Foothills Growth and Yield Association

Technical Note 2010-4

Monitoring and Decision Support for Forest Management in an MPB Environment – Project Overview and Update

March 5, 2010

Objectives and Strategy

The overall objective of the project is to provide decision support to forest managers assessing silvicultural treatment options for stands attacked by mountain pine beetle in Alberta. This is being achieved by concurrently:

- Assembling baseline data from a network of permanent sample plots and applying the best predictive capability available to making projections of post-attack stand development from these data;
- Monitoring dynamics of MPB-attacked stands in order to validate, inform and improve projections on an ongoing basis.

Project History

During 2006 and 2007 two independent initiatives led to the formulation of the project.

1. Alberta Sustainable Resource Development (SRD) convened an expert panel on lodgepole pine stand dynamics following MPB. The panel developed hypotheses regarding the probable development of stands after attack, and recommended that these should be validated by a specially created network of PSPs in which a broad range of ecosystem attributes are measured.
2. The Foothills Growth and Yield Association (FGYA) identified and elaborated the need for a new initiative to examine the MPB problem in relation to regeneration silviculture, and develop information and management tools. With generous assistance from the BC Ministry of Forests it organized a tour of MPB affected areas in the Prince George Forest District of BC as the initial basis for developing a project plan.

A project proposal was developed and awarded funding under FRIAA Provincial Projects Initiative in late 2007. The project is administered by the Foothills Research Institute MPB Ecology Program (MPBEP).

Tasks[1] conducted during the first full year of project implementation (April 1 2008 to March 21 2009) included:

- Pre-compilation of existing data for over 5000 permanent sample plots belonging to SRD and the 9 FGYA member companies;
- Assessment of supplementary baseline data requirements for stand and ecological conditions not already included in recent inventory measurements;
- Selection of a candidate sample network of 280 PSPs representing a range of 8 ecological strata and other prevalent lodgepole pine stand conditions, and a sub-sample of 150 plots for supplementary baseline assessment;
- Baseline supplementary field measurements and field checks for plot infestation status completed for 149 plots;
- Compilation of existing and new data as a basis for characterizing pre-attack stand conditions;
- Dendro-chronological measurements and analysis of a sub-sample of 15 plot clusters in the northern portion of the study area.

[1] For a more detailed description, see Foothills Growth and Yield Association Information Note: Regeneration Management in an MPB Environment, Progress Report for 2008, March 2009.

In June 2009 an "MPB-silviculture decision tools" workshop was held in Hinton with the purpose of identifying more specifically the methods and information products needed to forecast and manage stand development following MPB attack in Alberta.[2] This provided the basis for detailed planning and specification of the decision support tool (DST). A contract was awarded in October 2009 for development of a preliminary DST.

The high over-wintering success of beetles in 2008-09, combined with higher and more extensive than expected flight activity during the summer of 2009, created the need for expanding monitoring efforts. A revised work plan and expanded program, involving monitoring of 240 plots on a prioritized schedule during 2009, 2010 and 2011, was developed by the FGYA, approved and supported by the MPBEP, with field work funded by the FRIAA Fire Hazard Reduction and Forest Health Program.

Baseline Information and the PSP Network

Map 1 shows locations of the 240 plots (159 plot clusters) included in the PSP network scheduled for monitoring. Assembly of detailed baseline information has been completed for 149 plots, including compilation of the most recently available measurements collected by the plot owners, and supplementary measurements of site quality, saplings, regeneration, non-tree vegetation, tree mortality, arboreal lichens, and cone serotiny. Compilation of existing data will be completed for all 240 plots in 2010.

Monitoring

Table 1 shows the number of plots scheduled each year for two levels of monitoring: "basic" and "detailed".

Table 1. Monitoring schedule – number of plots by year and level

Monitoring level	Year[3]			Total
	2009	2010	2011	
Basic	89	62	89	240
Detailed	0	23	62	85

"Basic" monitoring is being undertaken to measure the level of MPB attack and associated tree mortality. It involves field-checking the actual PSPs plus the surrounding stand. Within the PSP, those trees showing symptoms of MPB attack are inspected for number of pitch tubes (by three categories: < 20, 20 – 50, > 50) and attack stage (green, fader, red, grey).

Scheduling priorities identified for basic monitoring of PSPs were:

1. Extreme 2008-2009 over-wintering success;
2. High over-wintering success AND infestation previously reported in area;
3. Infestation previously reported in area OR high over-wintering success;
4. Moderate over-wintering and no previous infestation reported;
5. High 2009 summer activity and not meeting criteria for priorities 1-4;
6. Other.

[2] Foothills Research Institute - Foothills Growth and Yield Association MPB-Silviculture Decision Tools Workshop, Friday, June 26, 2009 Hinton Training Centre, Hinton, Alberta, *Workshop Report*.

[3] Period from April 1 of the indicated year to March 31 of the next

Basic monitoring was scheduled according to the above priority classes as follows:

- Classes 1-2: September 1, 2009 – December 31, 2009;
- Class 3: January 1, 2010 – March 31, 2010;
- Classes 4-5: August 1, 2010 – March 31, 2011;
- Class 6: August 1, 2011 – December 31, 2011.

Table 2 summarizes data received for 2009 to date (79 of the 89 scheduled plots). It shows by priority class the proportion of plots attacked, and the distributions of infested trees by attack stage.

Table 2. Monitoring results to date - percentage of plots attacked and stage of attack

Priority class	% of plots attacked	% distribution of attacked trees by attack stage			
		Green	Fader	Red	Grey
1	85.0	72	9	17	1
2	60.7	78	14	3	4
3	9.7	97	0	0	3
Total	46.8	76	10	12	2

"Detailed" monitoring will be conducted at 2-year intervals following attack, and will assess:

- Level of MPB attack and tree mortality;
- Survival / growth response of understorey trees;
- Post-attack tree regeneration;
- Effects of MPB attack on cone serotiny and seed viability;
- Changes in cover of non-tree vegetation.

Detailed measurements are scheduled in 2010 for plots reported as infested in 2008. Final reports of infestation in 2009 are not yet complete (2009 fieldwork is contracted for completion March 31, 2010), but in the interim the schedule for 2011 is based on those plots that either:

- Have already been confirmed as infested;
- Had beetle attack reported in the surrounding stand in 2008;
- Are in areas that incurred extreme over-wintering survival in 2008-09; or
- Are in areas that incurred high levels of both 2008-09 over-winter survival and summer 2009 flight activity.

Decision Support Tool Development

The DST will forecast post-attack stand development, taking into account pre-attack stand structure (characterized from baseline PSP data), mortality levels and silvicultural treatment options. It will predict shelf-life and fall-down of killed timber, regeneration rates, growth of the residual stand and regeneration, and non-tree vegetation responses.

The preliminary version will utilize existing growth and yield models, and will draw on:

- CFS studies of shelf-life and fall-down;
- Published papers on seed release, recruitment and over-storey establishment (primarily from BC);
- FGYA models for post-harvest regeneration performance (for post-salvage scenarios);
- Expert opinion.

Development of the preliminary DST was contracted to The Forestry Corp, for completion by June 30, 2010.

Map 1. Locations of Permanent Sample Plots