CENTRE FOR ENHANCED FOREST MANAGEMENT

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The impact of cone numbers and slash load on the natural regeneration of lodgpole pine on high elevation sites

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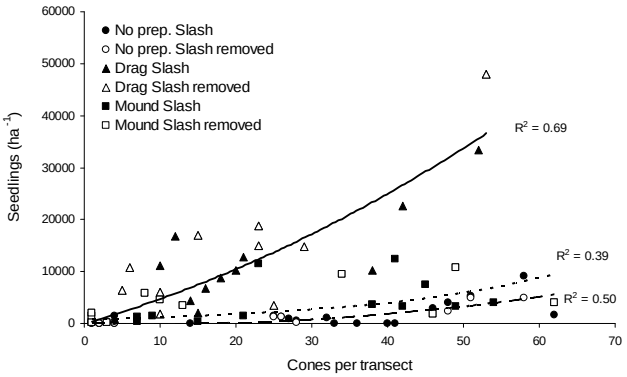
Two harvesting methods are currently used in clearcut silvicultural systems in high elevation lodgepole pine stands in Alberta; full-tree and cut-to-length harvesting. Cut-to-length harvesting leaves most of the slash and cones in the cutblocks, while full-tree harvesting removes much of the slash and cones from the site. However it is not known whether the differences in cone numbers and slash loads will affect the density and performance of regenerating pine seedlings or whether other factors such as microsite availability will be more critical to their success. The objective of this study was to evaluate natural pine regeneration in relation to cone density, slash load, and microsite availability as a result of mechanical site preparation treatments.

Methods: In a field study, cone density and natural lodgepole pine regeneration were evaluated in response to slash load (manipulated by slash removal), drag scarification, and mounding after cut-to-length harvesting of high elevation lodgepole pine stands in the Rocky Mountains. Lodgepole pine cone counts were conducted along line intersect transects immediately after logging: only cones less than one-third open were counted. Cone numbers were assessed twice, once after slash removal and after site preparation (dragging and mounding). Natural pine regeneration density and performance was monitored after the third and fifth growing season since harvest.

Results: The slash removal reduced slash volume by more than 50% but also reduced the number of lodgepole pine cones available for regeneration by 33%. Site preparation achieved high densities of pine regeneration even when there were relatively few cones in the slash removal (see different slopes of the lines in Figure). Drag scarification resulted in 12 times the number of pine seedlings compared to non-prepared plots. Mounded areas were similar to non-treated areas. Although slash removal did not have an effect on the number of naturally regenerated lodgepole pine seedlings, sites with lower slash load had better growth of pine.



The three trend lines identify the relationship between cone numbers and seedling density of each of the three mechanical soil preparation treatments: drag scarifying (——), mounding (.....), and no soil preparation (- - - -).

Implications: Soil surface disturbance is the major driver for natural pine seedling establishment and significantly influences mortality and growth of naturally regenerated lodgepole pine seedlings in these feathermoss dominated high elevation forests.

Both full-tree and cut-to-length harvesting system are suitable for these sites provided that soil scarification occurs since the number of cones needed to achieve sufficient densities of natural pine regeneration can be much lower than on sites where no mechanical soil preparation is applied.

The mounding treatment is likely only practical on sites where poor natural regeneration can be expected, since mounding only provided planting spots for seedling stock and not enough suitable microsites to assist in the natural regeneration of lodgpole pine

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Further Information:

Landhäusser, S.M. 2009. Impact of slash removal, drag scarification, and mounding on lodgepole pine cone distribution and seedling regeneration after cut-to-length harvesting on high elevation sites. For. Ecol. Manage. 258: 43-49.

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