Responses of lodgepole pine and the *Dry Alder* complex to manual cutting: A summary of 5 year PROBE results

About the *Dry Alder* complex

This community is dominated by Sitka alder, and willow is also common on some sites. It is most common in the MS zone, but it is also found in the ICH, SBS, upper IDF, and lower ESSF zones. Development of the *Dry Alder* complex is encouraged by ground disturbance during logging, mechanical site preparation, and burning treatments that create suitable seedbeds for alder or that stimulate existing root crowns to sprout. Development is hindered by severe fires or mechanical site preparation treatments that kill root systems. The *Dry Alder* complex reduces light availability to understory conifers, and may also compete for water on dry sites. However, alder benefits sites by fixing nitrogen, and may also, to some extent, protect understory seedlings from frost damage. (Full complex description)

Results

This section summarizes 5-year results for the fully replicated PROBE experiment that studies lodgepole pine and vegetation responses to manual cutting of the *Dry Alder* complex in 5-7 year-old plantations in the MS zone. Study sites were mesic, moderately sloping (20-35%), with north to north-easterly aspect. Alder cover averaged 22% at the time of treatment. (Full Methods description)

Table 1. A summary of 5-year lodgepole pine responses

Was there a significant[a] improvement in conifer performance 5 years after treatment?	
Survival	No
Basal stem diameter	No
Stem diameter increment	No
Height	No
Leader length	No
Height:diameter ratio	No

a Differences are significant where $p \leq 0.05$ according to ANOVA.

Lodgepole pine responses 5 years after brushing

- ***Survival*** - Lodgepole pine survival was not affected by manual cutting of the *Dry Alder* complex. Survival of the 10-12 year-old pine was excellent (≥96%) in both the treatment and control.
- ***Vigour*** - Lodgepole pine vigour was unaffected by the manual cutting treatment (Figure 1). Almost all pine were of good or moderate vigour.
- ***Stem diameter*** - Lodgepole pine stem diameter did not increase in response to the manual cutting treatment (Figure 2a). Pine were growing well regardless of brushing.

- ***Height*** - Lodgepole pine height did not increase in response to the manual cutting treatment (Figure 2b). Pine were growing well regardless of brushing.
- ***Height:diameter ratio*** - Lodepole pine height: diameter ratio was not affected by brushing (Figure 2c).

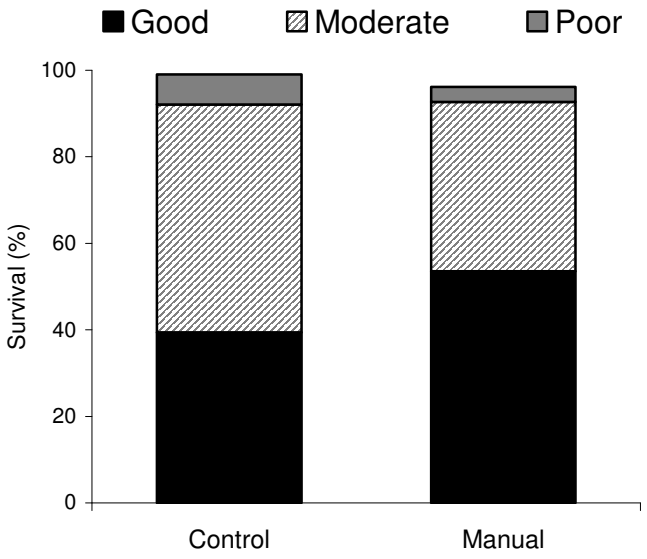

Figure 1. A comparison of lodgepole pine survival and vigour in the control and treatment 5 years after manual cutting of the *Dry Alder* complex.

