

Summary of Input Received:
Workshop to Present the Results of the 1st Year of a project to
produce a
Provincial Level Projection of the Current MPB Outbreak
March 25, 2004

Funded by the Mountain Pine Beetle Initiative and the Ministry of Forests



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Table of Contents

<u>Introduction and Purpose of the Document</u>	2
<u>Refinements to the Model</u>	2
<u>The Beetle Infestation Projection Sub-Model</u>	2
<u>Decay / Shelf Life Sub-Model</u>	4
<u>Management Sub-Model</u>	4
<u>Re-Focusing Scenarios</u>	5

Introduction and Purpose of the Document

On March 25, 2004 the members of the project team for the “Provincial Level Projection of the Current MPB Outbreak” project hosted a workshop to present the results of their work. The project outline, describing in some details the objectives of the project and the methods we are using, the results presented at the workshop and the detailed minutes of the workshop are provided as separate documents.

The intent of this document is to provide a summary of the input received that is accompanied by a set of tasks for the project team for the coming year. The input and tasks are organized into two groups:

- Refinements to the model refer to issues raised primarily by domain experts about the specification of the model and its behaviour. The issues will be dealt with through an iterative process of model refinement, presentation and feedback with the appropriate domain experts. This will occur during the next 3 months.
- Refocusing of scenarios refers to issues raised primarily by principal clients. This involves changes in the emphasis questions that should be asked on given the results of the first year of the project and changes in the problem that have occurred since the [first \(scoping\) workshop](#) was held in September, 2003. These issues will be dealt with by:
 - obtaining necessary information about specification of the new scenarios from domain experts; and
 - providing draft results of the scenario evaluation to principal clients in an iterative fashion. This will occur between July and December, 2004, culminating in December with a workshop to present the final results of the project.

Refinements to the Model

The results presented at the workshop were based on a projection model that had received substantial input from a variety of domain experts. Nonetheless, the model was admittedly a draft version and a variety of useful and significant refinements were suggested at the workshop. The workshop presentation format is valuable because it is difficult to thoroughly appreciate the strengths and weaknesses of a model until it is presented in a full context with all of its sub-components and the results. In addition the workshop format allows domain experts, who are “naïve” with respect to the model, to evaluate it.

The Beetle Infestation Projection Sub-Model

The most serious criticism of the beetle infestation projection sub-model is it is simply killing everything everywhere after sufficient time. In this sense the model only tells how long it is going to take to get to an inevitable conclusion. We note that the version of the beetle sub-model used to evaluate the different

management scenarios does have this behaviour. Therefore, our projections, overall, represent the “worst case” scenario. However, we contend that, regardless of the actual stopping behaviour of the outbreak, the comparison among scenarios and the resulting conclusions remain valid. That is, one could assume that the infestation was going to subside at some point in time of its own accord, or as the result of some very unusual weather event but that assumption would not alter the main conclusions presented about the differences among management scenarios.

As part of the sensitivity analysis of the beetle model behaviour we presented the results of a version of the model that does “stop” after consuming approximately 80% of the susceptible pine. At the moment this represents the most “optimistic” version of the model. Over the next 3 months we intend to put some significant effort into examining assumptions about the “stopping behaviour” of the model. This will include further examination of outputs from the stand level and landscape level infestation progression models and a gathering and analysis of available data regarding stand level mortality at the end of outbreaks. We will include the most reasonable set of assumptions in further examination of management scenarios to determine what, if any, effect they have on the outcome.

Some concern was expressed about the method used to model the long distance dispersal of beetles. These concerns fell into two categories:

- One issue was that it may be more reasonable to simply use spatial statistics to quantify autocorrelation between the outbreak in successive years, rather than relying on dispersal model paradigm. This could certainly be done and the virtue of such an approach is it makes a clear separation between mechanism and effect and eliminates the need to postulate any beetle “behaviours”. The disadvantage is that this approach will take significantly more effort for an unknown improvement in model predictions. In addition, the method and results would be more difficult to explain and understand. We will investigate the merits and demerits of the approach with Marie Jose Fortin (University of Toronto).
- Secondly, it was pointed out that, while the model includes the effect of average wind direction during the flight period, it may be useful to look at modeling specific wind events during each year. The resulting variability in model outcomes may be more realistic than those provided by the average wind parameters. In addition, the actual wind for the years from 1999 to 2003 should be more thoroughly examined to determine whether or not it offers some additional explanation regarding the observed progression of the outbreak.

