Chemical Release

1. Belz, D. and T.E. Nishimura. 1989. Effects of imazapyr, 2,4-D and metsulfuron methyl on conifer tolerance. Proceedings-of-the-Western-Society-of-Weed-Science (Vol. 42): 98-104.

Keywords: site preparation
chemical preparation
release treatments
chemical release
tree/stand health

Abstract: Imazapyr at 0.25-1.0 lb/acre alone or 0.5 lb/acre in combination with 2,4-D 2 lb/acre or metsulfuron 0.3 lb/acre was evaluated for effect on growth and injury to Pseudotsuga menziesii, Pinus ponderosa, Tsuga heterophylla and Abies amabilis seedlings in thePacific Northwest region. Applications were made at 4 times: 3 month pre-planting in Dec., as buds began to swell in Mar., during the spring flush of growth in May, and after bud set in Aug. The effect of different application rates was of less significance than their timings. Application during active growth gave unacceptable injury levels; pre-planting caused least injury, but autumn treatment was acceptable for tolerant species. Species tolerance was in the order Pinus ponderosa > Pseudotsuga menziesii > T. heterophylla > A. amabilis.

OSU Link
Non-OSU Link

2. Brandeis, T.J., M. Newton and E.C. Cole. 2001. Underplanted conifer seedling survival and growth in thinned Douglas-fir stands. Canadian-Journal-of-Forest-Research 31(2): 302-312.

Keywords: planting operations
thinning
commercial thinning
site preparation
chemical preparation
release treatments
chemical release
growth
tree/stand health
regeneration

Abstract: In a multilevel study conducted at the Oregon State University's McDonald-Dunn Research Forest, Oregon, USA, to determine limits to underplanted conifer seedling growth, Douglas-fir (Pseudotsuga menziesii), grand fir (Abies grandis), western redcedar (Thujaplicata) and western hemlock (Tsuga heterophylla) seedlings were planted in January 1993 beneath second-growth Douglas-fir stands that had been thinned in 1992 to basal areas ranging from 16 to 31 m2/ha. Understorey vegetation was treated with a broadcast herbicide (glyphosate + imazapyr) application prior to thinning, a directed release herbicide (glyphosate, plus triclopyr for tolerant woody stems) application 2 years later, or no treatment beyond harvest disturbance. Residual overstorey density was negatively correlated with percent survival for all four species. Broadcast herbicide application improved survival of grand fir and

western hemlock. Western redcedar, grand fir and western hemlock stem volumes were inversely related to overstorey tree density and this effect increased over time. There was a strong indication that this was also the case for Douglas-fir. Reduction of competing understorey vegetation resulted in larger fourth-year stem volumes in grand fir and western hemlock.

OSU Link
Non-OSU Link

3. Brandeis, T.J., M. Newton and E.C. Cole. 2002. Biotic injuries on conifer seedlings planted in forest understory environments. New Forests 24:1-14.

Keywords: planting operations
site preparation
chemical preparation
release treatments
chemical release
thinning
tree/stand protection
growth
tree/stand health

Abstract: The effects of partial overstorey retention, understorey vegetation management, and protective Vexar(R) tubing on the frequency and severity of biotic injuries in a two-storied stand underplanted with western redcedar (Thuja plicata), Douglas-fir (Pseudotsugamenziesii), grand fir (Abies grandis), and western hemlock (Tsuga heterophylla) were investigated. The most prevalent source of damage was browsing by black-tailed deer (Odocoileus hemionis columbiana); deer browsed over 74% of Douglas-fir and over 36% of westernredcedar seedlings one or more times over the four years of this study. Neither the spatial pattern of thinning (even or uneven) nor the density of residual overstorey affected browsing frequency. Spraying subplots may have slightly increased browsing frequency, but the resulting reduction of the adjacent understorey vegetation increased the volume of all seedlings by 13%, whether or not they were browsed. Vexar(R) tubing did not substantially affect seedling survival, browsing damage frequency, or fourth-year volume. Greater levels ofoverstorey retention reduced frequency of second flushing. Chafing by deer and girdling by rodents and other small mammals began once seedlings surpassed 1 m in height. Essentially all grand fir seedlings exhibited a foliar fungus infection.

OSU Link
Non-OSU Link

4. Busse, M.D., G.O. Fiddler and A.W. Ratcliff. 2004. Ectomycorrhizal formation in herbicide-treated soils of differing clay and organic matter content. Water, Air, and Soil Pollution 152:23-34.

Keywords: release treatments
chemical release
growth
tree morphology
tree/stand health

soil properties
mycorrhizal response

Abstract: Herbicides are commonly used on private timberlands in the western United States for site preparation and control of competing vegetation. How non-target soil biota respond to herbicide applications, however, is not thoroughly understood. We tested the effects of triclorpyr, imazapyr, and sulfometuron methyl on ectomycorrhizal formation in a greenhouse study. Ponderosa pine, Douglas-fir, and white fir seedlings were grown in four forest soils ranging in clay content from 9 to 33% and organic matter content from 3 to 17%, and treated with commercial formulations of each herbicide at 0, 1.0, and 2.0 times the recommended field rate. Many of the possible herbicide-soil combinations resulted in reduced seedling growth. Root development was particularly sensitive to the three herbicides, with an average of 51% fewer root tips compared to the control treatment. The ability of mycorrhizal fungi to infect the remaining root tips, however, was uninhibited. Mycorrhizal formation was high, averaging 91% of all root tips, regardless of herbicide, application rate, soil type, or conifer species. In agreement, soil microbial biomass and respiratory activity were unaffected by the herbicide treatments. The results show that these herbicides do not alter the capability of mycorrhizal fungi to infect roots, even at concentrations detrimental to seedling growth.

OSU Link
Non-OSU Link

5. Cole, E.C. and M. Newton. 1987. Fifth-year response of Douglas-fir to crowding and nonconiferous competition. Canadian-Journal-of-Forest-Research 17(2): 181-186.

Keywords: release treatments
chemical release
growth
tree morphology

Abstract: Measurements were made in autumn 1982 in 5-yr-old plantations with trees spaced 17-123 cm apart, alone or with grass or red alder (Alnus rubra) on 3 site types in the Oregon Coast Range. Crowding and competition from both grass and alder reduced aboveground dry wt. per tree. Dry wt./ha was higher at higher tree densities, but this is expected to change with time as the larger trees at low densities form fully stocked stands. Grass showed the greatest effect on growth at the driest site. Although red alder decreased growth on all sites, the effect was most significant at the coastal site where light is most limiting and moisture least limiting. For the production of max. individual tree size, low stocking with control of competing vegetation is recommended.

OSU Link
Non-OSU Link

6. Cole, E.C. and M. Newton. 1989a. Height growth response in Christmas trees to sulfometuron and other herbicides. Proceedings-of-the-Western-Society-of-Weed-Science (Vol. 42): 129-135.

