Precommercial Thinning

1. Christiansen, E.C. and S.G. Pickford. 1991. Natural abatement of fire hazard in Douglas-fir blowdown and thinning fuelbeds. Northwest-Science 65(4): 141-148.

Keywords: thinning
precommercial thinning
tree/stand health

Abstract: The changes over time in fuelbed loading and depth in precommercially thinned and windthrown low altitude stands of Douglas fir (Pseudotsuga menziesii) were investigated in the Bull Run Watershed, Oregon, using standard fuel inventory techniques. Non-linear least squares regressions were fitted to the resulting data. Slash from precommercial thinning lost half of its original loading and depth within 2 yr. No foliage was retained on twigs and branches after 1 yr. Changes in fuels from windthrown trees were similar to those in slash, except that more material was present initially. Fine fuels (<3 inches in diameter) decreased to background levels within 2-4 yr, but large fuels persisted for longer. Sound logs became rotten after about 80 yr. The study confirmed that the fire hazard after precommercialthinning slash and wind throw was abated after 3 yr.

OSU Link
Non-OSU Link

2. Cruickshank, M.G., D.J. Morrison and Z.K. Punja. 1997. Incidence of Armillaria species in precommercial thinning stumps and spread of Armillaria ostoyae to adjacent Douglas-fir trees. Canadian-Journal-of-Forest-Research 27(4): 481-490.

Keywords: thinning
precommercial thinning
tree/stand health

Abstract: The frequency of Armillaria species in precommercial thinning stumps and the interaction at root contacts between Douglas fir (Pseudotsuga menziesii) crop trees and stumps colonized by A. ostoyae were investigated at sites in four biogeoclimatic zones along a transect from the coast through the southern interior of British Columbia. The frequency of stumps colonized by A. ostoyae and A. sinapina varied among lower, mid, and upper slope transects. On coastal sites, A. sinapina dominated fresh hygrotopes and A. ostoyaedominated slightly dry hygrotopes, and the frequency of both fungi was low on moist hygrotopes. On interior sites, A. ostoyae was found over all hygrotopes, but with lower frequency on the driest sites. The distribution of the two Armillaria species on sites is apparently determined by anoxia associated with periodic soil saturation, by drying of the soil, and by host response limiting spread of pathogenic species. At root contacts between colonized stump roots and crop tree roots, transfer and infection by A. ostoyae occurred more frequently in moist biogeoclimatic zones than dry ones. Lesion size on crop tree roots was related to inoculum volume at some sites and to stump root diameter at others. The percentage of lesions on roots at which crop trees formed callus was associated with tree bole volume. The results indicate that there will be crop tree mortality following precommercial thinning, especially where inoculum levels are high in the Interior Cedar-Hemlock and Interior Douglas fir biogeoclimatic zones.

OSU Link
Non-OSU Link

3. Curtis, R.O., G.W. Clendenen and D.J. DeMars. 1981. A new stand simulator for coast Douglas-fir: DFSIM user's guide. Pacific-Northwest-Forest-and-Range-Experiment-Station,-USDA-Forest-Service General-Technical-Report PNW-GTR-128. ii + 79 p.

Keywords: planting operations
thinning
precommercial thinning
commercial thinning
fertilization
yield
computer modeling

Abstract: A description of a computer program, written in FORTRAN IV, for simulating managed stands. The program has been developed from remeasured plot data contributed by many organizations in the Pacific Northwest USA. It can produce yield tables which include estimates of effects of initial spacing, precommercial and commercial thinning and addition of N fertilizer. Topics discussed include program limitation and potential for further development. Appendices include operating instructions and notes on testing. The program is available from the authors on request.

OSU Link
Non-OSU Link

4. DeBell, D.S., C.A. Harrington and J. Shumway. 2002. Thinning shock and response to fertilizer less than expected in young Douglas-fir stand at Wind River Experimental Forest. Pacific-Northwest-Research-Station,-USDA-Forest-Service Research-Paper PNW-RP-547. ii + 20 p.

