 | 239 | 255 | 271 | 288 | 304 | 320 | 336 | 353 |
| 32 | 50 | 69 | 87 | 106 | 124 | 142 | 161 | 179 | 198 | 216 | 235 | 253 | 272 | 290 | 309 | 327 | 346 | 364 | 383 | 401 |
| 34 | 57 | 78 | 98 | 119 | 140 | 161 | 182 | 203 | 224 | 244 | 265 | 286 | 307 | 328 | 349 | 370 | 391 | 411 | 432 | 453 |
| 36 | 64 | 87 | 110 | 134 | 157 | 181 | 204 | 227 | 251 | 274 | 298 | 321 | 344 | 368 | 391 | 415 | 438 | 461 | 485 | 508 |
| 38 | 71 | 97 | 123 | 149 | 175 | 201 | 227 | 253 | 279 | 306 | 332 | 358 | 384 | 410 | 436 | 462 | 488 | 514 | 540 | 566 |
| 40 | 79 | 108 | 136 | 165 | 194 | 223 | 252 | 281 | 310 | 339 | 368 | 396 | 425 | 454 | 483 | 512 | 541 | 570 | 599 | 628 |
| 42 | 87 | 119 | 150 | 182 | 214 | 246 | 278 | 310 | 342 | 373 | 405 | 437 | 469 | 501 | 533 | 565 | 597 | 628 | 660 | 692 |
| 44 | 96 | 130 | 165 | 200 | 235 | 270 | 305 | 340 | 375 | 410 | 445 | 480 | 515 | 550 | 585 | 620 | 655 | 690 | 725 | 760 |
| 46 | 104 | 143 | 181 | 219 | 257 | 295 | 333 | 372 | 410 | 448 | 486 | 525 | 563 | 601 | 639 | 678 | 716 | 754 | 792 | 831 |
| 48 | 114 | 155 | 197 | 238 | 280 | 321 | 363 | 405 | 446 | 488 | 530 | 571 | 613 | 655 | 696 | 738 | 779 | 821 | 863 | 904 |
| 50 | 123 | 168 | 214 | 259 | 304 | 349 | 394 | 439 | 484 | 530 | 575 | 620 | 665 | 710 | 755 | 801 | 846 | 891 | 936 | 981 |
| 52 | 134 | 182 | 231 | 280 | 329 | 377 | 426 | 475 | 524 | 573 | 622 | 671 | 719 | 768 | 817 | 866 | 915 | 964 | 1013 | 1062 |
| 54 | 144 | 197 | 249 | 302 | 354 | 407 | 460 | 512 | 565 | 618 | 670 | 723 | 776 | 829 | 881 | 934 | 987 | 1039 | 1092 | 1145 |
| 56 | 155 | 211 | 268 | 325 | 381 | 438 | 494 | 551 | 608 | 664 | 721 | 778 | 834 | 891 | 948 | 1005 | 1061 | 1118 | 1175 | 1231 |
| 58 | 166 | 227 | 288 | 348 | 409 | 470 | 530 | 591 | 652 | 713 | 774 | 834 | 895 | 956 | 1017 | 1078 | 1138 | 1199 | 1260 | 1321 |
| 60 | 178 | 243 | 308 | 373 | 438 | 503 | 568 | 633 | 698 | 763 | 828 | 893 | 958 | 1023 | 1088 | 1153 | 1218 | 1283 | 1349 | 1414 |

TABLE 17

Gross cubic-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

ponderosa pine

total height (feet)

| DBH (inches) | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 |
| 10 | 3 | 5 | 6 | 7 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 20 | 21 | 22 | 24 | 25 | 27 | 28 | 29 |
| 12 | 6 | 8 | 10 | 13 | 15 | 17 | 20 | 22 | 25 | 27 | 29 | 32 | 34 | 36 | 39 | 41 | 43 | 46 | 48 | 50 |
| 14 | 9 | 12 | 16 | 19 | 22 | 26 | 29 | 32 | 36 | 39 | 43 | 46 | 49 | 53 | 56 | 60 | 63 | 66 | 70 | 73 |
| 16 | 12 | 17 | 21 | 26 | 30 | 35 | 39 | 44 | 48 | 53 | 58 | 62 | 67 | 71 | 76 | 80 | 85 | 90 | 94 | 99 |
| 18 | 16 | 21 | 27 | 33 | 39 | 45 | 51 | 57 | 63 | 68 | 74 | 80 | 86 | 92 | 98 | 104 | 110 | 115 | 121 | 127 |
| 20 | 20 | 27 | 34 | 41 | 49 | 56 | 63 | 71 | 78 | 85 | 93 | 100 | 107 | 115 | 122 | 129 | 137 | 144 | 151 | 159 |
| 22 | 24 | 33 | 42 | 51 | 60 | 68 | 77 | 86 | 95 | 104 | 113 | 122 | 131 | 140 | 149 | 157 | 166 | 175 | 184 | 193 |
| 24 | 29 | 39 | 50 | 61 | 71 | 82 | 92 | 103 | 114 | 124 | 135 | 146 | 156 | 167 | 178 | 188 | 199 | 210 | 220 | 231 |
| 26 | 34 | 46 | 59 | 71 | 84 | 96 | 109 | 121 | 134 | 146 | 159 | 171 | 184 | 197 | 209 | 222 | 234 | 247 | 259 | 272 |
| 28 | 39 | 54 | 68 | 83 | 98 | 112 | 127 | 141 | 156 | 170 | 185 | 199 | 214 | 228 | 243 | 258 | 272 | 287 | 301 | 316 |
| 30 | 45 | 62 | 79 | 95 | 112 | 129 | 146 | 162 | 179 | 196 | 212 | 229 | 246 | 263 | 279 | 296 | 313 | 330 | 346 | 363 |
| 32 | 52 | 71 | 90 | 109 | 128 | 147 | 166 | 185 | 204 | 223 | 242 | 261 | 280 | 299 | 318 | 337 | 356 | 375 | 394 | 413 |
| 34 | 59 | 80 | 102 | 123 | 144 | 166 | 187 | 209 | 230 | 252 | 273 | 295 | 317 | 338 | 360 | 381 | 403 | 424 | 446 | 467 |
| 36 | 66 | 90 | 114 | 138 | 162 | 186 | 210 | 234 | 259 | 283 | 307 | 331 | 355 | 379 | 403 | 428 | 452 | 476 | 500 | 524 |
| 38 | 73 | 100 | 127 | 154 | 181 | 208 | 235 | 261 | 288 | 315 | 342 | 369 | 396 | 423 | 450 | 477 | 504 | 530 | 557 | 584 |
| 40 | 81 | 111 | 141 | 171 | 200 | 230 | 260 | 290 | 320 | 349 | 379 | 409 | 439 | 469 | 499 | 528 | 558 | 588 | 618 | 648 |
| 42 | 90 | 123 | 155 | 188 | 221 | 254 | 287 | 320 | 353 | 385 | 418 | 451 | 484 | 517 | 550 | 583 | 616 | 648 | 681 | 714 |
| 44 | 99 | 135 | 171 | 207 | 243 | 279 | 315 | 351 | 387 | 423 | 459 | 495 | 531 | 567 | 604 | 640 | 676 | 712 | 748 | 784 |
| 46 | 108 | 147 | 187 | 226 | 265 | 305 | 344 | 384 | 423 | 463 | 502 | 541 | 581 | 620 | 660 | 699 | 739 | 778 | 818 | 857 |
| 48 | 118 | 160 | 203 | 246 | 289 | 332 | 375 | 418 | 461 | 504 | 547 | 590 | 633 | 676 | 719 | 762 | 805 | 848 | 891 | 934 |
| 50 | 128 | 174 | 221 | 267 | 314 | 360 | 407 | 454 | 500 | 547 | 593 | 640 | 687 | 733 | 780 | 827 | 873 | 920 | 967 | 1013 |
| 52 | 138 | 188 | 239 | 289 | 339 | 390 | 440 | 491 | 541 | 591 | 642 | 692 | 743 | 793 | 844 | 894 | 945 | 995 | 1046 | 1096 |
| 54 | 149 | 203 | 257 | 312 | 366 | 420 | 475 | 529 | 584 | 638 | 692 | 747 | 801 | 856 | 910 | 964 | 1019 | 1073 | 1128 | 1182 |
| 56 | 160 | 219 | 277 | 335 | 394 | 452 | 511 | 569 | 628 | 686 | 745 | 803 | 862 | 920 | 979 | 1037 | 1096 | 1154 | 1213 | 1271 |
| 58 | 172 | 235 | 297 | 360 | 422 | 485 | 548 | 611 | 673 | 736 | 799 | 862 | 924 | 987 | 1050 | 1113 | 1176 | 1238 | 1301 | 1364 |
| 60 | 184 | 251 | 318 | 385 | 452 | 519 | 586 | 654 | 721 | 788 | 855 | 922 | 989 | 1057 | 1124 | 1191 | 1258 | 1325 | 1393 | 1460 |

TABLE 18

Gross cubic-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

incense cedar

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 |
| 10 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 12 | 4 | 6 | 8 | 9 | 11 | 13 | 15 | 17 | 18 | 20 | 22 | 24 | 25 | 27 | 29 | 31 | 32 | 34 | 36 | 38 |
| 14 | 7 | 9 | 12 | 14 | 17 | 20 | 22 | 25 | 28 | 30 | 33 | 35 | 38 | 41 | 43 | 46 | 49 | 51 | 54 | 57 |
| 16 | 9 | 13 | 16 | 20 | 24 | 27 | 31 | 34 | 38 | 42 | 45 | 49 | 52 | 56 | 60 | 63 | 67 | 70 | 74 | 78 |
| 18 | 12 | 17 | 21 | 26 | 31 | 35 | 40 | 45 | 49 | 54 | 59 | 63 | 68 | 73 | 77 | 82 | 87 | 91 | 96 | 101 |
| 20 | 15 | 21 | 27 | 33 | 39 | 44 | 50 | 56 | 62 | 68 | 74 | 80 | 85 | 91 | 97 | 103 | 109 | 115 | 121 | 126 |
| 22 | 19 | 26 | 33 | 40 | 47 | 54 | 62 | 69 | 76 | 83 | 90 | 97 | 104 | 112 | 119 | 126 | 133 | 140 | 147 | 154 |
| 24 | 23 | 31 | 40 | 48 | 57 | 65 | 74 | 82 | 91 | 99 | 108 | 117 | 125 | 134 | 142 | 151 | 159 | 168 | 177 | 185 |
| 26 | 27 | 37 | 47 | 57 | 67 | 77 | 87 | 97 | 107 | 117 | 127 | 138 | 148 | 158 | 168 | 178 | 188 | 198 | 208 | 218 |
| 28 | 31 | 43 | 55 | 66 | 78 | 90 | 101 | 113 | 125 | 137 | 148 | 160 | 172 | 184 | 195 | 207 | 219 | 230 | 242 | 254 |
| 30 | 36 | 49 | 63 | 76 | 90 | 103 | 117 | 130 | 144 | 157 | 171 | 184 | 198 | 211 | 225 | 238 | 252 | 265 | 279 | 292 |
| 32 | 41 | 56 | 72 | 87 | 102 | 118 | 133 | 149 | 164 | 179 | 195 | 210 | 225 | 241 | 256 | 272 | 287 | 302 | 318 | 333 |
| 34 | 47 | 64 | 81 | 99 | 116 | 133 | 151 | 168 | 185 | 203 | 220 | 237 | 255 | 272 | 290 | 307 | 324 | 342 | 359 | 377 |
| 36 | 52 | 72 | 91 | 111 | 130 | 150 | 169 | 189 | 208 | 228 | 247 | 267 | 286 | 306 | 325 | 345 | 364 | 384 | 403 | 423 |
| 38 | 58 | 80 | 102 | 123 | 145 | 167 | 189 | 210 | 232 | 254 | 276 | 297 | 319 | 341 | 363 | 384 | 406 | 428 | 450 | 471 |
| 40 | 65 | 89 | 113 | 137 | 161 | 185 | 209 | 233 | 257 | 281 | 306 | 330 | 354 | 378 | 402 | 426 | 450 | 474 | 499 | 523 |
| 42 | 72 | 98 | 125 | 151 | 178 | 204 | 231 | 257 | 284 | 310 | 337 | 364 | 390 | 417 | 443 | 470 | 497 | 523 | 550 | 577 |
| 44 | 79 | 108 | 137 | 166 | 195 | 224 | 253 | 283 | 312 | 341 | 370 | 399 | 429 | 458 | 487 | 516 | 545 | 575 | 604 | 633 |
| 46 | 86 | 118 | 150 | 181 | 213 | 245 | 277 | 309 | 341 | 373 | 405 | 437 | 469 | 501 | 532 | 564 | 596 | 628 | 660 | 692 |
| 48 | 94 | 128 | 163 | 198 | 232 | 267 | 302 | 337 | 371 | 406 | 441 | 476 | 510 | 545 | 580 | 615 | 650 | 684 | 719 | 754 |
| 50 | 102 | 139 | 177 | 215 | 252 | 290 | 328 | 365 | 403 | 441 | 479 | 516 | 554 | 592 | 630 | 667 | 705 | 743 | 781 | 818 |
| 52 | 110 | 151 | 191 | 232 | 273 | 314 | 354 | 395 | 436 | 477 | 518 | 559 | 599 | 640 | 681 | 722 | 763 | 804 | 844 | 885 |
| 54 | 119 | 163 | 206 | 250 | 294 | 338 | 382 | 426 | 470 | 514 | 558 | 602 | 647 | 691 | 735 | 779 | 823 | 867 | 911 | 955 |
| 56 | 128 | 175 | 222 | 269 | 317 | 364 | 411 | 459 | 506 | 553 | 601 | 648 | 695 | 743 | 790 | 838 | 885 | 932 | 980 | 1027 |
| 58 | 137 | 188 | 238 | 289 | 340 | 391 | 441 | 492 | 543 | 594 | 644 | 695 | 746 | 797 | 848 | 899 | 949 | 1000 | 1051 | 1102 |
| 60 | 147 | 201 | 255 | 309 | 364 | 418 | 472 | 527 | 581 | 635 | 690 | 744 | 799 | 853 | 907 | 962 | 1016 | 1071 | 1125 | 1179 |