Keywords: release treatments
chemical release
growth

tree/stand health
stand conditions

Abstract: Abies procera, A. grandis and Pseudotsuga menziesii cv. Menziesii were evaluated for tolerance to sulfometuron (0.05-0.21 kg/ha), atrazine (4.5 kg/ha) and hexazinone (2.2 kg/ha). Herbicides were applied pre-budbreak and sulfometuron was also applied post-budbreak. Weeds were suppressed equally effectively by all rates and herbicides pre-em. Low rates of sulfometuron were less effective post-em. There was no significant damage to A. procera seedlings, although the highest rate of sulfometuron slowed growth significantly. A. grandis was not affected by any treatment. All treatments caused injury to 1-year-old P. menziesii, primarily needle chlorosis and slight stunting. Growth was best in atrazine-treated plots. For 3-year-old P. menziesii, injury was not significant but high rates of sulfometuroncaused cosmetic damage. Best growth was observed with hexazinone and worst with sulfometuron. Post-budbreak applications and high rates of sulfometuron reduced growth more than pre-budbreak application and low rates.

OSU Link
Non-OSU Link

7. Cole, E.C. and M. Newton. 1989b. Seasonal efficacy comparison of two glyphosate formulations. Proceedings-of-the-Western-Society-of-Weed-Science (Vol. 42): 136-142.

Keywords: release treatments
chemical release
tree/stand health
stand conditions

Abstract: Glyphosate formulations with 13% (Roundup) and without (Accord) surfactant were compared at 0.84 and 1.68 kg/ha, applied June-Oct. against Alnus rubra, Rubus spectabilis, R. parviflorus, R. ursinus and Pteridium aquilinum in a Pseudotsuga menziesii cv.menziesii plantation. No differences in efficacy between the two formulations against any species were noted. All species were controlled better by high rates of herbicide. R. spectabilis and R. parviflorus were controlled <less or =>100%, although July applications were least effective. A. rubra was reduced <less or =>80% and early application gave best control. Rates of application had less effect on Pteridium aquilinum control (<less or =>98%), and Oct. applications were least effective. Damage to Pseudotsuga menziesii was worst with June applications and decreased through the year. Oct. treatment caused negligible damage.

OSU Link
Non-OSU Link

8. Cole, E.C., M. Newton and D.E. White. 1986. Response of northwestern hardwoods, shrubs, and Douglas-fir to Arsenal and Escort. Proceedings-of-the-Western-Society-of-Weed-Science (Vol.39): 93-101.

Keywords: release treatments
chemical release
tree/stand health
stand conditions

Abstract: Arsenal (imazapyr) and DPX-T6376 (metsulfuron) were evaluated for scrub control in Pseudotsuga menziesii plantations at 3 sites in Oregon in 1984-85. Arsenal produced the most complete and consistent control of Acer macrophyllum when applied in late summer, but early summer applications were more effective against the sclerophyll brush species Arbutus menziesii, Ceanothus velutinus var. laevigatus, Arctostaphylos columbiana and A. viscida. High rates of Arsenal gave good control of Alnus rubra and Rubus spectabilis, but did not control R. laciniatus or R. procerus. On all the controlled species, growth of new foliage was decreased or prevented. DPX-T6376 reduced the crown vol. of A. macrophyllum and killed the sclerophyll brush species, all Rubus spp. but not A. rubra. Both chemicals produced severe injury to P. menziesii.

OSU Link
Non-OSU Link

9. Cole, E.C., M. Newton and D.E. White. 1988. Efficacy of imazapyr and metsulfuron methyl for site preparation and conifer release in the Oregon Coast Range. Forest-Research-Laboratory,-Oregon-State-University Research-Note 81. 7 p.

Keywords: release treatments
chemical release
tree/stand health
stand conditions

Abstract: Imazapyr (Arsenal) and metsulfuron methyl (Escort) were tested at 3 rates for controlling shrubs in young Douglas fir (Pseudotsuga menziesii) plantations on 3 sites in the Oregon Coast Range. Imazapyr was highly effective on red alder (Alnus rubra) and bigleafmaple (Acer macrophyllum), but was less effective on salmonberry (Rubus spectabilis) and other blackberry (Rubus) species. Metsulfuron-methyl was ineffective on red alder and bigleaf maple, but gave excellent control of salmonberry, Himalaya blackberry (R. procerus) and evergreen blackberry (R. laciniatus). Both chemicals caused severe injury to Douglas fir seedlings, especially when applied during the growing season. It is concluded that these herbicides are promising for site preparation, but have limited use for release of Douglas fir.

OSU Link
Non-OSU Link

10. Dimock, E.J., II and E.B. Collard. 1981. Postplanting sprays of dalapon and atrazine to aid conifer establishment. Pacific-Northwest-Forest-and-Range-Experiment-Station,-USDA-Forest-Service Research-Paper PNW-RP-280. iii + 16 p.

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

Abstract: A mixture of dalapon and atrazine at 8 and 4 lb/acre, respectively, or dalapon or atrazine alone were applied to control perennial grasses and forbs competing with newly planted seedlings of

ponderosa pine and Douglas fir. In 4 studies in Oregon in 1975, herbicides were spot sprayed around individual seedlings. In 2 studies in Washington and Oregon in 1976, herbicides were broadcast sprayed. The mixture consistently controlled grass and forbs better than either herbicide alone, reducing grass and forb cover respectively by 80-82% and 48-58% in the first year. Control persisted for 2-4 yr. Varying results are reported as to the effects of the different treatments on height growth and survival.

OSU Link
Non-OSU Link

11. Figueroa, P.F. 1989. Bigleaf maple control: triclopyr thin-line and spot-foliar application treatments using imazapyr, metsulfuron, and glyphosate. Proceedings-of-the-Western-Society-of-Weed-Science (Vol. 42): 104-119.

Keywords: release treatments
chemical release
stand conditions
economics

Abstract: Field trials were conducted to compare the efficacies of March applications of triclopyr thin-line +or- 1 kg/ha Mor-act or 2,4-D (1:1) with June spot-foliar applications of 0.6 or 1.1 kg/ha imazapyr, 0.170 kg/ha metsulfuron and 6.7 kg/ha glyphosate to control Acer macrophyllum in a Pseudotsuga menziesii plantation. All thin-line treatments gave 80% control 2 years later; complete sanding was hindered by stems growing along the ground. Dilution did not affect control. Spot-application success depended on degree of crown coverage. metsulfuron and glyphosate were not effective, but imazapyr control reached 60-70% 2 years after treatment. Only triclopyr and full coverage imazapyr suppressed A. macrophyllum growth to below the height of P. menziesii. Crown volume was held to pre-treatment levels with metsulfuron and glyphosate but decreased with imazapyr. The two treatment methods tested are potentially cost-effective; triclopyr costs are higher but spot-application carries higher labour costs. Application rates of 2 ml triclopyr/ Msuperscript 2 crown area will give 100% control if all stems are banded; with delivery rates of 59 ml/clump a 45% solution can be used.

OSU Link
Non-OSU Link

12. Figueroa, P.F. 1991. Ground applied herbicide methods for red alder control: herbicide efficacy, labor costs, and treatment method efficiency. *In* Proceedings-of-the-Western-Society-of-Weed-Science,12-14-March-1991. pp. 44: 53-68.

