

Testing forest vegetation management options in British Columbia

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INTRODUCTION

The mission of the forest vegetation management program is to ensure successful establishment and maintenance of many reforested areas to a free-growing stage while protecting other public forest resources in British Columbia. During 1996/97, approximately 72 529 ha of Crown forest land received brushing treatments to ensure establishment and growth of young seedlings at a cost of \$34.3 million. It is estimated that 80 000 ha of Crown forest land must be brushed annually in the province. Also, the demand for long-term information about issues, such as free-growing, green-up, growth and yield, biodiversity, stand dynamics, and stand structure, has increased substantially because of recent changes in provincial forestry legislation. Thus, ongoing testing and demonstration of promising vegetation management treatment options is needed to improve the development of cost-effective, environmentally sound, and socially acceptable vegetation management prescriptions.

Several experiment projects (EP) are under way to test promising integrated forest vegetation management options that focus on unique vegetation management objectives. We discuss five of these projects here.

EP 1135.01: Effectiveness of single and repeated manual cutting, and glyphosate for release of Engelmann spruce from a mixed shrub community in the ICHvk subzone

In 1991, a research trial consisting of eight treatments (see Table 1, page 21) was established at Soards Creek, near Mica, B.C. Treatments were replicated three times and assigned randomly to 30 × 30-m plots. Hand tools (e.g., grass whips, hand shears, machetes) were used to cut the vegetation to ground level. Glyphosate (2.1 kg ai/ha) was applied with a backpack sprayer. Within each treatment plot, 20 spruce seedlings were measured during the fall of each year. From 1992 to 1996, vegetation was assessed during the summer within 1.26 m radius plots centred on each of 10 crop seedlings in each treatment plot.

Results Repeated cutting for 3 years and glyphosate application resulted in reductions in total vegetation cover for 3 years. However, because of regrowth, no significant differences in total cover were detected among treatments. Treatments had a significant effect on vegetation height from 1993 to 1995.

Spruce survival 5 years after the treatments was high (> 85%) in both treated and untreated control plots (see Table 1, page 21). Glyphosate application and repeated cutting (annually or twice a year) resulted in spruce seedlings with significantly larger root collar diameter than untreated seedlings at the end of 5 years. Repeated summer cutting significantly increased fifth-year height over that of untreated seedlings and seedlings which only received a single summer manual treatment.

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EP 1135.03: A comparison of mulch mat and herbicide treatments for reducing grass competition in the IDFWW subzone

In 1993, a research trial consisting of five treatments (Table 1) was established in the Nahatlatch River drainage north of Boston Bar, B.C. Treatments were replicated four times and randomly assigned to 15 × 15-m plots. Herbicide treatments were applied before planting using a R+D backpack sprayer with a 4-m boom. Tredegar® mulch mats were installed with five metal staples.

Results Treatment with glyphosate and hexazinone effectively controlled the grass community for three growing seasons (Table 1). The percent cover of herbs and shrubs (e.g., *Mahonia aquifolium*) was reduced for only one growing season after herbicide treatment. The mat treatments significantly reduced herb cover for three growing seasons. In 1997, Douglas-fir diameter and height were significantly larger in both herbicide treatments (glyphosate and hexazinone) compared to the untreated control (Table 1). The seedling survival was also significantly better in both herbicide treatments compared to the untreated control.

TABLE 1 Means of fifth year (1997) Douglas-fir seedlings and fourth-year (1996) vegetation data

| Treatment | RCD ^a (mm) | Height (cm) | Survival (%) | Grasses % cover | Herbs % cover | Shrubs % cover |
|-----------------------------|--------------------------|----------------|-----------------|--------------------|------------------|-------------------|
| Untreated control | 7.4b | 41.7b | 57.5b | 11.6a | 35.9a | 18.1 |
| Glyphosate (2.1 kg ai/ha) | 12.7a | 62.8a | 95.0a | 4.3b | 25.8ab | 14.4 |
| Glyphosate (1.0 kg ai/ha) | 10.4ab | 53.7a | 92.5a | 6.0ab | 32.2ab | 17.3 |
| Hexazinone (2.1 kg ai/ha) | 14.6a | 69.1a | 80.0a | 4.5b | 22.7ab | 13.0 |
| Tredegar® mats (90 × 90 cm) | 9.9ab | 55.7a | 72.5ab | 7.3ab | 16.2b | 9.6 |

a RCD = root collar diameter.

EP 1135.05: Biological control of aspen and Sitka alder using the mycoherbicide *Chondrostereum purpureum* in the ICHmk and MSdm subzones

A research trial consisting of nine treatments (Table 2) was established in 1995 at two study sites to control aspen in ICHmk and Sitka alder in MSdm subzones. Treatments were replicated five times using a

TABLE 2 Treatments means for total aspen stems 3 years after treatment

| Treatment | Total aspen stems per hectare |
|--|-------------------------------|
| BB BC formulation × BC C.p. isolate (2139) | 15 701 |
| OB Ontario formulation × BC C.p. isolate (2139) | 24 669 |
| BO BC formulation × Ont. C.p. isolate (Jam6) | 27 855 |
| OO Ont. Formulation × Ont. C.p. isolate (Jam6) | 25 493 |
| O Ontario blank formulation | 19 721 |
| B BC blank formulation | 18 566 |
| R Release, herbicide (30% solution with mineral oil) | 18 604 |
| C Brushed only (cut stump) | 24 939 |
| U Untreated control (not brushed) | 13 874 |

randomized complete block design. All treatment plots (except uncut control) were manually brushed before the cut-stump application of treatments.

Results Three years after treatment total aspen stems, stem height, diameter, basal area, and stem volume were not significantly different between treatments (Table 2).

EP 1192: Experimental design Protocol for Long-term Operational Response Evaluations (EXPLORE)

This protocol provides a standard methodology for the establishment of operational experiments in silviculturally treated areas. It provides information on the effects of silvicultural practices on forest regeneration, stand dynamics, stand structure, community diversity, free-growing, green-up, and growth and yield. (See Working Paper 31, available online at: <http://www.for.gov.bc.ca/hfd/pubs/Docs/Wp/Wp31.htm>)

EP 1195: Remeasurement of vegetation management research trials 5+ years after treatment

Table 3 provides a list of trials established throughout the province to provide the long-term conifer and vegetation response data required to assess the effects of brushing activities on timber and non-timber resources.

TABLE 3 EP 1195 remeasurement sites

| Site name/BEC zone | Treatments | Reference |
|-----------------------------------|---|-----------------------------|
| Sunset Prairie site prep./ BWBS | Disked and undisked, with/without glyphosate | Working Paper No. 43 |
| Mackay River herbicide/ ESSF | Control, manual cutting, 2,4-D amine; 2,4-D ester, glyphosate | Research Report No. 11 |
| Redfish Creek manual brushing/ICH | Control, manual cuttings (1–3 times) | Extension Note No. 20 |
| Bush River/ ICH | Control, manual cutting, 2,4-D amine, glyphosate | Information Report BC-X-379 |
| Operational herbicide trials/SBS | Control/glyphosate | Extension Note (in prog.) |

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