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MERCHANTABLE HEIGHT OF TREES IN OREGON--A COMPARISON OF CURRENT LOGGING PRACTICE AND VOLUME TABLE SPECIFICATIONS

by

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A large proportion of present-day timber cruising is done by measuring or estimating three tree dimensions: diameter at breast height, form class, and merchantable height. Tree volumes are then determined from tables which equate volume to the varying combinations of height, d.b.h., and form class. Assumptions concerning merchantable height were made in constructing the volume tables, and although these assumptions were probably correct at the time the tables were developed, they may now be in error. Standards of utilization change, and the merchantable height of the past may not be the merchantable height of today. Since Bruce and Girard's board-foot volume tables[1/] are most frequently used in determining cruise volumes in the Pacific Northwest, current merchantable heights have been compared with those used in their tables.

Bruce and Girard's tables for 16-foot logs are constructed on the premise that merchantable height is determined by a minimum top diameter inside bark equal to 50 percent of d.i.b. at the top of the first 16-foot log, but in no case less than 8 inches. This 50

1/ Girard, James W., and Bruce, Donald. Board-foot volume tables for 16-foot logs. 44 pp. Portland, Oreg. [1949.]
Girard, James W., and Bruce, Donald. Board-foot volume tables for 32-foot logs. 40 pp. Portland, Oreg. [1947.]

percent of d.i.b. closely approximates 40 percent of d.b.h. for most trees. The tables for 32-foot logs are based on a merchantable top diameter of 60 percent of d.i.b. at the top of the first 32-foot log or, with small trees, 8 inches. Again, 40 percent of d.b.h. closely approximates the factor used at the top of the first log. Therefore, it has become standard cruising practice in the Northwest to assign a minimum merchantable top diameter of 40 percent of d.b.h. when estimating or measuring heights for the Bruce and Girard tables.

Is 40 percent of d.b.h. an appropriate minimum top diameter? Measuring trees before and after they are bucked into logs would answer this question. During the summer of 1958, 252 trees were measured in eastern Oregon. Half of these trees were old-growth ponderosa pine. Other species measured include Douglas-fir, lodgepole pine, white fir, subalpine fir, western larch, and Engelmann spruce. Diameters at breast height were measured before felling, and scaling diameters (i.b.) of the top logs were measured after bucking.

Top diameters (i.b.) from the volume tables were compared with actual merchantable top diameters in eastern Oregon (fig. 1). The two values are equal for trees with a d.b.h. of 30.5 inches (merchantable top = 12.2 inches). For most small trees, the 40-percent factor is a little too small--logs were not bucked quite as high in the tree as the volume tables indicate. Trees larger than 30.5 inches in diameter at breast height were utilized more completely--that is, to a smaller top diameter--than Bruce and Girard anticipated. The actual volumes to utilized top differ from table volumes by the following percentages:

D.b.h.	Difference (Percent)
11	+14.3
14	+ 2.0
18	- 4.3
22	- 2.2
26	- 2.4
30	- .1
34	+ .6
38	+ .9
42	+ 1.7
46	+ 1.2
50	+ 1.4