Keywords: release treatments
chemical release
economics
stand conditions

Abstract: A study was conducted to develop the cost estimates for ground-applied manual control methods in variable density red alder [Alnus rubra] stands and to evaluate the efficacy of the various herbicide formulations for each system. Field trials were initiated in 3 Douglas fir

[Pseudotsuga menziesii] plantations located on Weyerhaeuser Company land located in SW Washington. Two 6-year-old plantations had streamside buffer zones remaining from the previous year's operational herbicide spray programme; the 3rd was a 13-year-old plantation which had not been previously treated with herbicides to control A. rubra. The treatments tested were as follows: 50% triclopyr, 45% glyphosate and 10% imazapyr applied to the cut stump surface; low-vol. basal application of 5, 10 and 15% triclopyr and 2 and 4% imazapyr; thin-line application of 50, 75 and 100% triclopyr and 20 and 40% imazapyr; stream-line application of 10, 30 and 50% triclopyr and 4 and 20% imazapyr; hack-and-squirt application with imazapyr applied to 1 cut at 0.25, 0.5 and 0.75 ml and to 2 cuts at 0.25 and 0.5 ml; and capsule injection of 1 or 2 glyphosate capsules. A discussion of the results is presented and total treatment costs are given. It is concluded that ground application treatments have advantages over aerially applied treatments, including being useful for the treatment of areas of public sensitivity and when other environmental risks need to be minimized.

OSU Link
Non-OSU Link

13. Figueroa, P.F. 1993. Efficacy and cost of ground-applied herbicide methods for red alder control. Down to Earth 48(1): 6-10.

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

Abstract: The effects on red alder [Alnus rubra] mortality, diam. at breast height and height, and any phytotoxic effects to Douglas fir [Pseudotsuga menziesii] of Garlon 4 (triclopyr) at 4 lb/gallon and Chopper EC (imazapyr) at 2 lb, applied by stream line, thin line and low vol. treatments, and of Garlon 3A (triclopyr) at 3 lb, Roundup (glyphosate) at 3 lb and Arsenal (imazapyr) at 4 lb applied by cut stump treatment were evaluated in streamside buffer zones in two 6-year-old P. menziesii plantations in SW Washington. All treatments resulted in good control of A. rubra, but the most cost-effective control was achieved by the stream line application of Garlon 4, followed by low vol. basal or thin line treatments of Garlon 4 and cut stump treatment with 50% Garlon 3, 45% Roundup and 10% Arsenal. Negligible P.menziesii damage was caused by cut stump treatments, but damage occurred with basal-bark treatments although Garlon 4 generally caused less injury than Chopper EC.

OSU Link

14. Figueroa, P.F. and V.F. Carrithers. 1993. Bigleaf maple control: thinline basal applications using triclopyr and triclopyr plus picloram. *In* Proceedings-of-the-Western-Society-of-Weed-Science, 9-11-March-1993. pp. 46: 24-30.

Keywords: release treatments
chemical release
stand conditions
economics

Abstract: A field trial was conducted at Mt. St. Helens Tree Farm, Cowlitz county, Washington, in 1988-91 to determine the min. threshold level of herbicide needed to control bigleaf maple [Acer macrophyllum] stump sprouts in Douglas fir [Pseudotsuga menziesii]. Garlon(triclopyr) at 0.24-3 lb/gal was applied on 6 Dec. 1990, 6 Feb. 1991 and 11 Apr. 1991, and triclopyr + picloram at 1 + 0.5 lb was applied on 6 Feb. 1991 using thinline applications to the entire circumference of each stem in the bigleaf maple clump. The threshold level ofGarlon for <more or =>90% control was found to be between 1.1 and 1.7 ml/msuperscript 2 of crown area. Most treatments produced clumps that appeared to be dead during the 1st year but which resprouted in the 2nd year; it is suggested that such inconsistencies in mortality among treatments are due to the inability to completely band every stem. Economic considerations for herbicide costs are discussed.

OSU Link
Non-OSU Link

15. Figueroa, P.F., R.C. Heald and S.R. Radosevich. 1990. Sensitivity of actively growing Douglas-fir to selected herbicide formulations. Proceedings-of-the-Western-Society-of-Weed-Science 43: 45-52.

Keywords: release treatments
chemical release
growth
tree/stand health

Abstract: The results of field studies at 2 sites in Washington and California indicated that aerial spraying of 2,4-D at 4 lb/acre, triclopyr ester at 4 lb/acre or 2,4-D + triclopyr ester at 1.2 lb/acre + 0.5 lb/acre to control red alder [Alnus rubra] led to a significant reduction in Douglas fir [Pseudotsuga menziesii] growth and survival if applied during periods of active conifer growth. Herbicides applied singly at high rates caused significantly more mortality than the herbicides in combination. At both sites, trees had not fully recovered 5 and 6 years after treatment; damaged trees were at least 1 year behind untreated trees in growth.

OSU Link
Non-OSU Link

16. Fischer, V.F. and V.F. Carrithers. 1992. Tolerance of one and two year old douglas-fir seedlings to triclopyr applications. In Proceedings-of-the-Western-Society-of-Weed-Science, 10-12-March-1992.

Keywords: release treatments
chemical release
tree/stand health

Abstract: In field trials conducted near Marquam, Oregon, during 1988-90, the tolerance was evaluated of douglas-fir [Pseudotsuga menziesii] seedlings to triclopyr ester and triclopyr amine (both applied at 0.5-1.5 lb/acre) during the 1st 2 years after transplanting. Triclopyramine did not cause significant damage to 1- or 2-year-old plants. Triclopyr ester in a water carrier resulted in injury to terminal buds of 1-year-old plants when applied at 1.5 lb, and in a diesel carrier resulted in damage to lateral and terminal buds when applied at concn of <more or =>1.0 lb. Two-year-old plants were more tolerant than 1-year-old plants to both triclopyr formulations, with triclopyr ester at 1.5 lb in a water carrier resulting

in only slight needle injury. However, in a diesel carrier, triclopyr ester at 1.5 lb still resulted in terminal and lateral bud damage.

OSU Link
Non-OSU Link

17. 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

18. Gourley, M., M. Vomocil and M. Newton. 1990. Forest weeding reduces the effect of deer-browsing on Douglas fir. Forest-Ecology-and-Management 36(2-4): 177-185.

Keywords: release treatments
chemical release
tree/stand protection
growth
tree/stand health

Abstract: In January and February 1981, three-year-old bare-root Douglas fir (Pseudotsuga menziesii) transplants were established in four clear-felled locations in the Oregon Coast Range where browsing by black tail deer (Odocoileus hemionus columbiana) was expected. Protection was provided against browsing by 5 physical (rigid protection tube 7.5x75 cm; protective netting, paper budcaps; leather guard 20x5 cm; and 'Remae' budcaps) and one chemical ('Deer Away') treatment, each of which was

tested with and without complete wood control with glyphosate. After five years, none of the protective treatments provided any growth advantages; some even caused growth losses. In contrast, weed control, with or without additional protective measures, consistently improved growth. By the 5th year, weeded trees averaged twice the biomass of unweeded trees, regardless of browsing. Average tree size was largest in the treatment with no weed competition and with no barriers to prevent browsing. Advantages of weeding were greatest on the poorest site. Weed control, in conjunction with the large size of transplants, appeared to prevent most loss due to damage from moderate deer-browsing.

OSU Link
Non-OSU Link

19. 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

20. 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

21. 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

22. Helgerson, O.T. 1990b. Response of underplanted Douglas-fir to herbicide injection of sclerophyll hardwoods in southwest Oregon. Western-Journal-of-Applied-Forestry 5(3): 86-89.

