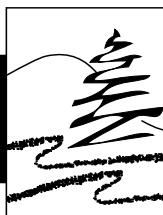


A KEY TO THE LITERATURE PRESENTING
TREE VOLUME AND TAPER EQUATIONS
FOR SPECIES IN THE PACIFIC NORTHWEST
AND CALIFORNIA

by

David W. Hann



College of
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Forest Research Laboratory
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The Author

David W. Hann is professor of forest biometrics in the Department of Forest Resources, Oregon State University, Corvallis.

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Introduction

This publication is a summary of the tree volume and taper equations that have been developed and published for species found in California, Oregon, Washington, British Columbia, southeast Alaska, Idaho, and western Montana. Volume of the stem is one of the most important single variables that a forester must estimate for a tree. Volume is directly proportional to a stem's biomass and, therefore, to its potential fiber and fuel yields. When combined with other variables, volume can be used to predict the lumber recovery, and therefore value, from a tree. Information about the tree's value can be influential in evaluating the financial worth of a stand of timber, determining the most appropriate thinning regime, or setting the allowable cut policy.

The following measures of volume are included in this summary:

1. Total stem cubic-foot or cubic-meter volume, which represents volume between the ground line and the tip of the tree. Total stem volume may be expressed as either outside bark (i.e., including the bark) or, more commonly, inside bark.
2. Merchantable cubic-foot or cubic-meter volume, which is the volume between the top of the stump and the merchantable top diameter. Stump height and merchantable top diameter either can be fixed for the given equation or can be variables in the equation.
3. Board-foot volume, as estimated by standard log rules such as International 1/4-inch, International 1/8-inch, Scribner, or occasionally by actual mill studies.

Taper equations are most often used to predict either the diameter or the squared diameter (which is proportional to area) of the tree's stem at any height on the tree. Depending upon the equation, the diameter may be either outside or inside the bark.

The resulting diameter estimates can be used to provide estimates of cubic-foot or cubic-meter volume, net lumber volume, and, given a particular product mix, optimal log size. Although volume predictions generated from taper equations are not usually identical to those derived from volume equations, taper equations can still yield accurate estimates of volumes and provide flexibility in calculating volume to different merchantability standards.

Criteria for Including Publications in the Key

The two criteria used to select the publications for this report were:

1. The publication had to be available for use by the general public. This meant that it could be found in any well-furnished forestry library.
2. The parameters for the equations had to be included in the publication. Publications that included only volume tables were not included in this key.

As a result of these criteria, many of the publications included in this key have received refereed peer review (i.e., they have been independently reviewed by other experts in the field). The practice of forestry has its basis in science, and a crucial element of the scientific method is the critical review of research results through the publication process. Refereed peer review should help ensure that the equations are of reasonable form and were developed with statistically sound methods. However, the user should be aware that errors do occur in refereed publications, particularly in publications with many equations or with complicated equations. Inclusion of a publication in this key does not guarantee that it is error-free. Therefore, a user should critically evaluate any equation before broadly applying it.

How to Select an Appropriate Equation

Once one has decided on the type of volume or diameter to be predicted, one should select an equation developed for the population to which it will be applied. Some of the attributes commonly used to define a population include: (1) tree species, (2) geographic location, and (3) the ranges in size (e.g., diameter at breast height [DBH] and total height) found in the population. If the modeling population (i.e., the one used in equation development) and the application population do not match, the user will have to determine whether application of the existing equations can be safely extrapolated to the population of interest. Ideally, to validate the appropriateness of the equation for the new population, one should collect an independent data set and compare predicted and actual values. As a minimum, the following steps should be taken when one considers an alternative:

1. Examine equations for the same species from the nearest geographic area.
2. If no equations exist for a species, examine equations for other species with a similar stem form.
3. Graph the alternative equations over the full range of sizes found in the application population and examine them for reasonableness of behavior—e.g., predicted volumes should not be negative and should monotonically increase as DBH and total height increase; predicted diameters from taper equations should not be negative and should monotonically decrease with increasing height above ground; and the diameter at the tree's tip should be zero.

Using the Key

Equations are given first for conifers and then for hardwoods. Within each section, species are listed alphabetically by scientific name. For each species, volume equations are listed first, followed by taper equations if they exist. Within a species, a separate listing is provided for each source of information. These sources are listed chronologically, and they provide the user with the following information:

1. "Reference"—A short listing refers the user to the full citation in the Literature Cited section at the end of this publication.
2. "Types of volumes predicted" and "Type of dependent variable predicted"—Volumes include total stem cubic-foot or cubic-meter volume, merchantable cubic-foot or cubic-meter volume, or board-foot volume. A number of publications give equations for predicting more than one type of volume. Taper equations include diameter or squared diameter, outside or inside the bark.
3. "Geographic location of sample"—This attribute helps define the population sampled during the development of the equations. Application of the equations outside this area is an extrapolation; the user should critically evaluate equations before using them beyond this geographic area.
4. "Number of trees sampled"—This attribute indicates the strength of the data set used to develop the equations. In general, the larger the number of trees sampled, the more likely the resulting equations will adequately characterize the intended population.
5. "Range in DBH of sample"—This attribute helps define the population sampled during development of the equations. Application of the equations outside this range in DBH is an extrapolation; the user should critically evaluate equations before using them for diameters outside this range.
6. "Range in total height of sample"—This attribute helps define the population sampled during development of the equations. Application of the equations outside this range in total height is an extrapolation; the user should critically evaluate the equations before using them for tree heights outside this range.

