Forests for Tomorrow Adaptive Management Initiative

Synthesis of Information on Selected Topics & Clarification of Key Uncertainties

EXCERPT:

Impact of Falling Dead Trees on Seedling Survival

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Impact of Falling Dead Trees on Seedling Survival

The Forests for Tomorrow (FFT) program was established by the BC Government in 2005 in response to the devastating impact of major fires and the mountain pine beetle (MPB) epidemic on the forest land base of the Province. The program is aimed at improving the future timber supply and protecting other forest values through the re-establishment of young forests on lands that would otherwise remain underproductive.

The mountain pine beetle epidemic had affected over 10 million hectares of forest land by 2008 and is expected to expand further. This loss in forest cover is unprecedented in both scale and complexity. Many forest types have been affected across a range of ecological conditions from the dry Chilcotin to moist sub-boreal and high elevation zones. These twin factors of scale and complexity have, in turn, created numerous uncertainties for forest managers. Adaptive management strategies have been proposed as one approach for dealing with these uncertainties.

An adaptive management workshop held on June 26, 2008 under the FFT program for key staff engaged in restoring forest cover to the mountain pine beetle area raised a range of uncertainties or questions from participants. This is one of the topics for which our team was asked to review and summarize information in the existing literature.

The Issue

When stands are attacked by mountain pine beetle, and dead stands are under planted with seedlings, some of those seedlings may die as dead stems fall on them. The extent of mortality of seedlings is unknown.

Background

Many studies document rates of snag fall after beetle kill (see table 2 in the synthesis section on "Risk of fire after mountain pine beetle"), but no empirical studies or modelling efforts outlining effects of falling dead trees on seedling survival were found. Two studies, Forests Practice Board (2007) and Coates (2008) studied regeneration in stands that were killed by mountain pine beetle nearly 20 years ago and did not note damage to the understory by falling trees. The lack of observations may mean that tree fall does not have a significant impact on stand density. Similarly, damage by falling pine is not mentioned in broader literature on lodgepole pine succession, which also means it likely is not a large issue.

Basic Biology

A large number of factors interact to influence what mortality of seedlings could be expected under mountain pine beetle-killed stands. Although at first glance it seems it should be possible to model falling stems and estimate mortality, in fact the modelling is so complicated and will lead to such poor predictions that empirical studies would provide better guidance.

Several Issues Complicate Modelling Attempts[1]

- Dead stems stay standing for various lengths of time depending on species and site. If the stems fall with branches intact, they will have greater impact on seedlings than if they fall after the main branches have dropped off. The impact (fly swatter effect) of falling branches is unknown.
- Stems will not all fall to the ground but instead will often be suspended on other stems for a time. Suspended stems likely won't kill seedlings immediately and may not kill them when they eventually fall to ground. The likelihood and duration of suspension depends in part on how many branches remain.

[1] The information in the following sections results from discussions with Dr. D Huggard 604-986-1073.

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- Stems will not generally fall randomly but be influenced by wind direction at the time when they are susceptible to blow down. The difference in expected mortality between random and directional falling of dead stems in unknown. The proportion of stands that experience random or directional falling of snags is also unknown.
- Breakage rates will also affect seedling mortality. Snags often break before the main stem falls over. These rates vary by species (which we know), but the impact of these smaller pieces that fall is difficult to estimate.
- Sometimes trees fall and roll, thus impacting more seedling than if they didn't roll. The impacts are dependent on topography and stand density, and also depend upon how many other trees have fallen.
- Natural ingress pattern, distribution, and density will also play an important role in determining impacts.

All in all, the complications to modelling will result in very poor predictions of mortality. We suggest embarking on some empirical studies.

Suggested Approaches

Empirical studies could be undertaken to see if mortality of seedling and saplings by falling trees is a large issue. Measures of cause of seedling mortality would be simple to add to the experimental work proposed by Forest for Tomorrow that will look at seedling responses under various canopy conditions. There may be opportunities to analyse data on falling trees impacting seedlings from the Opax and Ponderosa pine study sites (Vyse pers. comm.).

Key Uncertainties

Little information is available on the degree to which seedling damage and mortality is caused by falling overstory. Proposed experiments for FFT will measure overstory plots including rates of snag fall and down wood decay. As well, measures of seedling survival under different canopy densities will record causes of mortality and damage. Thus, the experiments will gain information on effects of tree fall.

Short-Term Learning

The information gained through the experiments will add information over the long term (5 to 10 years and longer). These experiments will not help decisions over the next few years. We suggest that seedling mortality due to falling trees will not be a large issue and should not affect the decision to under plant.

Literature Cited

Coates, D. 2008. Evaluation of stand dynamics after a 25-30 year old MPB attack in the Flathead Region of south eastern British Columbia. Final Technical Report to FIA-FSP. Project Number: M085196.

Forest Practices Board. 2007. Lodgepole Pine Stand Structure 25 Years after Mountain Pine Beetle Attack Special Report FPB/SR/32.

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