Manual Release

1. DeBell, D.S. and T.C. Turpin. 1989. Control of red alder by cutting. Pacific-Northwest-Research-Station,-USDA-Forest-Service Research-Paper PNW-RP-414. ii + 10 p.

Keywords: release treatments
manual release
stand conditions

Abstract: Effects of tree age, month of cutting, and height and angle of the cut on sprouting of red alder (Alnus rubra) stumps were evaluated in a study designed to develop an effective method for controlling red alder in Douglas fir (Pseudotsuga menziesii) plantations in the Oregon Coast Range.

OSU Link
Non-OSU Link

2. Flint, L.E. and S.W. Childs. 1987. Effect of shading, mulching, and vegetation control on Douglas-fir seedling growth and soil water supply. Forest-Ecology-and-Management 18(3): 189-203.

Keywords: release treatments
chemical release
manual release
growth
soil properties

Abstract: Harsh environments on many harvested sites in SW Oregon necessitate site modifications for successful regeneration of Douglas fir. A 2-yr study was made with 350 seedlings to assess the effects of 12 soil-surface shading, mulching, and vegetation control techniques on seedling growth and soil temp. and moisture environments. Major effects of treatments were to lower soil surface temp., reduce soil surface evaporation, and reduce vegetative competition for soil water. These affected seedlings by adjusting the timing of seedling growth and reducing soil water loss to increase available water for seedling use. Final seedling shoot vol. and stem diam. both differed among treatments. Seedlings in treatments where competing vegetation was controlled showed significantly greater growth than seedlings in other treatments. Soil water loss in treatments where either soil surface evaporation was controlled by mulching, or where competing vegetation was controlled, was significantly less than water loss from the shaded and control treatments. Soil water loss in treatments with vegetation controlled by herbicide was significantly less than in treatments with vegetation controlled by scalping. Seedlings showed greatest growth with treatments that elicited the most efficient use of available microsite water either by reducing soil surface evaporation or vegetation competition.

OSU Link
Non-OSU Link

3. Harrington, T.B. and J.C. Tappeiner, II. 1997. Growth responses of young Douglas-fir and tanoak 11 years after various levels of hardwood removal and understory suppression in southwestern Oregon, USA. Forest-Ecology-and-Management 96(1/2): 1-11.

Keywords: release treatments
manual release
growth
tree/stand health

Abstract: Douglas fir (Pseudotsuga menziesii) was planted as 2-yr-old bare rooted seedlings on 2 sites in SW Oregon cleared of old-growth Douglas fir and understorey tanoak (Lithocarpus densiflorus) in 1980, and broadcast burned in 1981. Planting was done in 1981 at one site and in 1982 at the second site. Height, diameter, and crown width of the young Douglas fir and sprout-origin tanoak were measured 1-11 years after reducing the density of the tanoak stand (in 1983, at 2 yr old) to 0, 25, 50 and 100% of its initial cover. On some of the experimental plots suppression of understorey vegetation was also carried out. Tanoak cover developed linearly with time, with steepness of the growth trajectory increasing at a diminishing rate with increasing percentage of initial tanoak cover. Fifth-year cover ofunderstorey vegetation declined linearly with increasing percentage of initial tanoak cover. Survival of Douglas fir (96-100%) differed little among initial abundances of tanoak, while growth trajectories for its size became increasingly exponential with decreasing percentage of initial tanoak cover. Eleventh-year heights of Douglas fir were similar for 0, 25 and 50% of initial tanoak cover; however, diameter increased linearly with decreasing percentage of initial tanoak cover, and the slope of the relationship steepened with understorey suppression. The results indicate that young stands exhibiting a wide range of stand compositions and productivities can be established by early manipulations of tanoak and understorey abundance. Complete removal of tanoak plus understorey suppression are necessary to maximize Douglas fir growth, while productive, mixed stands can be achieved by removing 50% or more of tanoak cover.

OSU Link
Non-OSU Link

4. Harrington, T.B., J.C. Tappeiner, II and T.F. Hughes. 1991. Predicting average growth and size distributions of Douglas-fir saplings competing with sprout clumps of tanoak or Pacific madrone. New-Forests 5(2): 109-130.