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

Abstract: Low-value broadleaf sclerophyll forests in SW Oregon, typically composed of tanoak (Lithocarpus densiflorus), Pacific madrone (Arbutus menziesii) and chinkapin (Castanopsis chrysophylla), may be converted to commercially valuable Douglas fir (Pseudotsugamenziesii) by underplanting. Results are given of studies of container-grown plug and nursery-grown bareroot fir seedlings planted out in March 1983 on plots in which all broadleaf stems had been previously (September 1981) injected with triclopyr amine. Although 60% broadleaf cover was killed by injection, 7 years later ground cover was significantly greater on these treated plots because of sprouting. Seedlings planted beneath treated broadleaf trees experienced greater daytime, but less predawn, moisture stress; plugs survived better than bareroots; and survival of seedlings on treated plots was not significantly better until 2 years after planting. Herbicide injection also resulted in increased height, diameter and volume growth rates of Douglas fir seedlings, and is recommended for the establishment of a conifer stand.

OSU Link
Non-OSU Link

23. Kelpsas, B.R. 1987. Seasonal impacts of fluroxypyr and triclopyr on conifers and shrubs. Proceedings-of-the-Western-Society-of-Weed-Science (Vol.40): 128-129.

Keywords: release treatments
chemical release
tree/stand health
stand conditions

Abstract: Release of Pseudotsuga menziesii from Rubus spectabilis and Alnus rubra in a plantation in the Pacific Northwest could be achieved by 1.12 kg fluroxypyr/ha applied in May at the early foliar stage without appreciable long-term injury. P. menziesii tolerated 1.12 kgtriclopyr/ha but was severely damaged by 1.12 kg and 2.24 kg fluroxypyr when applied during the dormant season in Mar.

Both fluroxypyr and triclopyr were more effective against A. rubra than R. spectabilis. Control of R. spectabilis with triclopyr was marginal.

OSU Link
Non-OSU Link

24. Ketchum, J.S., R. Rose and B. Kelpsas. 2000. Comparison of adjuvants used in fall-release herbicide mixtures for forest site preparation. Tree-Planters' Notes 49(3): 66-71.

Keywords: site preparation
chemical preparation
release treatments
chemical release
tree/stand health
stand conditions

Abstract: Tank mixes of the herbicides imazapyr and glyphosate were applied at 3 rates with 3 adjuvants (LI-700Reg., Nu-Film-IRReg., Silwet L-77Reg.) over California hazelnut (Corylus cornuta var. californica), vine maple (Acer circinatum), and brackenfern (Pteridiumaquilinum var. lanuginosum) on a 2-year-old clearcut of Douglas fir (Pseudotsuga menziesii) in Oregon. The herbicide 2,4-D was applied at 3 rates with 2 adjuvants (HerbimaxReg., Nu-Film-IR) over greenleaf manzanita (Arctostaphylos patula) on a 4-year-old Douglas firclearcut in Oregon. Tank mixes of imazapyr and glyphosate with LI-700 or Nu-Film-IR were sprayed at 3 rates over 1-year-old seedlings of Douglas fir on 2 sites in Oregon. The herbicide rate strongly influenced the percentage of foliage injured and percentage of stems killed for all herbicide treatments. The adjuvants evaluated did not influence efficacy of herbicide applications on California hazelnut, vine maple, or brackenfern. Herbimax increased visual foliar damage resulting from 2,4-D application on greenleaf manzanita. Douglas fir foliage was damaged by the higher herbicide rates; the damage was greater from Nu-Film-IR than from LI-700.

OSU Link
Non-OSU Link

25. 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

26. 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

27. Knowe, S.A. 1994b. Incorporating the effects of interspecific competition and vegetation management treatments in stand table projection models for Douglas-fir saplings. Forest-Ecology-and-Management 67(1-3): 87-99.

Keywords: release treatments
chemical release
growth
tree morphology

Abstract: A stand table projection system based on individual-tree and stand-level models for young Douglas fir (Pseudotsuga menziesii var. menziesii) plantations was developed from and evaluated with remeasurement data from xeric sites in the Siskiyou Mountains of SW Oregon (established in a competition gradient study), and mesic sites in the Coast Ranges of Oregon and Washington (established in a treatment efficacy study). A projection equation was developed for relative tree size, defined as the ratio of individual-tree diameter at 15 or 30 cm above ground level (depending on the study location) to quadratic mean diameter. The relative size projection equation for the Coast Ranges study included the effect of total vegetation control, which indicated that diameters of Douglas fir receiving total vegetation control tended to become more uniform over time in the Coast Ranges. An additional equation was developed to project quadratic mean diameter so that individual-tree diameters could be estimated from projected relative size. The effect of vegetation management treatments on projected quadratic mean diameters in the Siskiyou study was expressed as an interaction between proportion of cover removed by treatments (intensity) and dominant height of Douglas fir at time of treatment relative to current dominant height. In 1- and 2-yr projection periods, the stand table projection system performed similarly to a diameter distribution prediction system based on a Weibull distribution function. However, the difference between projected and predicted diameter distributions became more pronounced as the projection period increased to 5 years.

OSU Link
Non-OSU Link

28. 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

29. 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

30. 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

31. 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

32. Monleon, V.J., M. Newton, C. Hooper and J.C. Tappeiner, II. 1999. Ten-year growth response of young Douglas-fir to variable density varnishleaf ceanothus and herb competition. Western-Journal-of-Applied-Forestry 14(4): 208-213.

Keywords: site preparation
chemical preparation
release treatments
chemical release
growth

Abstract: The effect of different densities of varnishleaf ceanothus (Ceanothus velutinus var. laevigatus) and herbaceous vegetation control on stem diameter, height, and volume of Douglas-fir (Pseudotsuga menziesii var. menziesii) seedlings was examined during the 10 yr following planting on a site near Springfield, Oregon, in winter 1996-97. Initial densities of ceanothus ranged between 0 and 15 000 seedlings/ha and were obtained by interplanting ceanothus germinants or chemical thinning after clearcutting and broadcast-burning. Herbaceous vegetation control was achieved by a single application of glyphosate following planting, with shrub seedlings covered. Ceanothus density in the range of 0 to 6750 plants/ha did not have an effect on Douglas fir diameter, height, or volume at age 10; however, Douglas fir growth was significantly decreased when ceanothus densities reached 15 000 plants/ha. Ten years after planting, Douglas fir volume in the treatments with <less or =>6750 ceanothus/ha was 1.7 times greater than that in the 15 000 ceanothus/ha treatment. In contrast, removal of herbaceous vegetation after planting significantly increased tree diameter, height, and volume, regardless of ceanothus density. Even 10 yr after application of the treatment, trees without early herb competition grew faster and had mean dbh, height, and volume that were 1.02 cm, 0.55 m, and 12.98 dmsuperscript 3/tree greater respectively than those with herbs. Thus, a treatment at plantation establishment to control herbaceous vegetation and to reduce ceanothus density to less than 7000 plants/ha will ensure an increase in growth and stocking for at least 10 yr.

OSU Link
Non-OSU Link

33. Newton, M. and E.C. Cole. 1989. Where does sulfometuron fit in Pacific northwest silviculture? Proceedings-of-the-Western-Society-of-Weed-Science (Vol. 42): 121-128.

