

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

About the *Aspen* complex

This community is widespread throughout central and northern British Columbia. In the southern interior, it occurs most abundantly in the IDF, MS, and ICH zones. It is characterized by relatively pure stands of trembling aspen, but paper birch and black cottonwood may be present in lesser quantities. At high density and basal area, aspen can reduce light and soil moisture to levels that are limiting to conifer growth for at least part of the growing season. However, aspen also benefits conifers by taking up large amounts of nutrients and retaining them in the ecosystem. It also slows the spread of root diseases, provides protection from frost damage, and by increases windfirmness of neighbouring conifers. ([Full complex description](#))

Results

This section summarizes 5-year results from the fully replicated PROBE experiment that studies lodgepole pine and vegetation responses to manual cutting in 7-10 year-old stands in the IDF and MS zones. Study sites were mesic, moderately sloping (20-50%), with southerly or easterly aspect. Elevation ranged from 1220-1400 m, and broadleaf cover averaged 28% 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	Yes
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** - Manual cutting of the *Aspen* complex had no effect on lodgepole pine survival. Five years after treatment, when pine were 12-15 years-old, survival was excellent in both the treatment and control (average 99%).
- **Vigour** - Lodgepole pine vigour was declining slightly in the control relative to the treatment by the time trees were 12-15 years-old (Figure 1). This suggests survival could eventually decline somewhat in the control relative to the treatment.
- **Stem diameter** - Five years after manual cutting, lodgepole pine stem diameter was significantly larger in the treatment than the control (Figure 2a).
- **Height** - Manual cutting had no effect on lodgepole pine height within 5 years of treatment (Figure 2b).

- Height:diameter ratio** - Lodgepole pine height:diameter ratio was significantly lower in the treatment relative to the control 3 years after treatment, but the difference, although relatively large (63 in the control versus 50 in the treatment), was not significant 5 years after treatment (Figure 2c).

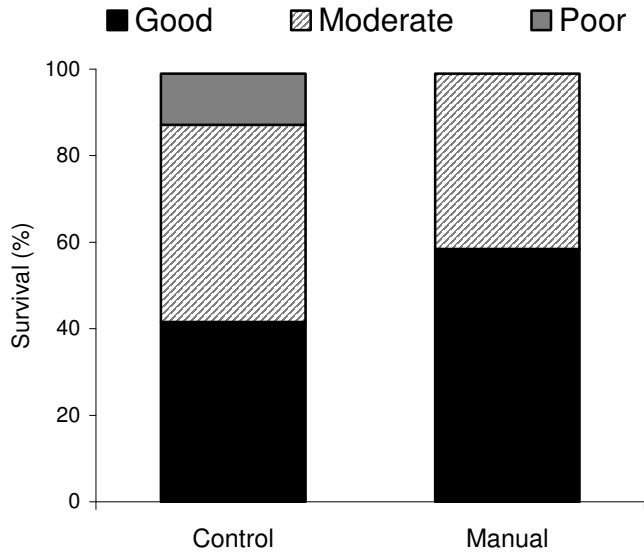


Figure 1. A comparison of lodgepole pine survival and vigour in the control and treatment 5 years after manual cutting.

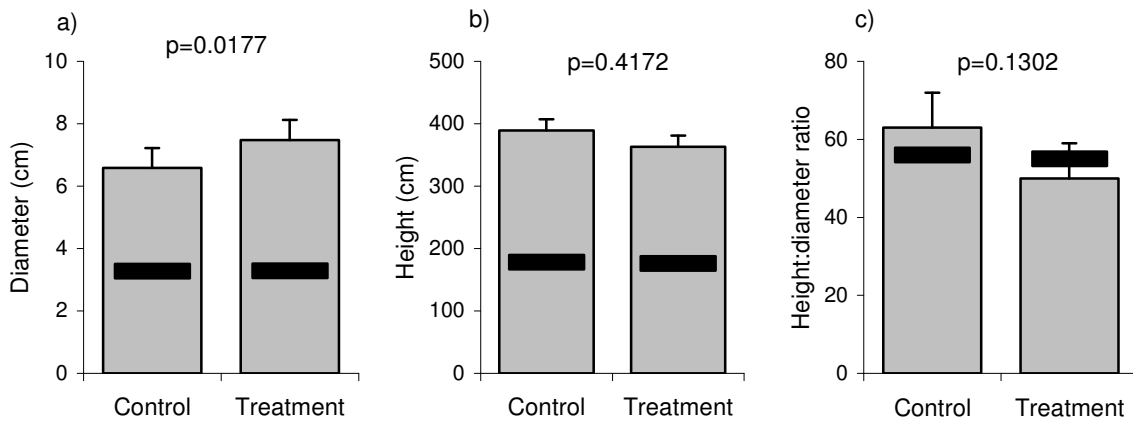


Figure 2. Comparisons of lodgepole pine (a) basal stem diameter, (b) height, and (c) height:diameter ratio in the control and treatment 5 years after manual cutting. Horizontal bands represent lodgepole pine size at the time of treatment. Error bars represent 1 standard error.