Keywords: release treatments
manual release
growth
stand conditions

Abstract: Average growth and size distributions of 3- to 6-year-old (in 1983) Douglas fir (Pseudotsuga menziesii) saplings in three plantations in SW Oregon were studied for 7 years (1983-1989) after thinning of associated sprout clumps of tanoak (Lithocarpus densiflorus) or Pacific madrone (Arbutus menziesii); in some cases shrubs and herbs were also suppressed. Biologically based nonlinear equations explained 66, 90, and 53% of variation in average annual increment of Douglas fir height, diameter-squared, and crown cover, respectively. Equations for annual increment of crown cover of broadleaved and understorey vegetation explained only 10 to 12% of the variation, because these parameters exhibited a high degree of variability. Model simulations demonstrated that, for the same initial levels of cover, tanoak had faster rates of crown cover growth than madrone and also caused greater limitations in Douglas fir growth. Suppression of shrubs and herbs increased growth of Douglas fir only when broadleaved species were absent. Weibull functions adequately described size distributions for Douglas fir in 92% of individual-tree data sets. Regression functions of broadleaved

crown cover and average Douglas fir size explained 51, 93, and 24% of variation in the Weibull A, B, and C parameters, respectively. Model simulations with predictedWeibull parameters demonstrated that broadleaved competition caused a positive skewing in size distributions for height and stem diameter of Douglas fir.

OSU Link
Non-OSU Link

5. Harrington, T.B., R.G. Wagner, S.R. Radosevich and J.D. Walstad. 1995. Interspecific competition and herbicide injury influence 10-year responses of coastal Douglas-fir and associated vegetation to release treatments. Forest-Ecology-and-Management 76(1/3): 55-67.

Keywords: release treatments
chemical release
manual release
growth
tree/stand health
tree physiology
stand conditions

Abstract: Responses of competing vegetation and planted Douglas fir (Pseudotsuga menziesii var. menziesii) were studied for 10 years after six herbicide and manual release treatments in the Washington and Oregon Coast Ranges. Studies were installed in six 2- or 3-yr-old plantations, with Douglas fir densities of 988 to 1482 plants/ha at time of planting and 721 to 1282/ha 2 to 3 years late. Research objectives were to quantify regional, long-term responses of vegetation (Douglas fir and non-coniferous species) to various levels of competition, light and soil water availability, and intensity versus importance of factors influencing Douglas fir growth. Three treatments reduced shrub cover relative to the untreated check: triclopyr in year 1, glyphosate in years 1-5, and repeated control (via several herbicide applications) in years 1-10. Reductions in woody cover from glyphosate stimulated increases in herb cover in years 3 and 5, while repeated control reduced herb cover in years 1, 2 and 5. Through year 10, Douglas fir survival (86-99%) varied little among treatments. Visual symptoms of herbicide injury to Douglas fir from triclopyr (45% of trees) and glyphosate (17% of trees) were associated with 0.1-0.2 m reductions in first-year height. After adjusting for tree size, Douglas fir growth in stem basal area 2 years after triclopyr was less than that of the untreated check, suggesting prolonged effects of herbicide injury. Because it sustained low levels of interspecific competition, caused minimal tree injury, and prevented overtopping cover from red alder (Alnus rubra), repeated control was the only treatment in which Douglas fir size (9.8 m height and 21 cm basal diameter in year 10) significantly exceeded (P<less or =>0.02) that of the untreated check (7.8 m height and 12 cm diameter).

OSU Link
Non-OSU Link

6. Hobbs, S.D. and K.A. Wearstler, Jr. 1985. Effects of cutting sclerophyll brush on sprout development and Douglas-fir growth. Forest-Ecology-and-Management 13(1/2): 69-81.

Keywords: release treatments

manual release
stand conditions
tree physiology
growth

Abstract: In SW Oregon, varying amount of brush were removed from a sclerophyll brushfield dominated by Quercus chrysolepis and Arctostaphylos patula with scattered Pseudotsuga menziesii saplings. Brush removal was accomplished by slashing (cut by chainsaw) near ground level at three intensities: (1) total removal, (2) partial removal, and (3) an untreated control. Sclerophyll brush species responded within 3 weeks of slashing by vigorous sprouting, which was greatest in total brush removal areas where 861 513 sprout stems/ha developed during the first year. Soil water potentials and predawn xylem pressure potentials of Douglas fir were less negative in total removal areas than in partial removal and untreated control areas. Relative growth rates of Douglas fir saplings temporarily increased in total and partial brush removal areas, but were not significantly different from the untreated control 3 yr after treatment. Slashing of sclerophyll brush to release long-suppressed Douglas fir is not recommended because of rapid brush recovery by sprouting.