Keywords: release treatments
chemical release
stand conditions
tree/stand health

Abstract: Field trials in the Oregon Coast Range were conducted to evaluate sulfometuron for weed control in established and newly-planted stands of Pseudotsuga menziesii. North Coast sites were aerially-sprayed with 0.11 or 0.22 kg/ha sulfometuron +or- 2.2 kg/ha 2,4-D. South Coast sites received 0.11 or 0.165 kg/ha sulfometuron, and this was compared with 1.65 kg/ha hexazinone, 4.4 + 0.42 or 0.40 kg/ha atrazine + glyphosate +or- 1.25% surfactant (R-11). Weed cover and tree damage were assessed visually. In South Coast sites, all treatments reduced weed cover >50%. Broadleaved weeds and grasses were well controlled, but none of the treatments suppressed shrub growth. Broadleaved weeds were best controlled by hexazinone, and all other weeds by sulfometuron. On North Coast sites, all treatments reduced weed cover. Broadleaved weeds, grasses, shrubs and Rubus ursinus were all suppressed, but ferns were not. 2,4-D enhanced the effect of sulfometuron on broadleaved weeds and R. ursinus, but injury to P. menziesii was also greater. This was acceptable on terminal growth <3-5 cm, above which foliage necrosis, terminal dieback and growth check occurred. Timing of sulfometuron treatment alone was not significant, and the effects of rate of application were not clear from the first season's observations.

OSU Link
Non-OSU Link

34. Newton, M., E.C. Cole and D.E. White. 1986. What influences control of coastal deciduous brush with glyphosate. Proceedings-of-the-Western-Society-of-Weed-Science (Vol.39): 86-92.

Keywords: release treatments
chemical release
stand conditions
tree/stand health

Abstract: The effects of 0.5, 1.0 or 1.5 lb a.e. glyphosate/acre as Rodeo or Roundup applied in July or Aug. at 2 spray vol. with or without surfactant were studied on 5 woody species in the Oregon Coast Range. Glyphosate was more effective in 10 than 3 gallons spray/acre. Aug. applications were best, except in the case of Alnus rubra and conifers which were best controlled by July treatments. Addition of surfactant improved efficiency at low rates and vol. of glyphosate. Rubus spectabilis was most susceptible in Aug. andSambucus racemosa was equally sensitive at both dates, but R. procerus and R. laciniatus were resistant. In a 2nd trial against Acer macrophyllum, crown reduction ranged from 60 to 85% with no differences between rates but decreasing efficacy with lower spray volumes. Plantings of Pseudotsuga menziesii were injured by all treatments in July but not in Aug.

OSU Link
Non-OSU Link

35. Newton, M., E.C. Cole and D.E. White. 1993. Tall planting stock for enhanced growth and domination of brush in the Douglas-fir region. New-Forests 7(2): 107-121.

Keywords: nursery operations
site preparation
prescribed fire
release treatments
chemical release
growth
tree/stand health

Abstract: Two long-term experiments in Oregon followed the development of planted stock of various sizes, origins, and species. In one experiment, multi-year comparisons of container, 2+0 bare rooted, and 3-yr-old Douglas fir (Pseudotsuga menziesii) transplants showed a strong positive relation between initial height and long-term (10-14 yr) growth under a range of site conditions with high probability of brush development. In another experiment, Douglas fir, western hemlock (Tsuga heterophylla), and Sitka spruce (Picea sitchensis) were planted on brushfield sites (disturbed by logging 0 and 4 yr previously) where salmonberry (Rubus spectabilis) was or had been dominant. Half the seedlings were released with glyphosate 6 months after planting. Western hemlock and Douglas fir bare rooted stock all grew well if planted in a fresh burn, despite rapid regrowth of salmonberry, but virtually all seedlings less than 60 cm tall except Sitka spruce were killed by 4-yr-old salmonberry if not released. Release improved growth of seedlings in the fresh burn by 6%, gaining an average of about 0.6 year toward reaching a height of 6 m. Release improved growth of survivors in 4-yr-old salmonberry by 51% in height, 72% in diameter, and 325% in volume at age 12 yr. Sitka spruce grew well until damaged by insects. Western hemlock growth was equal to or greater than that of Douglas fir of comparable initial height. In all comparisons, the probability of being overtopped by brush decreased with increasing initial stock height, and the effect of suppression on growth was also inversely related to initial height. Tall wilding seedlings had comparable advantages to nursery-grown seedlings, although Sitka spruce survival was not reliable.

OSU Link
Non-OSU Link

36. Newton, M. and D.S. Preest. 1988. Growth and water relations of Douglas fir (Pseudotsuga menziesii) seedlings under different weed control regimes. Weed-Science 36(5): 653-662.

Keywords: release treatments
chemical release
growth
soil properties
tree physiology

Abstract: Growth of Douglas fir (P. menziesii) was increased by controlling grasses and broadleaved weeds with combinations of 4.4 kg atrazine/ha and 2.2 kg 2,4-D or 2,4,5-T during the first 3 years after

planting on a well-drained moist site in the Oregon Coast Range. The greatest growth occurred if weeds were controlled in the same growing season that tree seedlings were transplanted to the field; smaller increments came from second- and third-year weed control. Growth increases attributable to early weed control continued through the fifth year, indicating that conditions during establishment strongly influenced later growth. Plots with no herbaceous vegetation had more available soil water than those with competing vegetation, and tree seedlings on these plots experienced less water stress. Irrigation in the third year increased stem diameter of seedlings in that year but had no effect thereafter. Increases in average seedling stem volume at 5 years after transplanting were linearly related to the difference in observed xylem potential during the first three seasons after transplanting and the xylem potential at which photosynthesis ceased, -2 MPa.

OSU Link
Non-OSU Link

37. Newton, M., D.S. Preest and D.E. White. 1987. Effect of relieving moisture stress with extended weed control in Douglas-fir. Proceedings-of-the-Western-Society-of-Weed-Science (Vol.40): 129-130.

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

Abstract: The growth of Douglas fir Pseudotsuga menziesii seedlings was increased during the first 5 years by controlling grasses and forbs in 7 herbicide regimes during the 1st 3 years, the effect diminishing with time after planting. Devegetated plots had more available moisture through the growing season than those with Agrostis tenuis or mixed mixed grass/forb cover dominated by A. tenuis or Hypochaeris radicata. Tree moisture stress followed soil moisture but only after allowing for large fluctuations of diurnal stress. Weed control relieved moisture stress in trees.
P. menziesii photosynthesis tended to shut down in the region of -2.0 MPa moisture stress. For the 1st 3 years in a favourable coastal environment approx. 1700 MPa-h above -2.0 MPa was estimated to be required for survival. Increments of moisture beyond that would contribute significantly to growth.

OSU Link
Non-OSU Link

38. Petersen, T.D. and M. Newton. 1983. Growth of Douglas-fir following release from snowbrush and forbs in the Oregon Cascades. Proceedings-of-the-Western-Society-of-Weed-Science (Vol. 36):58-59.

Keywords: release treatments
chemical release
growth

Abstract: Ceanothus velutinus and other weeds such
as Epilobium angustifolium, Rubus ursinus and Pteridium aquilinum suppressed the growth of Douglas fir in plantations of the central Cascades of W. Oregon. Stem vol. increases of Douglas fir after 4 yr were

greatest when all competing vegetation had been controlled for 1 growing season with herbicides. It is suggested that C. velutinus competes with Douglas fir by depleting soil moisture although the cause of competition by other weeds is unknown. The best time for releasing Douglas fir from competition is discussed.