Vegetation responses

Table 2. Duration of vegetation responses

Years of significant ^a vegetation reduction	
Broadleaf cover	None
Broadleaf height	Years 3 - 10+

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

b Tall broadleaves are broadleaves at least as tall as the target conifer.

Manual cutting reduced mean broadleaf height for at least 5 years, which allowed the relatively fast growing lodgepole pine to maintain an ongoing height advantage (Figure 3). After 5 years, 66% of cut aspen had an average of two sprouts or suckers per stem, and they averaged 190 cm tall. There were no significant treatment effects on broadleaf cover because of sprout and sucker production. Other vegetation components (e.g., shrubs and herbs) were unaffected by the manual cutting treatment. There were no significant treatment effects on the richness or diversity of vascular plant species within 3 years of manual cutting.

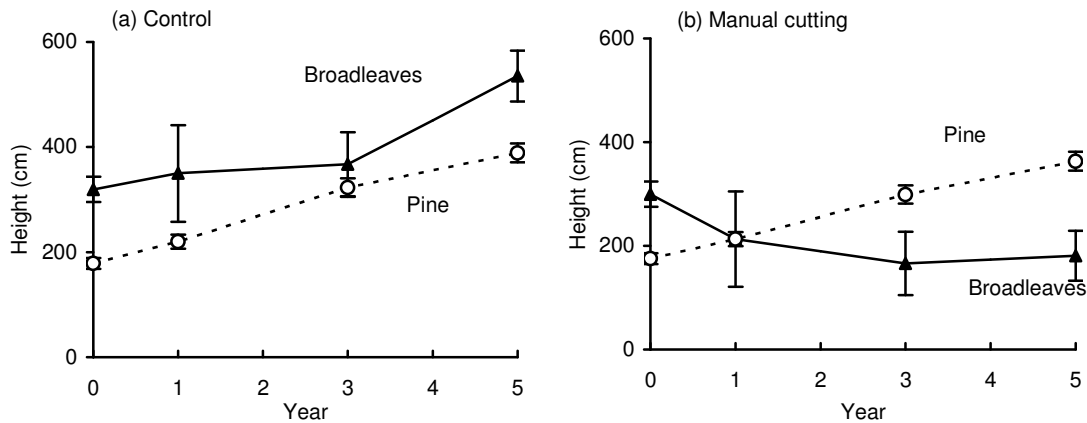


Figure 3. A comparison of average lodgepole pine and broadleaf height profiles in (a) the control and (b) the manual cutting treatment.

Management interpretations

Survival - The *Aspen* complex did not reduce lodgepole pine survival by age 12-15 years, but the presence of poor vigour stems in the control suggests that mortality could increase in the future. Further assessments are required to determine whether the competitive effects of this complex increase with age. This is particularly important with regard to lodgepole pine because of their low shade tolerance. A study in the Cariboo-Chilcotin found that the competitive effects of trembling aspen on lodgepole pine increased as stands aged from 7-12 years-old to 15-19 years-old (Newsome et al. 2003).

Conifer growth - Our results suggest that competition from the *Aspen* complex is intense enough in 7-10 year old lodgepole pine stands that growth will improve as a result of manual cutting. In this study, diameter increased within 5 years of manual cutting, but height was unaffected. Differences in height:diameter ratio were quite large (although statistically insignificant) by the time pine were 12-15 years-old, which suggests that control pine were becoming spindly as a result of competition for light.

Treatment efficacy – A single manual cutting treatment significantly reduced the height of the *Aspen* complex for at least 5 years. After 5 years, height of treated aspen was approximately one-third that of control aspen. Aspen initially produced an average of 4 suckers of sprouts per cut stump. After 5 years, this number had declined to 2 stems per stump, with an average height of 190 cm.

Richness and diversity - Manual cutting applied to the *Aspen* complex did not affect species richness or species diversity within 3 years of treatment. Full results are described in [LMH 48 \(Simard et al. 2001\)](#).

References

Newsome, T., J.L. Heineman, A. Nemeč. 2003. Competitive effects of trembling aspen on lodgepole pine performance in the SBS and IDF zones of the Cariboo-Chilcotin region of south-central British Columbia. Technical Report 005, BC Min. For., Victoria, B.C.

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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