OSU Link
Non-OSU Link

7. Jaindl, R.G. and S.H. Sharrow. 1988. Oak/Douglas-fir/sheep: a three-crop silvopastoral system. Agroforestry-Systems 6(2): 147-152.

Keywords: planting operations
release treatments
manual release
tree/stand health
growth

Abstract: A small scale agroforestry study started in 1952 was revisited in 1985 to evaluate the long-term influence of site preparation and grazing on tree growth and survival in a system with Douglas fir, white oak (Quercus garryana) and sheep. In 1952-53, 2-yr-old Douglas fir seedlings were planted at the rate of 2500 trees/ha under 3 levels of site preparation: (1) no treatment; (2) oak thinned by 50%; and (3) oak clear felled. From 1954 to 1960, yearling ewes grazed half of each of the 3 thinning treatments for 3-4 wk each spring. The conifers were undisturbed since grazing was discontinued in 1960. Survival of planted conifers averaged 64% in 1985 and did not vary among either site preparation or grazing treatments. From 1964 to 1985, trees on the thinned and clear felled plantations grew an av. ht. of 1060 and 990 cm, respectively, compared with 900 cm on the unthinned plantation. D.b.h. averaged 3.8 and 5.6 cm greater on thinned or clear felled plantations, respectively, than on the unthinned control by 1985. Conifers on grazed plantations had increased ht. andd.b.h. growth during the first 12 yr of plantation life, averaging 63 cm taller and 0.7 cm greater in d.b.h. than the ungrazed plots by 1964. By 1985 the difference in ht. (122 cm) and d.b.h. (1.0 cm) between grazed and ungrazed plantations was not statistically significant. These data suggest that although site preparation can positively influence conifer growth, total clear felling is no better than thinning oaks. Furthermore, proper grazing can increase ht. and d.b.h. growth of the conifers during and immediately after the grazing years.

OSU Link
Non-OSU Link

8. Karl, M.G. and P.S. Doescher. 1993. Regulating competition on conifer plantations with prescribed cattle grazing. Forest-Science 39(3): 405-418.

Keywords: release treatments
manual release
stand conditions
tree physiology
soil properties

Abstract: On conifer plantations, competitive understorey vegetation often retards growth and establishment of tree seedlings. Livestock grazing is one method of controlling the understorey vegetation and increasing the availability of site resources to tree seedlings. It was hypothesized that prescribed cattle grazing ameliorates water stress of young tree seedlings by reducing root growth of competing understorey species. On a Douglas-fir (Pseudotsuga menziesii) and ponderosa pine (Pinus ponderosa) plantation in SW Oregon planted in 1986, seedling water stress was evaluated using the pressure chamber technique and gravimetric soil water determinations in 1986-89. Root growth of orchardgrass (Dactylis glomerata), the major understorey competing species, was quantified in 1988 and 1989 using the root periscope/mini-rhizotron technique. Seedling water stress levels during spring and summer were similar in cattle-grazed areas and ungrazed areas in 1986 to 1988, but in summer 1989, water stress was reduced significantly in the grazed area. Soil water content was higher in the grazed area in 1989, especially at the 10-20 cm soil depth. End of season (July) orchardgrass root growth in grazed plots was 18% less in 1988 and 15% less in 1989 than root growth in ungrazed plots. It is concluded that repeated cattle grazing of orchardgrass reducedtranspirational surface area and root growth sufficiently to increase soil water availability to tree seedlings. Thus, prescribed cattle grazing on conifer plantations can enhance seedling physiological status by acting as a regulator of above- and belowground competition.

OSU Link
Non-OSU Link

9. Knapp, W.H., T.C. Turpin and J.H. Beuter. 1984. Vegetation control for Douglas-fir regeneration on the Siuslaw National forest: a decision analysis. Journal-of-Forestry 82(3): 168-173.

Keywords: planting operations
site preparation
chemical preparation
mechanical preparation
prescribed fire
release treatments
chemical release
manual release
growth
yield
economics

Abstract: Records from 324 plantations in Oregon were used to calculate the effect on stocking of various methods of controlling competing vegetation before and after plantation establishment. A decision tree analysis using 6 management regimes on 5 stocking classes indicated that if no site

preparation or release (other than broadcast burning to reduce fuels) were practised, the forest would produce 63% of the m.a.i. and 35% of the present net worth (PNW) expected if all means of control (chemical, manual and burning) were available and used. If only manual control methods were used 78% of the max. m.a.i. and 57% of the max. PNW would be expected. When all methods except phenoxy herbicides were available, the expected m.a.i. and PNW were reduced to no less than 90%. The yield reduction varied with aspect, and the type of prelogging vegetation. Declines were least on SW-facing sites that were originally predominantly conifers, and greatest on NE-facing slopes that had supported broadleaves. Limitations of the analysis are discussed.