OSU Link
Non-OSU Link

39. Petersen, T.D., M. Newton and S.M. Zedaker. 1988. Influence of Ceanothus velutinus and associated forbs on the water stress and stemwood production of Douglas-fir. Forest-Science 34(2): 333-343.

Keywords: release treatments
chemical release
tree physiology
soil properties
growth

Abstract: In studies in the central Cascade Mts., Oregon, three regimes were established in 1978 around individual trees in four 5-yr-old and four 10-yr-old stands, viz. no treatment (control), elimination of C. velutinus with 2,4-D or elimination of C. velutinus and forbs with 2,4-D and glyphosate. Seasonal and diurnal variation in stem and soil water potentials were measured during 1979. Soil water potential during late summer was <-1.5 MPa at depths of 10, 40 and 100 cm on control plots and at depths of 10 and 40 cm in 5-yr-old stands and 10 cm in 10-yr-old stands in plots where only C. velutinus was eliminated. In the absence of shrubs and forbs, soil water potential at 100 cm was near field capacity throughout the season. Predawn stem water potential during late summer was significantly lower on control plots than on the treatment plots for all 5-yr-old stands and for two of the 10-yr-old stands. By 1986, tree stems were 2-6 cm larger in basal diam. and 1-2 m taller in the absence of competitors. The increase in stem size was greater in the stand treated at 5 yr old than in that treated at 10 yr old. The correlation between growth and water stress suggests that interspecific competition for soil water during summer drought is a limiting factor in stemwood production.

OSU Link
Non-OSU Link

40. Reynolds, P.E., K. King, R. Whitehead and T.S. MacKay. 1986. One-year results for a coastal British Columbia glyphosate conifer release trial. Proceedings-of-the-Western-Society-of-Weed-Science (Vol.39): 107-117.

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

Abstract: In trials on the W. coast of Vancouver Island in 1984, fir plantations on a reclaimed watershed were aerially treated with 2 kg glyphosate/ha. A single spray gave good control of Rubus spectabilis but very variable control of Alnus rubra ranging from 0 to 100%. Gaultheria shallow [G. shallon] was not

controlled by glyphosate. Control of many species was greater on upper slopes than in the watershed valley bottom. There was minor crop tree injury to Tsuga heterophylla and Thuja plicata with recovery after 1 year, but no injury toPicea sitchensis, Pseudotsuga menziesii, Abies amabilis or A. grandis. Some increases in crop tree height were noted after herbicide treatment.

OSU Link
Non-OSU Link

41. Roberts, S.D., C.A. Harrington and T.A. Terry. 2005. Harvest residue and competing vegetation affect soil moisture, soil temperature, N availability, and Douglas-fir seedling growth. Forest-Ecology-and-Management 205(1/3): 333-350.

Keywords: site preparation
chemical preparation
release treatments
chemical release
soil properties
growth
tree physiology

Abstract: Decisions made during stand regeneration that affect subsequent levels of competing vegetation and residual biomass can have important short-term consequences for early stand growth, and may affect long-term site productivity. Competing vegetation clearly affects the availability of site resources such as soil moisture and nutrients. Harvest residues can also affect the availability of site resources. We examined second and third year seedling performance of a Douglas fir (Pseudotsuga menziesii) plantation with different vegetation control and biomass retention treatments on a highly productive site in the coast range of Washington, USA. Treatments included a bole-only harvest without vegetation control (BO-VC), a bole-only harvest with complete vegetation control (BO+VC), and a total tree harvest with complete vegetation control that also included removal of all coarse woody debris and harvest residues (TTP+VC). The VC treatment involved: (a) in the first year, broadcast application of Oust and Accord concentrate applied with a surfactant 2 weeks before planting; (b) in the second year, a March broadcast application of Atrazine and a directed spot-spray of Accord Concentrate on the vegetation between rows in April-May; and (c) in the third year, a March broadcast application of Atrazine and Oust, a direct spot-spray application of Accord Concentrate, and a spot-spray of Transline with surfactant on April-May to control persistent shrub species. The study was conducted to determine if vegetation control and residue retention treatments affected soil moisture, soil temperature, and apparent nitrogen (N) availability, and whether these differences in site resources were correlated with seedling size and growth. In both second and third growing seasons, volumetric soil moisture at 0-20 cm depth was lowest on plots that did not receive vegetation control (BO-VC). Seedlings on these plots also had the lowest diameter and volume growth. In year 2, which was fairly moist, volume growth on TTP+VC plots was slightly higher than on BO+VC plots. TTP+VC plots did have lower soil moisture, but soil temperatures were slightly warmer. In year 3, a drier year, growth was greatest on BO+VC plots, which had consistently higher soil moisture levels. Apparent N availability in year 3 also varied with vegetation control. Douglas fir foliar N concentrations averaged 2.3% on the plots where competing vegetation was eliminated, compared to 1.8% on plots where competing vegetation was not controlled. Douglas fir foliar N concentrations did not differ between residue retention treatments, although N concentrations of competing vegetation were higher where residual biomass was retained. Higher apparent N availability was correlated with greater seedling growth. Based on the

results from years 2 and 3, it appears that soil moisture, particularly late in the growing season, had the greatest effect on seedling growth in both years. Available N may also have played a role, although the effects of N cannot be completely separated from those of soil moisture. When soil moisture is adequate, it appears that available N and soil temperature exert greater influence on growth. Vegetation control and residue retention can influence all 3 of these factors. The relative importance of each factor may depend on the year-to-year variation in environmental conditions.

OSU Link
Non-OSU Link

42. Rose, R. and J.S. Ketchum. 1998. Early results of the 'Herb II' study: evaluating the influence vegetation control has on fertilization at the time of planting. *In* Proceedings of the Annual Meeting of the Western Society of Weed Science, Waikoloa, Hawaii, 10-12 March, 1998. pp. 55-59.

Keywords: release treatments
chemical release
fertilization
growth

Abstract: Field trials were conducted at 5 sites in the Pacific Northwest region of the USA to assess the interactive effects between increasing levels of control of deerbrush (Ceanothus integerrimus), snowbrush (C. velutinus), black cottonwood (Populus trichocarpa), Scotch broom (Cytisus scoparius), Portuguese broom (C. striatus), trailing blackberry (Rubus sp.), thimbleberry (R. parviflorus) and salmonberry (R. spectabilis) with hexazinone or sulfometuron, and fertilizer treatments using slow release briquettes of N:P:K at 14:3:3 or 9:9:4 applied at planting for Douglas fir (Pseudotsuga menziesii), ponderosa pine (Pinus ponderosa), western hemlock (Tsuga heterophylla) and coastal redwood (Sequoia sempervirens). Results indicated that at all but one site, weed control +or- fertilizer led to increased tree growth, while at the fifth site weed control + fertilizer gave the greatest growth. Fertilizer alone did not increase growth at any site.

Non-OSU Link

43. Rose, R. and J.S. Ketchum. 2002. Interaction of vegetation control and fertilization on conifer species across the Pacific Northwest. Canadian-Journal-of-Forest-Research 32(1): 136-152.

