FIFTH YEAR GROWTH RESPONSE OF DOUGLAS-FIR TO TWO YEARS OF SPOT WEED CONTROL AND CONTROLLING HERBACEOUS VERSUS WOODY WEEDS

Robin Rose[1], and J. Scott Ketchum[2]
1Department of Forest Science, Oregon State University, Forest Science Laboratory Corvallis, OR 97361. Tel: 541-737-6580 Fax: 541-737-5814 Email roser@fsl.orst.edu
2Department of Forest Science, Oregon State University

Introduction

Spot herbicide applications offer many advantages: It is helpful where aerial spray applications are unsuitable because of terrain, residual overstory, and neighbors. It applies less active ingredient over the landscape and in some cases can lower vegetation management costs. It can be applied to vegetation adjacent to crop trees but, where there are rare plant species or where species diversity is an issue, can leave the remainder of the vegetation untouched. From an operational perspective little is known about how the size of a spot herbicide application will affect Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) growth. For example, what is the optimum spot size to required to maximize growth, or how much growth is being sacrificed by applying a small spot versus applying a broadcast treatment across a plantation. There is a need to document growth differences associated with varying spot vegetation control.

Clearcuts in Oregon west-side forests are initially dominated by herbaceous vegetation, although woody species usually dominate sites within 5 years of harvest (Isaac 1940, Dryness 1973, Schoonmaker and McKee 1988). Traditionally, western foresters have ignored early herbaceous vegetation on harvested sites and have concentrated control efforts on woody vegetation. However, they are recognizing that early herbaceous control may increase seedling growth: for example, it has been shown to enhance the growth of loblolly pine (*Pinus taeda* L.) in the southeastern US (Cain 1991, Miller et al. 1991, Creighton et al. 1987). Several studies hint that such early herbaceous control may be equally important to establishment and growth of Douglas-fir in the Pacific Northwest (Petersen and Newton 1983, Cole and Newton 1987, Newton and Preest 1988, Wagner and Radosevich1989).

The objectives of this study were: determine the spot vegetation control area needed to maximize growth and determine the relative influence of early woody only and herbaceous only treatments on Douglas-fir growth in clearcuts of western Oregon and Washington.

Materials and Methods

The experimental design was repeated on two western Oregon sites near the towns of Summit and Marcola in 1992, and one western Washington site near Silver Lake in 1993. Each site was installed as a completely randomized design of 8 treatments on 24 plots such that each treatment was replicated three times per site. The perimeters of the sites were fenced to prevent confounding of results from deer damage. Each treatment plot was 0.045 ha in which 49 seedlings were planted at approximately 3m spacing and surrounded by a similarly spaced buffer strip of two tree rows. Experimental treatments consisted of six tree centered spot treatment sizes (0, 0.38m^2, 1.5m^2, 3.35m^2, 5.95m^2, and complete weed control), a herbaceous vegetation control only, and a woody vegetation control only treatment all applied in the spring the first two

Wagner, R.G. and D.G. Thompson (comp.). 1998. Third International Conference on Forest Vegetation Management: Popular summaries. Ont. Min. Nat. Resour., Ont. For. Res. Inst., For. Res. Info. Pap. No. 141.

years after planting. Additionally, all woody vegetation was controlled each year for the first three years in the spot treatments and the woody only treatments.

The planted seedlings were measured for stem caliper, and height each fall for 5 years. Conical stem volume for individual Douglas-fir seedlings was calculated as $\pi D^2H/12$ (cm^3) where D is diameter and H is seedling height in cm. Regression analysis was used to evaluate the influence of area of vegetation control on stem volume. Data for the herbaceous only, woody only, complete vegetation control and no herbicide treatments were analyzed as a 2 x 2 factorial design using Analysis of Variance. Plot means of fifth-year stem volume for Douglas-fir seedlings were analyzed as dependent variables with herbaceous and woody control as the main effects. The data from the three sites were analyzed independently on the assumption that site characteristics would influence seedling response. Means separations were performed using Fishers Protected LSD method.

Results and Discussion

Growth increased linearly with area of tree centered vegetation control at Summit and Silver Lake (Figure 1). At Marcola growth initially increased with area of control and leveled off at the greatest areas of vegetation control applied. An additional term in the regression model ($area^2$) resulted in a significantly better fit at Marcola. The results suggest that to maximize Douglas-fir growth, complete or near complete weed control is needed. Control areas of less than $6m^2$ will not maximize growth but may accomplish growth objectives when weighed against other management goals in some situations. However, more work is needed on how site quality may influence this response.