OSU Link
Non-OSU Link

10. Knowe, S.A. 1994a. Effect of competition control treatments on height-age and height-diameter relationships in young Douglas-fir plantations. Forest-Ecology-and-Management 67(1-3): 101-111.

Keywords: release treatments
chemical release
manual release
growth
tree morphology

Abstract: Height-age and height-diameter models for plantations of young Douglas fir (Pseudotsuga menziesii var. menziesii) were examined in relation to vegetation management treatments. The models were developed from 10 years of measurements in a competition release study installed on six sites in the Coast Ranges of Oregon and Washington. Analysis of height growth patterns for dominant trees indicated significant differences between the total vegetation control treatment and operational release treatments or no treatment. The resulting height-age function depicted exponential growth patterns for the total vegetation control treatment and nearly linear patterns for the operational release treatment and no treatment. The height-diameter function was compatible with dominant height growth and quadratic mean diameter prediction functions. Different height-diameter curve shapes were associated with total vegetation control and the operational release and no treatments. The resulting function implied that Douglas fir trees of a given diameter and age were slightly taller when underinterspecific competition, especially for trees with smaller diameters. The height-age and height-diameter functions may be used in conjunction with diameter distribution or stand table projection models developed for these data to predict dynamics and stand structure in young Douglas fir plantations.

OSU Link
Non-OSU Link

11. Knowe, S.A., T.B. Harrington and R.G. Shula. 1992. Incorporating the effects of interspecific competition and vegetation management treatments in diameter distribution models for Douglas-fir saplings. Canadian-Journal-of-Forest-Research 22(9): 1255-1262.

Keywords: release treatments
manual release
chemical release

growth
tree morphology

Abstract: A parameter recovery procedure for the Weibull distribution function, based on diameter percentiles, was modified to incorporate the effects of competing vegetation in young Douglas fir (Pseudotsuga menziesii var. menziesii) plantations. The procedure was tested using data from sites in the Coast Ranges of Oregon and Washington and in the Siskiyou Mountains of SW Oregon. The Coast Ranges study was conducted in 2- to 3-yr-old plantations needing release from woody shrub (mainly Rubus spectabilis and R. parviflorus) and broadleaved tree (Alnus rubra and Acer macrophyllum) competition. Release treatments were an untreated control, manual cutting, triclopyr ester applied aerially, glyphosate applied aerially, and a total vegetation control treatment consisting of annual broadcast applications of hexazinone and spot treatments of glyphosate and triclopyr.
The Siskiyou Mountains study was conducted in 1- to 2-yr-old plantations on sites covered by tanoak (Lithocarpus densiflorus). Tanoak sprout clumps were left unthinned or were thinned to 50, 25 and 0% of the pretreatment cover. Four percentiles (0, 25th, 50th, 95th) of the cumulative probability distribution were predicted as functions of quadratic mean diameter and age. In the Siskiyou study, cover and total vegetation control affected quadratic mean diameter and all four percentiles; intensity of the vegetation treatments affected the 0 and 25th percentiles, and the interaction between intensity and timing of treatment affected mean diameter. In the Coast Ranges study, only quadratic mean diameter was affected by cover of woody vegetation, while quadratic mean diameter and the 25th percentile were significantly affected by total vegetation control. The predicted distributions showed decreasing variance with increasing cover, particularly in the Siskiyou Mountains. In the Coast Ranges study, the coefficient of variation increased with increasing cover, indicating that the variance of stem diameters was affected by average size. On xeric sites in the Siskiyou Mountains, high diameter variability in plots with total vegetation control suggests that interspecific competition may inhibit the expression of microsite variation.

OSU Link
Non-OSU Link

12. McDonald, P.M. and G.O. Fiddler. 1993. Feasibility of alternatives to herbicides in young conifer plantations in California. Canadian-Journal-of-Forest-Research 23(10): 2015-2022.