CONIFERS

***Abies*—Fir**

***Abies amabilis* (Dougl.) ex Forbes—Pacific silver fir**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: Not provided

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Taper

Reference: Czaplewski *et al.* (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Northwest Oregon and Southern Washington

Number of trees sampled: 284

Range in DBH of sample: 7–49 inches

Range in total height of sample: 35–170 feet

***Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.—white fir**

Volume

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 12–66 inches

Range in total height of sample: 40–200 feet

Reference: Wensel (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Scribner board-foot volume inside bark from a 1.5-foot stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 340

Range in DBH of sample: 10–56 inches

Range in total height of sample: Not provided

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Eastern Oregon and Eastern Washington

Number of trees sampled: 202 including grand fir

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Walters *et al.* (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 3.1–37.7 inches

Range in total height of sample: 21.7–161.9 feet

Reference: Walters and Hann (1986a)

Type of volume predicted: Merchantable cubic-foot volume inside bark from any stump height between 0.0 and 4.5 feet to any top diameter inside bark between 0.0 and 6.0 inches

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 3.1–37.7 inches

Range in total height of sample: 21.7–161.9 feet

Reference: McDonald and Skinner (1989)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 80

Range in DBH of sample: 3–40 inches

Range in total height of sample: Not provided

Taper

Reference: Amidon (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Sierra Nevada of California

Number of trees sampled: 319

Range in DBH of sample: 6–34 inches

Range in total height of sample: 23–121 feet

Reference: Biging (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 361

Range in DBH of sample: 5.6–34.3 inches

Range in total height of sample: 25.5–133.3 feet

Reference: Walters and Hann (1986b)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 3.1–37.7 inches

Range in total height of sample: 21.7–161.9 feet

***Abies grandis* (Dougl. ex D. Don) Lindl.—grand fir**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: Not provided

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Allen *et al.* (1974)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol area of Northern Idaho

Number of trees sampled: 19

Range in DBH of sample: 5–9 inches

Range in total height of sample: 30–60 feet

Reference: Allen *et al.* (1976)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol, Elk City, Orofino, and Bovill areas of Northern Idaho

Number of trees sampled: 156

Range in DBH of sample: 2–9 inches

Range in total height of sample: 10–70 feet

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Eastern Oregon and Eastern Washington

Number of trees sampled: 202 including white fir

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Walters *et al.* (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 1.3–42.9 inches

Range in total height of sample: 11.1–161.7 feet

Reference: Walters and Hann (1986a)

Type of volume predicted: Merchantable cubic-foot volume inside bark from any stump height between 0.0 and 4.5 feet to any top diameter inside bark between 0.0 and 6.0 inches

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 1.3–42.9 inches

Range in total height of sample: 11.1–161.7 feet

Taper

Reference: Walters and Hann (1986b)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 1.3–42.9 inches

Range in total height of sample: 11.1–161.7 feet

Reference: Czaplewski *et al.* (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Oregon and Southern Washington

Number of trees sampled: 1447

Range in DBH of sample: 7–56 inches

Range in total height of sample: 35–205 feet

***Abies lasiocarpa* (Hook.) Nutt.—subalpine fir**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark

4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: Not provided

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

***Abies magnifica* A. Murr.—California red fir**

Volume

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 14–62 inches

Range in total height of sample: 50–190 feet

Reference: Wensel (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Scribner board-foot volume inside bark from a 1.5-foot stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 308

Range in DBH of sample: 10–56 inches

Range in total height of sample: Not provided

Taper

Reference: Biging (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 43

Range in DBH of sample: 7.8–27.8 inches

Range in total height of sample: 41.5–101.3 feet

Reference: Czaplewski *et al.* (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Southern Oregon

Number of trees sampled: 273

Range in DBH of sample: 11–67 inches

Range in total height of sample: 30–175 feet

***Chamaecyparis*—White-cedar**

***Chamaecyparis nootkatensis* (D. Don) Spach—Alaska-cedar**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 275

Range in DBH of sample: 2–48 inches

Range in total height of sample: 20–150 feet

Reference: Farr and LaBau (1971)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch and variable top diameter inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch and variable top diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 72

Range in DBH of sample: 5–28 inches

Range in total height of sample: 30–107 feet

Taper

Reference: Kozak et al. (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 74

Range in DBH of sample: 6–44 inches

Range in total height of sample: 44–148 feet

Juniperus—Juniper

***Juniperus occidentalis* Hook.—western juniper**

Volume

Reference: Chittester and MacLean (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark

Geographic location of sample: Eastern Oregon and Northeast California

Number of trees sampled: 73

Range in DBH of sample: 5–30 inches

Range in total height of sample: 20–60 feet

Larix—Larch

***Larix occidentalis* Nutt.—western larch**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia
Number of trees sampled: 942
Range in DBH of sample: 2–52 inches
Range in total height of sample: 20–180 feet

Reference: Allen *et al.* (1974)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol area of Northern Idaho
Number of trees sampled: 33
Range in DBH of sample: 3–12 inches
Range in total height of sample: 40–80 feet

Reference: Allen *et al.* (1976)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol, Elk City, Orofino, and Bovill areas of Northern Idaho
Number of trees sampled: 42
Range in DBH of sample: 2–9 inches
Range in total height of sample: 20–80 feet