Keywords: fertilization
thinning
precommercial thinning
growth

Abstract: Three thinning treatments (thinned to 3.7 by 3.7 m, thinned to 4.3 by 4.3 m, and an unthinned control treatment with nominal spacing averaging 2.6 by 2.6 m) were installed in a 10-year-old Douglas-fir (Pseudotsuga menziesii) plantation growing on a low-quality site at the Wind River Experimental Forest in southwest Washington, USA. Two years after thinning, two fertilizer treatments were superimposed on the design (0 and 224 kg per ha of nitrogen applied as ammonium nitrate). Diameter growth increased with increasing spacing throughout the 6-year study period, and it was also increased by fertilizer in both the thinned and unthinned (control) treatments. Thinning shock, a reduction in height growth after thinning, was expected at this study site because severe thinning shock had been documented in earlier nearby trials. Height growth was initially reduced slightly by thinning, but by the third 2-year period after thinning, height growth in thinned, unfertilized treatments was equal to or greater than height growth in the unthinned, unfertilized treatment. Fertilizer application increased height growth on average by 13 per cent in the first 2 years after fertilizer application. In the third and fourth years after fertilizer application, however, fertilizer increased

average height growth by 9 per cent, but the increase was substantial (16 per cent) only in theunthinned control treatment. The mild, ephemeral nature of thinning shock in our study was in contrast to the severe, long-lasting shock in earlier studies at Wind River. The milder shock in our study could be related to one or more of the following: (1) thinning was done at an early age, (2) impacts of fire (natural or prescribed) preceding planting were minor, and (3) seed source of the planted stock was appropriate for the location. Based on comparisons with other studies at Wind River and elsewhere, we suspect that use of nonlocal, maladapted seed sources in the earlier studies may have predisposed those trees to thinning shock. Furthermore, we suspect that the much higher responses to fertilizer application reported in the earlier studies may be associated with intense natural fires prior to planting, and the reduced nutritional status of those sites may have been further exacerbated by the use of maladapted seed sources.

OSU Link
Non-OSU Link

5. Filip, G.M. and L.M. Ganio. 2004. Early thinning in mixed-species plantations of Douglas-fir, hemlock, and true fir affected by Armillaria root disease in Westcentral Oregon and Washington: 20 year results. Western-Journal-of-Applied-Forestry 19(1): 25-33.

Keywords: thinning
precommercial thinning
tree/stand protection
growth
tree/stand health

Abstract: Four 10- to 20-year-old plantations were treated to determine the effects of precommercial thinning on tree growth and mortality caused by Armillaria root disease in the Cascade Range of western Oregon and Washington, USA. One plantation was Douglas-fir (Pseudotsuga menziesii) and noble fir (Abies procera), one Douglas-fir and western hemlock (Tsuga heterophylla), one Douglas-fir alone, and one Shasta red fir (Abies magnifica var. shastensis) and mountain hemlock (Tsuga mertensiana). After 20 years, differences in crop tree mortality between thinned and unthinned plots were not significant (P=0.9768). Quadratic mean diameter growth of crop trees, however, was significantly (P=0.0053) greater in thinned than in unthinned plots. Crop tree basal area/ac growth was significantly (P=0.0008) greater in thinned plots. There were no significant (P=0.6647) differences in basal area/ac growth of all trees between thinned and unthinned plots. Apparently, from a root-disease perspective, precommercial thinning does not affect incidence of crop-tree mortality after 20 years, but individual and per acre tree growth of crop trees increase significantly.

OSU Link
Non-OSU Link

6. Filip, G.M. and D.J. Goheen. 1995. Precommercial thinning in Pseudotsuga, Tsuga, and Abies stands affected by armillaria root disease: 10-year results. Canadian-Journal-of-Forest-Research 25(5): 817-823.

