Squamish Forest District

Extension Note

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Response of Douglas-Fir and Western Redcedar Seedlings to Different Intensities of Vegetation Management: Year 12 Results

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Prepared for the Transition Zone Working Group

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INTRODUCTION

For forest managers, predicting the response of seedlings to vegetation management, and understanding the persistence of this release for growth and yield, are issues of major interest. Deciding how to invest available resources so as to secure maximum growth from young plantations requires knowledge about site conditions and the expected effects of vegetation competition. The development of growth and yield data for establishing plantations in Coastal British Columbia suggests that growth rates during the first 10 years are highly influenced by local microclimate and site conditions, to the degree that merging early height growth curves with site index curves can be difficult. Growth curves offer the potential to project future growth and would help the plantation manager in making decisions concerning the timing and application of vegetation management strategies.

This extension note briefly reviews the Year 12 results of a study on the south coast of British Columbia in which the response of Douglas-fir and western redcedar seedlings to different intensities of vegetation management are being monitored.

OBJECTIVES

The study has been examining the effect of different intensities of vegetation management on height-age and diameter relationships of coastal Douglas-fir (Fdc) and western redcedar (Cw).

METHODS

The trial is located at Ring Creek, northwest of the town of Squamish, at 350 m elevation in site series 05 of the Dry Maritime subzone of the Coastal Western Hemlock biogeoclimatic zone (CWHdm).

Opening 92G075-69 was a stand conversion project from alder to conifer. It was prescribe burned in 1986 and operationally planted in the spring of 1987 with 2+0 bareroot stock.

Three vegetation control treatments were applied after broadcast burning, as shown in Table 1. Treatments were not replicated. The Herbicide treatment involved aerial application of Vision at 1.78 kg ai/ha during the third growing season. Complete vegetation removal involved manual brushing as well as backpack-applied Vision, as shown in Table 2. No treatments were applied in the Control.

Measurements were carried out at ages 1, 3, 5, 7, 11, and 12. Root collar diameters for Years 11 and 12 were imputed from 30-cm heights. Vegetation assessments were not conducted regularly. In Year 10, the Control plot had a mixture of red alder and some thimbleberry and bracken. In comparison to the other treatments, the Herbicide plot was quite open, with few shrubs. The Complete treatment remained surprisingly clear of vegetation except for scattered herbs. The adjacent unburned area was dominated by fireweed and bracken fern.

RESULTS AND DISCUSSION

For both species, the trend was consistent: the best growth occurred with the Complete treatment (Table 3).

Analysis of Year 7 results indicated that large, statistically significant differences existed

Table 1. Treatments following broadcast burning, and sample sizes.

Treatment	Species	Seedlings (no.)	Vegetation management
Control	Fdc	36	Untreated.
	Cw	28	
Herbicide	Fdc	31	Aerial spray with Vision.
	Cw	35	
Complete	Fdc	31	Aerial spray with Vision, several brushings.
	Cw	26	

between all treatments for total height and diameter for each species. By Year 12, treatment differences were significantly different for height and diameter, but no significant differences occurred in height between the Herbicide and the Control plots for either Fdc or Cw. For the most part, the treatment differences evident at Year 7 persisted through to Year 12, with incremental growth remaining variable in the Cw treatments but becoming similar between treatments for the Fdc (Figure 1 and Figure 2). Although the treatments diverged for Cw, by Year 12 the trees were predominantly above the potentially competing vegetation, and no longer reflect the direct influence of vegetation-management practices.

Vegetation management has had greater effects on the growth of Cw than of Fdc. At Year 12, the height growth of the Cw in Control and Herbicide plots was delayed four years compared to the Complete plots. Height growth of the Complete Fdc was only about a year more advanced than the other treatments. Root-collar diameter growth of Cw in the Complete treatment was nearly 6 years more advanced than other treatments. The indication that height growth responded to Herbicide treatment in Year 3 is only slight. Perhaps the Herbicide results would have been better if the treatment had been done earlier than the third growing season, before the onset of competition. The height growth results are comparable to Knowe's (1994) results with Fdc in Oregon.