Keywords: genetic tree improvement
site preparation
prescribed fire
release treatments
manual release
chemical release
growth
economics

Abstract: A research programme (involving 40 studies) was started in 1980 to compare the effectiveness and cost of various vegetation management techniques used for enhancing growth of 1- to 3-yr-old conifer (Pseudotsuga menziesii, Pinus ponderosa, P. jeffreyi, Abiesmagnifica and A. concolor var. lowiana) plantations in California. The studies were ended after 10 yr when competition became intraspecific. The techniques used included direct methods such as manual manipulation, mulching, herbicides (Garlon 3A [triclopyr], 2,4-D orVelpar [hexazinone]), and grazing for releasing

conifer seedlings from undesirable vegetation, and several silvicultural practices (broadcast burning, group selection, genetically improved seedlings) that serve as indirect methods for reducing or avoiding vegetation problems. Manual release and mulching were effective but expensive. Herbicides were effective, applicable to almost all plant communities, and relatively inexpensive. Grazing was good for cattle and sheep, but did not significantly enhance conifer seedling growth. Silvicultural control of weeds was promising, but there was not enough information to evaluate feasibility. It was concluded that in most instances, forests cannot be managed economically without herbicides, if the objective is to grow seedlings at the potential of the site and the plant community includes sprouting broadleaves and shrubs or rhizomatous forbs and ferns. If the objective is to create a forest with several age-classes and variable structure, but with slower seedling growth, longer rotations, and less species diversity in early seral stages, then it is possible to accomplish this using other vegetation management techniques.

OSU Link
Non-OSU Link

13. McDonald, P.M. and G.O. Fiddler. 1996. Development of a mixed shrub-tanoak-Douglas-fir community in a treated and untreated condition. Pacific-Southwest-Research-Station, USDA-Forest-Service Research-Paper PSW-RP-225. iv + 16 p.

Keywords: release treatments
manual release
chemical release
tree/stand health
growth
tree morphology
stand conditions
economics

Abstract: On a medium site in northern California, a tanoak (Lithocarpus densiflorus)-mixed shrub community in a Douglas fir plantation was given several treatments (manual release two and three times, a combination chainsaw and cut surface herbicide (Garlon 3A [triclopyr]) treatment, two foliar herbicides (2,4-D or Garlon 4), and a tank mix of the two herbicides) to study its development in both a natural (control) and treated condition. The herbicides were each applied twice. Survival of planted Douglas fir (Pseudotsuga menziesii) seedlings was recorded for 11 years and growth was quantified for 9 years after the last treatment application. In addition to Douglas fir, data are presented individually for the two most abundant species (tanoak and snowbrush, Ceanothus velutinus var. hookeri), forgreenleaf manzanita (Arctostaphylos patula), and for the hardwood tree and shrubs combined. At the study's end in 1992, combined vegetation in the control had a mean density of 1800 plants/acre, foliar cover of 23 700 ftsuperscript 2/acre, and height of 11.2 ft. In contrast, combined tree and shrubs in the most effective treatment for controlling them (cut and spray Garlon 3A) had a mean density of 150 plants/acre, foliar cover of 150 ftsuperscript 2/acre and height of 5.9 ft at study end. Because competition for site resources was low, Douglas fir seedlings developed best in this treatment. Mean Douglas fir diameter was 4.6 inches at 12 inches above mean ground line, height averaged more than 21 ft, and mean foliar cover was 39 850 ftsuperscript 2 at the end of the study. The cost was $227 per acre.

OSU Link
Non-OSU Link

14. McDonald, P.M. and G.O. Fiddler. 1999. Ecology and development of Douglas-fir seedlings and associated plant species in a Coast Range plantation. Pacific-Southwest-Research-Station, USDA-Forest-Service Research-Paper PSW-RP-243. ii + 18 p.

Keywords: release treatments
manual release
chemical release
stand conditions
growth
tree morphology
economics

Abstract: On an average site in northern coastal California, USA, a tanoak (Lithocarpus densiflorus)-mixed shrub community was given several treatments (manual release one, two, and three times; a combination chainsaw and cut surface chemical treatment; two foliar chemicals; and a tank mix of the two chemicals) to study its development over an 11-year period (1981-91) in both a broadcast-burned (untreated control) and released (treated) condition. The chemicals were 2,4-D, Garlon [triclopyr] 3A, and Garlon 4, each applied two times. The site had been planted with 2+0 seedlings of Douglas fir (Pseudotsuga menziesii) in 1979. In addition to Douglas-fir , data are presented individually for the four most abundant and well distributed species (tanoak, hairy manzanita (Arctostaphylos columbiana), huckleberries (Vaccinium ovatum and V. parviflorum), and rhododendron (Rhododendron macrophyllum)), and for these plus two more of the tallest and most abundant (but poorly distributed) species (snowbush (Ceanothus velutinus), elderberry (Sambucus mexicana)) combined. In 1991, combined shrubs in the control had a mean density of 4733 plants per acre, foliar cover of 16 800 ft2 per acre, and height of 9.5 feet. In contrast, combined shrubs in one of the most effective treatments for controlling them (2,4-D) had a mean density of 2000 plant per acre, foliar cover of 2600 ft2 per acre and height of 5.5 feet at the end of the study. Here, mean Douglas-fir diameter was 4.0 inches at 12 inches above mean ground line, height averaged 18.7 feet, and mean foliar cover was 34 800 ft2 per acre. The cost (including chemical) was $77 per acre. The biological and economical data in this paper provide the ecosystem manager, wildlife biologist, and fuels manager with knowledge on how to attain plant communities with different density and development potentials, and the cost of creating them.