TABLE 19

Gross cubic-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

white fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 12 |
| 10 | 3 | 5 | 6 | 8 | 9 | 10 | 12 | 13 | 15 | 16 | 18 | 19 | 21 | 22 | 23 | 25 | 26 | 28 | 29 | 31 |
| 12 | 6 | 8 | 11 | 13 | 16 | 18 | 20 | 23 | 25 | 28 | 30 | 32 | 35 | 37 | 40 | 42 | 44 | 47 | 49 | 52 |
| 14 | 9 | 12 | 16 | 19 | 23 | 26 | 30 | 33 | 37 | 40 | 44 | 47 | 51 | 54 | 58 | 61 | 64 | 68 | 71 | 75 |
| 16 | 12 | 17 | 22 | 26 | 31 | 36 | 40 | 45 | 50 | 54 | 59 | 64 | 68 | 73 | 78 | 82 | 87 | 92 | 96 | 101 |
| 18 | 16 | 22 | 28 | 34 | 40 | 46 | 52 | 58 | 64 | 70 | 76 | 82 | 88 | 94 | 100 | 106 | 112 | 118 | 124 | 130 |
| 20 | 20 | 27 | 35 | 42 | 50 | 57 | 65 | 72 | 80 | 87 | 95 | 102 | 110 | 117 | 125 | 132 | 140 | 147 | 154 | 162 |
| 22 | 24 | 33 | 43 | 52 | 61 | 70 | 79 | 88 | 97 | 106 | 115 | 124 | 134 | 143 | 152 | 161 | 170 | 179 | 188 | 197 |
| 24 | 29 | 40 | 51 | 62 | 73 | 84 | 94 | 105 | 116 | 127 | 138 | 149 | 160 | 170 | 181 | 192 | 203 | 214 | 225 | 236 |
| 26 | 35 | 47 | 60 | 73 | 86 | 98 | 111 | 124 | 137 | 149 | 162 | 175 | 188 | 201 | 213 | 226 | 239 | 252 | 265 | 277 |
| 28 | 40 | 55 | 70 | 85 | 99 | 114 | 129 | 144 | 159 | 174 | 189 | 203 | 218 | 233 | 248 | 263 | 278 | 293 | 308 | 322 |
| 30 | 46 | 63 | 80 | 97 | 114 | 132 | 149 | 166 | 183 | 200 | 217 | 234 | 251 | 268 | 285 | 302 | 319 | 336 | 354 | 371 |
| 32 | 53 | 72 | 92 | 111 | 130 | 150 | 169 | 189 | 208 | 228 | 247 | 267 | 286 | 305 | 325 | 344 | 364 | 383 | 403 | 422 |
| 34 | 60 | 82 | 104 | 125 | 147 | 169 | 191 | 213 | 235 | 257 | 279 | 301 | 323 | 345 | 367 | 389 | 411 | 433 | 455 | 477 |
| 36 | 67 | 92 | 116 | 141 | 165 | 190 | 215 | 239 | 264 | 289 | 313 | 338 | 363 | 387 | 412 | 436 | 461 | 486 | 510 | 535 |
| 38 | 75 | 102 | 130 | 157 | 184 | 212 | 239 | 267 | 294 | 322 | 349 | 377 | 404 | 432 | 459 | 487 | 514 | 542 | 569 | 597 |
| 40 | 83 | 113 | 144 | 174 | 204 | 235 | 265 | 296 | 326 | 357 | 387 | 418 | 448 | 478 | 509 | 539 | 570 | 600 | 631 | 661 |
| 42 | 92 | 125 | 158 | 192 | 226 | 259 | 293 | 326 | 360 | 393 | 427 | 461 | 494 | 528 | 561 | 595 | 629 | 662 | 696 | 729 |
| 44 | 101 | 137 | 174 | 211 | 248 | 284 | 321 | 358 | 395 | 432 | 469 | 506 | 542 | 579 | 616 | 653 | 690 | 727 | 764 | 801 |
| 46 | 110 | 150 | 190 | 231 | 271 | 311 | 351 | 392 | 432 | 472 | 512 | 553 | 593 | 633 | 674 | 714 | 754 | 795 | 835 | 875 |
| 48 | 120 | 164 | 207 | 251 | 295 | 339 | 383 | 426 | 470 | 514 | 558 | 602 | 646 | 690 | 734 | 778 | 822 | 865 | 909 | 953 |
| 50 | 130 | 177 | 225 | 273 | 320 | 368 | 415 | 463 | 510 | 558 | 606 | 653 | 701 | 749 | 796 | 844 | 892 | 939 | 987 | 1035 |
| 52 | 141 | 192 | 243 | 295 | 346 | 398 | 449 | 501 | 552 | 604 | 655 | 707 | 758 | 810 | 861 | 913 | 964 | 1016 | 1068 | 1119 |
| 54 | 152 | 207 | 263 | 318 | 374 | 429 | 485 | 540 | 596 | 651 | 707 | 762 | 818 | 873 | 929 | 985 | 1040 | 1096 | 1151 | 1207 |
| 56 | 163 | 223 | 282 | 342 | 402 | 461 | 521 | 581 | 641 | 700 | 760 | 820 | 880 | 939 | 999 | 1059 | 1119 | 1179 | 1238 | 1298 |
| 58 | 175 | 239 | 303 | 367 | 431 | 495 | 559 | 623 | 687 | 751 | 816 | 880 | 944 | 1008 | 1072 | 1136 | 1200 | 1264 | 1329 | 1393 |
| 60 | 188 | 256 | 324 | 393 | 461 | 530 | 598 | 667 | 736 | 804 | 873 | 941 | 1010 | 1079 | 1147 | 1216 | 1285 | 1353 | 1422 | 1491 |

TABLE 20

Gross cubic-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

Douglas fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 8 | 8 | 8 |
| 10 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 12 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 22 | 23 | 25 | 26 |
| 12 | 5 | 7 | 9 | 11 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 35 | 37 | 39 | 41 | 43 | 45 |
| 14 | 8 | 11 | 14 | 17 | 20 | 23 | 26 | 29 | 32 | 36 | 39 | 42 | 45 | 48 | 51 | 54 | 57 | 60 | 63 | 66 |
| 16 | 11 | 15 | 19 | 23 | 27 | 32 | 36 | 40 | 44 | 48 | 52 | 57 | 61 | 65 | 69 | 73 | 78 | 82 | 86 | 90 |
| 18 | 14 | 20 | 25 | 30 | 36 | 41 | 46 | 52 | 57 | 63 | 68 | 73 | 79 | 84 | 89 | 95 | 100 | 106 | 111 | 116 |
| 20 | 18 | 25 | 31 | 38 | 45 | 51 | 58 | 65 | 71 | 78 | 85 | 92 | 98 | 105 | 112 | 118 | 125 | 132 | 139 | 145 |
| 22 | 22 | 30 | 38 | 46 | 54 | 63 | 71 | 79 | 87 | 95 | 104 | 112 | 120 | 128 | 136 | 144 | 153 | 161 | 169 | 177 |
| 24 | 26 | 36 | 46 | 55 | 65 | 75 | 85 | 95 | 104 | 114 | 124 | 134 | 144 | 153 | 163 | 173 | 183 | 192 | 202 | 212 |
| 26 | 31 | 42 | 54 | 65 | 77 | 88 | 100 | 111 | 123 | 134 | 146 | 158 | 169 | 181 | 192 | 204 | 215 | 227 | 238 | 250 |
| 28 | 36 | 49 | 63 | 76 | 89 | 103 | 116 | 130 | 143 | 156 | 170 | 183 | 197 | 210 | 223 | 237 | 250 | 264 | 277 | 290 |
| 30 | 42 | 57 | 72 | 88 | 103 | 118 | 134 | 149 | 165 | 180 | 195 | 211 | 226 | 241 | 257 | 272 | 288 | 303 | 318 | 334 |
| 32 | 47 | 65 | 82 | 100 | 117 | 135 | 152 | 170 | 187 | 205 | 223 | 240 | 258 | 275 | 293 | 310 | 328 | 345 | 363 | 380 |
| 34 | 54 | 73 | 93 | 113 | 133 | 152 | 172 | 192 | 212 | 232 | 252 | 271 | 291 | 311 | 331 | 351 | 370 | 390 | 410 | 430 |
| 36 | 60 | 82 | 105 | 127 | 149 | 171 | 193 | 216 | 238 | 260 | 282 | 304 | 327 | 349 | 371 | 393 | 416 | 438 | 460 | 482 |
| 38 | 67 | 92 | 117 | 141 | 166 | 191 | 216 | 240 | 265 | 290 | 315 | 339 | 364 | 389 | 414 | 439 | 463 | 488 | 513 | 538 |
| 40 | 75 | 102 | 129 | 157 | 184 | 212 | 239 | 267 | 294 | 321 | 349 | 376 | 404 | 431 | 459 | 486 | 514 | 541 | 569 | 596 |
| 42 | 82 | 112 | 143 | 173 | 203 | 233 | 264 | 294 | 324 | 355 | 385 | 415 | 445 | 476 | 506 | 536 | 567 | 597 | 627 | 658 |
| 44 | 90 | 124 | 157 | 190 | 223 | 256 | 290 | 323 | 356 | 389 | 423 | 456 | 489 | 522 | 556 | 589 | 622 | 655 | 689 | 722 |
| 46 | 99 | 135 | 171 | 208 | 244 | 280 | 317 | 353 | 389 | 426 | 462 | 498 | 535 | 571 | 607 | 644 | 680 | 716 | 753 | 789 |
| 48 | 108 | 147 | 187 | 226 | 266 | 305 | 345 | 384 | 424 | 464 | 503 | 543 | 582 | 622 | 662 | 701 | 741 | 780 | 820 | 860 |
| 50 | 117 | 160 | 203 | 246 | 288 | 331 | 374 | 417 | 460 | 503 | 546 | 589 | 632 | 675 | 718 | 761 | 804 | 847 | 890 | 933 |
| 52 | 127 | 173 | 219 | 266 | 312 | 358 | 405 | 451 | 498 | 544 | 591 | 637 | 684 | 730 | 777 | 823 | 870 | 916 | 963 | 1009 |
| 54 | 137 | 187 | 236 | 287 | 337 | 387 | 437 | 487 | 537 | 587 | 637 | 687 | 737 | 788 | 838 | 888 | 938 | 988 | 1038 | 1088 |
| 56 | 147 | 201 | 254 | 308 | 362 | 416 | 470 | 524 | 578 | 631 | 685 | 739 | 793 | 847 | 901 | 955 | 1009 | 1063 | 1117 | 1171 |
| 58 | 158 | 215 | 273 | 331 | 388 | 446 | 504 | 562 | 620 | 677 | 735 | 793 | 851 | 909 | 967 | 1025 | 1082 | 1140 | 1198 | 1256 |
| 60 | 169 | 230 | 292 | 354 | 416 | 478 | 539 | 601 | 663 | 725 | 787 | 849 | 911 | 973 | 1035 | 1097 | 1158 | 1220 | 1282 | 1344 |

TABLE 21

Gross cubic-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

red fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 7 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 12 |
| 10 | 3 | 5 | 6 | 8 | 9 | 11 | 12 | 14 | 15 | 17 | 18 | 20 | 21 | 23 | 24 | 26 | 27 | 29 | 30 | 32 |
| 12 | 6 | 9 | 11 | 14 | 16 | 19 | 21 | 24 | 26 | 28 | 31 | 33 | 36 | 38 | 41 | 43 | 46 | 48 | 51 | 53 |
| 14 | 9 | 13 | 16 | 20 | 23 | 27 | 31 | 34 | 38 | 41 | 45 | 48 | 52 | 56 | 59 | 63 | 66 | 70 | 74 | 77 |
| 16 | 13 | 17 | 22 | 27 | 32 | 37 | 41 | 46 | 51 | 56 | 61 | 65 | 70 | 75 | 80 | 85 | 89 | 94 | 99 | 104 |
| 18 | 16 | 23 | 29 | 35 | 41 | 47 | 53 | 59 | 66 | 72 | 78 | 84 | 90 | 96 | 103 | 109 | 115 | 121 | 127 | 133 |
| 20 | 21 | 28 | 36 | 43 | 51 | 59 | 66 | 74 | 82 | 89 | 97 | 105 | 113 | 120 | 128 | 136 | 143 | 151 | 159 | 166 |
| 22 | 25 | 34 | 44 | 53 | 62 | 72 | 81 | 90 | 100 | 109 | 118 | 128 | 137 | 146 | 156 | 165 | 174 | 184 | 193 | 202 |
| 24 | 30 | 41 | 52 | 63 | 75 | 86 | 97 | 108 | 119 | 130 | 141 | 153 | 164 | 175 | 186 | 197 | 208 | 219 | 231 | 242 |
| 26 | 35 | 49 | 62 | 75 | 88 | 101 | 114 | 127 | 140 | 153 | 166 | 180 | 193 | 206 | 219 | 232 | 245 | 258 | 271 | 284 |
| 28 | 41 | 56 | 72 | 87 | 102 | 117 | 133 | 148 | 163 | 178 | 193 | 209 | 224 | 239 | 254 | 270 | 285 | 300 | 315 | 331 |
| 30 | 48 | 65 | 82 | 100 | 117 | 135 | 152 | 170 | 187 | 205 | 222 | 240 | 257 | 275 | 292 | 310 | 327 | 345 | 362 | 380 |
| 32 | 54 | 74 | 94 | 114 | 134 | 154 | 174 | 194 | 213 | 233 | 253 | 273 | 293 | 313 | 333 | 353 | 373 | 393 | 413 | 433 |
| 34 | 61 | 84 | 106 | 129 | 151 | 174 | 196 | 219 | 241 | 264 | 286 | 309 | 331 | 354 | 376 | 399 | 421 | 444 | 466 | 489 |
| 36 | 69 | 94 | 119 | 144 | 170 | 195 | 220 | 245 | 271 | 296 | 321 | 346 | 372 | 397 | 422 | 447 | 473 | 498 | 523 | 549 |
| 38 | 77 | 105 | 133 | 161 | 189 | 217 | 245 | 274 | 302 | 330 | 358 | 386 | 414 | 443 | 471 | 499 | 527 | 555 | 583 | 611 |
| 40 | 85 | 116 | 147 | 179 | 210 | 241 | 272 | 303 | 334 | 366 | 397 | 428 | 459 | 491 | 522 | 553 | 584 | 615 | 647 | 678 |
| 42 | 94 | 128 | 163 | 197 | 231 | 266 | 300 | 335 | 369 | 403 | 438 | 472 | 507 | 541 | 575 | 610 | 644 | 679 | 713 | 748 |
| 44 | 103 | 141 | 179 | 216 | 254 | 292 | 329 | 367 | 405 | 443 | 481 | 518 | 556 | 594 | 632 | 669 | 707 | 745 | 783 | 821 |
| 46 | 113 | 154 | 195 | 236 | 278 | 319 | 360 | 402 | 443 | 484 | 525 | 567 | 608 | 649 | 691 | 732 | 773 | 815 | 856 | 897 |
| 48 | 123 | 168 | 213 | 258 | 302 | 347 | 392 | 437 | 482 | 527 | 572 | 617 | 662 | 707 | 752 | 797 | 842 | 887 | 932 | 977 |
| 50 | 134 | 182 | 231 | 280 | 328 | 377 | 426 | 475 | 523 | 572 | 621 | 670 | 719 | 767 | 816 | 865 | 914 | 963 | 1012 | 1060 |
| 52 | 144 | 197 | 250 | 302 | 355 | 408 | 461 | 513 | 566 | 619 | 672 | 725 | 777 | 830 | 883 | 936 | 989 | 1041 | 1094 | 1147 |
| 54 | 156 | 213 | 269 | 326 | 383 | 440 | 497 | 554 | 611 | 668 | 725 | 781 | 838 | 895 | 952 | 1009 | 1066 | 1123 | 1180 | 1237 |
| 56 | 168 | 229 | 290 | 351 | 412 | 473 | 534 | 596 | 657 | 718 | 779 | 841 | 902 | 963 | 1024 | 1086 | 1147 | 1208 | 1269 | 1331 |
| 58 | 180 | 245 | 311 | 376 | 442 | 508 | 573 | 639 | 705 | 770 | 836 | 902 | 967 | 1033 | 1099 | 1165 | 1230 | 1296 | 1362 | 1427 |
| 60 | 193 | 263 | 333 | 403 | 473 | 543 | 614 | 684 | 754 | 824 | 895 | 965 | 1035 | 1106 | 1176 | 1246 | 1317 | 1387 | 1457 | 1528 |