The height growth characteristics for Cw differed from Fdc and seemed to be more sensitive to treatment effects. The data indicate that, on this site, Cw can have height increments greater than Fdc. However, maintaining these growth rates requires maintenance of a competition-free environment. Cw does not have any preformed growth. All of its growth is "free" and thus depends on the current conditions, hence its sensitivity to plantation conditions. The broadcast burn that occurred before the trial treatments may have served as adequate vegetation management for Fdc at this site.

For Fdc, there were no differences in height of dominant trees regardless of treatment; however, for Cw, strong differences persisted among treatments.

Regardless of the method of calculating site index, site index estimates for Fdc are similar between the different

Table 2. Schedule of the Complete treatment. Vegetation removal used backpack spray and manual methods.

Age (y)	Year	Activity
0	Spring 1987	Planted, vegetation removal
1	Fall 1987	Vegetation removal
2	1988	Vegetation removal
3	Spring 1989	Vegetation removal
3	Fall 1989	Aerial spray, vegetation removal
4	1990	Vegetation removal
5	Spring 1991	Vegetation removal
6	1992	Vegetation removal

treatments within the 60-to-180-cm range at 50 years depending on the method of estimating site index. For Cw the site index spread is >600 cm at 50 years. The diverging growth rates among treatments suggest that vegetation management has altered site index for Cw.

Not only does elimination of vegetation appear to affect growth significantly, but it also appears to affect a number of other features related to crown development, and site features. Trees in the Complete vegetation removal plots were not only the largest, but had the widest and thickest crowns. Trees in the other treatments had smaller crowns and thinner canopies. In the untreated Control, 3-m-high bracken fern was observed. In the Complete treatment, vegetation was sparse except for mosses, and differences in humus depth and form occurred among treatments.

CONCLUSIONS

Year 12 growth results confirms the superiority of Complete vegetation removal in enhancing the growth of both Fdc and Cw. Complete removal of vegetation provided a four-year height growth advantage for Cw and a one-year advantage for Fdc. Although height growth curves for Fdc are similar in shape regardless of the intensity of vegetation management, height growth curves for Cw are highly dependent on the intensity of vegetation management. Unlike height growth, diameter growth is highly dependent on the intensity of vegetation management and shows larger differences between treatments than height growth. The results suggest that although it may be possible to develop height growth projections that are independent of vegetation for Fdc, it is not feasible for Cw. The results also suggest that site index can be affected by vegetation competition. Even for Fdc, it is possible that predictive growth equations may not be suitable for the complete range of vegetation competition.

The results support the conventional wisdom that early and aggressive control of non-crop vegetation secures the largest growth response from seedlings.

Table 3. Summary of Year 12 results.

Species	Treatment	Height (cm)	Increment (cm)	Diameter (mm)	HD-Ratio
Fdc	Control	673	88	121	58
	Herbicide	729	95	140	54
	Complete	752	89	173	44
Cw	Control	350	35	52	70
	Herbicide	429	45	76	58
	Complete	658	44	121	68

