Commercial thinning: A way to mitigate BC’s midterm timber supply shortage

The recent mountain pine beetle (Dendroctonus ponderosae) (MPB) epidemic in BC has killed large volumes of pine, detrimentally affecting forest health and economics. Much of the standing dead timber was harvested before it was no longer merchantable or lost to fire. The Annual Allowable Cut (AAC) was increased in affected areas in order to allow licensees access to available timber. Additionally, licensees were required to include specific ratios of beetle killed pine in their overall volumes harvested.

The forest industry in BC requires continuous availability of mature and harvestable timber. Because profit margins are comparatively low, the industry is sensitive to changes in supply. To help provide a continuous flow, long-term sustained yields (LTSY) are calculated to inform AAC determinations. In an ideal situation, every year the same amount of timber would be available for harvest, very much like in a ‘normal forest’. Now that most of the available beetle-killed timber has been salvaged, or is no longer suitable for commercial use, the AAC will have to be lowered to pre-MPB levels. This could be a challenge for companies that have adjusted to the larger available volumes. An additional challenge is that the use of large amounts of beetle killed timber has included the harvest of stands that would – under normal circumstances – have been left to grow and would have contributed to current and future timber supply. Overall, the MPB epidemic has caused what we now call a “midterm timber supply shortage”, or a gap in age class distribution. This imminent shortage was identified in mid- to long-term supply studies, such as those carried out to determine AAC, or those required for the development of a sustainable forest management plan.

Researchers at FRESH (the Forest Resources and Environmental Services Hub, led by Dr Verena Griess) are working with the Canadian Wood Fibre Centre on possible solutions to this issue by focusing on the use of commercial thinnings. In commercial thinnings, a forest stand is thinned by harvesting a predetermined amount of the total standing timber before the stand reaches maturity. This allows an additional and earlier, but smaller, revenue generation from stands when compared to a clearcut only approach. The remaining stand continues to grow until it reaches maturity when a final harvest is scheduled. Such 2-pass systems allow for both short and long term economic returns and are widely used in Europe and other countries. However, they require an in-depth understanding of the natural processes and dependencies in a forest ecosystem and are associated with a number of challenges around economic feasibility.

To understand whether or not commercial thinnings are a possible option in helping to mitigate timber supply shortage in the province, we developed a timber supply model for Bulkley TSA (Timber Supply Area) in northwestern BC. Bulkley was selected as a typical interior TSA heavily impacted by the MPB epidemic. Forecasts and analyses for Bulkley TSA reveal that there is a lack of timber in the age cohort ranging from 60 to 79 years. If timber is scheduled for harvest at 70 to 130 years of age, a shortage in available timber is expected, starting 10-20 years from now.

We developed 6 heuristic modelling scenarios for Bulkley TSA combining different minimum stand volumes for a stand to be eligible for thinning at different distances from existing roads. All scenarios required a relatively stable harvest flow not fluctuating by more than ±10% per decade. Additionally each scenario was required to ensure the maintenance of a non-declining growing stock in the last 100 years of the 250 year planning horizon. The overall goal of all 6 scenarios was to maximise timber harvest.

Clearcuts were prioritized over commercial thinning, which was only carried out if clearcuts did not yield the required timber volumes per period. Stands were commercially thinned 20 years before reaching rotation age, and 40% of the timber was extracted from each stand on the first pass. For reasons of economic feasibility, stands needed to contain at least 100m$^3$/ha of timber in order to be eligible for thinning.

The basecase scenario (Scenario 1) represented the status quo and allowed forecasting current management plans in place. Stands are harvested when they reach a minimum volume of 150m$^3$/ha using clearcuts only. The first alternative scenario, Scenario 2, allowed clearcutting in stands that have reached a minimum volume of 150m$^3$/ha and commercial thinnings are allowed in stands that are located within 300m of an existing road. This limitation is lifted in Scenario 3 where clearcutting was allowed in stands of 150m$^3$/ha or more and commercial thinnings occurred throughout the harvestable landbase. For
scenarios 4-6, instead of a minimum volume, the CMAI (culmination of mean annual increment) was chosen to select stands to be harvested in each period. CMAI is the point in time in a forest stand’s life at which volume increments are just about to decrease. For Scenario 4, clearcutting at CMAI and no commercial thinnings were scheduled. In Scenario 5, clearcutting was scheduled at CMAI and commercial thinning occurred within 300m of roads. Scenario 6 scheduled clearcuts at CMAI, and allowed commercial thinning throughout the harvestable landbase.

Our results show that Scenarios 5 and 6, which allowed commercial thinning and clearcutting at CMAI, are the most promising scenarios for the mitigation of midterm timber supply shortage in the case study area. Results indicated that timber harvest volumes would, over the planning horizon of 250 years, fall within +/-2.1% of harvest levels of the basecase scenario, and the timber supply shortage would be dramatically shortened or entirely eliminated. Overall, the resulting age class distributions would be more uniform and would allow for a balanced LT SY.

These positive results led us to explore additional alternatives such as flipping harvest prioritization to increase commercial thinning activities, and using clearcuts only to complete the volumes required to meet harvest flow requirements (LT SY). For Scenario 5, this approach led to higher timber volumes harvested over the planning horizon, and a similar age class distribution to when clearcutting was prioritized. This finding suggests that using commercial thinnings can result in higher overall timber volumes available for commercial use.

Finally, we used an alternative software product to re-model Scenarios 5 and 6. This product included an optimizer, allowing prioritization between commercial thinning and clearcutting, given that the maximization of timber harvest was the set goal. This alternative software simulated lower amounts of timber available for harvest in Scenarios 5 and 6, and led to the creation of a more uniform age class distribution. As before, these findings hint at the potential for commercial thinning in mitigating midterm timber supply shortage.

While our initial findings indicate that commercial thinnings should be considered in the development of policies and approaches to mitigate timber supply shortage, additional questions need to be answered before robust recommendations can be made. These unknowns include the effects of differences in assortments stemming from commercial thinning operations, the costs of building and maintaining additional infrastructure such as roads, the economic impacts of a change in required machinery, or the effect of thinning on the actual growth in forest stands. Ultimately, the question of how forest policies can ensure that licensees benefit from their silvicultural investments needs to be answered before forestry in this province will be able to benefit from more sophisticated harvest approaches such as 2-pass systems.

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