LUMBER GRADES VS. SITE QUALITY OF SECOND-GROWTH DOUGLAS-FIR

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In Cooperation with the University of Wisconsin
Second-growth stands of Douglas-fir are looming high in importance in the Pacific Northwest as more extensive areas are being dedicated to future crops of timber. Since growing a crop of timber involves a period of not much less than 50 years for pulpwood, and a hundred years, more or less, for saw logs, it seems advisable that the future crop be evaluated, not only in terms of quantity but also of quality, as an indication of its usefulness when merchantable.

Accordingly, the Forest Products Laboratory, Madison, Wis., in cooperation with the Pacific Northwest Forest Experiment Station, Portland, Oreg., has initiated a comprehensive study of the quality of second-growth Douglas-fir stands, with a view of determining yields and quality of pulp, shrinkage, strength of clear wood, methods for drying, treating and gluing, and decay resistance as related to the environmental conditions of growth.

In this study the effect of forest site of widely different productivity, as shown by growth of the trees, has been emphasized. By forest "site" or "site quality" is meant the combined effect of the environmental characteristics of forest areas that result in different degrees of favorableness of tree growth; for example, soil, soil moisture, climate, etc. The combining influence is measured by total height growth of dominant trees at a given age. In the Douglas-fir region five classes of site are recognized, designated by I, II, III, IV, and V, representing average heights of trees at 100 years ranging from 200 feet for site I down to 80 feet for site V.

The forest areas selected for the study by the Experiment Station were site quality II and site quality IV for Douglas-fir. Both areas are situated in the Willamette National Forest, Lane County, Oreg., at elevations between about 2,500 and 3,500 feet. Site II

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Domestic trees have crowns extending above the general level of the forest canopy.

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is located on a southwesterly slope facing toward Salt Creek, and site IV on an opposite northeasterly slope. The most noticeable difference in the characteristics of the soil at the two places is a preponderance of gravel at site IV in contrast to a somewhat loamy soil at site II. Large boulders are abundant in both forests. The slope of the mountain side is steeper at site IV than at site II.

The two stands of timber were in marked contrast as to the size of their trees, especially in height. The dominant trees of the 100-year stand of site II averaged 170 feet in height, and those of the 150-year stand of site IV averaged 125 feet. Likewise, in the younger stand, dominant trees ranged up to 36 inches in diameter at breast height, while the larger trees in the 150-year stand did not exceed 30 inches in diameter. The stand on site II contained about 200 trees, and that on site IV about 400 trees, per acre. The slow growth of the trees during the last 20 years or more indicated that both stands were overstocked.

All trees on site II had grown more rapidly in height than the trees on site IV. Vertical distances between branch whorls on the trunks of the trees of site II were noticeably greater than between whorls on the trees of site IV. In both stands the trees had not yet completely rid themselves of dead branches. Those remaining on the trunks in site II were considerably larger in diameter on all but the smaller trees than those remaining on trunks in site IV.

While the greater height and diameter for a given age of the trees of site II reflect the high productivity of that area, it was found that lumber from typical logs from that site graded lower on the average than lumber from logs from site IV. The main factor determining the grade of lumber from the two sites was the condition of knots. Defects from other causes were practically absent. The larger trees cut from site II (fig. 1) not only contained larger knots, but a higher percentage of lumber with loose knots than the trees cut from site IV (fig. 2). By loose knots is meant knots formed by dead branches that remain on the trunks of the trees and become included in the trunks as the trees increase in diameter. When sawed into lumber loose knots are not an integral part of the boards containing them and after seasoning they are likely to drop out of boards leaving holes. Tight knots, on the other hand, are intergrown portions of living branches that remain solidly in a board or other piece of timber. A detailed investigation of the knots in both stands will be made.

In the grade tally after kiln drying, only 35 percent of the lumber from site II graded No. 1 or better, while 69 percent of that from site IV graded No. 1 or better. Applying these percentages to the total estimated yield per acre of 124,400 board feet
for site II at 100 years\(^2\) and 77,500 board feet for site IV at 150 years\(^2\), the present stand on site IV could be expected to yield 10,000 board feet more of No. 1 or better lumber than that on site II. However, according to the yield data of the Pacific Northwest Experiment Station\(^2\), the total yield per acre per year of all grades on site IV would be only about one-half that of site II and, naturally, it would come from many more smaller trees. In both stands it was clearly evident that lumber free from knots was practically unobtainable in rotations of less than 100 years. On site II where more rapid growth in diameter increased the amount of lumber with loose knots, the larger trees provided proportionately more of the lower-grade lumber than did the smaller trees.

Since the more profitable timber growing is closely associated with good-quality lumber grades, it is desirable to promote forest conditions that will yield products of the highest quality. Initial close stocking of trees in young stands is helpful in this direction, since with close stocking the forester is given a better chance to improve the stand by the selection of crop trees. Also with close stocking, lateral branches remain smaller and can be more cheaply removed if pruning is to be done, since less work is required for their removal.

In Douglas-fir stands, it appears to be essential that forestry practices be followed that will produce clear trunks on young crop trees at an early age if any clear lumber is to be obtained without waiting more than 100 years. Natural processes alone are very slow in bringing about improvements of this kind. After side branches are largely eliminated by pruning or otherwise, thinnings will stimulate diameter growth of the remaining trees and promote growth of the better-grade lumber in each tree. Of course, the establishment of conditions making production of high-quality lumber possible early in the life of the stand may be expected to be more profitably rewarded on the better sites.

Figure 1.--Douglas-fir boards (grade No. 2 Common) from site II containing knots, most of which loosened after drying.
Figure 2.—Douglas-fir boards (grade No. 1 Common) from site IV containing intergrown knots, most of which remained firm after drying.