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

Abstract: An experiment evaluating three levels of vegetation competition control (no control, 1.5 m2 of vegetation control, and 3.3 m2 of vegetation control), each with two fertilizer application treatments (fertilizer application at the time of planting with complete slow-release fertilizer (WoodaceReg. IBDU), or no fertilizer application), was installed at five sites. Two of these sites were planted with Douglas-fir

(Pseudotsuga menziesii) in the Oregon Coast Range, one with ponderosa pine (Pinus ponderosa) in eastern Washington, one with western hemlock (Tsuga heterophylla) in the coastal hemlock zone in Oregon, and one with coastal redwood (Sequoia sempervirens) in northern California, USA. At four of the five sites, mean stem volume, basal diameter, and height of seedlings increased significantly with increasing area of weed control, and the magnitude of difference between treatments increased with time. Fertilizer application significantly increased seedling size only at the two sites with adequate soil moisture; increases were marginally significant at a third. Response to fertilizer application was less than from weed control and impacted growth for only the first year, whereas the influence of weed control continued to influence growth the entire length of the study (4 years). Area of vegetation control and fertilizer application did not interact significantly at any site.

OSU Link
Non-OSU Link

44. Rose, R. and J.S. Ketchum. 2003. Interaction of initial seedling diameter, fertilization and weed control on Douglas-fir growth over the first four years after planting. Annals-of-Forest-Science 60(7): 625-635.

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

Abstract: Planting larger stock, fertilizer application and added years of weed control are often employed to increase growth rate of plantations. We evaluated these techniques using a replicated factorial study design repeated in two diverse locations in western Washington State, USA. Two different sizes of planting stock, NPK fertilizer application at planting and in the following year, and two or three years of weed control using herbicides were tested. No significant interactions among the treatment levels were found with all treatments influencing Douglas-fir (Pseudotsuga menziesii) growth in an additive manner. Fourth year stem volume gains were greatest from planting larger initial stock: planting seedlings 2 mm larger in basal diameter resulted in fourth-year stem volume gains of 35 and 43%. The fertilizer application treatments used produced early gains, but they were short lived. The third-year weed control treatment had no observable effect on fourth-year stem volume or on volume growth in years three or four.

OSU Link
Non-OSU Link

45. Rose, R., J.S. Ketchum and D.E. Hanson. 1999. Three-year survival and growth of Douglas-fir seedlings under various vegetation-free regimes. Forest-Science 45(1): 117-126.

Keywords: release treatments
chemical release
growth

tree morphology
tree/stand health
stand conditions

Abstract: Responses of Douglas-fir (Pseudotsuga menziesii) seedlings were studied for 3 yr (1993-96) following eight vegetation-control treatments in three western Oregon clearcuts. The objectives were to determine seedling growth response to different areas of spot vegetation control and to determine the relative influence of early woody and herbaceous competition on seedling growth. Herbicide treatment areas varied in size from those receiving no control to full control (9.3 msuperscript 2). Controlled areas were maintained free of herbaceous vegetation for 2 yr and all woody vegetation was controlled for 3 yr. Two additional treatments, complete control of woody vegetation only and complete control of herbaceous vegetation only, were also examined. On two sites (Summit and Marcola), seedling growth parameters were maximized at or near full vegetation control with a tree spacing of 3 m x 3 m. On the third site (Pedee), maximum growth response occurred between 5 and 6 msuperscript 2 of control. Herbaceous vegetation control resulted in increased seedling growth at all sites while woody vegetation control yielded increased seedling growth only at the Pedee site. Cumulative 3 yr herbaceous cover accounted for 68% and 41% of the variability in stem volume at Summit and Marcola, respectively. Adding cumulative 3 yr woody cover to the model accounted for an additional 18% and 49% of the variability in stem volume at Summit and Marcola, respectively. At Pedee, neither herbaceous nor woody cover significantly influenced 3 yr stem volume, suggesting that factors other than vegetation cover were responsible for differences measured.

OSU Link
Non-OSU Link

46. Roth, B.E. and M. Newton. 1996a. Role of Lammas growth in recovery of Douglas-fir seedlings from deer browsing, as influenced by weed control, fertilization, and seed source. Canadian-Journal-of-Forest-Research 26(6): 936-944.

Keywords: planting operations
release treatments
chemical release
fertilization
tree/stand protection
growth
tree/stand health

Abstract: This study examined the effects of weed control, nitrogen fertilizer, and seed source on Lammas growth (second flushing) in Douglas fir (Pseudotsuga menziesii) seedlings on 3 sites in the Oregon Coast Range. It also assessed the occurrence of deer (Odocoileushemionus columbianus) browsing as related to these silvicultural treatments and examined the role of Lammas growth in seedling recovery and escape from deer browsing. Seedlings (averaging 54 cm tall, 6 mm diameter at 15 cm above ground) were planted in February 1992, and measured at the time of planting and in autumn 1992 and 1993. Complete weed control with hexazinone (annual applications + spot treatments as necessary) significantly increased the occurrence of Lammas growth. Nitrogen fertilizer (220 kg/ha urea) decreased Lammas growth significantly, at least in part by favouring weed growth. Lammas growth was not influenced by seed source (genetically improved from a seed orchard or local wild stock). The increased Lammas growth associated with weed control mediated the effects of deer browsing.

Although multiple-year browsing occurred more commonly on weeded than unweeded seedlings, after two growing seasons weeded seedlings that were repeatedly browsed were twice as large as unbrowsed, unweeded seedlings. On one site, stock of wild origin was more heavily browsed than that from a seed orchard.

OSU Link
Non-OSU Link

47. Roth, B.E. and M. Newton. 1996b. Survival and growth of Douglas-fir relating to weeding, fertilization, and seed source. Western-Journal-of-Applied-Forestry 11(2): 62-69.

Keywords: planting operations
fertilization
release treatments
chemical release
growth
tree physiology
tree morphology
tree/stand health

Abstract: The goal of this study was to quantitatively evaluate the individual and interactive effects of weed control, nitrogen fertilizer, and seed source on Douglas fir (Pseudotsuga menziesii) survival and growth in plantations on a range of sites and growing conditions in western Oregon. Weed control with hexazinone (broadcast application after planting) was the dominant factor influencing seedling survival and growth and accounted for 49% of the explained variation in seedling volume after 2 years. Nitrogen fertilizer (urea) had no effect when used in conjunction with weed control and a negative effect when used without weed control. Seedlings from a seed orchard source were significantly larger in diameter and volume than those from a wild local source after two growing seasons, but second-year heights were similar for the two seedling types. Initial seedling size was positively correlated with growth rate.

OSU Link
Non-OSU Link

48. Stapanian, M.A. and D.W. Shea. 1986. Lignosulfonates: effects on plant growth and survival and migration through the soil profile. International-Journal-of-Environmental-Studies 27(2): 45-56.

Keywords: release treatments
chemical release
growth
stand conditions

Abstract: The effects of a refined lignosulfonate product obtained from the sulfite pulping process, on growth and survival of plants were investigated. After applications of 0, 7500, 15 000 and 22 500 cmsuperscript 3/msuperscript 2 to plots within a forest plantation, the following were monitored: (1) live aboveground biomass of vascular plants, (2) growth of Douglas fir (Pseudotsuga menziesii) and (3) lignosulfonate migration through the soil profile. Biomass of woody vegetation was not affected, and

that of herbaceous plants was significantly decreased only at the two greatest application rates. Growth of the Douglas fir trees was not significantly affected. Lignosulfonates disappeared from the soil profile at the same rate regardless of initial concentration. Although it is not practical to use this material asa herbicide in western Washington, land application of lignosulfonates may be environmentally more attractive than traditional disposal methods.

