Chemical Preparation

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.

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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.

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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.

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4. Feller, M.C. 1990. Herbicide application followed by prescribed fire to convert a brushfield into a conifer plantation in south coastal B.C.: a combination of the initial effects of two treatments. B.C. Ministry of Forests FRDA Report 146. 40 p.

Keywords: site preparation
chemical preparation
prescribed fire
growth

tree/stand health
soil properties
stand conditions

Abstract: A field study was carried out in Pseudotsuga menziesii stands in British Columbia, Canada, to investigate the effects on vegetation of glyphosate applications in September 1987 or July 1988, followed by burning in October 1988. Results did only show slight differences between treatments.

[**OSU Link**]
[**Non-OSU Link**]

5. Ketchum, J.S., R. Rose and B. Kelpsas. 1999. Weed control in spring and summer after fall application of sulfometuron. Western Journal of Applied Forestry 14:80-85.

Keywords: site preparation
mechanical preparation
chemical preparation
stand conditions

Abstract: This study tested the residual spring and summer efficacy of sulfometuron after applications in the autumn in second growth Douglas fir (Pseudotsuga menziesii) with red alder (Alnus rubra) and bigleaf maple (Acer macrophyllum) forest sites in the central Coast Range, Oregon, USA, which had been harvested in the summer. Sulfometuron alone (S) and sulfometuron plus imazapyr and glyphosate (SIG) were applied to vegetation on mechanically scarified sites and unscarified sites. The applications were replicated each month throughout autumn 1994. Vegetation cover was assessed in mid-June and mid-August 1995. The SIG treatment gave better control of vegetation than the S treatment, although cover was significantly lower for both herbicide treatments (9% to 54% for summed cover) compared to the control site (64% to 104% for summed cover). On scarified sites, the month of application, early or late autumn, did not significantly influence the efficacy of either treatment. On unscarified sites, however, applications of the SIG treatment later in autumn were less effective than early autumn treatments. Results suggest that autumn applications of sulfometuron are still effective in spring and may eliminate the need to treat sites again in the spring in order to achieve effective weed control.

[**OSU Link**]
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6. 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

7. 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

8. Knowe, S.A., W.I. Stein and L.J. Shainsky. 1997. Predicting growth response of shrubs to clear-cutting and site preparation in coastal Oregon forests. Canadian-Journal-of-Forest-Research 27(2): 217-226.

Keywords: planting operations
site preparation
chemical preparation
mechanical preparation
prescribed fire
stand conditions

Abstract: Cover-projection models were developed based on algebraic difference formulations of an exponential-power function to describe shrub recovery and development patterns following clear cutting, site preparation and Douglas fir (Pseudotsuga menziesii) planting at 4 sites in the Siuslaw National Forest, Oregon. The sites formed part of the Coastal Site Preparation Study initiated in 1980, in which the effects were tested of 6 treatments on shrub growth patterns. Treatments were: none other than scalping a 30-cm spot when each 2-0 seedling was planted (control); spot clearing by cutting to 15 cm height all woody vegetation within a 1.2 m radius of the seedling; spraying with glyphosate (2.52 kg a.e./ha) in early autumn 1980; broadcasting burning slash in midsummer 1980; manually slashing all woody vegetation in June 1980 and broadcast burning later in the summer; and spraying with picloram + 2,4-D (Tordon 101) in May or June 1980 (at 1.49 + 5.97 kg a.e./ha) and broadcast burning in the summer. Results on the development of Douglas fir and associated vegetation to age 10 yr have already been reported for this study (Stein (1995) Research Paper - Pacific Northwest Research Station, USDA Forest Service, No. PNW-RP-473; Knowe & Stein (1995) Canadian Journal of Forest Research 25 (9) 1538-1547). The shrub cover-projection models were developed by incorporating indicator variables into the model rate and shape parameters for the recovery of 3 specific shrubs (salal, Gaultheria shallon; thimbleberry, Rubus parviflorus; and salmonberry, Rubus spectabilis), and all shrubs. For salal, the shape parameter included an adjustment for burning treatments that delayed maximum cover by several years in comparison with unburned treatments. The rate parameter in the thimbleberry model was adjusted for burning treatments; maximum cover occurred about 2 yr earlier in burned than in unburned treatments. Both rate and shape parameters in the salmonberry model were adjusted for burning treatments; delayed established but increased growth rate and less salmonberry cover are characteristic of burned treatments compared with the unburned treatments. The rate and shape parameters in the model for the shrub group included adjustments for burning treatments. Overstorey removal fostered shrub development, whereas site preparation treatments slowed and curtailed it. The final cover-projection models accounted for 68-92% of the total variation in cover, with the adjustments for burning accounting for 1.5-3.3% of the variation. The predicted growth patterns are consistent with trends in site occupancy and published autecological characteristics.

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9. 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.

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Non-OSU Link

10. 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

11. Stein, W.I. 1997. Ten-year survival and growth of planted Douglas-fir and western redcedar after seven site-preparation treatments. Western-Journal-of-Applied-Forestry 12(3): 74-80.

Keywords: site preparation
chemical preparation
prescribed fire
tree/stand protection
growth
tree/stand health
stand conditions

Abstract: Western redcedar (Thuja plicata) and Douglas fir (Pseudotsuga menziesii) were planted together after applying seven site-preparation methods at one cable-logged site in the Oregon Coast Ranges. The treatments, applied during 1980, were: untreated control; spot clear by cutting; aerial spraying with glyphosate; broadcast burning; slash and burn; spray with Tordon 101 (picloram + 2,4-D) and burn; and burn and sow grass. Planting was done in early 1991, and vegetation and trees were measured periodically to 1990. Survival and growth of cedar were markedly less than Douglas fir on this favourable site where both species were components of the original stand. Repeated browsing severely impeded the cedar. Site preparation by broadcast burning generally yielded the best results, but sowing grass after broadcast burning produced Douglas fir responses similar to those for no site preparation. Where grass was sown, herbaceous cover was more abundant and taller, salmonberry (Rubus spectabilis) differed little in density but was slightly taller, and development of red alder

(Alnus rubra) was delayed. Red alder is currently overtopping conifers in all treatments, and release is needed to ensure sufficient conifer survival.

OSU Link
Non-OSU Link

12. Tesch, S.D. and S.D. Hobbs. 1989. Impact of shrub sprout competition on Douglas-fir seedling development. Western-Journal-of-Applied-Forestry 4(3): 89-92.

Keywords: site preparation
chemical preparation
growth

Abstract: In 1983, 1+0 container-grown Douglas fir (Pseudotsuga menziesii) seedlings were planted on a site in Oregon, USA, subject to summer drought under 3 amounts of sprout competition from greenleaf manzanita (Arctostaphylos patula) and canyon live oak (Quercus chrysolepis). Seedlings were planted among 0.25-m herbicide-killed sprouts, mature shrubs slashed just before planting, or 1-m tall sprouts, which represent an increasing order of competition. After 3 yr, Douglas fir survival did not differ significantly between treatments. However, percent cover of competing shrubs was negatively correlated with conifer root and shoot biomass. Under the least competition, root biomass increased 25x and shoot biomass 103x over dry wt. at planting, but dry wt. in other treatments increased <5 times. Douglas fir seedling growth did not increase significantly following shrub removal when vigorous sprouting occurred during the first year. After 3 yr, however, competitor cover in the minimum-competition plots was less than 15%, and conifer biomass had increased exponentially.

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