Keywords: thinning
precommercial thinning
tree/stand protection

growth
tree/stand health

Abstract: Four 10- to 20-year-old stands were pre-commercially thinned to determine the effects of thinning on tree growth and mortality caused by armillaria root disease (Armillaria ostoyae) in the Cascade Range of western Oregon and Washington, USA: one stand of Douglas fir (Pseudotsuga menziesii var. menziesii) and noble fir (Abies procera), one of Douglas fir and western hemlock (Tsuga heterophylla), one of Douglas fir alone, and one of Shasta red fir (Abies magnifica var. shastensis) and mountain hemlock (Tsuga mertensiana). After 10 years, differences in crop-tree mortality between thinned and unthinned plots were not significant in any of the four stands. Tree radial growth was significantly increased by thinning in 6 of 15 plots. Crop-tree basal area (per hectare) growth was significantly greater in thinned plots. Basal area (per hectare) growth of all trees was significantly greater in unthinned plots. Apparently, from a root-disease perspective, pre-commercial thinning does not affect the incidence of crop-tree mortality after 10 years, but tree growth increases significantly.

OSU Link
Non-OSU Link

7. Haight, R.G. 1993a. The economics of Douglas-fir and red alder management with stochastic price trends. Canadian-Journal-of-Forest-Research 23(8): 1695-1703.

Keywords: planting operations
site preparation
prescribed fire
release treatments
chemical release
thinning
precommercial thinning
commercial thinning
tree/stand protection
economics

Abstract: A financial analysis of Douglas fir (Pseudotsuga menziesii) and red alder (Alnus rubra) management was conducted using yield projections from the Stand Projection Simulator for the Pacific Northwest region of the United Sates. The analysis included uncertainty in the price trends and stocking levels of both species following reforestation. Results from a case study in which Douglas fir price is likely to increase faster than red alder price show that (i) on more productive sites, greater regeneration investment is justified to increase the likelihood of Douglas fir establishment, (ii) on less productive sites, low-cost regeneration options that produce mixed-species stands have expected present values close to or greater than a high-cost Douglas fir regeneration effort, (iii) optimal precommercial removal of red alder depends on mid-rotation prices and regeneration success, and in many cases growing a mixed-species stand to maturity produces the highest economic return, and (iv) commercial thinning of Douglas fir increases the expected present value of the most intensive regeneration option by up to 10%. The low-cost regeneration options have relatively high expected returns because of low initial investments and the presence of two species that may have high values in the future. The sensitivity of these results to changes in the probability distributions of regeneration success and price trends is discussed.

OSU Link
Non-OSU Link

8. Haight, R.G. 1993b. Technology change and the economics of silvicultural investment. Rocky-Mountain-Forest-and-Range-Experiment-Station,-USDA-Forest-Service General-Technical-Report RM-GTR-232. ii + 18 p.

Keywords: planting operations
site preparation
prescribed fire
release treatments
chemical release
tree/stand protection
thinning
commercial thinning
precommercial thinning
yield
economics

Abstract: Financial analyses of intensive and low-cost reforestation options are conducted for loblolly pine (Pinus contorta) stands with broadleaved competition in the Southern USA, and Douglas fir with red alder (Pseudotsuga menziesii with Alnus rubra) in the Pacific Northwest. Results show that the expected present values (EPVs) of low-cost options that result in mixtures of conifers and broadleaves are superior in some situations to the EPVs of the intensive options.

OSU Link
Non-OSU Link

9. Harper, P.A. and A.S. Harestad. 1986. Vole damage to coniferous trees on Texada Island. Forestry-Chronicle 62(5): 429-432.

Keywords: thinning
precommercial thinning
tree/stand protection
tree/stand health
growth

Abstract: Microtus townsendii injured trees by removal of bark and cambium from stems, branches and roots of Douglas fir, western hemlock and, rarely, Pinus monticola on Texada Island, British Columbia. Damage occurred more frequently in precommercially thinned stands <40 yr old than in unspaced stands. Trees with d.b.h. <less or =>19 cm were damaged by voles, but there was no selection by diam. or age class. No trees of ht. >16 m were damaged. For trees <16 m, damage increased as ht. decreased. There were n.s.d. in growth rates of trees damaged by voles when comparing the 2-yr av. before spacing and vole damage with the av. after these events. Stands should continue to be monitored to evaluate long-term effects of vole damage. On the basis of these results, control of voles is not recommended.