Reference: Faurot (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from ground to a 2.0-, 3.0-, 4.0-, 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: Western Montana
Number of trees sampled: 259
Range in DBH of sample: 2–21 inches
Range in total height of sample: 20–110 feet

Reference: Chapman *et al.* (1982)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Northeast Washington
Number of trees sampled: 37
Range in DBH of sample: 1–12 inches
Range in total height of sample: Not provided

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Eastern Oregon and Eastern Washington

Number of trees sampled: 133

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Taper

Reference: Czaplewski et al. (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Eastern Oregon

Number of trees sampled: 371

Range in DBH of sample: 9–47 inches

Range in total height of sample: 40–175 feet

Libocedrus—Incense-cedar

***Libocedrus decurrens* Torr.—incense-cedar**

Volume

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 12–66 inches

Range in total height of sample: 40–140 feet

Reference: Wensel (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Scribner board-foot volume inside bark from a 1.5-foot stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 211

Range in DBH of sample: 10–56 inches

Range in total height of sample: Not provided

Reference: Walters *et al.* (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 141

Range in DBH of sample: 0.8–33.4 inches

Range in total height of sample: 8.7–119.4 feet

Reference: Walters and Hann (1986a)

Type of volume predicted: Merchantable cubic-foot volume inside bark from any stump height between 0.0 and 4.5 feet to any top diameter inside bark between 0.0 and 6.0 inches

Geographic location of sample: Southwest Oregon

Number of trees sampled: 141

Range in DBH of sample: 0.8–33.4 inches

Range in total height of sample: 8.7–119.4 feet

Reference: McDonald and Skinner (1989)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 88

Range in DBH of sample: 3–40 inches

Range in total height of sample: Not provided

Taper

Reference: Amidon (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Sierra Nevada of California

Number of trees sampled: 162
Range in DBH of sample: 6–35 inches
Range in total height of sample: 16–89 feet

Reference: Biging (1984)

Type of dependent variable predicted: Diameter inside bark
Geographic location of sample: Northern California
Number of trees sampled: 95
Range in DBH of sample: 5.6–36.3 inches
Range in total height of sample: 22.4–108.3 feet

Reference: Walters and Hann (1986b)

Type of dependent variable predicted: Diameter inside bark
Geographic location of sample: Southwest Oregon
Number of trees sampled: 141
Range in DBH of sample: 0.8–33.4 inches
Range in total height of sample: 8.7–119.4 feet

***Picea*—Spruce**

***Picea engelmannii* Parry ex Engelm.—Engelmann spruce**

Volume

Reference: Kovats (1977)

Type of volume predicted: Total stem cubic-meter volume inside bark
Geographic location of sample: British Columbia
Number of trees sampled: About 100 including white spruce
Range in DBH of sample: Not provided
Range in total height of sample: 1–10 meters

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Eastern Oregon and Eastern Washington
Number of trees sampled: 50
Range in DBH of sample: Not provided
Range in total height of sample: Not provided

***Picea sitchensis* (Bong.) Carr.—Sitka spruce**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 1228

Range in DBH of sample: 2–96 inches

Range in total height of sample: 10–250 feet

Reference: Embry and Haack (1965)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-, 6.0-, and 8.0-inch top diameter inside bark
3. International board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark
4. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 284

Range in DBH of sample: 6–31 inches

Range in total height of sample: 40–170 feet

Reference: Bones (1968)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from stump to a variable top diameter inside bark
3. Scribner board-foot volume inside bark from stump to a variable top diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 266

Range in DBH of sample: 12–58 inches

Range in total height of sample: Not provided

Reference: Farr and LaBau (1976)

Type of volume predicted: Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 217

Range in DBH of sample: 11–38 inches

Range in total height of sample: 51–170 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 85

Range in DBH of sample: 6–51 inches

Range in total height of sample: 31–189 feet

Reference: Bruce (1984)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 439

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

***Pinus*—Pine**

***Pinus contorta* Dougl. ex Loud.—lodgepole pine**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia
Number of trees sampled: 2566
Range in DBH of sample: 2–24 inches
Range in total height of sample: 10–130 feet

Reference: Cole (1971)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from any stump height to any top diameter inside bark

Geographic location of sample: Western Montana, Wyoming, and Colorado

Number of trees sampled: 832

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Allen *et al.* (1974)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol area of Northern Idaho

Number of trees sampled: 88

Range in DBH of sample: 3–11 inches

Range in total height of sample: 40–70 feet

Reference: Allen *et al.* (1976)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol, Elk City, Orofino, and Bovill areas of Northern Idaho

Number of trees sampled: 351

Range in DBH of sample: 2–12 inches

Range in total height of sample: 20–90 feet

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California
Number of trees sampled: Not specified
Range in DBH of sample: 12–40 inches
Range in total height of sample: 40–140 feet

Reference: Faurot (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from ground to a 2.0-, 3.0-, 4.0-, 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: Western Montana
Number of trees sampled: 227
Range in DBH of sample: 2–18 inches
Range in total height of sample: 20–100 feet

Reference: Kovats (1977)

Type of volume predicted: Total stem cubic-meter volume inside bark
Geographic location of sample: British Columbia
Number of trees sampled: About 100
Range in DBH of sample: Not provided
Range in total height of sample: 1–10 meters

Reference: Chapman *et al.* (1982)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Northeast Washington
Number of trees sampled: 100
Range in DBH of sample: 1–12 inches
Range in total height of sample: Not provided

