Historic, Archive Document

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

for

Immature Ponderosa Pine in the Black Hills

Charles E. Boldt, Research Forester

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.b.h. 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. 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.

---

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


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

<table>
<thead>
<tr>
<th>Cubic feet per acre, entire stems, inside bark</th>
<th>Average total height of dominant and codominant trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand basal area, all stems</td>
<td>Average total height, feet</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
</tr>
<tr>
<td>:</td>
<td>20 : 30 : 40 : 50 : 60 : 70 : 80 : 90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sq. ft./acre</th>
<th>Volume per acre, cubic feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>78 118 157 196</td>
</tr>
<tr>
<td>20</td>
<td>157 235 314 392</td>
</tr>
<tr>
<td>30</td>
<td>235 353 470 588</td>
</tr>
<tr>
<td>40</td>
<td>314 470 627 784</td>
</tr>
<tr>
<td>50</td>
<td>392 588 784 980</td>
</tr>
<tr>
<td>60</td>
<td>470 706 941 1176</td>
</tr>
<tr>
<td>70</td>
<td>549 823 1098 1372</td>
</tr>
<tr>
<td>80</td>
<td>627 941 1254 1568</td>
</tr>
<tr>
<td>90</td>
<td>706 1058 1411 1764</td>
</tr>
<tr>
<td>100</td>
<td>784 1176 1568 1960</td>
</tr>
<tr>
<td>110</td>
<td>862 1294 1725 2156</td>
</tr>
<tr>
<td>120</td>
<td>941 1411 1882 2352</td>
</tr>
<tr>
<td>130</td>
<td>1019 1529 2038 2548</td>
</tr>
<tr>
<td>140</td>
<td>1098 1646 2195 2744</td>
</tr>
<tr>
<td>150</td>
<td>1176 1764 2352 2940</td>
</tr>
<tr>
<td>160</td>
<td>1254 1882 2509 3136</td>
</tr>
<tr>
<td>170</td>
<td>1333 1999 2666 3332</td>
</tr>
<tr>
<td>180</td>
<td>1411 2117 2822 3528</td>
</tr>
<tr>
<td>190</td>
<td>1490 2234 2979 3724</td>
</tr>
<tr>
<td>200</td>
<td>1568 2352 3136 3920</td>
</tr>
<tr>
<td>210</td>
<td>1646 2470 3293 4116</td>
</tr>
<tr>
<td>220</td>
<td>1725 2587 3450 4312</td>
</tr>
<tr>
<td>230</td>
<td>1803 2705 3606 4508</td>
</tr>
<tr>
<td>240</td>
<td>1882 2822 3763 4704</td>
</tr>
<tr>
<td>250</td>
<td>1960 2940 3920 4900</td>
</tr>
<tr>
<td>260</td>
<td>2038 3058 4077 5096</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Basal area in trees larger than 5.9 inches d.b.h.</th>
<th>Average total height, feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Sq. ft./acre</td>
<td>Volume per acre, cubic feet</td>
</tr>
<tr>
<td>15</td>
<td>52</td>
</tr>
<tr>
<td>20</td>
<td>127</td>
</tr>
<tr>
<td>30</td>
<td>238</td>
</tr>
<tr>
<td>40</td>
<td>350</td>
</tr>
<tr>
<td>50</td>
<td>462</td>
</tr>
<tr>
<td>60</td>
<td>573</td>
</tr>
<tr>
<td>70</td>
<td>685</td>
</tr>
<tr>
<td>80</td>
<td>796</td>
</tr>
<tr>
<td>90</td>
<td>908</td>
</tr>
<tr>
<td>100</td>
<td>1020</td>
</tr>
<tr>
<td>110</td>
<td>1131</td>
</tr>
<tr>
<td>120</td>
<td>1243</td>
</tr>
<tr>
<td>130</td>
<td>1354</td>
</tr>
<tr>
<td>140</td>
<td>1454</td>
</tr>
<tr>
<td>150</td>
<td>1564</td>
</tr>
<tr>
<td>160</td>
<td>1654</td>
</tr>
<tr>
<td>170</td>
<td>1764</td>
</tr>
<tr>
<td>180</td>
<td>1854</td>
</tr>
<tr>
<td>190</td>
<td>1964</td>
</tr>
<tr>
<td>200</td>
<td>2074</td>
</tr>
<tr>
<td>210</td>
<td>2184</td>
</tr>
</tbody>
</table>

Blocks indicate extent of basic data.
Standard error of estimate = 80.6 cubic feet = 5.8 percent at mean volume.