OSU Link
Non-OSU Link

49. Sumaryono and G. Crabtree. 1989. Differential tolerance of woody nursery crop seedlings to napropamide. Weed-Technology 3(4): 584-589.

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

Abstract: Field studies at Corvallis, Oregon and greenhouse experiments were conducted to evaluate the tolerance to napropamide of black locust
(Robinia pseudoacacia), honeylocust (Gleditsia triacanthos), apple, Douglas fir (Pseudotsuga menziesii), ponderosa pine (Pinusponderosa) and Japanese black pine (Pinus thunbergii) in the seedling stage. Deciduous species were more susceptible to napropamide than coniferous species. Apple had the slowest seed germination and root development and was more susceptible. The deciduous species had more secondary roots in the shallow soil layer which contained most of the herbicide than the coniferous species. The roots of all woody species tested in vitro were inhibited significantly by contact with the herbicide, but only shoot growth of apple and black locust was inhibited. Injury to woody nursery crop seedlings may be avoided by delaying herbicide application.

OSU Link
Non-OSU Link

50. 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

51. 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

52. Walstad, J.D., J.D. Brodie, B.C. McGinley and C.A. Roberts. 1986. Silvicultural value of chemical brush control in the management of Douglas-fir. Western-Journal-of-Applied-Forestry 1(3): 69-73.

Keywords: release treatments
chemical release
growth
yield
economics

Abstract: Retrospective analyses were made of 3 Douglas fir plantations (age 12-39 yr) in western Oregon and Washington, to determine the long-term silvicultural effects and economic value of chemical brush control 10-25 yr earlier. Stocking and growth of Douglas fir were significantly greater on areas that received at least one aerial application of 2,4-D or 2,4,5-T than on untreated areas. On two sites, invading Alnus rubra virtually excluded Douglas fir in the absence of brush control. On the third site, Ceanothus velutinus var. laevigatusreduced Douglas fir stocking and diam. growth on untreated

areas. On all three sites, projections of mature yield and economic returns based on current stand conditions indicated substantial benefits for areas where brush control treatments were applied.

OSU Link
Non-OSU Link

53. White, D.E. and M. Newton. 1983. Effects of glyphosate and two formulation of hexazinone in young conifer plantations. Proceedings-of-the-Western-Society-of-Weed-Science (Vol.36): 54-56.

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

Abstract: In April 1979, 1 month after transplanting 3-yr-old Douglas fir (Pseudotsuga menziesii), hexazinone liquid and solid formulations at 0, 1.11, 1.68 or 2.23 kg/ha were applied to the plots separately and in combination with 0 or 0.62 kg glyphosate/ha. There was no significant difference between formulations of hexazinone in effect on the herbaceous community which was dominated by Arrhenatherum elatius, Holcus lanatus, Elymus glaucus and Rubus ursinus. However, addition of glyphosate increased the mean weed-free condition from 67.25 to 85.1%. At the same time, in glyphosate-treated plots, mean ht. of 4th yr trees was 149.9 cm compared with 162.6 cm in hexazinone-only plots. Survival of 2nd yr trees was also affected.

OSU Link
Non-OSU Link

54. White, D.E. and M. Newton. 1989. Competitive interactions of whiteleaf manzanita, herbs, Douglas-fir, and ponderosa pine in southwest Oregon. Canadian-Journal-of-Forest-Research 19(2): 232-238.

Keywords: release treatments
chemical release
growth
stand conditions

Abstract: Whiteleaf manzanita (Arctostaphylos viscida) was established on 3 sites in Oregon in 1983 at densities ranging from 0 to 27 000 seedlings/ha in 2-yr-old mixed Douglas fir (Pseudotsuga menziesii)/ponderosa pine (Pinus ponderosa) stands. Invading herbs were controlled by spraying all plots with glyphosate and hexazinone, except one at each site at the 13 500 density. Intraspecific manzanita competition reduced individual shrub basal diameter, leaf area, biomass, and canopy volume by the 3rd year of the study. Stem volume of 5-yr-old conifers was reduced in relation to manzanita density, biomass, LAI, and canopy cover. The presence of herbaceous vegetation reduced both manzanita and conifer growth by the 3rd year.

OSU Link
Non-OSU Link

55. White, D.E. and M. Newton. 1990. Herbaceous weed control in young conifer plantations with formulations of nitrogen and simazine. Canadian-Journal-of-Forest-Research 20(11): 1685-1689.

Keywords: release treatments
chemical release
fertilization
stand conditions
tree/stand health
growth

Abstract: Weed control and second year survival and growth of newly planted 2+0 Douglas fir (Pseudotsuga menziesii) and 2+0 noble fir (Abies procera) seedlings were measured at 3 sites in Oregon after application of herbicide and fertilizer in a replicated complete factorial experiment with 4 levels of simazine (0, 2.2, 4.4, 8.8 kg/ha), 3 levels of N (0, 110, 220 kg/ha), 2 types of N (urea prill; urea + trimamino-s-triazine (TST) prill) and 2 kinds of formulations (co-granular prill of simazine + nitrogen; nitrogen prill followed by liquidsimazine). For the first growing season, total weed and grass control increased with increasing simazine rates. Total weed control was better when urea + TST, rather than urea alone, was applied in conjunction with simazine. Formulation and nitrogen rate were not significant. After plot treatment with 1.1 kg liquid hexazinone/ha at the beginning of the second growing season, Douglas fir survival decreased as the rate of urea alone increased; survival decreased with little or no weed control and remained constant or increased with good weed control as the rate of urea + TST increased. Noble fir height and diameter, and Douglas fir diameter, decreased with poor weed control, but increased at least to the levels of untreated seedlings with good weed control. Noble fir diameter responded positively to added nitrogen. Although simazine may be toxic to first year conifers, this study suggests that more complete weed control in conjunction with fertilization may benefit young conifer plantations.

OSU Link
Non-OSU Link

56. White, D.E., L. Witherspoon-Joos and M. Newton. 1990. Herbaceous weed control in conifer plantations with hexazinone and nitrogen formulations. New-Forests 4(2): 97-105.

Keywords: release treatments
chemical release
fertilization
stand conditions
growth
tree/stand health

Abstract: In order to determine if herbicide efficacy is affected by nitrogen fertilizer, and to examine the effects of treatments on growth and survival of newly-planted 2-year-old Douglas fir (Pseudotsuga menziesii) and 3-year-old noble fir (Abies procera), the influence of different nitrogen fertilizers applied in different combinations with hexazinone formulations were evaluated on three herbaceous weed communities in Oregon. Field studies comparing three application methods in conifer plantations showed greatest reduction in total weed cover with a co-granular formulation of hexazinone and the slow-release nitrogen fertilizer triamino-s-triazine (TST). Slightly less control was achieved with separate applications of liquid hexazinone and TST granules, and poorest control with

granular urea followed by liquidhexazinone. Weed control increased with an increase in hexazinone rate. Statistical analysis of the effect on conifers showed that the highest hexazinone rate significantly increased survival of noble fir, stem diameter of both noble fir and Douglas fir, and that the highest nitrogen rate significantly reduced survival of both species but did not affect stem diameter. Survival of noble fir and diameter of both noble fir and Douglas fir were significantly increased where a co-granular formulation of hexazinone and TST granules was used.

OSU Link
Non-OSU Link

57. 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.

OSU Link
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