Reference: Dahms (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from stump to a 3.0-, 4.0-, and 5.0-inch top inside bark
3. International 1/4-inch board-foot volume inside bark from stump to a 5.0-, 6.0-, 7.0-, and 8.0-inch top inside bark
4. Scribner board-foot volume inside bark from stump to a 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: Central Oregon
Number of trees sampled: 194
Range in DBH of sample: Not provided
Range in total height of sample: Not provided

Reference: Cochran (1985)

Types of volumes predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Eastern Oregon and Eastern Washington

Number of trees sampled: 67

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Taper

Reference: Kozak et al. (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 456

Range in DBH of sample: 5–23 inches

Range in total height of sample: 42–130 feet

Reference: Kozak (1988)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 2881

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Czuplewski et al. (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Oregon and Southern Washington

Number of trees sampled: 1151

Range in DBH of sample: 6–27 inches

Range in total height of sample: 40–105 feet

Reference: Byrne (1993)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Idaho, Montana, and Wyoming

Number of trees sampled: 3624

Range in DBH of sample: 0.5–24.1 inches

Range in total height of sample: 7.2–112.1 feet

***Pinus jeffreyi* Grev. & Balf.—Jeffrey pine**

Volume

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 12–68 inches

Range in total height of sample: 40–230 feet

***Pinus lambertiana* Dougl.—sugar pine**

Volume

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 12–80 inches

Range in total height of sample: 50–230 feet

Reference: Wensel (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Scribner board-foot volume inside bark from a 1.5-foot stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 183

Range in DBH of sample: 10–60 inches

Range in total height of sample: Not provided

Reference: Walters et al. (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 1.9–42.2 inches

Range in total height of sample: 14.5–175.4 feet

Reference: Walters and Hann (1986a)

Type of volume predicted: Merchantable cubic-foot volume inside bark from any stump height between 0.0 and 4.5 feet to any top diameter inside bark between 0.0 and 6.0 inches

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 1.9–42.2 inches

Range in total height of sample: 14.5–175.4 feet

Reference: McDonald and Skinner (1989)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 49

Range in DBH of sample: 3–45 inches

Range in total height of sample: Not provided

Taper

Reference: Amidon (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Sierra Nevada of California

Number of trees sampled: 54

Range in DBH of sample: 6–26 inches

Range in total height of sample: 23–115 feet

Reference: Biging (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 84

Range in DBH of sample: 6.2–32.1 inches

Range in total height of sample: 36.7–137.7 feet

Reference: Walters and Hann (1986b)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 92

Range in DBH of sample: 1.9–42.2 inches

Range in total height of sample: 14.5–175.4 feet

***Pinus monticola* Dougl. ex D. Don—western white pine**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 381

Range in DBH of sample: 2–46 inches

Range in total height of sample: 20–190 feet

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Eastern Oregon and Eastern Washington

Number of trees sampled: 22

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 74

Range in DBH of sample: 6–27 inches

Range in total height of sample: 45–147 feet

***Pinus ponderosa* Dougl. ex Laws.—ponderosa pine**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 964

Range in DBH of sample: 2–44 inches

Range in total height of sample: 10–160 feet

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 12–68 inches

Range in total height of sample: 40–230 feet

Reference: Faurot (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from ground to a 2.0-, 3.0-, 4.0-, 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: Western Montana

Number of trees sampled: 362

Range in DBH of sample: 2–23 inches

Range in total height of sample: 10–110 feet

Reference: Wensel (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Scribner board-foot volume inside bark from a 1.5-foot stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Northern California
Number of trees sampled: 406
Range in DBH of sample: 10–60 inches
Range in total height of sample: Not provided

Reference: Oliver and Powers (1978)

Type of volume predicted: Total stem cubic-foot volume inside bark above a 1.0-foot stump
Geographic location of sample: Northern California
Number of trees sampled: 425
Range in DBH of sample: 1–24 inches
Range in total height of sample: 5–95 feet

Reference: Chapman *et al.* (1982)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Northeast Washington
Number of trees sampled: 28
Range in DBH of sample: 1–12 inches
Range in total height of sample: Not provided

Reference: Cochran *et al.* (1984)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Eastern Oregon and Eastern Washington
Number of trees sampled: Not provided
Range in DBH of sample: Not provided
Range in total height of sample: Not provided

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Eastern Oregon and Eastern Washington
Number of trees sampled: 137
Range in DBH of sample: Not provided
Range in total height of sample: Not provided

Reference: Walters *et al.* (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark
Geographic location of sample: Southwest Oregon
Number of trees sampled: 139
Range in DBH of sample: 1.3–35.6 inches
Range in total height of sample: 15.3–192.8 feet

Reference: Walters and Hann (1986a)

Type of volume predicted: Merchantable cubic-foot volume inside bark from any stump height between 0.0 and 4.5 feet to any top diameter inside bark between 0.0 and 6.0 inches

Geographic location of sample: Southwest Oregon

Number of trees sampled: 139

Range in DBH of sample: 1.3–35.6 inches

Range in total height of sample: 15.3–192.8 feet

Reference: McDonald and Skinner (1989)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 139

Range in DBH of sample: 3–40 inches

Range in total height of sample: Not provided

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 101

Range in DBH of sample: 6–40 inches

Range in total height of sample: 20–135 feet

Reference: Amidon (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Sierra Nevada of California

Number of trees sampled: 147

Range in DBH of sample: 6–32 inches

Range in total height of sample: 23–131 feet

Reference: Biging (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 254

Range in DBH of sample: 5.5–36.1 inches

Range in total height of sample: 27.5–153.1 feet

Reference: Walters and Hann (1986b)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 140