OSU Link
Non-OSU Link

10. Hessburg, P.F., D.J. Goheen and H. Koester. 2001. Association of black stain root disease with roads, skid trails, and precommercial thinning in Southwest Oregon. Western-Journal-of-Applied-Forestry 16(3): 127-135.

Keywords: thinning
precommercial thinning
tree/stand protection
tree/stand health

Abstract: The incidence and severity of black stain root disease (BSRD), caused by Leptographium wageneri, were evaluated in a two-stage sample of 500 precommercial-aged Douglas-fir (Pseudotsuga menziesii) plantations on 5 Resource Areas of the Medford District, Bureau of Land Management in Oregon, USA. Black stain was widely distributed throughout the western half of the District. Nearly 19% of the susceptible-aged (10- to 30-year-old) plantations were infected with black stain, but mortality losses were low. In both the extensive and intensive surveys, BSRD was more often distributed in precommercially thinned than unthinned plantations. Black stain occurred with significantly greater frequency adjacent to roads and major skid trails than in the main body of plantations. Roadside strips displayed significantly more injured trees and recent soil disturbance than the main body of plantations. BSRD incidence was high in comparison with other root diseases, but there was minimal impact to precommercial stand management. Low disease severity is somewhat unique among managed forests within this area of known high BSRD hazard. The lack of widespread damage from BSRD was associated with a lack of extensive tractor yarding and an apparent lack of precommercial thinning. Forest managers within high BSRD hazard areas can maintain low mortality levels by minimizing site disturbance and tree injury associated with timber harvesting, road building, and road maintenance activities and by timing precommercial thinning to avoid vector insect emergence and flight periods. Increased disturbance and injury to precommercial-aged stands will likely result in increased disease.

OSU Link
Non-OSU Link

11. Maguire, D.A. and W.S. Bennett. 1996. Patterns in vertical distribution of foliage in young coastal Douglas-fir. Canadian-Journal-of-Forest-Research 26(11): 1991-2005.

Keywords: thinning
precommercial thinning
tree morphology

Abstract: Variation in foliage distribution was analysed on trees and plots in a series of even-aged Douglas fir (Pseudotsuga menziesii) stands scheduled for management under a wide range of silvicultural regimes in British Columbia, Washington and Oregon. Branch-level foliage mass and foliage area equations were developed from a sample of 138 branches. These equations were applied to 27 trees on which the diameter and height of all live primary branches were measured, allowing estimation of both the total amount of foliage and its vertical distribution. A beta -distribution was fitted

to data describing the vertical distribution of foliage on each tree, and the resulting parameter estimates were modelled as functions of tree height, diameter at breast height, crown length, and relative height in the stand. Foliage area distribution tended to be shifted downward relative to foliage mass because of the expected increase in specific leaf area with depth into the crown. Similarly, the relative foliage distribution in terms of both mass and area was shifted downward as the tree became more dominant, or as relative height in the stand increased. In contrast, foliage on trees of similar relative height was shifted upward in response to the lower stand densities imposed by precommercial thinning. On the stand level, relative vertical distribution of foliage in the canopy was more peaked than would be implied by assuming a constant leaf area/sapwood area ratio throughout the composite tree crowns. Between-stand variation in vertical foliage distribution was dictated by differences in stand top height, height to crown base, and number of trees per hectare.

OSU Link
Non-OSU Link

12. Maguire, D.A., J.A. Kershaw, Jr. and D.W. Hann. 1991. Predicting the effects of silvicultural regime on branch size and crown wood core in Douglas-fir. Forest-Science 37(5): 1409-1428.

