

Detailed Minutes:
**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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Workshop Objectives

- To present the draft results of the first year of work.
- To come to a common understanding about the strengths and weaknesses of the current model.
- To obtain feedback from principal clients about the questions and scenarios that need to be examined next year.

Workshop Agenda

Scheduled Time	Topic	Speaker	Principal Audience
0900 – 0945	Executive Summary	Marvin Eng	Decision Makers
0945 – 1000	Discussion		
1000 – 1030	Refreshments		
1030 – 1130	Results of Scenarios and Presentation of Indicator Files	Marvin Eng	All “Client Representatives” and Domain Experts
1130 – 1200	Discussion		
1200 – 1300	Lunch		
1300 – 1345	Description of Input Data	Marvin Eng	All Domain Experts
1345 – 1400	Discussion		
1400 – 1445	Management Model Details	Andrew Fall	Forest Management and Beetle Management Domain Experts
1445 – 1500	Discussion		
1500 – 1530	Refreshments		
1530 – 1600	Beetle Model Details	Josie Hughes	Entomologists
1600 – 1630	Discussion		

Workshop Attendees

First	Last Name	Affiliation	Summary	Attended	
				Morning	All Day
Tim	Bogle	MOF FAB			X
Melanie	Boyce	MOF FAB	X		
Anthony	Britneff	MOF FPB			X
Phil	Burton	CFS			X
Shannon	Carson	MSRM PG			X
Bob	Clark	MOF NIER	X		
Mike	Clarkson	MOF FAB			X
Laura	Darling	WALP Parks			
Tim	Ebata	MOF FPB			X
Marvin	Eng	MOF Research			X
Andrew	Fall	Gowlland Technologies Ltd.			X
Lyle	Gawalko	WALP Parks		X	
Jim	Goudie	MOF Research	X		
Malcom	Grav	MSRM Client Solutions		X+	
Peter	Hall	MOF FPB		X	
Dave	Harrison	CFS		X	
Josie	Hughes	Consultant			X
Werner	Kurz	CFS			
Lorraine	Maclauchlan	MOF SIFR			X
Leslie	McAuley	MOF Research			X
Ann	Morrison	MSRM RIB			X
Larry	Pederson	MOF Chief Forester	X		
Barrie	Phillips	MOF Research	X		
David	Pioggini	MOF Kamloops		X	
Ron	Planden	MOF TIB			X
Leo	Rankin	MOF SIFR			X
Bill	Riel	CFS			X
Les	Safranvik	CFS (Emeritus)		X+	
Terry	Shore	CFS			X
Tory	Stevens	WALP Parks			
Gerry	Still	MOF Research	X		
Chris	Stockdale	CFS		X	
Steve	Taylor	CFS		X	
Adrian	Walton	MOF Research			X

Summary of Questions (& Answers) and Comments

(note that actual times, rather than scheduled times are provided)

Executive Summary (0910 – 1030)

Does the harvest model harvest all species within the cells? (yes)

How sensitive is the model to the overestimate of the aerial overview data? (the over estimate was recognized when the model was created and we “down graded” the aerial overview estimates in severely infested areas)

Does the model alter the queue for mixed or pure pine stands? (the model reacts to the Beetle Management Unit strategies that are assigned. It harvests entire cell, mixed or not, based on the strategy).

How do these results compare to the outbreak during the 80's? (This outbreak is clearly unprecedented)

Does double the AAC mean double the cut across the entire province? (yes)

The scenarios really change the rate of loss not the total amount killed over the entire run. (that is the obvious conclusion)

What would happen if we harvested only the lodepole pine (put all the AAC into the PL)? Would the collapse happen earlier? (the model harvests as much pine as it can)

The single tree treatments will have an impact if the outbreak ends early. (in some limited cases this may be true – at a provincial scale single tree treatments have almost no effect on the cumulative amount kill.

If single tree treatments push out the model in time then doesn't that allow the salvage to work more efficiently and prevent unrecoverable losses?

Why does decay rate affect area harvested so dramatically? (as the wood decays the volume per hectare that is harvested decreases. Therefore, more area must be harvested to obtain the same volume)

Would the results and maps be more effective if they showed percent forest killed rather than simply percent pine killed? (representation of the problem is a complex issue. It is difficult enough to represent the problem as it has been done).