Range in DBH of sample: 1.3–35.6 inches

Range in total height of sample: 15.3–192.8 feet

Reference: Czaplewski *et al.* (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Oregon and Southern Washington

Number of trees sampled: 1735

Range in DBH of sample: 9–61 inches

Range in total height of sample: 40–160 feet

***Pseudotsuga*—Douglas-fir**

***Pseudotsuga menziesii* (Mirb.) Franco—Douglas-fir**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 4764

Range in DBH of sample: 2–94 inches

Range in total height of sample: 10–300 feet

Reference: Curtis (1966)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Western Oregon and Western Washington

Number of trees sampled: Equation developed from tabular data

Range in DBH of sample: Equation developed from tabular data

Range in total height of sample: Equation developed from tabular data

Reference: Allen *et al.* (1974)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol area of Northern Idaho

Number of trees sampled: 92

Range in DBH of sample: 2–11 inches

Range in total height of sample: 20–70 feet

Reference: Bruce and DeMars (1974)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Northwest Oregon, Western Washington, and Southwest British Columbia

Number of trees sampled: 1127

Range in DBH of sample: 0.4–32 inches

Range in total height of sample: 6–167 feet

Reference: Allen *et al.* (1976)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Board-foot volume inside bark above a 1.0-foot stump

Geographic location of sample: The Athol, Elk City, Orofino, and Bovill areas of Northern Idaho

Number of trees sampled: 156

Range in DBH of sample: 2–13 inches

Range in total height of sample: 10–90 feet

Reference: MacLean and Berger (1976)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.5-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Interior California

Number of trees sampled: Not specified

Range in DBH of sample: 12–60 inches

Range in total height of sample: 50–210 feet

Reference: Faurot (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from ground to a 2.0-, 3.0-, 4.0-, 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: Western Montana

Number of trees sampled: 363

Range in DBH of sample: 2–22 inches

Range in total height of sample: 10–100 feet

Reference: Kovats (1977)

Type of volume predicted: Total stem cubic-meter volume inside bark

Geographic location of sample: British Columbia

Number of trees sampled: About 100

Range in DBH of sample: Not provided

Range in total height of sample: 1–10 meters

Reference: Wensel (1977)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Scribner board-foot volume inside bark from a 1.5-foot stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 261

Range in DBH of sample: 10–60 inches

Range in total height of sample: Not provided

Reference: Chapman *et al.* (1982)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Northeast Washington

Number of trees sampled: 24

Range in DBH of sample: 1–12 inches

Range in total height of sample: Not provided

Reference: Wensel and Krumland (1983)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 5.0-, 6.0-, 7.0-, and 8.0-inch top inside bark
2. Scribner board-foot volume inside bark from a 1.0-foot stump to a 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 231

Range in DBH of sample: 10–50 inches

Range in total height of sample: 40–200 feet

Reference: Cochran (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Eastern Oregon and Eastern Washington

Number of trees sampled: 210

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Walters *et al.* (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 680

Range in DBH of sample: 0.9–43.2 inches

Range in total height of sample: 9.0–200.9 feet

Reference: Walters and Hann (1986a)

Type of volume predicted: Merchantable cubic-foot volume inside bark from any stump height between 0.0 and 4.5 feet to any top diameter inside bark between 0.0 and 6.0 inches

Geographic location of sample: Southwest Oregon

Number of trees sampled: 680

Range in DBH of sample: 0.9–43.2 inches

Range in total height of sample: 9.0–200.9 feet

Reference: McDonald and Skinner (1989)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 154

Range in DBH of sample: 3–40 inches

Range in total height of sample: Not provided

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 175

Range in DBH of sample: 5–71 inches

Range in total height of sample: 27–231 feet

Reference: Wensel and Krumland (1983)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 385

Range in DBH of sample: 10–50 inches

Range in total height of sample: 40–200 feet

Reference: Amidon (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Sierra Nevada of California

Number of trees sampled: 42

Range in DBH of sample: 7–28 inches

Range in total height of sample: 30–130 feet

Reference: Biging (1984)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Northern California

Number of trees sampled: 202

Range in DBH of sample: 5.7–32.1 inches

Range in total height of sample: 38.8–150.6 feet

Reference: Walters and Hann (1986b)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Southwest Oregon

Number of trees sampled: 682

Range in DBH of sample: 0.9–43.2 inches

Range in total height of sample: 9.0–200.9 feet

Reference: Kozak (1988)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 605

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Czaplewski *et al.* (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Oregon and Southern Washington

Number of trees sampled: 1823

Range in DBH of sample: 7–77 inches

Range in total height of sample: 40–250 feet

Sequoia—Redwood

Sequoia sempervirens (D. Don) Endl.—redwood

Volume

Reference: Hasel (1950)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a variable stump to a 4.0-inch top inside bark
2. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to a variable top inside bark
3. International 1/4-inch board-foot volume inside bark from a 1.5-foot stump to a variable top inside bark
4. Scribner board-foot volume inside bark from a 1.5-foot stump to a variable top inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 145

Range in DBH of sample: 6–60 inches

Range in total height of sample: 50–170 feet

Reference: Palley (1959)

Types of volumes predicted:

1. Spaulding board-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top inside bark
2. International board-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 560