Keywords: thinning
precommercial thinning
commercial thinning
wood quality

Abstract: Three major determinants of wood quality (whorl frequency, branch size and crown wood core) in Douglas fir (Pseudotsuga menziesii) were estimated from the dynamics of crown structure in ORGANON, an individual-tree, distance-independent growth model. Data for the model were collected from Douglas fir plots in SW Oregon. Branch whorl locations were estimated directly from the height growth predictions assuming formation of one whorl per year. Mean maximum branch diameter was predicted as crown base receded past each whorl; branch diameter estimates were based on current depth of the whorl into crown, tree diameter, stand relative density, and site index. Diameter of crown wood core was established as diameter inside bark, also as crown base receded past each branch whorl. This approach facilitated description of harvested log distribution (40-ft butt logs) by various branch size, whorl frequency and crown wood core indices. Based on projections of a 9-yr-old Douglas fir stand to final harvest at 65 years, thinning precommercially to 121 trees/acre at 9 yr old resulted in a BD4 (mean of four largest branch diameters per log) of 2.5 inches, vs. 1.5 inches for the unthinned stand (484 trees/acre). When thinned to 121 trees/acre, approximately 55% of the volume/acre in 40-ft butt logs consisted of crown wood, as opposed to 30% at 484 trees/acre. Responses to subsequent thinnings were less pronounced, but included larger branches in the largest 80 trees/acre, and larger total crown wood percentages for a given initial stand density. Thinning from below resulted in larger average BD4 values and slightly greater crown wood percentages than proportional thinning. Individual-tree growth models that contain a crown recession component can easily be modified to predict crown wood core and indices of branch size.

OSU Link
Non-OSU Link

13. Marshall, P.L. 1988. A decision analytic approach to silvicultural investment decisions. Forest-Economics-and-Policy-Analysis-Research-Unit, University-of-British-Columbia Working-Paper 110. 28 p.

Keywords: planting operations
thinning
precommercial thinning
economics
growth

Abstract: A brief review of the literature is presented on methods for achieving optimal silvicultural decisions. The methods are generally computationally cumbersome and difficult to convert to simpler approximations required for most silvicultural decisions. An alternative method is presented and illustrated with two examples. The method involves a simple decision analytic structure. Projections were made for pure coastal Douglas fir Pseudotsuga menziesii for several treatments using three previously published growth models. Present NetWorth (PNW) was used as the criterion for choosing the treatment option and rotation age. The first example involved an initial planting density decision. Three planting densities were considered, viz. (1) 2500, (2) 1100 or (3) 750 seedlings/ha. The second example involved the decision to thin a 15-yr-old stand to a spacing similar to that produced by (1). The options were: (a) no treatment; (b) thin to 1100 stems/ha; and (c) thin to 500 stems/ha. The best strategy depended on which growth model was used. The study showed that a simplified decision analytic approach is a useful method to evaluate a decision, when aided by several growth models.

OSU Link
Non-OSU Link

14. Marshall, P.L. 1989. The economic value of additional information about treatment-response information for coastal Douglas-fir. Forest-Economics-and-Policy-Analysis-Research-Unit, University-of-British-Columbia Working-Paper 121. 39 p.

Keywords: planting operations
thinning
precommercial thinning
economics
growth

Abstract: A simple decision analytic approach was applied to initial planting density and precommercial spacing decisions for coastal Douglas fir (Pseudotsuga menziesii) across a range of sites in British Columbia. The range of biological response was represented by the output from 3 growth and yield models. Recent production costs and product values were applied to obtain value per hectare after delivery of logs to the mill. Future costs and revenues were discounted at 4, 6 and 8%. The best decisions from each growth model are presented by scenario. Limitations of the analysis and managerial implications are discussed.

OSU Link
Non-OSU Link

15. Miller, R.E., E.L. Obermeyer and H.W. Anderson. 1999. Comparative effects of precommercial thinning, urea fertilizer, and red alder in a site II, coast Douglas-fir plantation. Pacific-Northwest-Research-Station,-USDA-Forest-Service Research-Paper PNW-RP-513.ii + 25 p.