TABLE 22

Gross cubic-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

sugar pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 |
| 10 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 12 | 13 | 15 | 16 | 17 | 19 | 20 | 21 | 23 | 24 | 25 | 27 | 28 |
| 12 | 6 | 8 | 10 | 12 | 15 | 17 | 19 | 21 | 23 | 26 | 28 | 30 | 32 | 35 | 37 | 39 | 41 | 44 | 46 | 48 |
| 14 | 8 | 12 | 15 | 18 | 21 | 25 | 28 | 31 | 34 | 38 | 41 | 44 | 48 | 51 | 54 | 57 | 61 | 64 | 67 | 70 |
| 16 | 12 | 16 | 20 | 25 | 29 | 34 | 38 | 42 | 47 | 51 | 56 | 60 | 64 | 69 | 73 | 78 | 82 | 86 | 91 | 95 |
| 18 | 15 | 21 | 26 | 32 | 38 | 43 | 49 | 55 | 60 | 66 | 72 | 77 | 83 | 89 | 94 | 100 | 106 | 111 | 117 | 123 |
| 20 | 19 | 26 | 33 | 40 | 47 | 54 | 61 | 68 | 75 | 82 | 90 | 97 | 104 | 111 | 118 | 125 | 132 | 139 | 146 | 153 |
| 22 | 23 | 32 | 40 | 49 | 57 | 66 | 75 | 83 | 92 | 101 | 109 | 118 | 126 | 135 | 144 | 152 | 161 | 170 | 178 | 187 |
| 24 | 28 | 38 | 48 | 59 | 69 | 79 | 89 | 100 | 110 | 120 | 131 | 141 | 151 | 161 | 172 | 182 | 192 | 203 | 213 | 223 |
| 26 | 33 | 45 | 57 | 69 | 81 | 93 | 105 | 117 | 130 | 142 | 154 | 166 | 178 | 190 | 202 | 214 | 226 | 239 | 251 | 263 |
| 28 | 38 | 52 | 66 | 80 | 94 | 108 | 122 | 137 | 151 | 165 | 179 | 193 | 207 | 221 | 235 | 249 | 263 | 277 | 291 | 305 |
| 30 | 44 | 60 | 76 | 92 | 108 | 125 | 141 | 157 | 173 | 189 | 206 | 222 | 238 | 254 | 270 | 286 | 303 | 319 | 335 | 351 |
| 32 | 50 | 68 | 87 | 105 | 124 | 142 | 160 | 179 | 197 | 216 | 234 | 253 | 271 | 289 | 308 | 326 | 345 | 363 | 382 | 400 |
| 34 | 57 | 77 | 98 | 119 | 140 | 161 | 181 | 202 | 223 | 244 | 265 | 285 | 306 | 327 | 348 | 369 | 390 | 410 | 431 | 452 |
| 36 | 64 | 87 | 110 | 133 | 157 | 180 | 204 | 227 | 250 | 274 | 297 | 320 | 344 | 367 | 390 | 414 | 437 | 460 | 484 | 507 |
| 38 | 71 | 97 | 123 | 149 | 175 | 201 | 227 | 253 | 279 | 305 | 331 | 357 | 383 | 409 | 435 | 461 | 487 | 513 | 539 | 565 |
| 40 | 79 | 107 | 136 | 165 | 194 | 223 | 252 | 280 | 309 | 338 | 367 | 396 | 425 | 454 | 482 | 511 | 540 | 569 | 598 | 627 |
| 42 | 87 | 119 | 150 | 182 | 214 | 246 | 277 | 309 | 341 | 373 | 405 | 437 | 468 | 500 | 532 | 564 | 596 | 628 | 660 | 691 |
| 44 | 95 | 130 | 165 | 200 | 235 | 270 | 305 | 340 | 375 | 409 | 444 | 479 | 514 | 549 | 584 | 619 | 654 | 689 | 724 | 759 |
| 46 | 104 | 142 | 180 | 219 | 257 | 295 | 333 | 371 | 409 | 448 | 486 | 524 | 562 | 600 | 639 | 677 | 715 | 753 | 792 | 830 |
| 48 | 114 | 155 | 197 | 238 | 280 | 321 | 363 | 404 | 446 | 488 | 529 | 571 | 612 | 654 | 696 | 737 | 779 | 820 | 862 | 904 |
| 50 | 123 | 168 | 213 | 258 | 304 | 349 | 394 | 439 | 484 | 529 | 574 | 619 | 665 | 710 | 755 | 800 | 845 | 890 | 936 | 981 |
| 52 | 134 | 182 | 231 | 280 | 328 | 377 | 426 | 475 | 524 | 572 | 621 | 670 | 719 | 768 | 817 | 866 | 914 | 963 | 1012 | 1061 |
| 54 | 144 | 197 | 249 | 302 | 354 | 407 | 459 | 512 | 565 | 617 | 670 | 723 | 775 | 828 | 881 | 934 | 986 | 1039 | 1092 | 1144 |
| 56 | 155 | 211 | 268 | 324 | 381 | 438 | 494 | 551 | 607 | 664 | 721 | 777 | 834 | 891 | 947 | 1004 | 1061 | 1117 | 1174 | 1231 |
| 58 | 166 | 227 | 287 | 348 | 409 | 469 | 530 | 591 | 652 | 712 | 773 | 834 | 895 | 956 | 1016 | 1077 | 1138 | 1199 | 1260 | 1320 |
| 60 | 178 | 243 | 308 | 373 | 438 | 502 | 567 | 633 | 698 | 763 | 828 | 893 | 958 | 1023 | 1088 | 1153 | 1218 | 1283 | 1348 | 1413 |

TABLE 23

Gross board-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

ponderosa pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 10 | 12 | 16 | 18 | 20 | 20 | 20 | 20 | 31 | 33 | 46 | 48 | 50 | 50 | 50 | 50 | 61 | 63 |
| 10 | 13 | 20 | 30 | 40 | 46 | 50 | 46 | 68 | 76 | 79 | 80 | 105 | 111 | 112 | 109 | 125 | 141 | 143 | 155 | 161 |
| 12 | 20 | 30 | 43 | 54 | 68 | 85 | 90 | 105 | 126 | 133 | 154 | 167 | 173 | 199 | 206 | 211 | 240 | 250 | 250 | 280 |
| 14 | 30 | 46 | 64 | 81 | 103 | 127 | 148 | 161 | 182 | 208 | 216 | 251 | 266 | 292 | 311 | 322 | 353 | 369 | 400 | 414 |
| 16 | 31 | 64 | 92 | 116 | 142 | 176 | 200 | 227 | 257 | 288 | 319 | 338 | 378 | 397 | 437 | 463 | 486 | 522 | 541 | 581 |
| 18 | 43 | 83 | 111 | 155 | 192 | 229 | 271 | 304 | 339 | 385 | 417 | 463 | 495 | 541 | 573 | 610 | 655 | 689 | 733 | 768 |
| 20 | 56 | 104 | 144 | 198 | 238 | 294 | 339 | 391 | 439 | 489 | 539 | 587 | 639 | 686 | 738 | 785 | 838 | 889 | 938 | 990 |
| 22 | 71 | 127 | 180 | 244 | 297 | 366 | 417 | 487 | 549 | 609 | 671 | 732 | 798 | 856 | 923 | 979 | 1048 | 1103 | 1173 | 1227 |
| 24 | 87 | 153 | 231 | 295 | 374 | 452 | 521 | 600 | 670 | 749 | 819 | 898 | 970 | 1048 | 1121 | 1199 | 1271 | 1350 | 1423 | 1500 |
| 26 | 115 | 189 | 277 | 360 | 449 | 535 | 624 | 712 | 802 | 890 | 981 | 1069 | 1161 | 1249 | 1341 | 1429 | 1522 | 1609 | 1704 | 1799 |
| 28 | 135 | 218 | 325 | 415 | 528 | 623 | 736 | 832 | 946 | 1042 | 1157 | 1254 | 1369 | 1466 | 1581 | 1689 | 1793 | 1903 | 2015 | 2117 |
| 30 | 156 | 247 | 379 | 484 | 614 | 726 | 855 | 970 | 1100 | 1215 | 1345 | 1470 | 1591 | 1718 | 1847 | 1966 | 2094 | 2216 | 2340 | 2464 |
| 32 | 181 | 286 | 435 | 559 | 707 | 837 | 984 | 1118 | 1266 | 1400 | 1548 | 1694 | 1839 | 1978 | 2122 | 2265 | 2406 | 2550 | 2690 | 2837 |
| 34 | 205 | 327 | 496 | 639 | 805 | 956 | 1122 | 1276 | 1443 | 1607 | 1773 | 1932 | 2094 | 2258 | 2416 | 2583 | 2737 | 2909 | 3063 | 3235 |
| 36 | 231 | 371 | 561 | 724 | 911 | 1083 | 1268 | 1444 | 1630 | 1819 | 2001 | 2186 | 2361 | 2554 | 2729 | 2921 | 3097 | 3290 | 3477 | 3667 |
| 38 | 259 | 418 | 629 | 815 | 1022 | 1217 | 1423 | 1633 | 1838 | 2044 | 2244 | 2454 | 2652 | 2867 | 3066 | 3280 | 3489 | 3702 | 3905 | 4114 |
| 40 | 288 | 468 | 701 | 910 | 1139 | 1360 | 1586 | 1822 | 2048 | 2280 | 2500 | 2738 | 2961 | 3198 | 3422 | 3659 | 3894 | 4128 | 4358 | 4587 |
| 42 | 319 | 521 | 778 | 1011 | 1264 | 1509 | 1760 | 2023 | 2269 | 2530 | 2775 | 3038 | 3286 | 3548 | 3807 | 4068 | 4321 | 4576 | 4835 | 5083 |
| 44 | 353 | 576 | 858 | 1117 | 1393 | 1667 | 1941 | 2232 | 2500 | 2791 | 3063 | 3352 | 3627 | 3915 | 4202 | 4486 | 4768 | 5044 | 5336 | 5611 |
| 46 | 387 | 634 | 942 | 1229 | 1529 | 1832 | 2140 | 2452 | 2747 | 3067 | 3366 | 3683 | 3986 | 4300 | 4617 | 4926 | 5239 | 5542 | 5861 | 6165 |
| 48 | 423 | 694 | 1029 | 1345 | 1672 | 2005 | 2339 | 2683 | 3006 | 3354 | 3683 | 4028 | 4361 | 4712 | 5050 | 5386 | 5731 | 6063 | 6412 | 6745 |
| 50 | 461 | 758 | 1121 | 1467 | 1822 | 2186 | 2546 | 2923 | 3277 | 3654 | 4015 | 4389 | 4763 | 5132 | 5503 | 5864 | 6244 | 6607 | 6986 | 7360 |
| 52 | 500 | 824 | 1216 | 1594 | 1977 | 2384 | 2759 | 3174 | 3559 | 3968 | 4360 | 4764 | 5171 | 5570 | 5975 | 6368 | 6780 | 7175 | 7584 | 7991 |
| 54 | 540 | 893 | 1316 | 1726 | 2139 | 2581 | 2987 | 3435 | 3853 | 4294 | 4720 | 5155 | 5596 | 6026 | 6467 | 6893 | 7337 | 7766 | 8208 | 8649 |
| 56 | 583 | 964 | 1420 | 1863 | 2307 | 2784 | 3224 | 3707 | 4158 | 4632 | 5093 | 5562 | 6040 | 6496 | 6977 | 7438 | 7917 | 8380 | 8855 | 9332 |
| 58 | 626 | 1039 | 1528 | 2005 | 2481 | 2996 | 3470 | 3988 | 4475 | 4984 | 5481 | 5983 | 6498 | 6991 | 7507 | 8004 | 8517 | 9017 | 9536 | 10042 |
| 60 | 672 | 1116 | 1639 | 2153 | 2662 | 3215 | 3725 | 4280 | 4804 | 5349 | 5883 | 6420 | 6974 | 7503 | 8057 | 8591 | 9139 | 9677 | 10232 | 10776 |

