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PREDICTING STOCKING IMPROVEMENT IN REPRODUCTION STANDS OF DOUGLAS-FIR

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Some cut or burned-over Douglas-fir areas restocked promptly and fully. Others do not and seemingly never will restock adequately without the help of artificial seeding or planting. On some areas widely scattered seedlings become established and grow; filling-in is by second generation trees from the seed of these scattered parents. On still other areas stocking improves gradually over a period of years. The apparent inconsistencies and wide differences in rates of restocking are often disconcerting to the forester striving for stands of good density, and trying to determine if he should plant to obtain them.

Field Methods and Data

Improvement in stocking or the seeding-in of Douglas-fir must be related to a number of site factors. Recognizing this, the Western Washington Research Center undertook to study this relation in central western Washington[1/] during 1946-47.

1/ Field work was done in Thurston, southern Mason, eastern Grays Harbor, western Lewis, and southwestern Pierce Counties. The assistance of a forester from Weyerhaeuser Timber Company for a portion of the field work is gratefully acknowledged.

NOTE: This paper was published in the University of Washington Forest Club Quarterly, Vol. XXI No. 2, Seattle, 1947-48.

Transect lines were run through areas nonrestocked and through areas supporting Douglas-fir stands up to 35 years old. Stocking varied from nil or very poor to very good. To measure stocking, quadrat counts[2] were made along these lines at one-chain intervals. A circle 14.9 feet in radius was laid out and divided pie-fashion into four sectors. Each sector was tallied as a 1/250-acre quadrat. The number of quadrats stocked was recorded as 0 to 4, and the number judged from stem analyses to have been stocked 15 years ago was counted and tallied. This double tally gave a measure of the improvement in stocking that had taken place in the past 15 years.

For each group of four quadrats the following site information was recorded: seed source, brush cover, slope, and exposure.

Sufficient quadrat counts were obtained only in the seed source condition classified as good; hence the data presented here apply only to areas having a good seed source. Plots in this classification were within a distance equivalent to twice the height of trees of seed-bearing age.

Brush cover was classified as follows: light - brush, including bracken, less than two feet high covering less than 50 percent of the ground and/or taller brush less than 25 percent crown cover; medium - brush, including bracken, less than two feet high covering 50 to 75 percent of the ground and/or taller brush forming crown cover 25 to 50 percent; heavy - brush, including bracken, less than two feet high covering more than 75 percent of the ground and/or taller brush forming crown cover over 50 percent.

Slope was recorded as: level - less than 15 percent; medium - 15 to 40 percent; steep - over 40 percent.

Exposure was recorded as N, NE, E, etc. on an 8-point compass.

The forest type designation was recorded for each plot using Forest Survey definitions.[3]

2/ Stocked-quadrat method of measuring stocking is discussed in the following references:

Cowlin, R. W. Sampling Douglas Fir Reproduction Stands by the Stocked-quadrat Method. Jour. Forestry 30: 437-439. 1932.

Haig, I. T. The Stocked-quadrat Method of Sampling Reproduction Stands. Jour. Forestry 29: 747-749. 1931.

Munger, T. T. Stocked Quadrats vs. Number of Trees as a Basis for Classifying Reforesting Land. Pacific Northwest Forest Expt. Sta. Forest Research Notes 33: 2-7. 1945. (Processed)

Isaac, L. A. Reproductive Habits of Douglas-fir. 107 pp., illus. Washington, D.C. 1943.

3/ See "Forest Resources of the Douglas-fir Region" Forest Service, U.S.D.A. Miscellaneous Publication No. 389.

Analysis of the Data

Only those plots in the Douglas-fir restocking types in the 30-year age class or below, or in the nonrestocking cut-over types[4/] were used in the analysis. Data from plots which had been disturbed by fire, cutting, or heavy grazing, were omitted.

The percent of possible improvement in stocking that had taken place in 15 years was singled out for study. On those plots having four quadrats stocked 15 years ago, no improvement was considered possible, and the plots were omitted from further consideration. This left 1,637 plots or 6,548 quadrats for analysis.

The plots were then separated according to all the possible combinations of site factors. In sorting for exposure the compass points recorded were separated into two groups: favorable exposures, including the directions NW, N, NE, E, and SE; and unfavorable exposures, including S, SW, and W.

For each group, the number of quadrats stocked at the time of examination and 15 years previously was counted. The number stocked 15 years ago subtracted from the number stocked at time of examination gave a measure of actual stocking improvement. Actual improvement divided by the total possible improvement (both in number of quadrats) gave the percent of possible improvement occurring in 15 years.

Graphic analysis of the data indicated that some site factors when in particular combinations did not significantly affect the percent of possible improvement; hence some factors were combined before final percent figures were computed. That there is a definite relation between improvement in stocking and the factors studied was shown by least squares analysis. The coefficient of multiple correlation between percent possible improvement and brush cover, slope, and exposure is .22 which, although low, is significant at odds of 1 to 100.

When the sample plots were classified by the significant combinations of site factors, the percent of possible improvement which occurred in 15 years was:

	Light to medium brush cover	Dense brush cover
	Percent	Percent
Exposure favorable[5/]		
All slopes	55	34
Exposure unfavorable		
15 - 40 percent slopes	38	31
Over 40 percent slopes	26	26

4/ Types 34-9, small second growth, 6 to 20 inches; 34-10, seedlings and saplings, mostly less than six inches; 35, nonrestocked cut-over; and 36, recent cut-over. These types are defined in the publication cited in footnote 3.

5/ Includes unfavorable exposures on slopes less than 15 percent.