Range in DBH of sample: 11–50 inches

Range in total height of sample: 40–180 feet

Reference: Palley (1961)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to a 4.0-inch top inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 593

Range in DBH of sample: 4–50 inches

Range in total height of sample: 30–180 feet

Reference: Wensel and Krumland (1983)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 5.0-, 6.0-, 7.0-, and 8.0-inch top inside bark
2. Scribner board-foot volume inside bark from a 1.0-foot stump to a 5.0-, 6.0-, 7.0-, and 8.0-inch top diameter inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 900

Range in DBH of sample: 10–60 inches

Range in total height of sample: 40–200 feet

Taper

Reference: Wensel and Krumland (1983)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: North Coast of California

Number of trees sampled: 900

Range in DBH of sample: 10–60 inches

Range in total height of sample: 40–200 feet

***Sequoiadendron*—Giant sequoia**

***Sequoiadendron giganteum* (Lindl.) Buchholz—giant sequoia**

Volume

Reference: Wensel and Schoenheide (1971)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from stump to a 6.0-inch top inside bark
2. Scribner board-foot volume inside bark from stump to a 6.0-inch top diameter inside bark

Geographic location of sample: Southern Sierra Nevada in California

Number of trees sampled: 195

Range in DBH of sample: 12–60 inches

Range in total height of sample: 40–170 feet

Thuja—Cedar

Thuja plicata Donn ex D. Don—western redcedar

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 3087

Range in DBH of sample: 2–84 inches

Range in total height of sample: 10–210 feet

Reference: Farr and LaBau (1971)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from a 1.0-foot stump to a 6.0-Inch and variable top diameter inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 6.0-inch and variable top diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 182

Range in DBH of sample: 6–66 inches

Range in total height of sample: 30–158 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 176

Range in DBH of sample: 5–51 inches

Range in total height of sample: 27–189 feet

Reference: Kozak (1988)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 652

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

***Tsuga*—Hemlock**

***Tsuga heterophylla* (Raf.) Sarg.—western hemlock**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 4104

Range in DBH of sample: 2–74 inches

Range in total height of sample: 10–200 feet

Reference: Embry and Haack (1965)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-, 6.0-, and 8.0-inch top diameter inside bark
3. International board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark
4. Scribner board-foot volume inside bark from a 1.0-foot stump to a variable top diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 243

Range in DBH of sample: 5–26 inches

Range in total height of sample: 40–150 feet

Reference: Bones (1968)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from stump to a 4.0-inch top inside bark
2. International 1/4-inch board-foot volume inside bark from stump to a variable top diameter inside bark
3. Scribner board-foot volume inside bark from stump to a variable top diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 747

Range in DBH of sample: 12–56 inches

Range in total height of sample: Not provided

Reference: Farr and LaBau (1976)

Type of volume predicted: Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 160

Range in DBH of sample: 11–26 inches

Range in total height of sample: 58–149 feet

Reference: Wiley *et al.* (1978)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from stump to a 4.0-inch top inside bark

Geographic location of sample: Northwest Oregon and Western Washington

Number of trees sampled: 523

Range in DBH of sample: 2–39 inches

Range in total height of sample: 20–190 feet

Reference: Chambers and Foltz (1979)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Northwest Oregon and Western Washington

Number of trees sampled: 638

Range in DBH of sample: 2–50 inches

Range in total height of sample: 20–200 feet

Reference: Hoyer (1985)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Northwest Oregon and Western Washington

Number of trees sampled: 638

Range in DBH of sample: 2–50 inches

Range in total height of sample: 20–200 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 144

Range in DBH of sample: 5–42 inches

Range in total height of sample: 40–176 feet

Reference: Bruce (1984)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Southeast Alaska

Number of trees sampled: 1118

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Czuplewski *et al.* (1989)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: Northwest Oregon and Southern Washington

Number of trees sampled: 531

Range in DBH of sample: 5–57 inches

Range in total height of sample: 40–195 feet

Reference: Flewelling (1993), Flewelling and Raynes (1993)

Type of dependent variable predicted: Diameter inside bark

Geographic location of sample: Coastal Washington

Number of trees sampled: 239

Range in DBH of sample: 1–48 inches

Range in total height of sample: 10–190 feet

***Tsuga mertensiana* (Bong.) Carr.—mountain hemlock**

Volume

Reference: Bell *et al.* (1981)

Type of volume predicted: Total stem cubic-foot volume inside bark

Geographic location of sample: Central Oregon

Number of trees sampled: 98

Range in DBH of sample: 7–50 inches

Range in total height of sample: 30–110 feet

HARDWOODS

Acer—Maple

***Acer macrophyllum* Pursh—bigleaf maple**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 197

Range in DBH of sample: 2–26 inches

Range in total height of sample: 40–120 feet

Reference: Snell and Little (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark to any top inside bark from 0.0 to 9.0 inches

Geographic location of sample: Western Washington

Number of trees sampled: 16

Range in DBH of sample: 2–18 inches

Range in total height of sample: Not provided

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 61 for total stem and merchantable cubic volumes and 26 for "sawlog" cubic volumes

Range in DBH of sample: 5–33 inches

Range in total height of sample: 30–90 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 52

Range in DBH of sample: 6–23 inches

Range in total height of sample: 49–94 feet

Alnus—Alder

***Alnus rubra* Bong.—red alder**

Volume

Reference: Johnson *et al.* (1949)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from stump to a 4.0-inch top inside bark
2. Scribner board-foot volume inside bark from stump to an 8.0-inch top inside bark

