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# BEYOND BEETLE: FACILITATED LODGEPOLE PINE REGENERATION AFTER MPB ATTACK IN LODGEPOLE PINE FORESTS OF WEST-CENTRAL ALBERTA

Lodgepole pine is adapted to stand-replacing disturbances, after which suitable seedbeds, sufficient light levels, and limited competition from vegetation allow for abundant natural regeneration of pine. Mountain pine beetle (MPB) has recently expanded into lodgepole pine forests in Alberta, which have historically experienced no, or minimal, previous attacks. The Beyond Beetle project was initiated to improve our understanding of the future successional development, productivity and health of lodgepole pine forests following MPB attack. Results showed that natural regeneration of lodgepole pine in post-MPB-attack forests in west-central Alberta is extremely poor. This can be attributed to lack of suitable regeneration microsites, low seed availability, competition from ground vegetation, and shading from residual live overstory. The goals of this part of the study were to assess the effectiveness of one possible management option for post-MPB forests: partial harvesting and site preparation treatments, which are designed to facilitate natural regeneration in lodgepole pine stands that have been partially killed by MPB.

Figure 1. A cleared machine corridor between partially harvested retention strips.

## METHODS

We conducted this research in an operational-scale partial harvesting trial established near Spirit River, Alberta that was established in lodgepole pine-dominated forest that had experienced ~ 50% mortality due to MPB. Our research area included two blocks, each of which included five plots (~0.75 ha) that were unharvested (control) and four plots that were partially harvested. The partially harvested areas included two different zones: machine trails (5 m wide) that were completely harvested and used for machine access and partially harvested retention strips (15 m wide) between these (Figure 1). The partially harvested plots were divided into four sub-plots, which received one of four site preparation treatments: mixing, mounding, scalping, no site prep (control). To quantify the possibilities for establishment of lodgepole pine seedlings we initiated an artificial sowing experiment in which seeds of lodgepole pine were sown in small plots in areas that represented different harvesting treatments and microsites as follows: In unharvested plots and plots that had been partially harvested but not site prepared (both machine trails and retention strips) we sowed seeds in five naturally-occurring microsites: mineral soil, thin organic (1- 3 cm depth), thick organic (> 3 cm deep), decayed wood, and feather moss. In partially harvested forest (both machine trails and retention strips), we established sown plots in the site preparation treatments: mixing, scalping, mound high position, mound low position, and the non-site-prepared control. Germination and survival of pine seedlings was monitored for three years (Figure 2, 3).

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Figure 2. Lodgepole pine seedlings germinating in different naturally-occurring microsites in the artificial sowing experiment.

## RESULTS

Pine regeneration was generally poor in unharvested areas: 13% of sown microplots in unharvested areas had seedlings one year after sowing, but this decreased to <1% of sites three years later. In partially harvested sites, overall 38% of sown plots had pine seedlings one year after sowing; this decreased to 21% three years later.

In partially harvested areas machine trails showed better pine establishment (43% of plots in year 1, declining to 26% by year 3) as compared to the retention strips (32% of plots in year 1, declining to 16% by year 3).

Figure 3. Microsite created by the mixing site preparation treatment (above) and seedlings germinating on decayed wood (below).

In unharvested areas there were few differences among the naturally occurring microsites. In partially harvested areas decayed wood was the best of the naturally occurring microsites. Of the site preparation treatments, mixing was best in both the machine trails and retention strips. Scalping was second best, notably in the machine trails.

## MANAGEMENT IMPLICATIONS

The results show that partial harvesting combined with site preparation could be a viable option for rehabilitating lodgepole pine forests post-MPB attack. Competing vegetation, such as the aspen suckers and grass that established quickly on our sites, will no doubt hinder survival of established seedlings as well as future recruitment. Thus, vegetation control may be necessary on some sites, in addition to partial harvesting and site preparation.

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