OSU Link
Non-OSU Link

15. McDonald, P.M., G.O. Fiddler and H.R. Harrison. 1995. Mulching to regenerate a harsh site: effect on Douglas-fir seedlings, forbs, grasses, and ferns. Pacific-Southwest-Research-Station, USDA-Forest-Service Research-Paper PSW-RP-222. ii + 10 p.

Keywords: release treatments
manual release
growth

Abstract: Douglas fir (Pseudotsuga menziesii) seedlings, 2+0, were planted in February 1989 on pastureland in the Arcata District, central coastal California. The tree seedlings were released from a complex forb-grass-fern community by applying very large (100ftsuperscript 2) or small (4 ftsuperscript 2) durable polypropylene mulches one month after planting. After 5 yr, stem diameter

of tree seedlings with large and small mulches was 1.6 and 1.36 inches, respectively. Only seedlings with large mulches were significantly larger than seedlings on small scalps or control areas.

OSU Link
Non-OSU Link

16. McDonald, P.M. and O.T. Helgerson. 1990. Mulches aid in regenerating California and Oregon forests: past, present, and future. Pacific-Southwest-Research-Station, USDA-Forest-Service General-Technical-Report PSW-GTR-123. ii + 19 p.

Keywords: release treatments
manual release
growth

Abstract: A discussion of the effects of various types of mulches for controlling seedling environment in plantations, mostly of Pseudotsuga menziesii and Pinus ponderosa.

OSU Link
Non-OSU Link

17. Pabst, R.J., J.C. Tappeiner, II and M. Newton. 1990. Varying densities of Pacific madrone in a young stand in Oregon alter soil water potential, plant moisture stress, and growth of Douglas fir. Forest-Ecology-and-Management 37(4): 267-283.

Keywords: release treatments
manual release
soil properties
tree physiology
growth

Abstract: In a study to evaluate the effects of mixed conifer/broadleaf stands on soil water potential, and Douglas fir (Pseudotsuga menziesii) moisture stress and growth,
Pacific madrone (Arbutus menziesii) and associated shrub and herbaceous vegetation were thinned to represent the following range of conditions: high-density madrone (H) with associated shrubs and herbs controlled; medium-density madrone (M), shrubs and herbs controlled; low-density madrone (L), shrubs and herbs controlled; no madrone (N), shrubs and herbs controlled; and no madrone (U), shrubs and herbs predominate. The study was carried out in 1985 and 1987 at a 2-ha droughty site in the Klamath Mountains, SW Oregon, planted in 1979 with 2+0 Douglas fir. Soil water-potential (psi) at a depth of 0-30 cm was consistently higher in treatment N than in all other treatments; in 1987 this difference was significant ($P<0.025$). Average psi in treatment U reached -1.5 MPa (permanent wilting point) between June and July in both years of the study, whereas in the other treatments that level was never reached. Soil water conditions were also relatively severe in treatment H. Predawn plant moisture stress (PMS) of Douglas fir was significantly ($P=0.0001$) less in treatment N than in all other treatments. Seasonal moisture-stress relief (SMSR) of Douglas fir was significantly related to madrone leaf area index (LAI) and was greatest in treatment N. Seasonal moisture stress relief of madrone was also significantly correlated with LAI. There were highly significant linear relationships between both predawn and midday PMS and soil water potential for Douglas fir and madrone. Results clearly show that conditions for maximum

Douglas fir growth occurred in treatment N. Average diameter growth of Douglas fir was greatest in treatment N, although not significantly different from that in treatment U, and least in treatment H. In 1987, Douglas fir growth in diameter, stem basal area, and stem volume was strongly related to SMSR and madrone LAI, and to a lesser extent, seasonal soil tension relief.