TABLE 24

Gross board-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

Incense cedar

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 11 | 12 | 13 | 16 | 17 | 18 | 20 | 20 | 20 | 20 | 20 | 20 | 30 | 32 | 33 |
| 10 | 10 | 13 | 18 | 20 | 30 | 40 | 43 | 48 | 50 | 50 | 70 | 71 | 75 | 77 | 78 | 88 | 94 | 108 | 110 | 110 |
| 12 | 15 | 20 | 30 | 38 | 48 | 52 | 74 | 83 | 88 | 87 | 112 | 122 | 125 | 138 | 152 | 159 | 162 | 179 | 198 | 200 |
| 14 | 18 | 30 | 45 | 59 | 74 | 88 | 102 | 119 | 140 | 146 | 164 | 187 | 197 | 219 | 233 | 244 | 270 | 280 | 290 | 308 |
| 16 | 30 | 35 | 64 | 85 | 104 | 125 | 146 | 168 | 185 | 218 | 234 | 257 | 285 | 301 | 331 | 351 | 364 | 398 | 415 | 447 |
| 18 | 26 | 59 | 83 | 103 | 141 | 170 | 198 | 224 | 262 | 286 | 316 | 350 | 369 | 411 | 432 | 473 | 501 | 516 | 562 | 586 |
| 20 | 35 | 76 | 111 | 145 | 180 | 208 | 256 | 292 | 332 | 373 | 407 | 443 | 491 | 522 | 560 | 605 | 641 | 685 | 711 | 763 |
| 22 | 45 | 94 | 129 | 182 | 230 | 274 | 317 | 368 | 415 | 459 | 511 | 559 | 608 | 658 | 705 | 757 | 807 | 846 | 906 | 945 |
| 24 | 57 | 113 | 159 | 222 | 275 | 336 | 394 | 451 | 513 | 567 | 622 | 685 | 742 | 809 | 862 | 929 | 982 | 1040 | 1100 | 1161 |
| 26 | 69 | 134 | 192 | 266 | 325 | 402 | 463 | 541 | 610 | 682 | 753 | 822 | 896 | 965 | 1040 | 1108 | 1184 | 1250 | 1317 | 1399 |
| 28 | 82 | 157 | 228 | 313 | 386 | 475 | 548 | 639 | 713 | 806 | 879 | 973 | 1053 | 1141 | 1222 | 1310 | 1392 | 1479 | 1562 | 1648 |
| 30 | 97 | 181 | 267 | 362 | 451 | 552 | 650 | 744 | 842 | 938 | 1036 | 1133 | 1231 | 1329 | 1429 | 1525 | 1625 | 1722 | 1827 | 1920 |
| 32 | 113 | 207 | 319 | 417 | 531 | 634 | 750 | 865 | 972 | 1089 | 1197 | 1314 | 1422 | 1539 | 1649 | 1766 | 1875 | 1993 | 2103 | 2220 |
| 34 | 130 | 234 | 364 | 483 | 607 | 732 | 857 | 984 | 1110 | 1239 | 1367 | 1496 | 1625 | 1754 | 1884 | 2012 | 2142 | 2271 | 2403 | 2531 |
| 36 | 158 | 273 | 413 | 544 | 687 | 825 | 970 | 1111 | 1258 | 1400 | 1548 | 1690 | 1840 | 1977 | 2133 | 2270 | 2427 | 2564 | 2721 | 2868 |
| 38 | 177 | 303 | 464 | 604 | 773 | 921 | 1091 | 1244 | 1414 | 1569 | 1740 | 1896 | 2068 | 2224 | 2397 | 2563 | 2727 | 2894 | 3056 | 3225 |
| 40 | 198 | 331 | 517 | 676 | 864 | 1030 | 1219 | 1390 | 1580 | 1753 | 1943 | 2118 | 2309 | 2494 | 2676 | 2863 | 3053 | 3232 | 3421 | 3602 |
| 42 | 219 | 369 | 575 | 751 | 958 | 1145 | 1353 | 1545 | 1754 | 1947 | 2157 | 2352 | 2563 | 2770 | 2979 | 3179 | 3387 | 3589 | 3795 | 4001 |
| 44 | 242 | 409 | 635 | 831 | 1058 | 1266 | 1494 | 1707 | 1936 | 2152 | 2382 | 2609 | 2839 | 3060 | 3287 | 3512 | 3737 | 3965 | 4188 | 4418 |
| 46 | 267 | 451 | 698 | 915 | 1164 | 1393 | 1642 | 1878 | 2128 | 2366 | 2617 | 2869 | 3118 | 3363 | 3611 | 3861 | 4101 | 4359 | 4598 | 4856 |
| 48 | 291 | 495 | 763 | 1003 | 1273 | 1526 | 1797 | 2056 | 2328 | 2601 | 2873 | 3141 | 3410 | 3682 | 3945 | 4226 | 4489 | 4769 | 5033 | 5315 |
| 50 | 317 | 540 | 833 | 1094 | 1387 | 1664 | 1958 | 2242 | 2538 | 2835 | 3130 | 3424 | 3715 | 4015 | 4302 | 4607 | 4894 | 5199 | 5498 | 5792 |
| 52 | 344 | 588 | 904 | 1190 | 1507 | 1809 | 2126 | 2437 | 2755 | 3081 | 3397 | 3720 | 4031 | 4360 | 4674 | 5003 | 5317 | 5648 | 5973 | 6300 |
| 54 | 373 | 638 | 979 | 1289 | 1631 | 1960 | 2302 | 2639 | 2992 | 3336 | 3676 | 4027 | 4365 | 4721 | 5061 | 5417 | 5768 | 6113 | 6467 | 6819 |
| 56 | 402 | 690 | 1056 | 1393 | 1760 | 2116 | 2484 | 2860 | 3228 | 3602 | 3964 | 4348 | 4713 | 5096 | 5463 | 5846 | 6225 | 6607 | 6981 | 7358 |
| 58 | 432 | 744 | 1136 | 1500 | 1894 | 2279 | 2673 | 3078 | 3472 | 3876 | 4267 | 4679 | 5073 | 5485 | 5881 | 6292 | 6702 | 7109 | 7514 | 7917 |
| 60 | 464 | 799 | 1219 | 1612 | 2032 | 2447 | 2870 | 3305 | 3725 | 4161 | 4582 | 5022 | 5447 | 5887 | 6314 | 6754 | 7194 | 7629 | 8066 | 8494 |

TABLE 25

Gross board-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

white fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 11 | 13 | 17 | 20 | 20 | 20 | 20 | 30 | 43 | 46 | 48 | 50 | 50 | 50 | 60 | 62 | 65 | 67 |
| 10 | 13 | 20 | 30 | 40 | 46 | 45 | 47 | 71 | 77 | 81 | 82 | 106 | 113 | 110 | 122 | 140 | 145 | 146 | 159 | 166 |
| 12 | 20 | 30 | 44 | 55 | 69 | 87 | 93 | 108 | 129 | 137 | 157 | 170 | 178 | 204 | 211 | 218 | 247 | 258 | 258 | 289 |
| 14 | 30 | 47 | 64 | 83 | 104 | 130 | 150 | 165 | 186 | 212 | 223 | 256 | 274 | 290 | 319 | 332 | 362 | 380 | 410 | 425 |
| 16 | 31 | 64 | 94 | 118 | 145 | 169 | 204 | 233 | 262 | 295 | 326 | 347 | 386 | 408 | 448 | 474 | 500 | 535 | 556 | 595 |
| 18 | 42 | 84 | 112 | 158 | 196 | 233 | 277 | 310 | 347 | 393 | 427 | 474 | 507 | 545 | 585 | 626 | 670 | 707 | 751 | 778 |
| 20 | 55 | 105 | 145 | 200 | 241 | 299 | 346 | 399 | 449 | 498 | 551 | 599 | 654 | 701 | 756 | 806 | 849 | 910 | 951 | 1013 |
| 22 | 70 | 129 | 182 | 248 | 302 | 371 | 425 | 496 | 549 | 621 | 674 | 747 | 806 | 875 | 934 | 1001 | 1072 | 1128 | 1199 | 1255 |
| 24 | 87 | 154 | 233 | 300 | 379 | 450 | 530 | 601 | 681 | 764 | 835 | 917 | 989 | 1071 | 1144 | 1226 | 1298 | 1380 | 1454 | 1535 |
| 26 | 105 | 191 | 278 | 365 | 454 | 545 | 634 | 726 | 816 | 908 | 1000 | 1092 | 1183 | 1276 | 1369 | 1460 | 1554 | 1645 | 1740 | 1830 |
| 28 | 134 | 220 | 328 | 426 | 535 | 637 | 747 | 846 | 962 | 1062 | 1178 | 1278 | 1395 | 1495 | 1613 | 1722 | 1831 | 1941 | 2049 | 2161 |
| 30 | 156 | 247 | 381 | 490 | 623 | 736 | 869 | 986 | 1119 | 1237 | 1370 | 1488 | 1623 | 1751 | 1875 | 2005 | 2138 | 2260 | 2391 | 2515 |
| 32 | 178 | 286 | 439 | 565 | 716 | 849 | 1000 | 1136 | 1287 | 1425 | 1577 | 1724 | 1866 | 2017 | 2166 | 2309 | 2456 | 2602 | 2747 | 2896 |
| 34 | 204 | 328 | 500 | 646 | 817 | 970 | 1139 | 1297 | 1467 | 1636 | 1796 | 1967 | 2135 | 2300 | 2465 | 2633 | 2796 | 2967 | 3125 | 3302 |
| 36 | 230 | 372 | 566 | 732 | 922 | 1098 | 1288 | 1468 | 1659 | 1849 | 2039 | 2225 | 2411 | 2602 | 2781 | 2978 | 3158 | 3356 | 3546 | 3733 |
| 38 | 258 | 419 | 635 | 823 | 1036 | 1234 | 1446 | 1649 | 1860 | 2078 | 2286 | 2499 | 2701 | 2921 | 3124 | 3345 | 3547 | 3767 | 3982 | 4199 |
| 40 | 287 | 469 | 707 | 920 | 1154 | 1378 | 1612 | 1851 | 2084 | 2319 | 2543 | 2789 | 3015 | 3258 | 3487 | 3730 | 3969 | 4211 | 4443 | 4681 |
| 42 | 318 | 521 | 784 | 1021 | 1279 | 1530 | 1787 | 2053 | 2309 | 2572 | 2823 | 3092 | 3346 | 3614 | 3869 | 4137 | 4403 | 4668 | 4929 | 5189 |
| 44 | 350 | 577 | 866 | 1128 | 1412 | 1690 | 1972 | 2267 | 2545 | 2839 | 3116 | 3413 | 3693 | 3988 | 4280 | 4574 | 4860 | 5148 | 5440 | 5722 |
| 46 | 385 | 635 | 950 | 1241 | 1550 | 1857 | 2164 | 2490 | 2792 | 3118 | 3424 | 3748 | 4058 | 4380 | 4702 | 5021 | 5338 | 5649 | 5976 | 6286 |
| 48 | 421 | 695 | 1038 | 1358 | 1694 | 2032 | 2376 | 2724 | 3055 | 3410 | 3747 | 4100 | 4439 | 4790 | 5144 | 5490 | 5840 | 6179 | 6536 | 6877 |
| 50 | 458 | 759 | 1131 | 1481 | 1845 | 2215 | 2586 | 2967 | 3329 | 3716 | 4083 | 4466 | 4838 | 5218 | 5604 | 5979 | 6363 | 6734 | 7121 | 7493 |
| 52 | 497 | 825 | 1227 | 1509 | 2002 | 2406 | 2806 | 3223 | 3616 | 4034 | 4434 | 4848 | 5253 | 5674 | 6085 | 6487 | 6908 | 7312 | 7731 | 8136 |
| 54 | 538 | 894 | 1327 | 1742 | 2167 | 2615 | 3031 | 3488 | 3914 | 4365 | 4800 | 5247 | 5696 | 6138 | 6585 | 7021 | 7476 | 7913 | 8366 | 8815 |
| 56 | 580 | 966 | 1431 | 1881 | 2337 | 2821 | 3271 | 3763 | 4224 | 4710 | 5179 | 5660 | 6145 | 6620 | 7106 | 7576 | 8065 | 8539 | 9025 | 9511 |
| 58 | 623 | 1040 | 1539 | 2025 | 2514 | 3036 | 3520 | 4048 | 4546 | 5067 | 5573 | 6088 | 6612 | 7116 | 7645 | 8152 | 8676 | 9187 | 9710 | 10234 |
| 60 | 669 | 1117 | 1653 | 2174 | 2697 | 3258 | 3779 | 4345 | 4879 | 5437 | 5982 | 6534 | 7097 | 7638 | 8203 | 8749 | 9311 | 9860 | 10419 | 10982 |