The influence of woody control only and herbaceous control only treatments differed by site (Figure 2). At no site was there a significant woody by herbaceous control interaction. At all three sites herbaceous control significantly increased Douglas-fir growth. The greatest gains were achieved at Summit with herbaceous only control resulting in a ~230% increase in stem volume over no herbaceous control, after 5 years. Early woody control had less of an influence on growth at all sites and only significantly influenced growth at the Summit site increasing growth by ~50%. Interestingly, in no other year up to year 5 had woody control significantly influenced growth at any of the sites. The herbicide used to create the herbaceous only treatments, hexazinone, has some pre-emergent activity on many of the woody species found on these sites. It is probable that the herbaceous treatments reduced woody cover in addition to herbaceous cover and it has taken 5 years for the woody component to recover enough to influence growth at Summit. A similar occurrence appears unlikely at Marcola but may be in the near future at Silver Lake. However, from an operational perspective few foresters are going to complain that their herbaceous treatments also help control woody germinants. The results of this study suggest that targeting the herbaceous component over the first two years of plantation establishment can greatly enhance the growth potential of a site for the first five years and likely further into the future of the stand.

Figure 1. Regression Curves for Stem Volume at Silver Lake, Marcola and Summit by area of spot vegetation control.

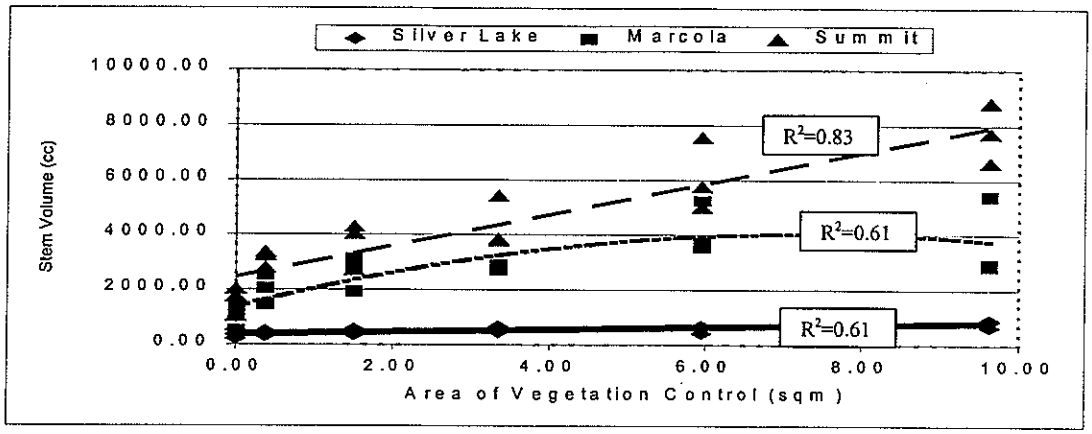
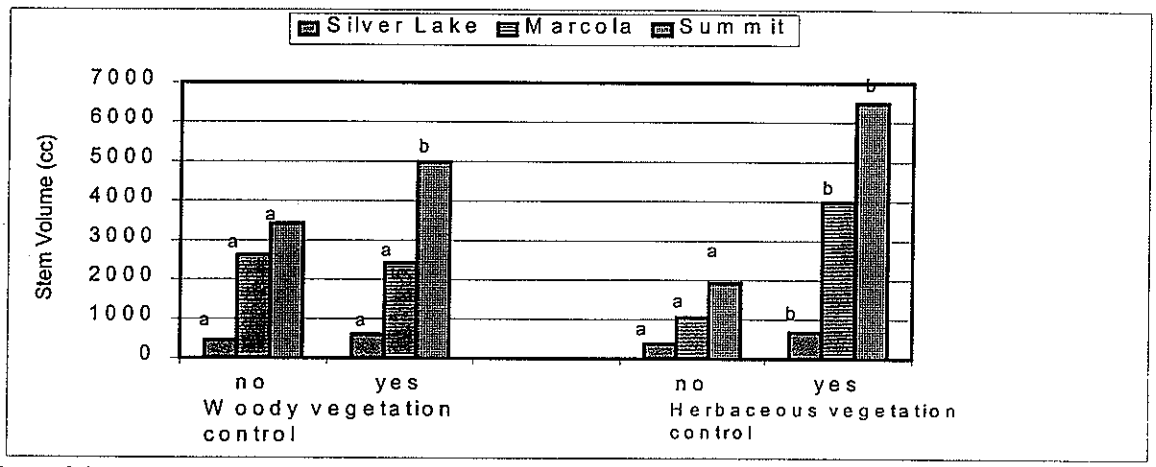


Figure 2. Mean Fifth Year stem Volume for Plots Receiving Herbaceous Only and Woody only Vegetation Control.[1]



[1]Bars of the same pattern (site) grouped by either woody vegetation control or herbaceous vegetation control , and associated with the same letter (a, or b) are not significantly different (α=0.05) using Fishers Protected LSD test.

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