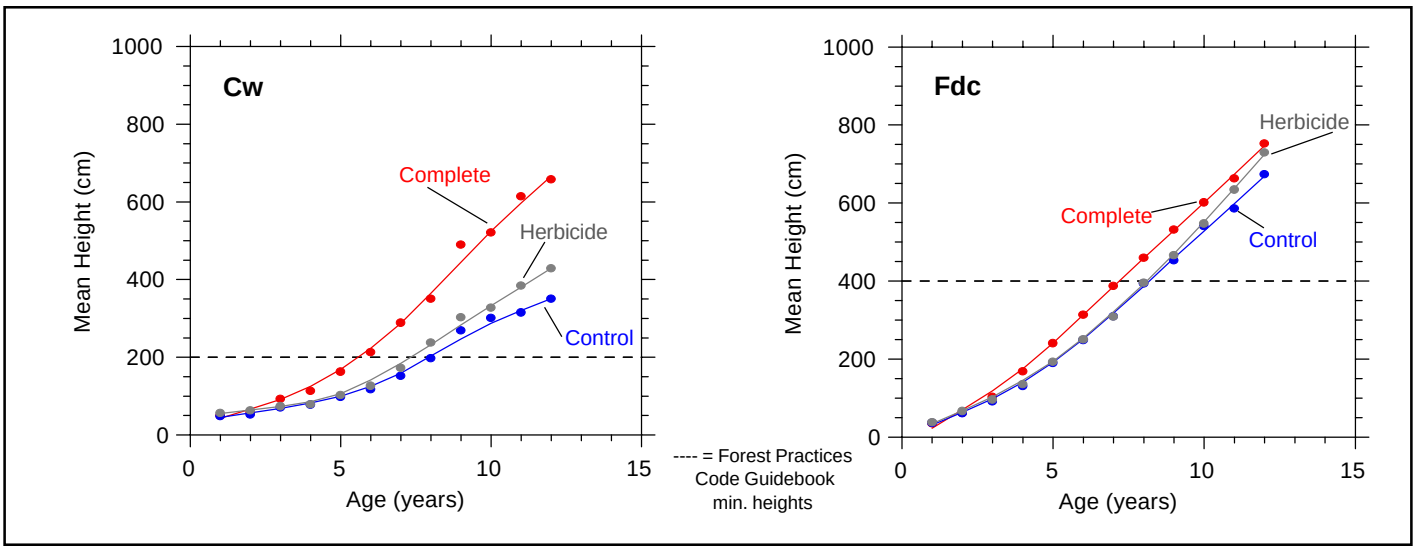

Figure 1. Mean height growth by age of Cw and Fdc.

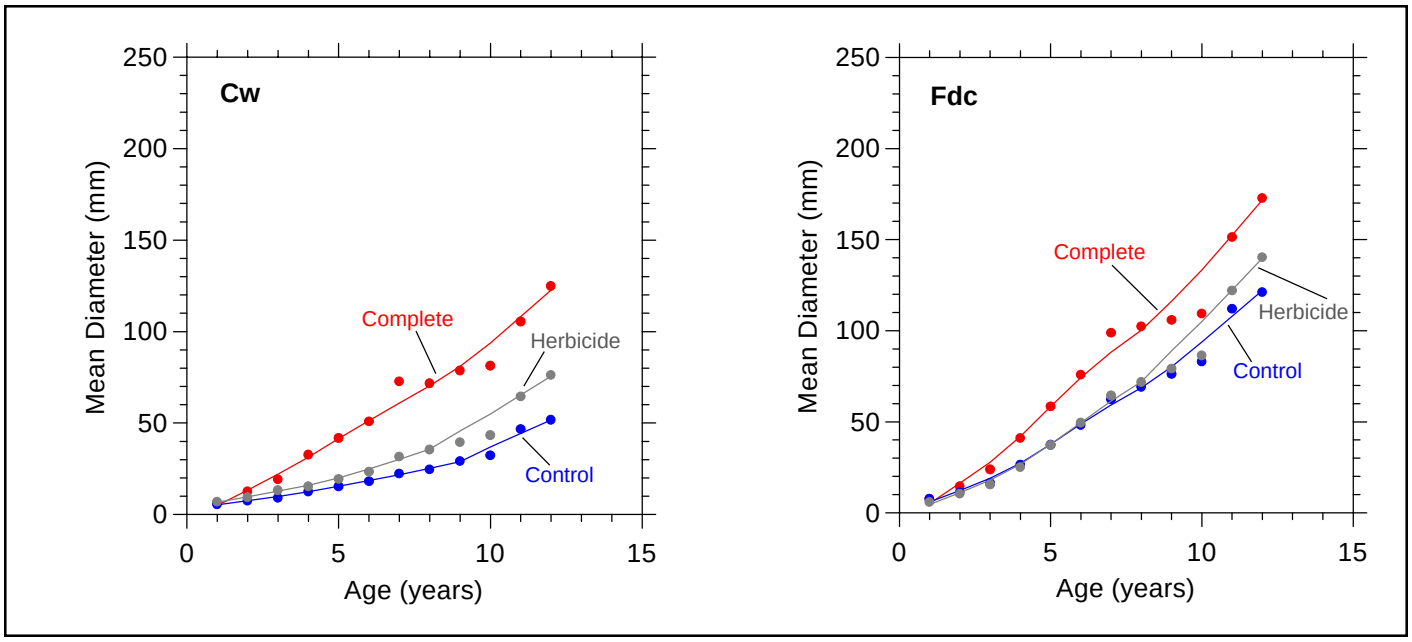

Figure 2. Diameter by age of Cw and Fdc.

KEYWORDS

Vegetation management, seedling response, plantation performance, Coast–Interior Transition, British Columbia.

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