TABLE 26

Gross board-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

Douglas fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 11 | 12 | 15 | 17 | 20 | 20 | 20 | 20 | 20 | 30 | 32 | 33 | 36 | 48 | 50 | 50 | 50 |
| 10 | 12 | 17 | 20 | 30 | 41 | 46 | 50 | 45 | 67 | 73 | 78 | 79 | 90 | 105 | 111 | 111 | 122 | 123 | 139 | 140 |
| 12 | 17 | 30 | 37 | 48 | 64 | 78 | 87 | 89 | 114 | 124 | 130 | 153 | 160 | 167 | 180 | 201 | 203 | 217 | 238 | 244 |
| 14 | 30 | 31 | 57 | 76 | 90 | 108 | 126 | 149 | 158 | 188 | 203 | 208 | 243 | 256 | 280 | 297 | 308 | 340 | 351 | 360 |
| 16 | 26 | 56 | 76 | 93 | 127 | 153 | 178 | 199 | 235 | 254 | 279 | 311 | 335 | 366 | 380 | 419 | 442 | 462 | 496 | 514 |
| 18 | 36 | 74 | 105 | 138 | 167 | 204 | 238 | 268 | 307 | 341 | 375 | 414 | 451 | 476 | 522 | 548 | 594 | 625 | 655 | 697 |
| 20 | 47 | 93 | 126 | 177 | 219 | 263 | 310 | 351 | 401 | 439 | 482 | 534 | 573 | 625 | 664 | 707 | 753 | 799 | 850 | 891 |
| 22 | 60 | 114 | 159 | 220 | 265 | 328 | 379 | 438 | 493 | 550 | 606 | 662 | 720 | 773 | 833 | 886 | 947 | 1004 | 1050 | 1119 |
| 24 | 75 | 137 | 196 | 266 | 325 | 399 | 458 | 534 | 593 | 670 | 729 | 808 | 871 | 945 | 1020 | 1083 | 1158 | 1221 | 1297 | 1359 |
| 26 | 90 | 161 | 235 | 317 | 401 | 476 | 560 | 638 | 723 | 801 | 886 | 974 | 1051 | 1139 | 1215 | 1303 | 1381 | 1468 | 1546 | 1633 |
| 28 | 107 | 188 | 289 | 381 | 473 | 569 | 663 | 759 | 853 | 951 | 1046 | 1144 | 1240 | 1338 | 1435 | 1532 | 1631 | 1727 | 1825 | 1921 |
| 30 | 136 | 226 | 337 | 439 | 552 | 658 | 772 | 880 | 995 | 1103 | 1220 | 1323 | 1445 | 1549 | 1672 | 1775 | 1899 | 2012 | 2125 | 2240 |
| 32 | 156 | 256 | 387 | 498 | 635 | 752 | 889 | 1008 | 1146 | 1266 | 1404 | 1526 | 1664 | 1795 | 1925 | 2057 | 2185 | 2319 | 2455 | 2582 |
| 34 | 177 | 287 | 443 | 570 | 724 | 860 | 1013 | 1152 | 1307 | 1446 | 1602 | 1752 | 1898 | 2049 | 2204 | 2348 | 2500 | 2648 | 2797 | 2947 |
| 36 | 202 | 326 | 500 | 647 | 820 | 974 | 1147 | 1305 | 1479 | 1638 | 1812 | 1983 | 2155 | 2320 | 2490 | 2658 | 2825 | 2996 | 3161 | 3335 |
| 38 | 226 | 367 | 561 | 728 | 920 | 1095 | 1288 | 1467 | 1659 | 1851 | 2043 | 2228 | 2418 | 2607 | 2793 | 2986 | 3167 | 3365 | 3547 | 3746 |
| 40 | 251 | 411 | 627 | 814 | 1026 | 1224 | 1436 | 1639 | 1852 | 2066 | 2277 | 2487 | 2695 | 2910 | 3113 | 3333 | 3536 | 3756 | 3969 | 4179 |
| 42 | 279 | 458 | 695 | 904 | 1139 | 1359 | 1594 | 1819 | 2053 | 2294 | 2524 | 2761 | 2986 | 3229 | 3455 | 3699 | 3925 | 4167 | 4406 | 4646 |
| 44 | 307 | 506 | 766 | 999 | 1256 | 1502 | 1758 | 2020 | 2275 | 2533 | 2780 | 3048 | 3297 | 3564 | 3815 | 4081 | 4344 | 4609 | 4865 | 5125 |
| 46 | 337 | 558 | 842 | 1099 | 1379 | 1651 | 1930 | 2219 | 2497 | 2783 | 3056 | 3349 | 3624 | 3916 | 4193 | 4484 | 4774 | 5061 | 5346 | 5629 |
| 48 | 368 | 611 | 920 | 1204 | 1510 | 1808 | 2112 | 2428 | 2730 | 3044 | 3345 | 3664 | 3966 | 4285 | 4589 | 4905 | 5224 | 5535 | 5849 | 6153 |
| 50 | 401 | 667 | 1003 | 1313 | 1644 | 1971 | 2301 | 2647 | 2970 | 3319 | 3646 | 3993 | 4324 | 4668 | 5012 | 5354 | 5693 | 6030 | 6374 | 6707 |
| 52 | 436 | 726 | 1089 | 1427 | 1785 | 2142 | 2507 | 2875 | 3226 | 3603 | 3961 | 4335 | 4696 | 5070 | 5444 | 5812 | 6183 | 6544 | 6922 | 7284 |
| 54 | 472 | 787 | 1178 | 1546 | 1931 | 2319 | 2712 | 3112 | 3493 | 3901 | 4288 | 4692 | 5084 | 5486 | 5892 | 6288 | 6692 | 7084 | 7493 | 7885 |
| 56 | 509 | 850 | 1271 | 1669 | 2083 | 2504 | 2924 | 3359 | 3771 | 4209 | 4628 | 5063 | 5487 | 5929 | 6358 | 6780 | 7222 | 7645 | 8085 | 8509 |
| 58 | 547 | 916 | 1367 | 1797 | 2242 | 2695 | 3145 | 3614 | 4059 | 4529 | 4982 | 5449 | 5905 | 6378 | 6843 | 7297 | 7770 | 8227 | 8700 | 9158 |
| 60 | 587 | 984 | 1467 | 1930 | 2405 | 2904 | 3370 | 3879 | 4357 | 4861 | 5348 | 5847 | 6349 | 6843 | 7344 | 7833 | 8341 | 8831 | 9337 | 9839 |

TABLE 27

Gross board-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

red fir

total height (feet)

| DBH (inches) | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 12 | 15 | 17 | 20 | 20 | 20 | 20 | 42 | 45 | 47 | 50 | 50 | 50 | 50 | 62 | 65 | 67 | 70 |
| 10 | 15 | 20 | 30 | 41 | 47 | 46 | 58 | 73 | 80 | 82 | 94 | 110 | 110 | 112 | 127 | 143 | 146 | 157 | 165 | 175 |
| 12 | 20 | 30 | 46 | 56 | 70 | 85 | 95 | 122 | 134 | 135 | 163 | 176 | 181 | 206 | 217 | 222 | 253 | 258 | 275 | 298 |
| 14 | 30 | 48 | 67 | 84 | 108 | 133 | 154 | 170 | 201 | 219 | 238 | 265 | 280 | 309 | 329 | 339 | 373 | 388 | 423 | 437 |
| 16 | 32 | 66 | 96 | 123 | 149 | 180 | 211 | 239 | 271 | 303 | 336 | 356 | 399 | 419 | 460 | 487 | 523 | 551 | 576 | 614 |
| 18 | 45 | 87 | 117 | 163 | 201 | 241 | 284 | 321 | 367 | 401 | 439 | 487 | 521 | 570 | 603 | 653 | 686 | 726 | 773 | 809 |
| 20 | 58 | 109 | 151 | 208 | 250 | 309 | 351 | 412 | 461 | 515 | 566 | 618 | 672 | 722 | 777 | 827 | 882 | 937 | 988 | 1043 |
| 22 | 74 | 133 | 189 | 256 | 313 | 384 | 449 | 512 | 577 | 640 | 705 | 770 | 836 | 900 | 971 | 1030 | 1102 | 1160 | 1233 | 1291 |
| 24 | 91 | 159 | 242 | 319 | 393 | 473 | 547 | 629 | 704 | 786 | 862 | 943 | 1019 | 1101 | 1178 | 1260 | 1338 | 1419 | 1496 | 1577 |
| 26 | 120 | 197 | 290 | 376 | 470 | 560 | 655 | 747 | 841 | 934 | 1030 | 1122 | 1219 | 1311 | 1409 | 1501 | 1600 | 1700 | 1791 | 1890 |
| 28 | 140 | 227 | 340 | 435 | 553 | 653 | 772 | 873 | 992 | 1094 | 1214 | 1317 | 1437 | 1549 | 1660 | 1774 | 1883 | 1999 | 2116 | 2223 |
| 30 | 162 | 258 | 396 | 507 | 643 | 761 | 896 | 1017 | 1153 | 1275 | 1411 | 1543 | 1670 | 1803 | 1938 | 2064 | 2197 | 2326 | 2457 | 2588 |
| 32 | 188 | 298 | 455 | 585 | 740 | 877 | 1031 | 1172 | 1327 | 1468 | 1623 | 1776 | 1929 | 2076 | 2227 | 2377 | 2524 | 2678 | 2819 | 2978 |
| 34 | 213 | 341 | 518 | 669 | 843 | 1002 | 1175 | 1337 | 1512 | 1685 | 1858 | 2026 | 2196 | 2368 | 2530 | 2709 | 2872 | 3052 | 3225 | 3395 |
| 36 | 240 | 387 | 586 | 758 | 953 | 1134 | 1328 | 1514 | 1708 | 1906 | 2098 | 2292 | 2476 | 2678 | 2862 | 3064 | 3249 | 3451 | 3647 | 3846 |
| 38 | 269 | 436 | 657 | 852 | 1069 | 1274 | 1490 | 1710 | 1925 | 2141 | 2352 | 2572 | 2781 | 3005 | 3215 | 3439 | 3659 | 3882 | 4096 | 4315 |
| 40 | 299 | 488 | 732 | 952 | 1191 | 1423 | 1661 | 1908 | 2145 | 2388 | 2620 | 2870 | 3103 | 3352 | 3587 | 3836 | 4083 | 4328 | 4569 | 4810 |
| 42 | 332 | 543 | 812 | 1057 | 1321 | 1579 | 1842 | 2118 | 2376 | 2650 | 2907 | 3183 | 3443 | 3718 | 3990 | 4263 | 4529 | 4797 | 5069 | 5330 |
| 44 | 367 | 600 | 896 | 1168 | 1457 | 1744 | 2031 | 2337 | 2618 | 2923 | 3209 | 3512 | 3801 | 4102 | 4403 | 4702 | 4998 | 5287 | 5594 | 5883 |
| 46 | 402 | 660 | 983 | 1284 | 1599 | 1917 | 2239 | 2566 | 2876 | 3211 | 3526 | 3858 | 4176 | 4505 | 4837 | 5161 | 5490 | 5808 | 6143 | 6462 |
| 48 | 439 | 724 | 1074 | 1405 | 1748 | 2097 | 2447 | 2808 | 3147 | 3512 | 3857 | 4218 | 4568 | 4936 | 5290 | 5638 | 6005 | 6354 | 6719 | 7069 |
| 50 | 478 | 789 | 1170 | 1532 | 1905 | 2286 | 2664 | 3059 | 3430 | 3825 | 4204 | 4596 | 4988 | 5375 | 5765 | 6144 | 6542 | 6923 | 7320 | 7712 |
| 52 | 519 | 858 | 1269 | 1664 | 2067 | 2493 | 2887 | 3321 | 3725 | 4154 | 4565 | 4988 | 5415 | 5834 | 6258 | 6671 | 7103 | 7517 | 7946 | 8373 |
| 54 | 561 | 930 | 1373 | 1802 | 2235 | 2698 | 3125 | 3593 | 4032 | 4494 | 4941 | 5397 | 5860 | 6311 | 6773 | 7220 | 7685 | 8135 | 8599 | 9061 |
| 56 | 605 | 1004 | 1482 | 1945 | 2411 | 2911 | 3372 | 3878 | 4351 | 4848 | 5331 | 5823 | 6323 | 6803 | 7307 | 7790 | 8292 | 8778 | 9275 | 9776 |
| 58 | 650 | 1082 | 1594 | 2094 | 2593 | 3132 | 3629 | 4171 | 4682 | 5215 | 5737 | 6263 | 6803 | 7320 | 7861 | 8382 | 8920 | 9444 | 9988 | 10518 |
| 60 | 697 | 1162 | 1710 | 2248 | 2781 | 3361 | 3896 | 4476 | 5026 | 5596 | 6157 | 6720 | 7300 | 7856 | 8436 | 8996 | 9571 | 10135 | 10716 | 11286 |

