

Structural Recruitment: factors affecting survival and growth of residual immature trees after clearcut overstory harvesting

Executive Summary

FIA-FSP Project no. Y071158

Ruth Lloyd¹, Melissa Todd², and Jeffrey Meggs³

In recent years, there has been increased emphasis on retention of structural features such as large live and dead trees, coarse woody debris (CWD) and immature understory trees during clearcut harvesting in the sub-boreal interior of British Columbia. These features serve as “lifeboat” habitat for species and processes during early seral stages and contribute to the recruitment of live and dead wood into a recovering ecosystem after disturbance. The project was conducted in the Morice Timber Supply Area in west-central B.C.; results should be applicable to similar forest types throughout the central Interior.

We investigated factors affecting the survival and development of residual immature subalpine fir trees in areas clearcut between 1995 and 2000 with the intent of providing guidance to the appropriate abundance and configuration of future residual immature tree retention in clearcut areas for the purposes of recruiting stand-level biodiversity structure and habitat. We anticipated that tree morphology (height, diameter) and configuration of retention (clump versus single tree) would affect the survival and growth of immature residual trees retained after harvest. To test this we examined measures of growth and survival for residual immature trees of varying sizes and in various retention configurations. We found that over 60% of the residual subalpine fir trees present after harvest did survive for at least the 7-12 years between harvest and survey. Survival rates were over 60% in saplings and were higher in larger trees, reaching 88% in trees >12.5cm diameter at breast height. Mortality was higher for solitary trees than for those growing in clumps, especially for smaller trees. Growth response in 317 out of 330 surviving trees was positive, and the mean MAI after harvest was two to three times higher than the mean pre-harvest MAI in all tree size classes. Smaller saplings survived better in clumped configurations, though live saplings grew better in solitary configurations.

Contrary to expectations, windthrow was not a significant cause of mortality; only 11 instances were observed out of a total sample of 571 trees. Common health issues were stem scarring, mainly due to harvest damage or sunscald, and branch dieback, which was most severe in saplings, especially in the SBSmc2, and appears to be associated with canopy removal. A forest health assessment was completed on all sampled trees, but other health issues were infrequent and likely within normal endemic limits.

While there is no apparent overriding source of mortality and survivorship of residual immature trees is good, particularly for larger stems and clumped saplings, regression analyses may refine correlative relationships between factors associated with stem morphology and group configuration versus effects on the growth and condition of surviving trees. We anticipate this may provide additional guidance to the type and distribution of residual immature retention best likely to contribute to long-term stand-level biodiversity objectives.

This study indicates that the long-term prospects for retained subalpine fir understory trees are quite favourable for biodiversity purposes, especially for those trees which are larger at the time of harvest. Preliminary examination of the data suggests that retention strategies should focus on a range of tree sizes rather than one size extreme or the other, preferably retained in clumped distributions.

Keywords: stand structure, structural retention, structural dynamics, residual immature trees, advance regeneration, sustainable forest management, biodiversity

Author contact information

¹ Ecological Consultant, Bulkley Valley Centre for Natural Resources Research and Management, rlloyd7@telus.net

² Research Wildlife Habitat Ecologist, Coast Forest Region, Nanaimo, BC, Melissa.Todd@gov.bc.ca

³ Consultant Biologist, Nanaimo, BC, meggs@telus.net