In salvage operations we could set harvest target based on amount of dead wood and salvage. (done properly, this could ameliorate the effect of increasing harvest area with salvage, to some extent).

Where does the decay rate come from? (the rate of 20% per year is a “rough” average of rates provided by operational foresters in the Lakes and Morice TSAs)

Decay rate has the biggest impact on salvage and non-recoverable losses. (yes)

Some percentages of pine within the stand may not be economically viable for salvage. (yes)

Decay is really a surrogate for economic viability. Don't use decay rate since it implies biological decay. What is really being measured is economic value, which depends on market value of the salvage wood. (point taken – we need to talk about “shelf life” for a variety of purposes).

Larry - The model reflects current and past relationships and management. The model cannot reflect alternate management scenarios – larger harvest. We are going to focus harvest on grey attack and avoid green wood.

There is an artefact in the model – a pixel is uniform, once a pixel is harvested all wood in the pixel is removed. The model could reflect the percentage of pine removed. (be that as it may, it is not possible for forestry operations in the real world to only harvest dead trees when salvaging)

Results of Scenarios and Presentation of Indicator Files (1100 – 1220)

What was the threshold for calling an area pine? (Any pine)

White Bark pine is not well represented across the landbase, so to lose 50% of the White Bark is a very large impact. (we agree)

Under predicting doesn't mean it is inaccurate since the reference data is questionable.

The drop in volume harvested is not due to growth.

Are the percentage attack and the decay rate linked? (no)

The decay rate is social value decay (shelf life for various purposes – saw logs in this case) not biological decay.

The model should reflect volume decay not social value decay. (internally the model should “react” to the “shelf life” that the harvesting sub-model responds to, that is, the sawlog shelf life. We need to have domain experts develop indicators for various other types of shelf life, e.g. bio-fuels, woodpecker habitat, etc.)

When pulp prices went up, the percent of dead wood being brought in went from 4% to 7%. (comment only)

What processes are stochastic in the model? There are many stochastic processes in the model, mostly represented by parameters drawn from a distribution)

How to represent the variation over the many runs? (??)

The further you project in time, the more variability but they converge near the end. (yes)

We may have a different answer if the stochastic events were to synchronise. (yes)

But the impact of uncertainty around decay rate is far greater than stochastic variability. (yes)

How would the model change if the you log by hazard (high risk stands) rather than red attack. (We will do a scenario to determine the answer to this question. Some results from district scale modeling shows that the approach is less effective at control)

Some licencees would like to log areas adjacent to red attack in order to prevent spread.. This was tried in a model in Lakes but it actually made things worse.

What proportion of stands are currently infested in Quesnel (79% of the pine and 64% of the forest is infested to some degree)

Why do TSAs that currently have low infestation peak lower (not just later)? (It may be reflecting the fragmentation of the landscape and the amount of available habitat.)

The model indicates that climate should be looked at in greater detail. (other projects are currently being initiated into climate suitability)

Would the ecologist have decay rate information from BEC data? (Ecologist can provide biological decay rate but the model really wants to know “how long can I go into this stand to remove dead wood, after grey attack”)

“Shelf-life” may be a better term. – it is better understood.

The decay rate should be a function of the salvage scenario not a separate model. (that would depend on how different the salvage scenario was. If we were to do separate scenarios for pulp and sawlogs then the answer would be yes)

There is workshop in Quesnel next week on “shelf-life”.

Are you able to look at climate and weather to predict an asynchronous flight? Do you have a weather sub-model? No temperature – just average wind across the district.

It may be useful to look the affect of climate change on species change. (The beetles have already gone beyond what we thought was suitable habitat. We need some help from those working on climate suitability here)

If we dis-allow restart, won't it just drag out the inevitable? (Maybe there is another factor that can control beetles that we are not accounting for. We will investigate this more thoroughly)

The outbreak in Chilcotin collapsed due to weather. The outbreaks in the USA, which collapsed soon after the Chilcotin, collapsed in half the time as Canada and may be due to other factors, such as habitat fragmentation. It may be self limiting process, meaning they consume up all their habitat.