TABLE 28

Gross board-foot volume table to a 1 ft. stump -- 6 inch top

Northern California Forest Yield Cooperative

sugar pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 10 | 12 | 15 | 17 | 18 | 20 | 20 | 20 | 20 | 31 | 33 | 46 | 47 | 50 | 50 | 50 | 50 | 60 |
| 10 | 13 | 18 | 20 | 30 | 43 | 50 | 50 | 66 | 72 | 78 | 79 | 90 | 106 | 111 | 112 | 120 | 126 | 141 | 142 | 154 |
| 12 | 18 | 30 | 40 | 53 | 66 | 83 | 88 | 103 | 122 | 130 | 134 | 159 | 168 | 172 | 202 | 206 | 220 | 242 | 248 | 259 |
| 14 | 30 | 43 | 61 | 79 | 98 | 113 | 143 | 154 | 176 | 200 | 209 | 241 | 259 | 263 | 298 | 313 | 343 | 357 | 367 | 402 |
| 16 | 29 | 61 | 90 | 111 | 137 | 161 | 191 | 220 | 245 | 268 | 306 | 326 | 363 | 389 | 411 | 446 | 459 | 502 | 524 | 558 |
| 18 | 40 | 79 | 105 | 148 | 186 | 219 | 252 | 291 | 327 | 370 | 402 | 437 | 475 | 513 | 554 | 589 | 630 | 655 | 706 | 731 |
| 20 | 53 | 100 | 137 | 189 | 227 | 282 | 327 | 375 | 424 | 469 | 520 | 564 | 616 | 658 | 702 | 760 | 799 | 856 | 895 | 953 |
| 22 | 67 | 123 | 172 | 235 | 285 | 351 | 400 | 468 | 517 | 586 | 641 | 704 | 761 | 823 | 881 | 942 | 1001 | 1062 | 1121 | 1181 |
| 24 | 82 | 146 | 211 | 284 | 359 | 425 | 499 | 568 | 643 | 712 | 787 | 856 | 932 | 1001 | 1077 | 1156 | 1224 | 1302 | 1369 | 1447 |
| 26 | 100 | 172 | 264 | 347 | 430 | 516 | 600 | 686 | 771 | 858 | 943 | 1031 | 1117 | 1205 | 1292 | 1378 | 1466 | 1552 | 1640 | 1727 |
| 28 | 128 | 210 | 312 | 404 | 507 | 603 | 707 | 804 | 909 | 1003 | 1113 | 1207 | 1318 | 1411 | 1523 | 1616 | 1729 | 1831 | 1934 | 2038 |
| 30 | 149 | 240 | 362 | 464 | 590 | 697 | 823 | 932 | 1058 | 1168 | 1295 | 1406 | 1534 | 1654 | 1772 | 1893 | 2020 | 2134 | 2258 | 2375 |
| 32 | 171 | 272 | 417 | 536 | 679 | 804 | 947 | 1075 | 1218 | 1347 | 1491 | 1630 | 1764 | 1905 | 2047 | 2182 | 2321 | 2458 | 2596 | 2736 |
| 34 | 195 | 312 | 475 | 612 | 774 | 918 | 1079 | 1227 | 1389 | 1537 | 1699 | 1860 | 2020 | 2175 | 2331 | 2489 | 2644 | 2805 | 2953 | 3120 |
| 36 | 220 | 354 | 538 | 694 | 875 | 1040 | 1220 | 1389 | 1570 | 1750 | 1930 | 2105 | 2281 | 2461 | 2630 | 2816 | 2986 | 3173 | 3352 | 3528 |
| 38 | 246 | 399 | 603 | 781 | 982 | 1170 | 1369 | 1562 | 1762 | 1967 | 2164 | 2365 | 2555 | 2764 | 2955 | 3162 | 3354 | 3563 | 3766 | 3971 |
| 40 | 274 | 446 | 672 | 873 | 1095 | 1306 | 1528 | 1754 | 1974 | 2196 | 2407 | 2640 | 2853 | 3083 | 3299 | 3529 | 3754 | 3984 | 4203 | 4428 |
| 42 | 304 | 497 | 745 | 970 | 1214 | 1451 | 1693 | 1946 | 2187 | 2436 | 2672 | 2928 | 3166 | 3421 | 3661 | 3915 | 4166 | 4417 | 4664 | 4909 |
| 44 | 335 | 549 | 822 | 1071 | 1340 | 1602 | 1869 | 2148 | 2412 | 2689 | 2951 | 3232 | 3496 | 3776 | 4052 | 4329 | 4600 | 4872 | 5148 | 5414 |
| 46 | 369 | 605 | 903 | 1178 | 1471 | 1761 | 2052 | 2361 | 2645 | 2954 | 3243 | 3550 | 3842 | 4147 | 4451 | 4754 | 5053 | 5346 | 5656 | 5948 |
| 48 | 403 | 663 | 988 | 1290 | 1608 | 1928 | 2253 | 2582 | 2895 | 3231 | 3549 | 3884 | 4204 | 4536 | 4870 | 5198 | 5528 | 5849 | 6187 | 6508 |
| 50 | 439 | 723 | 1076 | 1407 | 1752 | 2102 | 2453 | 2814 | 3156 | 3522 | 3869 | 4231 | 4582 | 4942 | 5307 | 5662 | 6025 | 6375 | 6742 | 7093 |
| 52 | 476 | 786 | 1167 | 1529 | 1901 | 2283 | 2662 | 3056 | 3428 | 3824 | 4202 | 4593 | 4976 | 5375 | 5764 | 6143 | 6542 | 6923 | 7319 | 7702 |
| 54 | 515 | 852 | 1263 | 1656 | 2058 | 2482 | 2875 | 3308 | 3711 | 4138 | 4549 | 4972 | 5397 | 5815 | 6238 | 6650 | 7080 | 7493 | 7922 | 8347 |
| 56 | 555 | 921 | 1362 | 1788 | 2220 | 2678 | 3103 | 3569 | 4005 | 4465 | 4909 | 5363 | 5823 | 6272 | 6732 | 7176 | 7639 | 8086 | 8547 | 9006 |
| 58 | 597 | 992 | 1465 | 1924 | 2387 | 2882 | 3340 | 3840 | 4311 | 4804 | 5283 | 5770 | 6266 | 6747 | 7243 | 7722 | 8219 | 8702 | 9196 | 9692 |
| 60 | 640 | 1065 | 1573 | 2066 | 2561 | 3093 | 3586 | 4122 | 4627 | 5155 | 5671 | 6193 | 6726 | 7237 | 7773 | 8288 | 8821 | 9339 | 9868 | 10401 |

TABLE 29

Gross board-foot volume table to a 1 ft. stump -- 8 inch top

Northern California Forest Yield Cooperative

ponderosa pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 15 | 17 | 19 | 22 | 24 | 26 | 30 | 31 | 32 | 32 | 33 | 34 | 49 | 52 | 54 | 58 |
| 12 | 15 | 22 | 28 | 34 | 38 | 58 | 66 | 74 | 80 | 83 | 104 | 112 | 123 | 127 | 130 | 151 | 161 | 170 | 174 | 178 |
| 14 | 24 | 35 | 44 | 72 | 87 | 97 | 123 | 139 | 152 | 161 | 191 | 207 | 216 | 244 | 261 | 272 | 297 | 314 | 329 | 338 |
| 16 | 31 | 50 | 83 | 105 | 122 | 159 | 181 | 197 | 236 | 258 | 291 | 317 | 335 | 370 | 396 | 413 | 450 | 474 | 491 | 529 |
| 18 | 43 | 82 | 112 | 140 | 183 | 215 | 256 | 291 | 319 | 364 | 397 | 438 | 474 | 501 | 547 | 580 | 621 | 658 | 686 | 733 |
| 20 | 56 | 106 | 144 | 196 | 237 | 277 | 334 | 374 | 430 | 472 | 524 | 569 | 609 | 667 | 708 | 764 | 808 | 861 | 908 | 945 |
| 22 | 71 | 131 | 180 | 245 | 297 | 363 | 417 | 467 | 538 | 589 | 659 | 712 | 781 | 836 | 904 | 959 | 1024 | 1083 | 1147 | 1205 |
| 24 | 87 | 157 | 221 | 298 | 364 | 443 | 510 | 589 | 658 | 738 | 806 | 886 | 956 | 1034 | 1106 | 1169 | 1255 | 1320 | 1405 | 1470 |
| 26 | 105 | 186 | 266 | 355 | 436 | 530 | 611 | 707 | 788 | 883 | 966 | 1062 | 1145 | 1242 | 1324 | 1420 | 1504 | 1600 | 1684 | 1780 |
| 28 | 125 | 216 | 314 | 418 | 515 | 624 | 721 | 833 | 929 | 1043 | 1139 | 1254 | 1350 | 1465 | 1561 | 1677 | 1773 | 1889 | 1985 | 2102 |
| 30 | 146 | 247 | 367 | 484 | 616 | 726 | 855 | 970 | 1098 | 1215 | 1344 | 1460 | 1589 | 1707 | 1834 | 1953 | 2083 | 2201 | 2329 | 2448 |
| 32 | 169 | 286 | 438 | 559 | 708 | 837 | 985 | 1118 | 1266 | 1400 | 1547 | 1682 | 1830 | 1966 | 2115 | 2250 | 2399 | 2534 | 2684 | 2819 |
| 34 | 209 | 327 | 498 | 639 | 808 | 956 | 1124 | 1276 | 1444 | 1597 | 1765 | 1920 | 2089 | 2243 | 2413 | 2566 | 2736 | 2890 | 3062 | 3215 |
| 36 | 235 | 371 | 564 | 724 | 914 | 1083 | 1271 | 1444 | 1632 | 1808 | 1996 | 2172 | 2362 | 2538 | 2728 | 2919 | 3097 | 3287 | 3466 | 3656 |
| 38 | 263 | 418 | 633 | 815 | 1027 | 1217 | 1427 | 1623 | 1833 | 2031 | 2241 | 2440 | 2651 | 2866 | 3066 | 3278 | 3479 | 3692 | 3893 | 4105 |
| 40 | 292 | 468 | 706 | 910 | 1144 | 1360 | 1591 | 1812 | 2044 | 2267 | 2499 | 2739 | 2961 | 3198 | 3422 | 3658 | 3883 | 4121 | 4344 | 4582 |
| 42 | 325 | 521 | 782 | 1011 | 1269 | 1509 | 1765 | 2011 | 2267 | 2516 | 2775 | 3039 | 3286 | 3549 | 3797 | 4061 | 4308 | 4571 | 4820 | 5084 |
| 44 | 358 | 576 | 862 | 1117 | 1399 | 1667 | 1947 | 2221 | 2500 | 2793 | 3063 | 3353 | 3627 | 3917 | 4192 | 4481 | 4756 | 5045 | 5320 | 5611 |
| 46 | 392 | 634 | 948 | 1229 | 1535 | 1832 | 2137 | 2441 | 2747 | 3067 | 3366 | 3684 | 3986 | 4303 | 4605 | 4921 | 5225 | 5541 | 5860 | 6165 |
| 48 | 428 | 694 | 1035 | 1345 | 1679 | 2005 | 2335 | 2671 | 3006 | 3356 | 3683 | 4031 | 4361 | 4707 | 5039 | 5382 | 5716 | 6063 | 6411 | 6745 |
| 50 | 465 | 758 | 1127 | 1467 | 1828 | 2186 | 2545 | 2911 | 3277 | 3656 | 4015 | 4391 | 4753 | 5127 | 5491 | 5865 | 6244 | 6607 | 6987 | 7350 |
| 52 | 504 | 824 | 1222 | 1594 | 1983 | 2374 | 2761 | 3177 | 3559 | 3971 | 4360 | 4768 | 5161 | 5567 | 5963 | 6368 | 6779 | 7175 | 7585 | 7981 |
| 54 | 545 | 893 | 1322 | 1726 | 2145 | 2571 | 2986 | 3437 | 3853 | 4297 | 4720 | 5159 | 5586 | 6023 | 6453 | 6893 | 7338 | 7766 | 8209 | 8638 |
| 56 | 587 | 964 | 1427 | 1863 | 2315 | 2774 | 3224 | 3710 | 4158 | 4637 | 5093 | 5567 | 6028 | 6499 | 6979 | 7438 | 7918 | 8380 | 8858 | 9321 |
| 58 | 631 | 1039 | 1534 | 2005 | 2489 | 2986 | 3470 | 3992 | 4475 | 4988 | 5481 | 5988 | 6487 | 6990 | 7508 | 8004 | 8519 | 9017 | 9529 | 10029 |
| 60 | 678 | 1116 | 1645 | 2153 | 2670 | 3205 | 3725 | 4283 | 4804 | 5352 | 5883 | 6427 | 6962 | 7503 | 8059 | 8591 | 9143 | 9677 | 10226 | 10763 |

TABLE 30

Gross board-foot volume table to a 1 ft. stump -- 8 inch top

Northern California Forest Yield Cooperative

incense cedar

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 17 | 17 | 19 | 21 | 22 | 24 | 24 | 26 | 28 | 30 |
| 12 | 0 | 15 | 19 | 22 | 28 | 32 | 34 | 37 | 54 | 59 | 66 | 71 | 75 | 78 | 80 | 97 | 103 | 111 | 116 | 120 |
| 14 | 17 | 24 | 33 | 39 | 60 | 69 | 80 | 89 | 95 | 119 | 131 | 141 | 147 | 168 | 181 | 194 | 200 | 206 | 233 | 243 |
| 16 | 22 | 35 | 47 | 75 | 91 | 105 | 131 | 150 | 165 | 177 | 207 | 226 | 240 | 266 | 286 | 302 | 314 | 346 | 365 | 377 |
| 18 | 28 | 48 | 80 | 103 | 124 | 157 | 183 | 204 | 238 | 265 | 286 | 322 | 348 | 369 | 405 | 431 | 452 | 489 | 515 | 536 |
| 20 | 35 | 62 | 104 | 134 | 175 | 207 | 237 | 282 | 315 | 343 | 390 | 423 | 449 | 500 | 530 | 574 | 609 | 638 | 685 | 720 |
| 22 | 45 | 94 | 129 | 168 | 221 | 262 | 313 | 355 | 395 | 450 | 493 | 544 | 588 | 628 | 684 | 727 | 779 | 824 | 864 | 920 |
| 24 | 57 | 114 | 159 | 207 | 271 | 321 | 385 | 437 | 500 | 554 | 602 | 671 | 722 | 786 | 842 | 904 | 961 | 1010 | 1077 | 1131 |
| 26 | 69 | 138 | 192 | 266 | 325 | 386 | 463 | 525 | 602 | 666 | 742 | 807 | 881 | 948 | 1010 | 1090 | 1154 | 1231 | 1297 | 1373 |
| 28 | 82 | 161 | 228 | 313 | 386 | 473 | 548 | 621 | 713 | 787 | 878 | 954 | 1046 | 1122 | 1212 | 1291 | 1379 | 1460 | 1532 | 1629 |
| 30 | 97 | 185 | 267 | 365 | 451 | 551 | 640 | 741 | 832 | 933 | 1026 | 1113 | 1221 | 1309 | 1417 | 1505 | 1613 | 1702 | 1809 | 1900 |
| 32 | 113 | 212 | 309 | 420 | 521 | 637 | 739 | 856 | 961 | 1078 | 1184 | 1303 | 1409 | 1526 | 1635 | 1751 | 1861 | 1963 | 2087 | 2190 |
| 34 | 130 | 241 | 354 | 478 | 596 | 727 | 845 | 977 | 1098 | 1232 | 1353 | 1489 | 1610 | 1745 | 1868 | 2003 | 2126 | 2260 | 2385 | 2520 |
| 36 | 148 | 269 | 402 | 541 | 676 | 822 | 958 | 1108 | 1244 | 1396 | 1533 | 1687 | 1824 | 1977 | 2115 | 2269 | 2408 | 2562 | 2701 | 2856 |
| 38 | 167 | 302 | 452 | 607 | 760 | 923 | 1077 | 1244 | 1399 | 1568 | 1724 | 1895 | 2050 | 2222 | 2378 | 2551 | 2707 | 2881 | 3036 | 3213 |
| 40 | 188 | 334 | 506 | 675 | 850 | 1030 | 1219 | 1390 | 1579 | 1753 | 1941 | 2118 | 2305 | 2484 | 2673 | 2852 | 3040 | 3220 | 3408 | 3588 |
| 42 | 209 | 368 | 563 | 751 | 960 | 1145 | 1353 | 1545 | 1754 | 1947 | 2156 | 2352 | 2562 | 2759 | 2968 | 3167 | 3378 | 3575 | 3786 | 3984 |
| 44 | 232 | 409 | 638 | 831 | 1059 | 1266 | 1495 | 1707 | 1937 | 2152 | 2381 | 2599 | 2830 | 3048 | 3280 | 3498 | 3730 | 3949 | 4183 | 4401 |
| 46 | 255 | 451 | 700 | 915 | 1166 | 1393 | 1644 | 1878 | 2130 | 2366 | 2618 | 2858 | 3111 | 3351 | 3605 | 3846 | 4102 | 4341 | 4599 | 4838 |
| 48 | 295 | 495 | 768 | 1003 | 1275 | 1526 | 1799 | 2056 | 2330 | 2591 | 2866 | 3128 | 3405 | 3668 | 3946 | 4209 | 4488 | 4752 | 5033 | 5310 |
| 50 | 321 | 540 | 836 | 1094 | 1391 | 1664 | 1962 | 2242 | 2541 | 2825 | 3125 | 3411 | 3712 | 4000 | 4301 | 4589 | 4894 | 5196 | 5488 | 5790 |
| 52 | 348 | 588 | 908 | 1190 | 1510 | 1809 | 2130 | 2437 | 2760 | 3070 | 3394 | 3706 | 4032 | 4345 | 4674 | 5001 | 5317 | 5647 | 5962 | 6291 |
| 54 | 377 | 638 | 982 | 1289 | 1636 | 1960 | 2307 | 2639 | 2987 | 3325 | 3673 | 4014 | 4365 | 4720 | 5061 | 5415 | 5758 | 6114 | 6455 | 6812 |
| 56 | 406 | 690 | 1061 | 1393 | 1765 | 2116 | 2488 | 2850 | 3224 | 3589 | 3965 | 4333 | 4713 | 5096 | 5463 | 5846 | 6215 | 6598 | 6968 | 7353 |
| 58 | 437 | 744 | 1142 | 1500 | 1899 | 2279 | 2679 | 3068 | 3469 | 3864 | 4267 | 4679 | 5073 | 5484 | 5881 | 6293 | 6690 | 7102 | 7500 | 7914 |
| 60 | 470 | 799 | 1225 | 1612 | 2039 | 2447 | 2875 | 3295 | 3724 | 4149 | 4582 | 5025 | 5447 | 5888 | 6314 | 6756 | 7183 | 7624 | 8052 | 8495 |

