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Abstract Curtis, Robert O. Extended rotations and culmination age of coast Douglas-fir: old studies speak to current issues. Res. Pap. PNW-RP Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research.

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Chapter 2 : Results for Robert-Curtis | Book Depository

Extended rotations and culmination age of coast Douglas-fir: old studies speak to current issues by Curtis, Robert O ; Pacific Northwest Research Station (Portland, Or.) Publication date

Advanced Search Douglas-fir Pseudotsuga menziesii [Mirb. The range of densities led to periodic Scribner and cubic volume growth peaking at ages 60â€”90 with mean annual increment peaking after age based on Organon model projections. Postthinning stand growth was greatest with the highest residual basal area; percent growth was highest in the lowest densities. Reductions were not statistically significant. Diameter increment and average size exceeded normal yield tables at one site and were inversely related to basal area. At age , the difference in projected quadratic mean diameter across the densities was about 6 inches. By age 65, some tree diameters were already late-seral sizes. Crown cover increased rapidly during 15 years after thinning. Mortality has been negligible in McDonald, but windthrow has removed trees, especially hemlock at Blodgett. In the Pacific Northwest, federal forestlands have been brought under the Northwest Forest Plan NWFP with the objective of providing late-seral habitat to protect the northern spotted owl Strix occidentalis and other late-seral wildlife, as required by the Endangered Species Act Thomas et al. Thus, the need exists for planning to include early- and late-seral conditions in forests, thereby providing rural economic support while enhancing and protecting native wildlife and other natural resources. Timing of stand harvesting has been linked to demand for wood products and maximum growth as well as late-seral environments. Yields were described for each site class of commercial forestland, assuming naturally regenerated fully stocked stands with no history of density management. Growth patterns in western hemlock Tsuga heterophylla [Raf. Many federal forests then adapted growth and harvest schedules with rotation ages with the greatest mean annual accumulation of merchantable timber. This approach set in motion harvesting sequences leading to roughly half of natural old stands on public lands and nearly all older stands on private timberlands being harvested over a to year period Thomas et al. With continuation of this approach, stands with mature structural development were no longer being propagated except in wilderness areas or other reserves. Harvesting at financial maturity substantially reduced mortality and therefore snags and large trees with a natural assemblage of late-seral habitat features. These features have been described by Franklin et al. Thinning has been proposed as a means to develop late-seral habitat more rapidly than provided by natural stands McComb et al. Simulation runs of thinning year-old Douglas-fir stands indicated that various management scenarios could result in nesting habitat for spotted owls earlier than would be expected through natural stand development Andrews et al. In , a long-term study that focused on patterns of commercial thinning at age 50 to enhance growth of dominant overstory trees to provide overstory and understory structural features for wildlife habitat was established in Oregon. The specific objectives of this article were to describe 1 tree size quadratic mean diameter and their frequency by diameter class in response to thinning at age 50, 2 the role of levels of residual stocking in thinned year-old managed stands on total yield within the next 50 years, 3 periodic and mean annual increments after different patterns of thinning from below, and 4 crown cover changes after thinning. The first site was established in and is located near Corvallis, Oregon McDonald, latitude This site was occupied by a to year-old stand with a mixture of planted unknown seed source and natural Douglas-fir with minor secondary species including grand fir Abies grandis Lindl. This site has a dry-summer climate with moderate temperatures and about 60 in. The second site Blodgett, latitude Blodgett stands were composed entirely of natural regeneration, also 50â€”55 years old, and varied in the percentages of western hemlock and Douglas-fir. Small amounts of western redcedar Thuja plicata [D. Rainfall distribution is similar to that at McDonald, but temperatures are cooler in summer, and annual precipitation is more than 70 inches. Soils are derived from highly weathered sedimentary rocks and are very deep. Study Design and Layout The study design was a randomized block split plot with three replications blocks at each site Cole and Newton Blocks were divided into two whole plots that were randomly assigned one of two