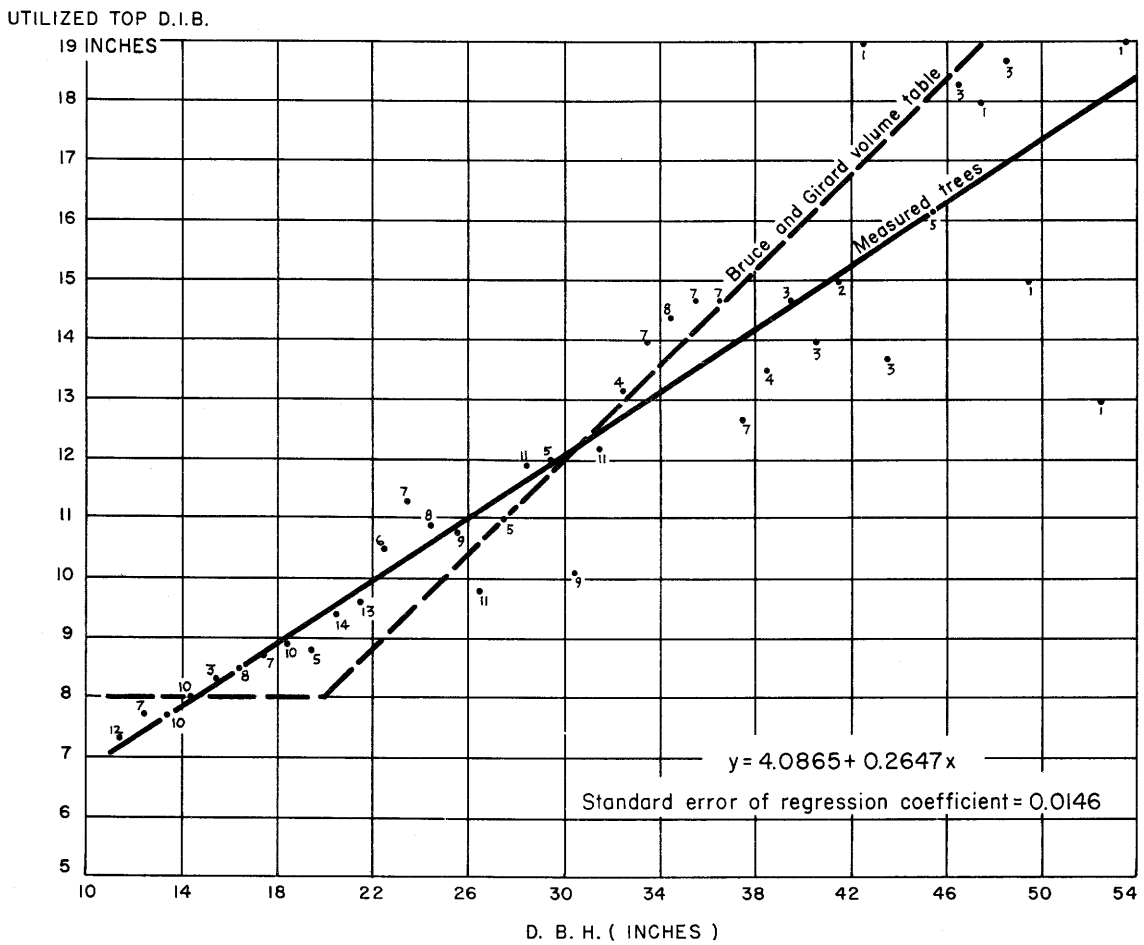

Figure 1.--The relation of utilized top d.i.b. to volume-table top d.i.b. in eastern Oregon.

A similar comparison in the coast range of western Oregon yielded somewhat different results (fig. 2). Ninety-five young-growth Douglas-fir trees of the Siuslaw National Forest were measured before and after bucking. Top diameters (i.b.) according to the volume tables were consistently larger than the actual utilized top diameters in these trees, regardless of d.b.h. Estimates of merchantable height made according to volume table standards would be too low for these trees. Volume estimates would also be

low. The following percentages show how actual volumes to utilized top differ from table volumes:

D.b.h.	Difference (Percent)
11	+11.1
14	+ 4.2
18	+ .6
22	+ 1.4
26	+ 1.5
30	+ 1.7
34	+ 4.2
38	+ 3.5
42	+ 5.0
46	+ 3.9
50	+ 4.4

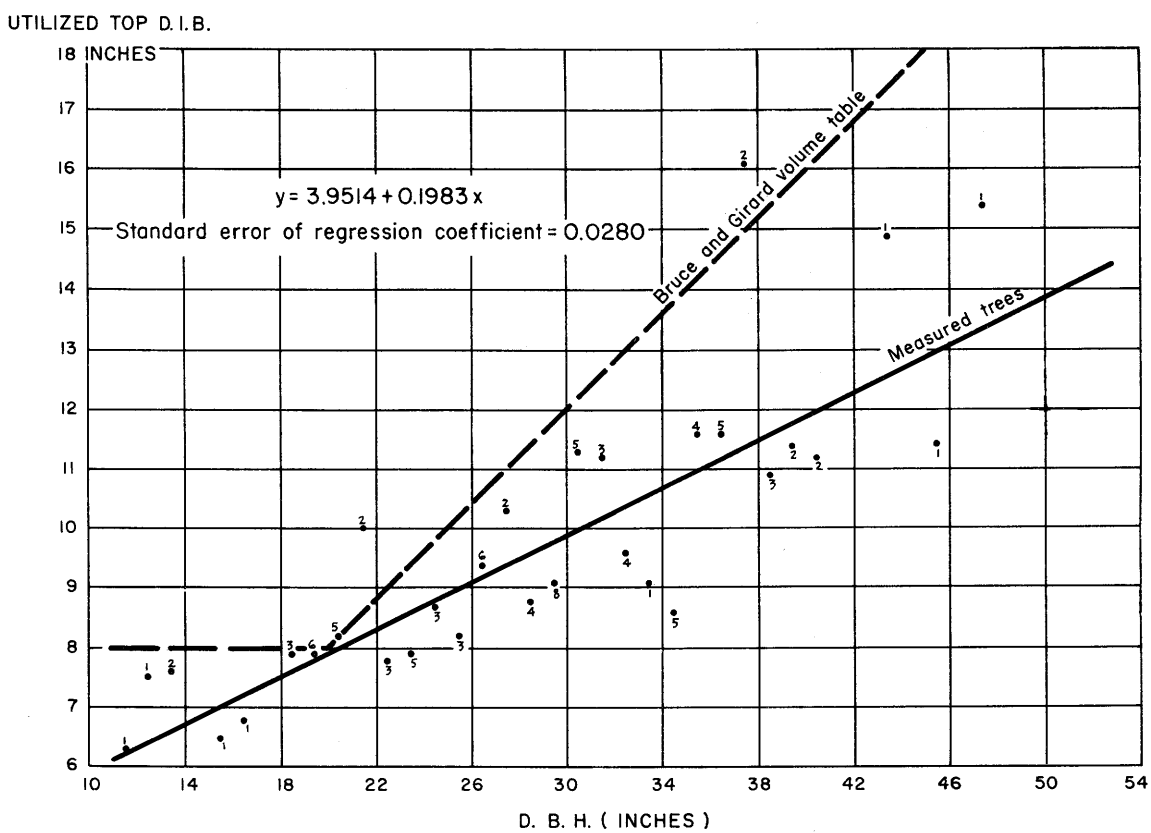

Figure 2.--The relation of utilized top d.i.b. to volume-table top d.i.b. for young-growth Douglas-fir on the Siuslaw National Forest, in western Oregon.

In order to test the possibility that differences between the two curves shown in figures 1 and 2 were due to chance rather than utilization standards, statistical tests were applied to the data used in constructing the curves. These analyses indicated highly significant differences in curve slopes; therefore, 40 percent of d.b.h. does not appear to be an appropriate minimum top diameter in the areas sampled.