TABLE 31

Gross board-foot volume table to a 1 ft. stump -- 8 inch top

Northern California Forest Yield Cooperative

white fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 17 | 19 | 22 | 26 | 28 | 31 | 32 | 33 | 33 | 34 | 50 | 55 | 57 | 61 | 64 | 68 |
| 12 | 15 | 22 | 28 | 35 | 39 | 59 | 70 | 78 | 83 | 87 | 109 | 120 | 128 | 132 | 151 | 160 | 171 | 178 | 182 | 203 |
| 14 | 24 | 36 | 46 | 74 | 89 | 100 | 126 | 143 | 156 | 166 | 197 | 214 | 224 | 252 | 270 | 282 | 309 | 327 | 340 | 350 |
| 16 | 31 | 51 | 85 | 107 | 125 | 162 | 185 | 203 | 243 | 265 | 297 | 324 | 345 | 381 | 406 | 426 | 463 | 489 | 506 | 546 |
| 18 | 42 | 83 | 112 | 143 | 187 | 220 | 262 | 296 | 327 | 373 | 407 | 449 | 484 | 515 | 562 | 596 | 623 | 674 | 705 | 752 |
| 20 | 55 | 107 | 145 | 199 | 242 | 282 | 339 | 382 | 438 | 483 | 536 | 583 | 624 | 682 | 726 | 782 | 829 | 882 | 930 | 970 |
| 22 | 70 | 131 | 182 | 249 | 302 | 368 | 425 | 477 | 548 | 602 | 674 | 728 | 797 | 855 | 923 | 981 | 1047 | 1107 | 1159 | 1233 |
| 24 | 87 | 159 | 223 | 303 | 369 | 451 | 519 | 600 | 670 | 751 | 823 | 903 | 976 | 1041 | 1129 | 1196 | 1283 | 1350 | 1436 | 1505 |
| 26 | 105 | 188 | 268 | 360 | 443 | 539 | 622 | 719 | 803 | 901 | 985 | 1083 | 1168 | 1267 | 1352 | 1449 | 1537 | 1634 | 1721 | 1817 |
| 28 | 124 | 217 | 317 | 422 | 523 | 633 | 734 | 847 | 947 | 1062 | 1162 | 1278 | 1378 | 1495 | 1594 | 1712 | 1811 | 1929 | 2029 | 2147 |
| 30 | 146 | 250 | 370 | 489 | 609 | 735 | 854 | 986 | 1118 | 1237 | 1368 | 1488 | 1619 | 1741 | 1870 | 1993 | 2125 | 2247 | 2378 | 2500 |
| 32 | 168 | 286 | 442 | 565 | 717 | 849 | 1001 | 1136 | 1287 | 1425 | 1576 | 1714 | 1865 | 2004 | 2157 | 2295 | 2447 | 2587 | 2740 | 2878 |
| 34 | 193 | 328 | 503 | 646 | 819 | 970 | 1142 | 1297 | 1467 | 1626 | 1797 | 1956 | 2128 | 2286 | 2460 | 2618 | 2791 | 2950 | 3125 | 3282 |
| 36 | 234 | 372 | 569 | 732 | 926 | 1098 | 1290 | 1468 | 1660 | 1839 | 2032 | 2213 | 2406 | 2587 | 2781 | 2961 | 3157 | 3337 | 3536 | 3728 |
| 38 | 262 | 419 | 638 | 823 | 1039 | 1234 | 1449 | 1649 | 1863 | 2066 | 2283 | 2485 | 2703 | 2905 | 3124 | 3341 | 3547 | 3764 | 3971 | 4188 |
| 40 | 291 | 469 | 711 | 920 | 1159 | 1378 | 1616 | 1841 | 2079 | 2306 | 2544 | 2774 | 3015 | 3257 | 3487 | 3728 | 3959 | 4202 | 4431 | 4674 |
| 42 | 322 | 521 | 789 | 1021 | 1284 | 1530 | 1793 | 2043 | 2305 | 2559 | 2822 | 3093 | 3346 | 3614 | 3869 | 4138 | 4392 | 4661 | 4916 | 5184 |
| 44 | 356 | 577 | 870 | 1128 | 1418 | 1690 | 1976 | 2256 | 2544 | 2825 | 3116 | 3414 | 3693 | 3989 | 4270 | 4567 | 4848 | 5143 | 5425 | 5722 |
| 46 | 390 | 635 | 954 | 1241 | 1556 | 1857 | 2171 | 2479 | 2792 | 3120 | 3424 | 3749 | 4058 | 4382 | 4692 | 5016 | 5326 | 5649 | 5960 | 6286 |
| 48 | 426 | 695 | 1044 | 1358 | 1700 | 2032 | 2373 | 2712 | 3055 | 3411 | 3747 | 4102 | 4439 | 4793 | 5132 | 5484 | 5826 | 6178 | 6535 | 6877 |
| 50 | 463 | 759 | 1137 | 1481 | 1853 | 2215 | 2583 | 2956 | 3329 | 3718 | 4083 | 4470 | 4838 | 5221 | 5593 | 5976 | 6348 | 6734 | 7121 | 7493 |
| 52 | 502 | 825 | 1233 | 1609 | 2010 | 2406 | 2805 | 3210 | 3616 | 4036 | 4434 | 4851 | 5253 | 5669 | 6073 | 6488 | 6908 | 7312 | 7732 | 8136 |
| 54 | 542 | 894 | 1333 | 1742 | 2173 | 2605 | 3033 | 3490 | 3914 | 4369 | 4800 | 5251 | 5686 | 6135 | 6573 | 7021 | 7475 | 7913 | 8366 | 8805 |
| 56 | 584 | 966 | 1437 | 1881 | 2344 | 2811 | 3271 | 3765 | 4224 | 4713 | 5179 | 5664 | 6135 | 6617 | 7092 | 7576 | 8066 | 8539 | 9027 | 9501 |
| 58 | 628 | 1040 | 1545 | 2025 | 2522 | 3026 | 3520 | 4051 | 4546 | 5072 | 5573 | 6094 | 6602 | 7119 | 7631 | 8152 | 8679 | 9187 | 9713 | 10223 |
| 60 | 673 | 1117 | 1659 | 2174 | 2705 | 3248 | 3779 | 4348 | 4879 | 5442 | 5982 | 6539 | 7085 | 7638 | 8205 | 8749 | 9313 | 9860 | 10422 | 10970 |

TABLE 32

Gross board-foot volume table to a 1 ft. stump -- 8 inch top

Northern California Forest Yield Cooperative

Douglas fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 17 | 19 | 21 | 22 | 26 | 28 | 30 | 31 | 31 | 32 | 32 | 33 | 33 |
| 12 | 0 | 19 | 24 | 30 | 34 | 37 | 55 | 63 | 70 | 76 | 80 | 83 | 104 | 112 | 118 | 124 | 127 | 145 | 153 | 161 |
| 14 | 21 | 31 | 40 | 62 | 74 | 88 | 96 | 120 | 136 | 147 | 154 | 181 | 196 | 206 | 214 | 244 | 258 | 266 | 289 | 305 |
| 16 | 26 | 44 | 73 | 92 | 110 | 140 | 161 | 179 | 210 | 231 | 249 | 279 | 303 | 321 | 350 | 374 | 392 | 421 | 446 | 464 |
| 18 | 36 | 59 | 100 | 125 | 162 | 193 | 218 | 259 | 288 | 311 | 357 | 384 | 423 | 455 | 479 | 522 | 552 | 575 | 621 | 649 |
| 20 | 47 | 94 | 125 | 162 | 212 | 249 | 297 | 337 | 371 | 424 | 462 | 512 | 553 | 585 | 641 | 677 | 729 | 769 | 817 | 860 |
| 22 | 60 | 116 | 159 | 218 | 264 | 311 | 374 | 422 | 484 | 533 | 593 | 646 | 690 | 756 | 803 | 867 | 917 | 978 | 1030 | 1089 |
| 24 | 75 | 141 | 196 | 267 | 325 | 398 | 458 | 515 | 593 | 651 | 728 | 788 | 864 | 925 | 999 | 1063 | 1135 | 1201 | 1257 | 1337 |
| 26 | 90 | 167 | 235 | 320 | 391 | 477 | 550 | 637 | 712 | 798 | 875 | 960 | 1038 | 1109 | 1202 | 1273 | 1365 | 1438 | 1529 | 1603 |
| 28 | 107 | 193 | 279 | 375 | 462 | 562 | 650 | 752 | 841 | 942 | 1033 | 1135 | 1225 | 1327 | 1419 | 1521 | 1613 | 1714 | 1807 | 1908 |
| 30 | 126 | 222 | 326 | 435 | 539 | 654 | 758 | 876 | 980 | 1100 | 1203 | 1323 | 1428 | 1548 | 1653 | 1774 | 1879 | 2000 | 2105 | 2227 |
| 32 | 146 | 254 | 376 | 500 | 622 | 752 | 874 | 1007 | 1130 | 1265 | 1387 | 1526 | 1645 | 1785 | 1920 | 2046 | 2180 | 2307 | 2440 | 2568 |
| 34 | 167 | 286 | 430 | 570 | 726 | 860 | 1014 | 1152 | 1307 | 1446 | 1600 | 1742 | 1895 | 2038 | 2193 | 2335 | 2489 | 2633 | 2788 | 2930 |
| 36 | 190 | 326 | 503 | 647 | 820 | 974 | 1148 | 1305 | 1479 | 1638 | 1811 | 1972 | 2146 | 2307 | 2483 | 2643 | 2818 | 2980 | 3156 | 3317 |
| 38 | 215 | 367 | 564 | 728 | 922 | 1095 | 1290 | 1467 | 1662 | 1841 | 2036 | 2216 | 2411 | 2593 | 2788 | 2970 | 3167 | 3348 | 3546 | 3726 |
| 40 | 255 | 411 | 630 | 814 | 1030 | 1224 | 1440 | 1639 | 1855 | 2056 | 2272 | 2475 | 2692 | 2895 | 3113 | 3316 | 3536 | 3752 | 3959 | 4176 |
| 42 | 283 | 458 | 698 | 904 | 1142 | 1359 | 1596 | 1819 | 2058 | 2282 | 2521 | 2747 | 2987 | 3213 | 3455 | 3695 | 3925 | 4165 | 4395 | 4637 |
| 44 | 311 | 506 | 770 | 999 | 1261 | 1502 | 1762 | 2010 | 2270 | 2520 | 2783 | 3033 | 3297 | 3563 | 3815 | 4080 | 4334 | 4600 | 4852 | 5118 |
| 46 | 341 | 558 | 847 | 1099 | 1384 | 1651 | 1937 | 2209 | 2494 | 2770 | 3055 | 3349 | 3624 | 3916 | 4193 | 4485 | 4762 | 5054 | 5332 | 5624 |
| 48 | 374 | 611 | 925 | 1204 | 1515 | 1808 | 2117 | 2418 | 2728 | 3032 | 3345 | 3665 | 3966 | 4285 | 4589 | 4908 | 5211 | 5530 | 5834 | 6154 |
| 50 | 407 | 667 | 1008 | 1313 | 1650 | 1971 | 2305 | 2636 | 2971 | 3320 | 3646 | 3993 | 4324 | 4670 | 5002 | 5347 | 5680 | 6026 | 6359 | 6707 |
| 52 | 441 | 726 | 1093 | 1427 | 1790 | 2142 | 2504 | 2864 | 3226 | 3605 | 3961 | 4338 | 4696 | 5071 | 5432 | 5807 | 6169 | 6544 | 6906 | 7284 |
| 54 | 477 | 787 | 1184 | 1546 | 1936 | 2319 | 2708 | 3100 | 3493 | 3903 | 4288 | 4694 | 5084 | 5489 | 5881 | 6285 | 6678 | 7084 | 7491 | 7885 |
| 56 | 513 | 850 | 1277 | 1669 | 2090 | 2504 | 2923 | 3347 | 3771 | 4212 | 4628 | 5066 | 5487 | 5924 | 6347 | 6782 | 7207 | 7645 | 8084 | 8509 |
| 58 | 552 | 916 | 1373 | 1797 | 2248 | 2695 | 3144 | 3617 | 4059 | 4531 | 4982 | 5451 | 5905 | 6373 | 6830 | 7297 | 7771 | 8227 | 8700 | 9158 |
| 60 | 592 | 984 | 1473 | 1930 | 2411 | 2894 | 3372 | 3882 | 4357 | 4865 | 5348 | 5851 | 6339 | 6840 | 7331 | 7833 | 8340 | 8831 | 9337 | 9829 |