Geographic location of sample: Northwest Oregon, Western Washington, and Southwestern British Columbia

Number of trees sampled: 372

Range in DBH of sample: 8–28 inches

Range in total height of sample: 60–120 feet

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 599

Range in DBH of sample: 2–22 inches

Range in total height of sample: 30–110 feet

Reference: Curtis *et al.* (1968)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above the stump
2. Merchantable cubic-foot volume inside bark from stump to a 4.0-, 6.0-, 8.0-, 10.0-, and 12.0-inch top inside bark
3. International 1/4-inch board-foot volume inside bark from stump to a 6.0-, 8.0-, 10.0-, and 12.0-inch top inside bark
4. Scribner board-foot volume inside bark from stump to a 6.0-, 8.0-, 10.0-, and 12.0-inch top inside bark

Geographic location of sample: Northwest Oregon, Western Washington, and Southwestern British Columbia

Number of trees sampled: 473

Range in DBH of sample: 2–24 inches

Range in total height of sample: 20–120 feet

Reference: Snell and Little (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark to any top inside bark from 0.0 to 9.0 inches

Geographic location of sample: Western Oregon and Western Washington

Number of trees sampled: 53

Range in DBH of sample: 1–25 inches

Range in total height of sample: Not provided

Taper

Reference: Curtis *et al.* (1968)

Type of dependent variable predicted: Squared diameter inside bark
Geographic location of sample: Northwest Oregon, Western Washington, and Southwestern British Columbia

Number of trees sampled: 473

Range in DBH of sample: 2–24 inches

Range in total height of sample: 20–120 feet

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark
Geographic location of sample: British Columbia

Number of trees sampled: 101

Range in DBH of sample: 5–18 inches

Range in total height of sample: 53–108 feet

Arbutus—Madrone

***Arbutus menziesii* Pursh—Pacific madrone**

Volume

Reference: Hornibrook *et al.* (1950)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a variable stump to a 4.0-inch top inside bark
2. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to a variable top inside bark
3. Scribner board-foot volume inside bark from a 1.5-foot stump to a variable top inside bark

Geographic location of sample: Northwest California

Number of trees sampled: 70

Range in DBH of sample: 6–44 inches

Range in total height of sample: 20–100 feet

Reference: McDonald (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 85

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Snell and Little (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark to any top inside bark from 0.0 to 9.0 inches

Geographic location of sample: Southwest Oregon and Northwest California

Number of trees sampled: 31

Range in DBH of sample: 1–25 inches

Range in total height of sample: Not provided

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 60 for total stem cubic volumes, 58 for merchantable cubic volumes, and 32 for "sawlog" cubic volumes

Range in DBH of sample: 5–27 inches

Range in total height of sample: 20–100 feet

***Betula*—Birch**

***Betula papyrifera* Marsh.—paper birch**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 320

Range in DBH of sample: 2–18 inches

Range in total height of sample: 30–90 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 73

Range in DBH of sample: 5–21 inches

Range in total height of sample: 45–89 feet

***Castanopsis*—Chinkapin**

***Castanopsis chrysophylla* (Dougl.) A. DC.—giant chinkapin**

Volume

Reference: Snell and Little (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark to any top inside bark from 0.0 to 9.0 inches

Geographic location of sample: Southwest Oregon and Northwest California

Number of trees sampled: 30

Range in DBH of sample: 1–24 inches

Range in total height of sample: Not provided

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 60 for total stem and merchantable cubic volumes and 40 for "sawlog" cubic volumes

Range in DBH of sample: 5–31 inches

Range in total height of sample: 20–100 feet

***Lithocarpus*—Tanoak**

***Lithocarpus densiflorus* (Hook. & Arn.) Rehd.—tanoak**

Volume

Reference: Hornibrook *et al.* (1950)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a variable stump to a 4.0-inch top inside bark
2. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to a variable top inside bark
3. Scribner board-foot volume inside bark from a 1.5-foot stump to a variable top inside bark

Geographic location of sample: Northwest California

Number of trees sampled: 82

Range in DBH of sample: 6–40 inches

Range in total height of sample: 30–120 feet

Reference: McDonald (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 144

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Snell and Little (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark to any top inside bark from 0.0 to 9.0 inches

Geographic location of sample: Southwest Oregon and Northwest California

Number of trees sampled: 31

Range in DBH of sample: 1–26 inches

Range in total height of sample: Not provided

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 60 for total stem cubic volumes, 59 for merchantable cubic volumes, and 37 for "sawlog" cubic volumes

Range in DBH of sample: 5–39 inches

Range in total height of sample: 20–110 feet

Populus—Aspen, Cottonwood, Poplar

***Populus tremuloides* Michx.—quaking aspen**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 700

Range in DBH of sample: 2–20 inches

Range in total height of sample: 10–110 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark

Geographic location of sample: British Columbia

Number of trees sampled: 126

Range in DBH of sample: 5–21 inches

Range in total height of sample: 53–108 feet

***Populus trichocarpa* Torr. & Gray—black cottonwood**

Volume

Reference: Browne (1962)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top diameter inside bark
3. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to an 8.0-inch top diameter inside bark
4. Merchantable cubic-foot volume inside bark from a 2.0-foot stump to a 12.0-inch top diameter inside bark

Geographic location of sample: British Columbia
Number of trees sampled: 329
Range in DBH of sample: 2–58 inches
Range in total height of sample: 30–150 feet