Keywords: fertilization
thinning
precommercial thinning
growth
yield
tree/stand health
soil properties

Abstract: The number of red alder (Alnus rubra) trees retained with 300 Douglas-fir (Pseudotsuga menziesii) per acre was varied on a high-quality site in coastal Oregon. Alder densities of 0, 20, 40, and 80 per acre were tested. A fifth treatment eliminated nitrogen-fixing alder, but substituted nitrogen fertilizer. Treatment 6 had neither thinning nor alder control. Treatments were randomly assigned within each of three blocks in a 9-year-old plantation. Stand density was reduced within 15 of these 18 experimental units. Surplus conifers were cut, but surplus red alder were controlled by the "hack-and-squirt" method. Because numerous trees of other species regenerated naturally, combined density of all species before thinning ranged from 1400 to 5700 trees per acre. Subsequent 17-year change in number, average height, basal area, and volume of Douglas-fir were compared. Retaining 20, 40, or 80 alder per acre reduced numbers of associated Douglas-fir by about 10, 17, and 23 percent, respectively. In pure Douglas-fir plots, gross volume growth was similar for non-fertilized and fertilized plots, indicating no measurable benefits of additional nitrogen. In mixed stands, red alder reduced yield of associated Douglas-fir, but not yield of combined species. Similar comparisons are needed at other locations, especially those with known nitrogen deficiency.

OSU Link
Non-OSU Link

16. Mitchell, A.K., H.J. Barclay, H. Brix, D.F.W. Pollard, R. Benton and R. DeJong. 1996. Biomass and nutrient element dynamics in Douglas-fir: effects of thinning and nitrogen fertilization over 18 years. Canadian-Journal-of-Forest-Research 26(3): 376-388.

Keywords: fertilization
thinning
precommercial thinning
carbon allocation
tree physiology
growth
soil properties

Abstract: The effects of thinning (two-thirds of basal area removed) and N fertilizer (448 kg N/ha as urea) on biomass and nutrition of a 24-year-old Douglas fir (Pseudotsuga menziesii) stand at Shawnigan Lake, British Columbia, were studied over 18 years. At years 0, 9, and 18 after treatments, the aboveground biomass and N, P, K, Ca, and Mg contents of stemwood, stem bark, foliage, and dead and live branches were determined (kg/ha), and increments in these properties (kg/ha per year) were calculated for the 0-9 and 9-18 year periods. Foliar biomass was increased by both treatments during the first period and also by thinning in the second period. Aboveground net primary production (ANPP) per unit of foliage biomass (foliage efficiency) was increased by treatments in the 0-9 year period. The combined effects of increased foliage mass and foliage efficiency resulted in increased total biomass production. Thinning and fertilizer application increased the uptake of all elements except for P with

fertilizer. This increase may have contributed to the long-term increase in stem growth. Retranslocation of elements before foliage shedding was important for tree nutrition, but was not improved by fertilizer during the 9-18 year measurement period. The efficiency of N use in dry matter production (ANPP/unit of N uptake) was decreased by fertilizer. This implied that poor sites would respond to fertilizer better than rich sites.

OSU Link
Non-OSU Link

17. Mitchell, K.J. and J.R. Cameron. 1985. Managed stand yield tables for coastal Douglas-fir: initial density and precommercial thinning. Ministry-of-Forests, British-Columbia

Keywords: planting operations
thinning
precommercial thinning
growth
yield

Abstract: Yield tables are presented for second growth stands of Pseudotsuga menziesii, established naturally (4440 trees/ha) or planted with 300, 500, 750, 1110 or 2500 trees/ha in British Columbia. Separate tables describe the development of stands thinned to 500 or 1100 stems/ha when 6 m tall. The yield tables were produced by a biologically oriented tree and stand simulation model (TASS) calibrated to conform with the yield of remeasured plots.

OSU Link
Non-OSU Link

18. Morrison, D.J. and A.L.S. Johnson. 1999a. Annosus root disease in pre-commercially thinned stands in coastal British Columbia. Canadian-Forest-Service Technology Transfer Note 20, Pacific-Forestry-Centre, Victoria, BC.

Keywords: thinning
precommercial thinning
tree/stand protection
tree/stand health

Abstract: An outline is given of the strategic importance of Heterobasidion annosum, detection and recognition, damage to roots, factors affecting infection and colonization of stumps and management implications for spacing in juvenile stands. The relative susceptibilities of different species were: Abies amabilis>Picea sitchensis>Tsuga heterophylla>Pseudotsuga menziesii.

OSU Link
Non-OSU Link

19. Morrison, D.J. and A.L.S. Johnson. 1999b. Incidence of Heterobasidion annosum in precommercial thinning stumps in coastal British Columbia. European-Journal-of-Forest-Pathology 29(1): 1-16.