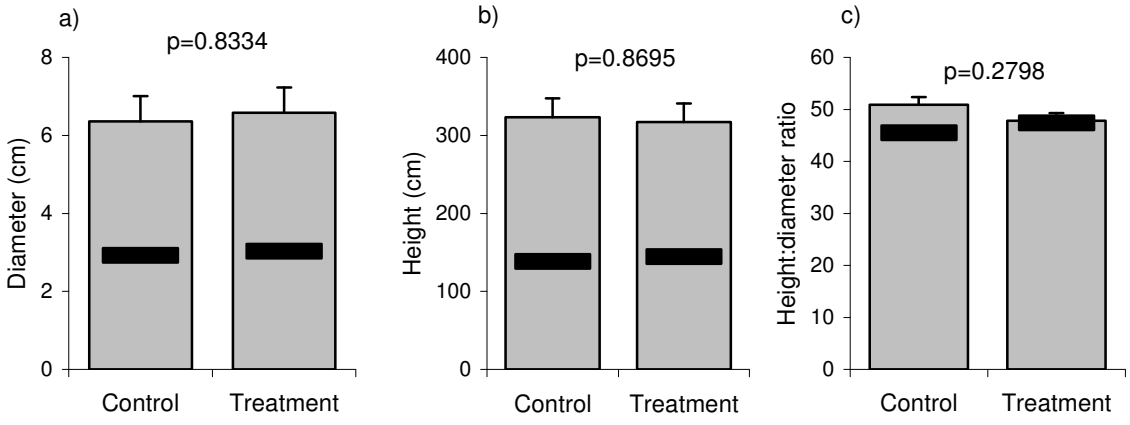

Figure 2. Comparisons of lodgepole pine (a) basal stem diameter, (b) height, and (c) height:diameter ratio in the control and treatment 5 years after manual cutting of the *Dry Alder* complex. Horizontal bands represent lodgepole pine size at the time of treatment. Error bars represent 1 standard error.

Vegetation responses

Table 2. Duration of vegetation responses

Years of significant[a] vegetation reduction	
Alder cover	None
Alder height	None
Herb cover	None
Herb height	None

a Differences are significant where p≤0.05 according to ANOVA.

Manual cutting immediately reduced alder height below that of lodgepole pine (Figure 3). However, because of the large amount of variability that existed between sites, the difference in alder height between the treatment and control was not statistically significant, even 1 year after cutting. There also were no significant treatment effects on herb height and cover during the 5 years following manual cutting. Richness and diversity of vascular plant species were not affected by the manual cutting treatment.

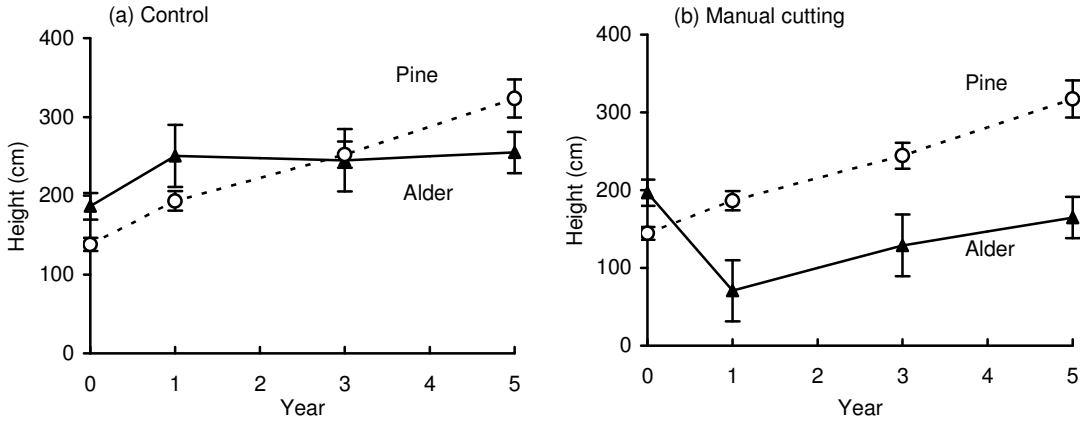

Figure 3. A comparison of average lodgepole pine and Sitka alder height profiles in (a) the control and (b) the manual cutting treatment.

Management interpretations

Survival – Our results suggest that it is not necessary to brush the *Dry Alder* complex to ensure good survival of lodgepole pine on mesic sites in the MS zone. Survival was excellent in both the treatment and the control.

Conifer growth – Lodgepole pine growing among the *Dry Alder* complex on mesic sites will grow well, and brushing is not required. In our study, 5 years after manual cutting treatments were applied, lodgepole pine stem diameter, height, and height:diameter ratio were equal in the treatment and control.

Effects of brushing on free-growing status – Manual cutting will immediately reduce alder height below that of lodgepole pine, but our results indicate that untreated pine will naturally outgrow alder by the time they are 8-10 years-old.

Treatment efficacy – A single manual cutting treatment caused no statistically significant reductions in height or cover of the *Dry Alder* community. However, the lack of significance is due mainly to variability among sites. As shown by Figure 3, alder in the manual cutting treatment had, on average, not quite regained its pre-treatment height after 5 years.

Richness and diversity – A single manual cutting treatment applied to the *Dry Alder* complex had no effect on richness or diversity of vascular plant species or vegetation structural groups. Full results are described in LMH 48 (Simard et al. 2001).

References

Simard, S.W., J.L. Heineman, W.J. Mather, D.L. Sachs, and A. Vyse. 2001. Effects of operational brushing on conifers and plant communities in the southern interior of British Columbia: Results from PROBE 1991-2000. Res. Br., Min. For., Victoria, B.C. Land Manage. Handb. No. 48.

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