Taper

Reference: Kozak *et al.* (1969)

Type of dependent variable predicted: Squared diameter inside bark
Geographic location of sample: British Columbia
Number of trees sampled: 142
Range in DBH of sample: 5–48 inches
Range in total height of sample: 45–167 feet

Reference: Kozak (1988)

Type of dependent variable predicted: Diameter inside bark
Geographic location of sample: British Columbia
Number of trees sampled: 573
Range in DBH of sample: Not provided
Range in total height of sample: Not provided

Quercus—Oak

***Quercus agrifolia* Née—coast live oak**

Volume

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. “Sawlog” cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. “Sawlog” cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California
Number of trees sampled: 60 for total stem cubic volumes, 59 for merchantable cubic volumes, and 68 for “sawlog” cubic volumes
Range in DBH of sample: 5–39 inches
Range in total height of sample: 20–100 feet

***Quercus chrysolepis* Liebm.—canyon live oak**

Volume

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. “Sawlog” cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. “Sawlog” cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California
Number of trees sampled: 58 for total stem and merchantable cubic volumes and 68 for “sawlog” cubic volumes
Range in DBH of sample: 5–31 inches
Range in total height of sample: 20–100 feet

***Quercus douglasii* Hook. & Arn.—blue oak**

Volume

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. “Sawlog” cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger

6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 60 for total stem and merchantable cubic volumes and 32 for "sawlog" cubic volumes

Range in DBH of sample: 5–27 inches

Range in total height of sample: 20–60 feet

***Quercus engelmannii* Greene—Engelmann oak**

Volume

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark

Geographic location of sample: California

Number of trees sampled: 61

Range in DBH of sample: 5–31 inches

Range in total height of sample: 20–50 feet

***Quercus garryana* Dougl. ex Hook.—Oregon white oak**

Volume

Reference: Hornibrook et al. (1950)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a variable stump to a 4.0-inch top inside bark
2. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to a variable top inside bark
3. Scribner board-foot volume inside bark from a 1.5-foot stump to a variable top inside bark

Geographic location of sample: Northwest California

Number of trees sampled: 105

Range in DBH of sample: 6–40 inches

Range in total height of sample: 20–90 feet

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 60 for total stem and merchantable cubic volumes and 32 for "sawlog" cubic volumes

Range in DBH of sample: 5–35 inches

Range in total height of sample: 20–90 feet

***Quercus kelloggii* Newb.—California black oak**

Volume

Reference: Hornibrook *et al.* (1950)

Types of volumes predicted:

1. Merchantable cubic-foot volume inside bark from a variable stump to a 4.0-inch top inside bark
2. Merchantable cubic-foot volume inside bark from a 1.5-foot stump to a variable top inside bark
3. Scribner board-foot volume inside bark from a 1.5-foot stump to a variable top inside bark

Geographic location of sample: Northwest California

Number of trees sampled: 79

Range in DBH of sample: 6–42 inches

Range in total height of sample: 20–90 feet

Reference: McDonald (1983)

Types of volumes predicted:

1. Total stem cubic-foot volume inside bark above a 1.0-foot stump
2. Merchantable cubic-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark
3. Scribner board-foot volume inside bark from a 1.0-foot stump to a 4.0-inch top inside bark

Geographic location of sample: North-central California

Number of trees sampled: 104

Range in DBH of sample: Not provided

Range in total height of sample: Not provided

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 59 for total stem cubic volumes, 60 for merchantable cubic volumes, and 26 for "sawlog" cubic volumes

Range in DBH of sample: 5–43 inches

Range in total height of sample: 30–140 feet

***Quercus lobata* Née—valley oak**

Volume

Reference: Harrington *et al.* (1979)

Type of volume predicted: Total stem cubic-foot volume outside bark

Geographic location of sample: Central Coast of California

Number of trees sampled: 20

Range in DBH of sample: 6.5–54.8 inches

Range in total height of sample: 26.6–74.1 feet

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark

5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 59 for total stem and merchantable cubic volumes and 27 for "sawlog" cubic volumes

Range in DBH of sample: 5–39 inches

Range in total height of sample: 20–100 feet

***Quercus wislizeni* A. DC.—interior live oak**

Volume

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 58 for total stem and merchantable cubic volumes and 68 for "sawlog" cubic volumes

Range in DBH of sample: 5–39 inches

Range in total height of sample: 20–90 feet

***Umbellularia*—California-laurel**

***Umbellularia californica* (Hook. & Arn.) Nutt.—California-laurel**

Volume

Reference: Pillsbury and Kirkley (1984)

Types of volumes predicted:

1. Total stem cubic-foot volume outside bark
2. Total stem cubic-meter volume outside bark
3. Merchantable cubic-foot volume outside bark from a 1.0-foot stump to a 4.0-inch top outside bark
4. Merchantable cubic-meter volume outside bark from a 0.3-meter stump to a 10.0-centimeter top outside bark
5. "Sawlog" cubic-foot volume outside bark from a 1.0-foot stump to a 9.0-inch top outside bark for trees 11-inch DBH or larger
6. "Sawlog" cubic-meter volume outside bark from a 0.3-meter stump to a 23.0-centimeter top outside bark for trees 28-centimeter DBH or larger

Geographic location of sample: California

Number of trees sampled: 60 for total stem and merchantable cubic volumes and 30 for "sawlog" cubic volumes

Range in DBH of sample: 5–31 inches

Range in total height of sample: 20–110 feet

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