Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

FOREST SERVICE

U.S. DEPARTMENT OF AGRICULTURE

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Stand Volume Tables

for

Immature Ponderosa Pine in the Black Hills

Charles E. Boldt, Research Forester¹

The volume tables presented here give direct estimates of total and merchantable cubic-foot volumes per acre for immature ponderosa pine stands in the Black Hills. The tables provide a timesaving shortcut for determining stand volumes, since they eliminate the need for summing estimates for individual trees or size classes.

Table 1 gives estimates of total cubic-foot volume per acre, including stumps and upper stemwood of all trees. Two values are required to use this table: (1) basal area of the stand, in square feet per acre, and (2) average total height of dominant and codominant trees, in feet.

Table 2 provides estimates of stand merchantable volume, in trees 6.0 inches d.b.h. and larger, exclusive of volume in upper stemwood smaller than 4.0 inches d.i.b. and in stumps 0.5 foot high. Use of this table also requires two values: (1) basal area of trees larger than 5.9 inches d.b.h., in square feet

per acre, and (2) average total height of dominants and codominants, in feet.

Basal areas can be obtained from either plots or point samples, well distributed throughout the stand. The height value required by both tables should be an arithmetic average of total heights of five or more dominants and codominants on each plot or near each point where basal area is measured. When volume estimates are made for sapling or pole stands that have an overstory composed of remnants of a parent stand, the overstory trees should be excluded from the basal area and height samples.

These volume tables were derived from data collected by Myers and Van Deusen on 60 sample plots used in a study of periodic growth in immature pine stands in the Black Hills.² Graphic analysis of the data revealed a strong linear correlation between total cubic-foot volume per acre and the product of basal area times average total height of dominants

and codominants. A regression line was fitted to the data by the method of least squares:

$$V_T = 0.392 B_T H$$

where V_T = stand volume in cubic feet per acre, B_T = basal area per acre, all stems in square feet, and H = average total height of dominants and codominants, in feet.

Stand merchantable volume was similarly correlated with basal area of merchantable trees and average total height of dominants and codominants. Another least-squares regression equation was computed for that relationship:

$$V_M = 0.372 B_M H - 96.3$$

where V_M = stand merchantable volume in cubic feet per acre, B_M = basal area of all trees larger than 5.9 inches d.b.h., in square feet per acre, and H = average total height of dominant and codominant trees.

These two equations were used to compute the volumes shown in the tables. They can

also be used to obtain volume estimates for combinations of basal area and average height in between those given in the tables.

Merchantable cubic-foot volumes may be converted to standard cord measure by applying appropriate conversion factors. For an estimate of the number of rough (unpeeled) cords per acre, divide merchantable cubic-foot volume by 77. For an estimate of the number of cords of peeled wood, divide merchantable cubic-foot volume by 98.³ Cord estimates thus obtained will be sufficiently accurate for most purposes, although probable limits of error cannot be given.

¹Author stationed at Rapid City, South Dakota, in cooperation with the South Dakota School of Mines and Technology.

²Myers, Clifford A., and Van Deusen, James L. *Growth of immature stands of ponderosa pine in the Black Hills*. U.S. Forest Serv. Rocky Mountain Forest and Range Expt. Sta. Paper 61, 14 pp., 1961.

³Woodfin, R. O., Jr., and Landt, E. F. *Conversion of cubic-foot volumes of Black Hills ponderosa pine to cords*. U.S. Forest Serv. Rocky Mountain Forest and Range Expt. Sta. Res. Note 31(Rev.) 2 pp. 1960.

Table 1.--Total cubic-foot volume for immature stands of ponderosa
pine in the Black Hills of South Dakota and Wyoming

Cubic feet per acre,
entire stems, inside
bark

Average total height of
dominant and codominant
trees

Stand basal area, all stems	Average total height, feet							
	20	30	40	50	60	70	80	90

Sq. ft./acre

Volume per acre, cubic feet

10	78	118	157	196				
20	157	235	314	392				
30	235	353	470	588				
40	314	470	627	784				
50	392	588	784	980				
60	470	706	941	1176				
70	549	823	1098	1372				
80	627	941	1254	1568	1882			
90	706	1058	1411	1764	2117			
100	784	1176	1568	1960	2352			
110	862	1294	1725	2156	2587			
120	941	1411	1882	2352	2822			
130	1019	1529	2038	2548	3058			
140	1098	1646	2195	2744	3293	3842	4390	
150	1176	1764	2352	2940	3528	4116	4704	5292
160	1254	1882	2509	3136	3763	4390	5018	5645
170	1333	1999	2666	3332	3998	4665	5331	5998
180	1411	2117	2822	3528	4234	4939	5645	6350
190	1490	2234	2979	3724	4469	5214	5958	6703
200	1568	2352	3136	3920	4704	5488	6272	7056
210	1646	2470	3293	4116	4939	5762	6586	7409
220	1725	2587	3450	4312	5174	6037	6899	
230	1803	2705	3606	4508	5410			
240	1882	2822	3763	4704				
250	1960	2940	3920	4900				
260	2038	3058	4077	5096				

Blocks indicate extent of basic data.

Standard error of estimate = 79.7 cubic feet = 3.5 percent at mean
volume.

Table 2.--Merchantable cubic-foot volume for immature
 Stands of ponderosa pine in the Black Hills
 of South Dakota and Wyoming

Cubic feet per acre,
 excluding 0.5-foot
 stumps and stemwood
 less than 4.0 inches
 d.i.b. Average total
 height of domi-
 nant and codomi-
 nant trees

Basal area in trees larger than 5.9 inches d.b.h.	Average total height, feet					
	20	30	40	50	60	70

Sq. ft./acre

Volume per acre, cubic feet

10		15	52			
20	52	127	201			
30	127	238	350			
40	201	350	499	648		
50		462	648	834	1020	
60		573	796	1020	1243	1466
70		685	945	1206	1466	1726
80		796	1094	1392	1689	1987
90		908	1243	1578	1912	2247
100		1020	1392	1764	2136	2508
110		1131	1540	1950	2359	2768
120		1243	1689	2136	2582	3028
130		1354	1838	2322	2805	3289
140			1987	2508	3028	3549
150			2136	2694	3252	3810
160			2284	2880	3475	4070
170			2433	3066	3698	4330
180			2582	3252	3921	4591
190			2731	3438	4144	4851
200			2880	3624	4368	
210			3028	3810	4591	

Blocks indicate extent of basic data.

Standard error of estimate = 80.6 cubic feet = 5.8 per-
 cent at mean volume.