Description of Input Data (1330-1410)

The depletion data is current to 2000/2001.

The TFLs were established in '56-59 and at that time PL was considered a weed. As a result there is very little pine in TFLs.

Are depletions an important factor in the model? (we will get some current depletion data and see if it makes a difference)

If we could better quantify the mortality at a stand level, possibly with satellite imagery, rather than aerial overview, would it make a difference to the results? (the provincial scale result would not be likely to change much although there may be differences at the management unit level. The bottom line is that this work must be done now to be of value and the satellite image interpretation is not available).

At what scale do the results look good at? (1:500,000, Caribou herd, TSA)

Management Model Details (1410-1500)

Why does the model use VQOs but not other management constraints? (VQO seems to be the most constraining management consideration)

Are you able to vary harvesting practices during a run, such as within VQOs? (we would do that first by turning off for an entire run to see their impact)

So does the model not age the trees? (we age stands but we don't increase their volumes, so volume estimates will be downward bias)

Suppression takes into account the budget used for harvest? (yes)

Is it possible that some of the parameters may need to be adjusted by Management Unit? (not unless there is good evidence to show that there is a difference among units)

Do you take the volumes of the single tree treatments? (no)

If they can get to a tree to harvest it then they will not fall and burn it.

Putting out Non Replaceable Forest Licences with uplift in some districts. BMUs are switching from suppression to holding action. Licencees are taking their licence and going after green wood. Salvage Non Replaceable Forest Licences are being developed to target specific salvage.

Kamloops has just switched from suppression to salvage, according to the licencees. They skipped holding. It is the interest of the licensee to switch direct to salvage since it absolves them from dealing with the beetles.

The models results for the old Nelson region in 2004 are very close to what is being done there.

If the licensee is willing to accept unsalvaged losses then they will go harvest green wood instead.

Each district does not have their own rules, they are just choosing not to follow the rules.

It would be interesting to see if the model could incorporate an uplift and pick the areas to be harvested.

Some areas are designated Monitor until they are available to salvage.

MoF is going to establish some SNRFLs where there is red attack which is not currently allocated to a cut block.

Beetle Model Details (1530-1625)

Is the 2003 data part of the calibration? (it was used to test the model but was then incorporated into the data for the projections)

Are you taking into account wind levels are year, or only during their time of dispersal? (only during dispersal)

Did the old wind data support the directional shift that was observed in the data? (we have not checked in detail)

How much influence does wind have on the model results? (it is reasonably significant because of the very large long distance beetle pressure)

The beetles move up and down the lines between the moist and semi-moist (along ecotones)

The old pine stands are less susceptible, maybe due to the old stands being at higher elevations.

Why is there a greater dispersal from high density beetle areas? (The model is not to explain why the beetles move, just explain how they move.)

Need have the aerial overview data corrected or adjusted using recent surveys.

In the aerial overview data, low is considered 1-10% but most of the attack is on the order of 1-2%.

During the summer of 2002 there was a definite movement of wind down into the Chilcotin from the north.

In the Robson Valley, they did miss a lot of infestation in the aerial overview.

The model may be overestimating the amount of host if the aerial overview is downward biased.

Mackenzie may be underestimated in the aerial overview data.

Final Discussion (1625 - 1640)

What is the difference in stumpage revenue based on the different management scenerios? (we need to do scenarios to evaluate this)

Need to take into account other bark beetles. e.g. in Lakes and Morice.

Including the green wood in the harvesting model is realistic since licencees want to harvest green wood as well.

Melanie made a presentation to Exec last year, which included stumpage and revenue.

By saying the kill is non-catastrophic licencees can cut the extra dead wood and not have it put against their AAC. (??)

If it is considered catastrophic they have to take all the dead wood and it goes against their AAC.

Flip Chart Notes and Associated Comments

Flip chart notes are in **bold**.

Comments and recollection from the team members are in *italics*.

Executive Summary

No flip chart notes

Results of Scenarios and Presentation of Indicator Files

Whitebark – focus management there?

Because whitebark pine is important and rare – could we save some if we focussed on it?