OSU Link
Non-OSU Link

18. Prasad, R. 2000. Some aspects of the impact and management of the exotic weed, Scotch broom (Cytisus scoparius (L.) Link) in British Columbia, Canada. Journal-of-Sustainable-Forestry 10(3/4): 341-347.

Keywords: release treatments
manual release
growth
photosynthesis

Abstract: A recent cutover area near Maple Mountain, Duncan, British Columbia, was planted with 2+1 Douglas fir (Pseudotsuga menziesii) seedlings in 1994. Scotch broom (Cytisus scoparius) invaded the site rapidly. Growth (height and root collar diameter) of Douglas fir seedlings was monitored for 2 years on uncleared plots and on plots where the dense canopy of broom was manually cut and completely removed. Results showed that the broom reduced photosynthetically active radiation by 71% and growth of Douglas fir by 45-46%. Formulations of 3 fungal pathogens
(Fusarium tumidum, Pleiochaeta setosa, Chondrostereum purpureum) were tested in a greenhouse for their effects on growth of Scotch broom seedlings. Only F. tumidum was effective, suppressing the growth of 1-, 3- and 6-month-old seedlings.

OSU Link
Non-OSU Link

19. Price, D.T., T.A. Black and F.M. Kelliher. 1986. Effects of salal understory removal on photosynthetic rate and stomatal conductance of young Douglas-fir trees. Canadian-Journal-of-Forest-Research 16(1): 90-97.

Keywords: release treatments
manual release
photosynthesis
tree physiology
soil properties
growth

Abstract: Studies were made in a thinned 32-yr-old Douglas fir stand on a drought-prone site on the E. coast of Vancouver Island. Four pairs of similar trees were selected and
the salal (Gaultheria shallon) understorey was removed completely from around one of each pair. The root zones of each tree were isolated using plastic sheeting buried to bedrock.
Photosynthesis, stomatal conductance, soil water potential and canopy microclimate were measured intensively in one pair on 4 clear days during an extended dry period in June 1982. B.a. increment of the

four pairs of trees was measured over 3 growing seasons. To determine the effect of soil water potential on tree photosynthesis, the same variables were measured for 3 consecutive days in Aug. 1982 for another tree initially subjected to a soil water potential of approx. -1.6 MPa, but irrigated to approx. -0.02 MPa between days 1 and 2. Solar irradiance decreased markedly between days 2 and 3, thus creating a unique data set. Results showed that removal of the understorey significantly increased rates of photosynthesis in Douglas fir, both diurnally and seasonally. Photosynthesis was not generally limited by stomatal conductance unless vapour pressure deficit was high and photon flux density was saturating. Improved tree growth after understorey removal was due to the increased soil water potential that increased both photosynthetic capacity and stomatal conductance.

OSU Link
Non-OSU Link

20. Tung, C.H., J. Batdorff and D.R. DeYoe. 1986a. Survival and growth of Douglas-fir seedlings with spot-spraying, mulching and root-dipping. Western-Journal-of-Applied-Forestry 1(4): 108-111.

Keywords: nursery operations
release treatments
chemical release
manual release
tree/stand health
growth

Abstract: In trials near Coos Bay, Oregon, 480 bare-rooted 2+0 Douglas fir seedlings, half of which had roots treated with Terra Sorb (a hydrolysed starch material capable of absorbing large amounts of water), were planted on a harsh site where several regeneration attempts had failed. After planting, seedlings received no further treatment, or glyphosate or paper mulch were applied around seedlings for 1 or 2 yr. Root dipping in Terra Sorb did not enhance survival or growth. Survival was significantly greater after the third season when competing vegetation was controlled with mulch or glyphosate during the first one or two seasons. Survival of seedlings treated twice with glyphosate was 26, 23 and 21% greater, respectively, than seedlings receiving one glyphosate treatment and one or two mulch applications. Ht. growth was n.s.d. among treatments.

OSU Link
Non-OSU Link

21. Wagner, R.G. and M.W. Rogozynski. 1994. Controlling sprout clumps of bigleaf maple with herbicides and manual cutting. Western Journal of Applied Forestry 9(4):118-124.