Finally, concern was expressed that the model does not adequately incorporate known information about the variation in the suitability of the climate for beetles over the province. We recognize this shortcoming of the model and are actively engaged with other researchers, funded by the Mountain Pine Beetle Initiative, who are investigating this aspect of the system. We intend to incorporate a

refined climatic suitability component to the model that supports the state of knowledge at the point when the second version of our model needs to be completed (June 2004).

Decay / Shelf Life Sub-Model

The “dead wood decay” component is admittedly over-simplified and analysis indicates that the results, with respect to indicators about salvage, are very sensitive to the assumption that was used in the comparison among management scenarios (i.e. 20% loss of volume per year at a stand level). Several excellent suggestions were made at the workshop to improve this aspect of the modelling. Most importantly it was pointed out the word “decay” is not particularly suitable for most contexts related to this problem. A better phrase is “shelf life”. The distinction is that “shelf life” indicates how long a given stand will be useable for a given purpose after it the pine has been killed. The point is that the “shelf life” for saw logs, pulp, bio fuels and woodpecker habitat are very different. In general it is felt that “shelf life” functions are more like step functions than continuous declines. That is, the dead pine in any given stand, is useable for a specific purpose for a given length of time, after which none of it is useable. Based on the input received we intend to modify the model in two ways:

1. While the projection is running the management sub-model will respond to a shelf life function that is specific to the to the particular management scenario that is being evaluated. Shelf life functions will be developed by polling appropriate domain experts. It is anticipated that the shelf life functions may have some regional specificity (e.g. by Biogeoclimatic Zone).
2. The indicators files will report the volume of pine that has been killed and the length of time since it died. With this information users can apply any number of value specific shelf life functions to the output. Note that the management model will still only respond to one shelf life function.

Management Sub-Model

Some very specific feedback was received about the nature of the management model. In addition, the project team has identified a number of issues that need to be dealt with:

- Determine and correct the reasons that some management units are not able to meet their area based AAC after 20 years
- Refine the process for allocating Beetle Management Unit strategies, particularly as the outbreak is subsiding
- Refine the selection criteria of stands within a Beetle Management Unit to enable focussing more, and less, strongly on harvesting green pine and dead pine.

- Add the ability to specify volume based, rather than area based, harvest targets to accommodate more elaborate analysis of salvage based scenarios.

Re-Focusing Scenarios

During the first year of the project we focussed on developing and evaluating scenarios regarding the efficacy of various beetle management strategies at a provincial scale. Feedback that we received from the principal clients at the workshop indicates that we should re-focus our effort this year on the following topics:

1. Are there any dramatic changes that can be made that would change the conclusion about the efficacy of beetle management at a provincial scale? For example, what, if any, effect does eliminating the VQO constraints have?
2. Are there conclusions about beetle management at the periphery of the outbreak that differ from the general provincial conclusions and, if so, to what extent can these conclusions actually be supported by the provincial scale model?
3. What effect does variation parameters in the beetle sub-model have on conclusions about beetle management and salvage focus management? This question is particularly addressed at an evaluation of “stopping conditions”. The question what is the difference in the conclusions drawn if one explicitly models the stopping of the outbreak versus simply adjusting downward the impacts of the beetle sub-model that does not stop?
4. Finally, and most importantly, most of the effort this year will be devoted to developing and evaluating a suite of “well formed” salvage scenarios. Significant effort needs to be devoted to developing conceptual models of salvage operations at various scales. This will require engagement with a variety of domain experts both in district offices and at headquarters. Of particular interest are questions about:
 - a. the relationship between assumptions about shelf life and salvage methods on non-recovered losses;
 - b. the relationship between the specification of what constitutes a “salvage block” and impacts on standing volume of non-pine species;
 - c. the relationship between shelf life assumptions, salvage methods and the resulting area harvested.