Decay – help with social/economics

-- **new term**

-- **shelf-life**

-- **attribute of strategy, not of wood**

The beginning of a discussion that continued throughout the day. The key points are:

- *“decay” is not a biological process primarily, but a social/economic one that depends on markets and the uses for dead wood (lumber, pulp, fuel, etc)*
- *the term decay is misleading, and we should use another – shelf life, degradation rate – neither of these are perfect either.*
- *Werner Kurz suggests making decay a property of the management scenario, rather than the wood itself.*
- *we need help with this*

Wind and weather – variability and sensitivity

-- **summer asynchrony**

-- **weather data**

Does having actual wind direction in the model make a difference?

Does using annual wind information from 1999 to 2002 help explain directional differences in outbreak spread between years?

Can we incorporate weather variability in some way? (stochastic weather events)

Remember that cool wet summers causing asynchronous flight are important as well as killing-cold winters.

Logging by hazard

Try a management scenario where loggers go for high hazard stand without beetles.

Impact of small (2000 – 5000 ha) reserves?

This is a comment from Dave Piggini, who is concerned about little parks.

Effect of missing depletions? (logging 2000 to 2003)

The forest cover data we have does not include logging that occurred between 2000 and 2003. It is possible to get more recent data, though not clear how easy it will be to incorporate this information – Anne Morrison offers to provide the information.

Speculation later in the afternoon on this topic is that while it will not make a large difference to our overall predictions, accounting for these depletions might help explain model behaviour in moderately infested management units where we significantly over-predict mortality (e.g. Morice). We could also test sensitivity to this issue by running the management model from 2000 to 2003 to update the forest cover map artificially.

Remember – appropriate-use guidelines for output

People will be less likely to use the output from this model inappropriately if we include guidelines for appropriate use in the data package. The main inappropriate use we anticipate is to interpret results at too small a scale, where stochasticity dominates the output. We need to think a bit more carefully about what units are too small, and write up a guide for data users.

Spatial variability in management practice? (VQO's)

All managers interpret zoning restrictions in the same way, and different practices occur in different places. Unfortunately, spatial variability in management practices, at the management unit scale, is probably too detailed for this model.

Description of Input Data

No flip chart notes

Management Model Details

Harvest targeting given mixed BMU designations.

This is a hard thing to model, and one that we would appreciate some input or guidance on.

Uplifts – pay attention to how they are allocated (economic, in a hurry, in salvage and holding areas, not suppression.

Dave Piggin notes that temporary uplift in the cut are allocated differently from volume in the base cut. Volume must be allocated in a hurry, and must be economic to harvest, so larger concentrations of dead wood tend to be selected. Consider further what this means, and whether it is worth incorporating somehow into the management model.

SNRFL's - < 500 metres salvage allocated

Caveat to above comment. Tiny little volume allocations are made for beetle suppression. Too detailed.

BMU calculation comments

- **Kootenay is not bad**
- **transfer of responsibility issues.**

Lorraine Maclaughlan says our Kootenay BMU designations are not bad. 2003 designations there were just wrong, but they have been fixed up now.

With DFAM, companies (as of 2004) are doing BMU designations. The tendency is to designate areas as salvage units, as this designation absolves companies of expensive beetle management responsibilities. Regional beetle folks (Lorraine, Leo) think overall our BMU designations look quite good – possibly better than the designations actually being made by companies. Lost in this discussion is the essential point that we predict salvage strategies to be more effective than beetle management strategies at suppressing beetles.

Beetle Model Details

Add equivalent CC area within community watersheds as a constraint.

The comment here is that real managers do take into account other factors. Sometimes they will stop chasing volume because the area logged is too high.

Beetle long distance dispersal? Simply use geostatistic instead? (spatial autocorrelation)

The question was could we use spatial statistics to quantify autocorrelation between successive beetle years, rather than relying on dispersal model paradigm. The answer is probably. The virtue of such an approach is it makes a clear separation between mechanism and effect, and gets us out of dispersal speculation hot water. The down side is that it will take more work. Also it can be harder to explain and understand. Josie Hughes will investigate pros and cons with Marie Jose Fortin.

Include actual wind direction 1999-2003

We need to look at the available wind data for the overview data period to see how much of the pattern can be explained by actual wind speed and direction.