Keywords: release treatments
chemical release
manual release
stand conditions

Abstract: Trials were conducted in 5 young Douglas fir (Pseudotsuga menziesii) plantations for controlling bigleaf maple (Acer macrophyllum) clumps. Herbicides tested were glyphosate (Roundup), imazapyr (Arsenal), metsulfuron methyl (Escort), triclopyr amine

(Garlon3A), triclopyr ester (Garlon 4), and 2,4-DP [dichlorprop] + 2,4-D (Weedone 170). Four methods of herbicide application (basal spray, thinline, foliage spray, and cut-surface) and 3 treatment timings (early foliar, late foliar, and dormant periods) were tested. Manual cutting alone was also evaluated at each of the treatment timings. Imazapyr foliage sprays, triclopyr ester thinline, dormant 3% triclopyr ester basal spray, late-foliar 2,4-DP + 2,4-D basal spray, and manual cutting with triclopyr amine cut-surface application provided the best control among the treatments tested over the 3 yr of study. Imazapyr foliage sprays provided the best long-term control by killing most treated clumps. Triclopyr ester thinline treatments provided the most consistent and effective results among the basal applications. Stump applications of triclopyr amine were more effective than manual cutting alone or manual cutting with glyphosate cut-surface application.

OSU Link
Non-OSU Link

22. Wang, Z., M. Newton and J.C. Tappeiner, II. 1995. Competitive relations between Douglas-fir and Pacific madrone on shallow soils in a Mediterranean climate. Forest-Science 41(4): 744-757.

Keywords: release treatments
manual release
soil properties
growth

Abstract: A large area of Pacific Coast forests is characterized by shallow soil, with negligible rainfall in the growing season. The availability of bedrock water and its effects on growth and ecophysiology of 11-yr-old planted Douglas fir (Pseudotsuga menziesii) and sprouting Pacific madrone (Arbutus menziesii) was studied. The study was carried out at 3 regulated densities (0, 330 or 1322 clumps/ha) of madrone sprouts on shallow (<50 cm) residual soils in the Klamath Mts of SW Oregon. Total bedrock water depleted from March to September, as observed in drill holes by neutron probe, and did not suffer significantly among the 3 densities of madrone sprouts. However, cover in plots with the highest density of madrone depleted 50 mm of water from the 1.5 m layer by June, whereas vegetation on lower density treatments withdrew 15-28 mm by June, with later withdrawal distributed more uniformly through the growing season. Madrone density significantly affected basal diameter and height growth of Douglas fir. Madrone was consistently taller than Douglas fir in all plots. The height of 11-yr-old madrone sprout clumps (424-465 cm) did not differ significantly among densities. Madrone leaf area index and biomass were higher at the high density of madrone than at medium density. Physiological advantages and rooting habits of madronegive it a competitive advantage over Douglas fir at this site, that it might not have if bedrock did not provide the principal water reservoir for summer growth.

OSU Link
Non-OSU Link

23. Woods, J.H., D. Kolotelo and A.D. Yanchuk. 1995. Early selection of coastal Douglas-fir in a farm-field test environment. Silvae-Genetica 44(4): 178-186.

Keywords: genetic tree improvement
planting operations
site preparation

mechanical preparation
release treatments
chemical release
manual release
genetic relationships
wood quality
growth

Abstract: Farm-field tests are progeny tests established using intensive site preparation, close spacing and nearly complete weed control. Early growth and wood density of coastal Douglas-fir (Pseudotsuga menziesii) in a farm-field environment for up to 7 years from seed were compared with stem volume and wood density from 11 field sites at age 13 (20-25 of commercial rotation). The farm-field test material comprised 70 full-sib families from six 6-tree half-diallels (some reciprocals and missing crosses) without selfs. Parent trees were from natural stand selections in the coastal area of British Columbia, Canada, and the farm-field test was conducted on southern Vancouver Island. Family heritabilities were high for almost all traits in both the farm-field and field sites. Breeding-value correlations of farm-field heights with field stem volume at age 13 increased from a low of 0.5 for farm-field age 1 and levelled off at about 0.7 by farm-field age 3. Farm-field diameter with field volume age 13 breeding-value correlations were initially lower than those for height, but increased to 0.82 by age 7. Wood density breeding value correlations between field pilodyn assessments at age 13 and farm-field stem sections at age 6 were 0.83. Maximum family-selection efficiency per year (including a 5-year breeding delay), relative to direct selection on field volume 13, reached 162% using index selection on farm-field height and diameter at age 3. Within-family selection efficiencies per year were highest at age 1 and declined quickly thereafter. All selection in the farm-field test had a higher efficiency per unit time than selection in field tests. It is concluded that correctly established farm-field tests will provide greater per year gains in stem yield and wood density traits than field sites.