types of thinning: Each whole plot was divided into 4 McDonald or 3 Blodgett subplots and randomly assigned a residual density. In the gap thinning, the basal area was removed in three 0. All trees were removed within gaps. If the basal area removal in gaps was insufficient to meet target basal areas, the matrix between gaps was thinned uniformly. Stand descriptions for McDonald Forest, including site index, pre- and postthinning basal area, postthinning trees per acre, quadratic mean diameter, Curtis relative density index, and Scribner volumes from the initial study thinning and rethinning cut and standing post volume. View Large Table 1. View Large Stand descriptions for Blodgett, including site indices for Douglas-fir and western hemlock, pre- and postthinning basal areas for both species, total postthinning trees per acre, quadratic mean diameter, Curtis relative density index, and Scribner volume for the initial study thinning and standing. Stand descriptions for Blodgett, including site indices for Douglas-fir and western hemlock, pre- and postthinning basal areas for both species, total postthinning trees per acre, quadratic mean diameter, Curtis relative density index, and Scribner volume for the initial study thinning and standing. Western redcedar are not included. View Large Table 2. View Large Most of the plot areas had been commercially thinned previously; McDonald had been thinned two or more times previously with the last entry at least 10 years before establishment of this study; most Blodgett stands had been thinned once about 8 years before the onset of the study. Parts of two of the highest density plots at Blodgett had no evidence of previous entries other than the history of progressive clearcutting and natural regeneration. Yields of earlier thinnings are unknown. Ground and cable systems were used on both sites for thinning, depending on the slope. In year 8 of the study at McDonald, measurements of the underplanted seedlings to provide future structural features indicated they were being suppressed by the residual overstory in the higher densities. Volumes from rethinning were included along with establishment harvests on those identified treatments at McDonald Table 1. Other than the initial study thinning, no subsequent thinning had occurred at Blodgett. Table 2 describes the volumes of Douglas-fir and hemlock after establishment harvest at Blodgett; whereas traces of western redcedar were present, negligible redcedar was removed. Yield data presented here include all harvests since study initiation plus residual stand volumes. Evidence of prior thinning suggested that earlier entries at McDonald had opened the stand for understory development and probably led to trees with longer crowns than those in stands not previously thinned. No estimates of volume removed before this study were included in projections. Measurements Before thinning, information on basal area and diameter distributions was collected on McDonald and Blodgett permanent sample points. Basal area was estimated using a 20 BAF prism. Diameters within a After the initial thinning of whole subplots, all residual conifer trees greater than 2-in. Trees were remeasured 3 no heights , 5, 7, 10, and 15 years after the initial measurements. A total of 5, numbered overstory trees in McDonald plots and 4, trees at Blodgett provided the data for this analysis. Analyses Estimates of volumes and growth projections for 50 years after thinning were derived using the Organon Stand Growth Simulator ed. Organon is an individual tree growth model that uses tree lists as input data to project stand development, including mortality. For the projections, diameters for all trees greater than in. Because of the rethinning at McDonald, input data varied for the projections. The first 5 years of data for MED and MHI plots were similarly charted until rethinning and then the year 10 measurements tree lists after rethinning were used to develop trajectories from years 10 to 50 beyond the initial study thinning. Analyses were based on Organon projections 50 years after the initial study thinning, stand age years, and sites were analyzed individually. Variables included trees per acre, basal area per acre, quadratic mean diameter, crown cover, cubic foot volume, Scribner board foot volume, mean and periodic annual increment Scribner volume , and frequency of trees greater than 30 in. Minimum standards for old-growth conditions included trees greater than 32 in. For Blodgett, the ratio of Douglas-fir to western hemlock volume was also analyzed. Results Features relating to stand maturity were showing modest separation of diameters and diameter growth Figure 1 with different residual densities, decreasing with the increase in basal area. The number of trees greater than or in. The lower proportion of trees greater than 30 in. Differences were not significant for the in. As at McDonald, the number of trees with projected diameters greater than 30 or 40 in. However, the proportion of trees greater than 30 in. Proportions of trees greater than

40 in. For trees per acre and quadratic mean diameter, the HIGH density had significantly more trees with smaller average diameters than the other densities while retaining the same number of trees greater than 30 inches. Basal area increments were consistently greater in HIGH density treatments than in LOW Figure 2 , but the percent growth was higher in LOW associated with slightly higher diameter growth rates on the larger stems resulting from thinning from below. The rate of basal area increment decreased with age, whereas volume per square foot of basal area increased with increments of tree height data not shown. Volume increments and standing crops after thinning, whether Scribner board foot Figure 3 or cubic foot volumes Figure 4 , exhibited almost linear patterns up to age years. Both sites illustrated some divergence in board-foot yield among residual stand densities. The two rethinned stands at McDonald did not show obvious decreases in slopes of volume curves despite the loss of growing stock from an extra entry. At McDonald, standing volumes in the LOW and MED densities were similar, reflecting the similarity of growing stock after rethinning, but volumes were significantly different among the other densities. Volumes for all densities were significantly different from each other at Blodgett.

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