Keywords: thinning
precommercial thinning
tree/stand protection
tree/stand health

Abstract: Coniferous stumps in 83 stands in coastal British Columbia, Canada, were sampled 3-5 years after precommercial thinning between 1981 and 1986. The percentage of stumps and surface area colonized by H. annosum were determined for 25 stumps of each species, in each 5-cm diameter class present in each stand. There were significant differences among species in the percentages of stumps and surface area colonized, with Douglas-fir (Pseudotsuga menziesii) having the lowest values, amabilis fir (Abies amabilis) and Sitkaspruce (Picea sitchensis) the highest and western hemlock (Tsuga heterophylla) being intermediate. For each species, both the percentage of stumps and surface area colonized increased with increasing diameter. In stumps that were grafted to an adjacent tree, there was decreased incidence of H. annosum for Douglas-fir and Sitka spruce and increased incidence for western hemlock and amabilis fir. There were trends in the percentage of stumps and area colonized for season of thinning and biogeoclimatic subzones, with the values for most species decreasing as the amount of precipitation increased. It is suggested that the increase in inoculum can be minimized by thinning trees when less than 15 years old, by cutting only trees less than 10 cm in diameter and by thinning during low risk seasons.

Non-OSU Link

20. Omule, S.A.Y. 1984. Results from a correlated curve trend experiment on spacing and thinning of coastal Douglas fir. B.C. Ministry-of-Forests Research-Note 93. ix + 22 p.

Keywords: thinning
precommercial thinning
growth
yield
tree/stand health

Abstract: Plots were established in 1952 in 13-yr-old plantations and given a variety of thinning treatments to produce post-thinning densities of 125-3000 stems/ha. Trees were measured at intervals up to 1980. Analysis showed that diam., ht. and their growth increased with decrease in density. Mortality, b.a., total vol. and b.a. growth decreased as density decreased. Stand merchantable vol. was not affected by density except at extremes. Prolonged early suppression appeared to reduce the ability of a stand to respond to subsequent thinning in terms of b.a. and total vol.

OSU Link
Non-OSU Link

21. Peterson, C.E. 1984. Fertilization of Douglas-fir plantations in the Pacific Northwest RFNRP Cooperative. *In* Proceedings IUFRO Symposium on Site and Productivity of Fast Growing Plantations Volume 2, South African Forest Research Institute, Pretoria, South Africa. Eds. D.C. Grey, A.P.G. Schonau and C.J. Schutz. pp. 637-645.

Keywords: planting operations

fertilization
thinning
precommercial thinning
growth

Abstract: Since 1975, the RFNRP cooperative has established 26 installations in young widely spaced plantations of Douglas-fir for testing response to 224 kg-N/ha. These plantations ranged in breast-height age from 3 to 23 years, and although response to fertilization was favorable in all Douglas-fir plantations, those which were spaced to 1000 trees/ha responded significantly better than plantations of 725 trees/ha, in both absolute and relative 2-year basal area increment (msuperscript 2 ha-1 year-1). Response also appears to be greater when fertilizer was applied 2 years after precommercial thinning, as opposed to fertilizing and thinning at the same time. The relationship of growth response with stocking level is discussed, as well as the timing of fertilization relative to spacing, in young Douglas-fir plantations.

OSU Link
Non-OSU Link

22. Sachs, D. and J.A. Trofymow. 1991. Testing the performance of FORCYTE-11 against results from the Shawnigan Lake thinning and fertilization trials on Douglas-fir. Canadian-Forest-Service, Pacific and Yukon Region Information-Report BC-X-324. viii + 58 p.

Keywords: fertilization
thinning
precommercial thinning
growth
yield
tree physiology
carbon allocation
tree/stand health
computer modeling

Abstract: FORCYTE-11 is an ecosystem-based forest growth simulation model. Its performance was evaluated with data on stand and tree biomass, height, stocking (mortality) and foliar assimilation and loss rates for Douglas fir (Pseudotsuga menziesii) in thinning/fertilizer trials in British Columbia.

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