TABLE 33

Gross board-foot volume table to a 1 ft. stump -- 8 inch top

Northern California Forest Yield Cooperative

red fir

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 15 | 19 | 21 | 24 | 26 | 30 | 32 | 33 | 33 | 34 | 50 | 53 | 57 | 61 | 64 | 68 | 69 |
| 12 | 17 | 22 | 31 | 36 | 40 | 62 | 72 | 80 | 85 | 104 | 115 | 126 | 131 | 135 | 158 | 169 | 177 | 182 | 201 | 213 |
| 14 | 24 | 37 | 47 | 77 | 92 | 103 | 131 | 148 | 161 | 188 | 206 | 220 | 245 | 264 | 279 | 289 | 320 | 338 | 349 | 378 |
| 16 | 32 | 53 | 89 | 111 | 129 | 168 | 191 | 226 | 252 | 273 | 309 | 336 | 355 | 395 | 419 | 437 | 479 | 502 | 537 | 565 |
| 18 | 45 | 86 | 116 | 148 | 194 | 227 | 271 | 307 | 337 | 385 | 419 | 463 | 501 | 530 | 580 | 613 | 659 | 696 | 724 | 775 |
| 20 | 58 | 110 | 151 | 205 | 248 | 292 | 350 | 394 | 452 | 498 | 553 | 602 | 642 | 704 | 747 | 807 | 852 | 909 | 958 | 1012 |
| 22 | 74 | 137 | 189 | 256 | 313 | 381 | 439 | 507 | 565 | 620 | 694 | 750 | 823 | 880 | 951 | 1010 | 1080 | 1140 | 1209 | 1271 |
| 24 | 91 | 164 | 232 | 312 | 382 | 464 | 536 | 620 | 691 | 775 | 848 | 931 | 1005 | 1087 | 1163 | 1245 | 1322 | 1389 | 1479 | 1547 |
| 26 | 110 | 193 | 278 | 373 | 458 | 555 | 642 | 741 | 828 | 929 | 1015 | 1115 | 1203 | 1304 | 1392 | 1494 | 1581 | 1683 | 1771 | 1871 |
| 28 | 130 | 225 | 329 | 437 | 540 | 654 | 757 | 873 | 976 | 1094 | 1196 | 1316 | 1418 | 1538 | 1640 | 1761 | 1863 | 1984 | 2086 | 2208 |
| 30 | 152 | 258 | 384 | 507 | 645 | 761 | 897 | 1017 | 1151 | 1275 | 1410 | 1533 | 1667 | 1792 | 1928 | 2051 | 2187 | 2311 | 2446 | 2571 |
| 32 | 176 | 298 | 458 | 585 | 743 | 877 | 1032 | 1172 | 1327 | 1468 | 1624 | 1765 | 1920 | 2063 | 2219 | 2362 | 2519 | 2660 | 2818 | 2960 |
| 34 | 217 | 341 | 521 | 669 | 845 | 1002 | 1177 | 1337 | 1513 | 1675 | 1851 | 2014 | 2191 | 2353 | 2531 | 2693 | 2873 | 3034 | 3215 | 3390 |
| 36 | 244 | 387 | 589 | 758 | 956 | 1134 | 1331 | 1514 | 1710 | 1895 | 2092 | 2278 | 2476 | 2662 | 2861 | 3061 | 3249 | 3448 | 3636 | 3835 |
| 38 | 273 | 436 | 660 | 852 | 1074 | 1274 | 1494 | 1700 | 1920 | 2129 | 2348 | 2558 | 2781 | 3004 | 3215 | 3438 | 3649 | 3872 | 4083 | 4308 |
| 40 | 304 | 488 | 737 | 952 | 1196 | 1423 | 1665 | 1898 | 2141 | 2376 | 2619 | 2870 | 3103 | 3352 | 3587 | 3835 | 4071 | 4321 | 4556 | 4805 |
| 42 | 338 | 543 | 816 | 1057 | 1327 | 1579 | 1847 | 2106 | 2374 | 2636 | 2907 | 3184 | 3443 | 3719 | 3980 | 4256 | 4517 | 4792 | 5054 | 5331 |
| 44 | 371 | 600 | 900 | 1168 | 1462 | 1744 | 2038 | 2325 | 2618 | 2925 | 3209 | 3513 | 3801 | 4104 | 4393 | 4696 | 4985 | 5288 | 5577 | 5883 |
| 46 | 407 | 660 | 989 | 1284 | 1605 | 1917 | 2236 | 2555 | 2876 | 3212 | 3526 | 3859 | 4176 | 4508 | 4826 | 5158 | 5476 | 5807 | 6142 | 6462 |
| 48 | 444 | 724 | 1080 | 1405 | 1755 | 2097 | 2444 | 2795 | 3147 | 3514 | 3857 | 4222 | 4568 | 4931 | 5279 | 5639 | 5990 | 6354 | 6718 | 7069 |
| 50 | 483 | 789 | 1176 | 1532 | 1911 | 2286 | 2662 | 3062 | 3430 | 3828 | 4204 | 4598 | 4978 | 5370 | 5752 | 6144 | 6542 | 6923 | 7321 | 7702 |
| 52 | 523 | 858 | 1275 | 1664 | 2073 | 2483 | 2888 | 3323 | 3725 | 4157 | 4565 | 4993 | 5405 | 5830 | 6246 | 6671 | 7104 | 7517 | 7948 | 8363 |
| 54 | 566 | 930 | 1379 | 1802 | 2242 | 2688 | 3123 | 3596 | 4032 | 4497 | 4941 | 5401 | 5850 | 6307 | 6759 | 7220 | 7686 | 8135 | 8600 | 9050 |
| 56 | 609 | 1004 | 1489 | 1945 | 2419 | 2901 | 3372 | 3881 | 4351 | 4853 | 5331 | 5828 | 6312 | 6805 | 7308 | 7790 | 8293 | 8778 | 9278 | 9764 |
| 58 | 655 | 1082 | 1600 | 2094 | 2601 | 3122 | 3629 | 4175 | 4682 | 5220 | 5737 | 6268 | 6792 | 7319 | 7862 | 8382 | 8921 | 9444 | 9981 | 10506 |
| 60 | 704 | 1162 | 1716 | 2248 | 2789 | 3351 | 3896 | 4479 | 5026 | 5600 | 6157 | 6727 | 7289 | 7856 | 8438 | 8996 | 9574 | 10135 | 10710 | 11274 |

TABLE 34

Gross board-foot volume table to a 1 ft. stump -- 8 inch top

Northern California Forest Yield Cooperative

sugar pine

| DBH (inches) | total height (feet) 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 15 | 17 | 21 | 22 | 24 | 26 | 30 | 31 | 31 | 32 | 33 | 33 | 33 | 49 | 52 |
| 12 | 15 | 21 | 26 | 33 | 36 | 39 | 61 | 70 | 77 | 80 | 84 | 106 | 114 | 122 | 126 | 129 | 151 | 160 | 168 | 172 |
| 14 | 22 | 33 | 43 | 68 | 81 | 93 | 102 | 131 | 146 | 155 | 182 | 196 | 209 | 217 | 248 | 263 | 272 | 299 | 314 | 326 |
| 16 | 28 | 48 | 79 | 100 | 117 | 152 | 174 | 190 | 227 | 248 | 264 | 301 | 323 | 339 | 377 | 398 | 429 | 454 | 474 | 506 |
| 18 | 40 | 64 | 107 | 134 | 175 | 206 | 232 | 277 | 307 | 349 | 382 | 407 | 454 | 483 | 524 | 557 | 584 | 630 | 661 | 700 |
| 20 | 53 | 102 | 137 | 173 | 227 | 266 | 320 | 360 | 411 | 454 | 490 | 548 | 586 | 640 | 682 | 734 | 779 | 814 | 871 | 911 |
| 22 | 67 | 125 | 172 | 234 | 285 | 347 | 399 | 449 | 517 | 567 | 634 | 686 | 750 | 804 | 868 | 924 | 971 | 1041 | 1091 | 1160 |
| 24 | 82 | 150 | 211 | 285 | 349 | 424 | 489 | 565 | 632 | 707 | 776 | 836 | 919 | 981 | 1063 | 1126 | 1208 | 1272 | 1352 | 1417 |
| 26 | 100 | 177 | 254 | 342 | 418 | 509 | 587 | 679 | 758 | 849 | 929 | 1022 | 1102 | 1194 | 1275 | 1367 | 1449 | 1539 | 1623 | 1712 |
| 28 | 118 | 207 | 300 | 401 | 494 | 600 | 693 | 801 | 894 | 1004 | 1097 | 1207 | 1300 | 1410 | 1504 | 1614 | 1709 | 1819 | 1914 | 2025 |
| 30 | 139 | 238 | 351 | 464 | 577 | 696 | 808 | 930 | 1042 | 1168 | 1293 | 1406 | 1529 | 1644 | 1767 | 1882 | 2005 | 2121 | 2243 | 2360 |
| 32 | 161 | 270 | 405 | 536 | 680 | 804 | 946 | 1075 | 1217 | 1347 | 1489 | 1620 | 1763 | 1894 | 2036 | 2168 | 2312 | 2443 | 2587 | 2718 |
| 34 | 184 | 312 | 478 | 612 | 776 | 918 | 1080 | 1227 | 1389 | 1537 | 1700 | 1849 | 2013 | 2161 | 2324 | 2474 | 2638 | 2787 | 2953 | 3101 |
| 36 | 224 | 354 | 541 | 694 | 877 | 1040 | 1222 | 1389 | 1571 | 1740 | 1923 | 2093 | 2276 | 2446 | 2630 | 2800 | 2985 | 3154 | 3342 | 3524 |
| 38 | 251 | 399 | 607 | 781 | 985 | 1170 | 1373 | 1562 | 1765 | 1956 | 2159 | 2351 | 2555 | 2748 | 2955 | 3160 | 3354 | 3560 | 3754 | 3960 |
| 40 | 278 | 446 | 676 | 873 | 1100 | 1306 | 1532 | 1744 | 1969 | 2183 | 2409 | 2625 | 2853 | 3082 | 3299 | 3527 | 3744 | 3973 | 4190 | 4421 |
| 42 | 308 | 497 | 751 | 970 | 1219 | 1451 | 1698 | 1936 | 2184 | 2423 | 2672 | 2928 | 3166 | 3420 | 3661 | 3914 | 4155 | 4410 | 4650 | 4904 |
| 44 | 341 | 549 | 827 | 1071 | 1346 | 1602 | 1874 | 2138 | 2410 | 2676 | 2951 | 3233 | 3496 | 3776 | 4042 | 4322 | 4587 | 4867 | 5133 | 5415 |
| 46 | 374 | 605 | 908 | 1178 | 1477 | 1761 | 2059 | 2349 | 2645 | 2956 | 3243 | 3551 | 3842 | 4149 | 4441 | 4748 | 5040 | 5347 | 5640 | 5948 |
| 48 | 408 | 663 | 994 | 1290 | 1614 | 1928 | 2250 | 2571 | 2895 | 3233 | 3549 | 3885 | 4204 | 4539 | 4859 | 5193 | 5515 | 5849 | 6186 | 6508 |
| 50 | 443 | 723 | 1082 | 1407 | 1759 | 2102 | 2450 | 2803 | 3156 | 3524 | 3869 | 4235 | 4582 | 4945 | 5296 | 5658 | 6010 | 6375 | 6741 | 7093 |
| 52 | 480 | 786 | 1173 | 1529 | 1908 | 2283 | 2660 | 3044 | 3428 | 3826 | 4202 | 4597 | 4976 | 5370 | 5751 | 6144 | 6542 | 6923 | 7319 | 7702 |
| 54 | 519 | 852 | 1269 | 1656 | 2064 | 2472 | 2877 | 3311 | 3711 | 4142 | 4549 | 4976 | 5387 | 5812 | 6225 | 6650 | 7079 | 7493 | 7922 | 8337 |
| 56 | 559 | 921 | 1368 | 1788 | 2226 | 2668 | 3103 | 3572 | 4005 | 4468 | 4909 | 5368 | 5813 | 6269 | 6718 | 7176 | 7640 | 8086 | 8549 | 8996 |
| 58 | 601 | 992 | 1471 | 1924 | 2395 | 2872 | 3340 | 3843 | 4311 | 4807 | 5283 | 5776 | 6256 | 6746 | 7229 | 7722 | 8222 | 8702 | 9199 | 9681 |
| 60 | 645 | 1065 | 1579 | 2066 | 2569 | 3083 | 3586 | 4126 | 4627 | 5160 | 5671 | 6198 | 6715 | 7238 | 7774 | 8288 | 8823 | 9339 | 9871 | 10390 |