Beetles tend to be most prevalent in areas that are moisture ecotones because of drought stress.

Be that as it may there are several problems involved. Not only is it unclear where all these “ecotones” occur it is also not apparent that we need to have beetles doing different things in different places to adequately model the problem

Do any of the severity ratings in the overview mean what they say?

Tim E. says that “low” is also highly overestimated.

Can we use actual data to help?

Talk to Tim Ebata and Leo Rankin more about this.

Chilcotin 2003 is actually 1-2% infested and is likely the result of wind blowing beetles down the valleys. Check fire weather data.

This comment comes from Leo Rankin. Lorraine Maclaughlan concurs that beetles follow valleys. Is there some way to infer beetle movement from topography more systematically?

Over-predictions

- **In Robson Valley they missed beetles in the overview (cloudy) – check the date on the overview file** to make sure we have the corrected data
- **In Merritt the infestations has been in progression longer than 1999.** *Perhaps here beetle dynamics are a bit different for this reason? Perhaps also failing to account for harvesting between 2000 and 2003 is a problem?*
- **Okanagan?**

JH proposed sending a summary of the beetle model (results and key assumptions) to beetle people present at this session (Lorraine MacLaughlan, Leo Rankin, Tim Ebata, Terry Shore and Bill Riel – I will include Les Safranyik as well, though he had to leave earlier in the day). They have agreed (I think) to comment in writing so I will have a more thorough record of their relevant ideas and observations.

Final Discussion

Crown revenue issues?

Some recognition that not all volume is worth the same amount, and an urge to attach money value to our results. On the one hand, we want to stay away from valuation. On the other, we recognize that remaining growing stock is dispersed across the landscape, and much of it will not be economically viable. We need to clarify whether salvage stumpage rates are applied to whole stands, or just to the salvage wood in a stand. Talk to Peter Jacobsen, and talk more about the difference between volume and value among ourselves.

Other bark beetles/competing management objectives (spruce beetles)

What are the consequences of assuming that beetles are the only important thing in the world.

Mike will get Melanie's presentation on stumpage revenues.

Les Safranyik apologised for having to leave early, and left JH with the following note:

"Since outbreaks (nature of) in central interior are at difference stages and apparently different character from those that exist in the Southern part of the province, could not the course of the epidemic be modeled separately for the two regions? And to see if the combined effect would be similar in outcome than the outcome based on projections for the entire province."

Post Workshop De-Briefing

Participants were Josie Hughes, Andrew Fall and Marvin Eng.

An important concern about the beetle model is whether or not beetles are killing everything everywhere because this outbreak is fundamentally different from outbreaks in the past, or whether the model is simply not capable of any other behaviour. One way to test this is to run the model in less extreme conditions than are presently found. We can do this by running in the Southern Interior of the province only, omitting beetle pressure centre to the North. This is similar to Les' suggestion.

As an aside, we note that JH is letting infestations restart *ad infinitum*, and the probability of restarting is not different from the probability that beetles start in the first place. Les and others suggest that beetles suffer much higher mortality when they must search hard for the few remaining trees, so restarting an infestation in a stand that has already suffered high mortality should be harder than starting an infestation in a fresh stand. JH can include this dynamic in the beetle model by making a separate restart model. This model will be informed by the same SELES/MPB output as the infestation progression model. To make it sensible, JH requests that AF rerun SELES/MPB in Morice and Lakes, distinguishing between immigrant beetles that come from within 1 km, and immigrants that come from farther away.

There is some sense that discussion during the meeting was too much focussed on beetle management strategies, missing the initial conclusion that it is largely too late for beetle management, and the important task now is to devise effective salvage strategies. The many of the principal clients, who attended the executive summary only or the morning session only, indicated that the main focus of further scenario development be on salvage. We need significant assistance from forest managers with a variety of specific domain expertise to adequately specify a range of plausible salvage scenarios. We hope to address many of the questions about beetle management with simple on/off sensitivity analyses (i.e. turn VQO constraints, road proximity constraints, and park constraints all off – if management does not become significantly more effective, we can safely ignore more subtle variations in management practice).