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FOREST SERVICE

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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

## Estimating Volumes and Diameters at Breast Height from Stump Diameters, Southwestern Ponderosa Pine

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There is a close correlation between stump diameter inside bark and diameter at breast height outside bark (d.b.h.) of southwestern ponderosa pines. Stump diameters may thus be used to estimate the d.b.h. and volume of trees that have been cut and hauled away.

The procedure for determining d.b.h. and volume from stump diameter is as follows:

1. Tally the stumps of the missing trees by average diameters inside bark 1 foot above ground level on the uphill side.
2. Convert stump diameters to d.b.h. by means of table 1.
3. Construct a curve of tree height over d.b.h. from measurements of trees remaining on and adjacent to the area. Read the average height of trees in each d.b.h. class.
4. Obtain the volume of one tree in each d.b.h. class (with the average height of the class) from the appropriate standard volume table.

5. Multiply the volume of one tree in each d.b.h. class by the number of trees tallied in the class, and total the class volumes.

Table 1 summarizes the following linear relationships:

For immature ponderosa pines with stump diameters of 4 to 11 inches:

$$\text{D.b.h.} = 0.23 + 1.05 (\text{stump diameter})$$

Correlation coefficient(r): 0.999. Standard error of estimate: 0.12 inch.

For immature and old-growth ponderosa pines with stump diameters of 12 to 40 inches:

$$\text{D.b.h.} = 1.32 + 0.96 (\text{stump diameter})$$

Correlation coefficient(r): 0.999. Standard error of estimate: 0.21 inch.

The relationships were computed from diameter measurements of 1,483 felled trees. All areas of commercial ponderosa pine in Arizona and New Mexico were represented in the sample.

Table 1. --Diameter outside bark at breast height from diameter inside bark at the top of a stump  
 1 foot high on the uphill side, southwestern ponderosa pine  
 (In inches)

Stump diameter, inside bark	:	Diameter breast high, outside bark	::	Stump diameter, inside bark	:	Diameter breast high, outside bark
4.5	:	5.0	::	23.5	:	23.9
5.5	:	6.0	::	24.5	:	24.8
6.5	:	7.1	::	25.5	:	25.8
7.5	:	8.1	::	26.5	:	26.8
8.5	:	9.2	::	27.5	:	27.7
9.5	:	10.2	::	28.5	:	28.7
10.5	:	11.3	::	29.5	:	29.6
11.5	:	12.3	::	30.5	:	30.6
12.5	:	13.3	::	31.5	:	31.6
13.5	:	14.3	::	32.5	:	32.5
14.5	:	15.2	::	33.5	:	33.5
15.5	:	16.2	::	34.5	:	34.4
16.5	:	17.2	::	35.5	:	35.4
17.5	:	18.1	::	36.5	:	36.4
18.5	:	19.1	::	37.5	:	37.3
19.5	:	20.0	::	38.5	:	38.3
20.5	:	21.0	::	39.5	:	39.2
21.5	:	22.0	::	40.5	:	40.2
22.5	:	22.9	::		:	