FRIAA Fire Hazard Reduction and Forest Health Program

Monitoring and Decision Support for Forest Management in a Mountain Pine Beetle Environment

Phase 2 Proposal for the Period September 1, 2009 – March 31, 2012

Prepared by the:

Foothills Growth and Yield Association

September 29, 2009

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1. Project Overview

1.1. Title and Initiative

FRIAA-FHRFHP September 2009: "Monitoring and Decision Support for Forest Management in a Mountain Pine Beetle Environment – Phase 2".

This project is complementary to Phase 1 of the same initiative, and is necessitated by increased beetle activity during 2008 and 2009. The Applicant has acquired funding and support for research aspects of the work from the Foothills Research Institute and through FRIAA Open Funds. The Phase 2 proposal to the FRIAA Fire Hazard Reduction and Forest Health Program is for funding to cover operational and field aspects of the work aimed at mitigating the impacts of MPB on industries and forest-dependent communities.

1.2. Applicant

The Applicant is the Foothills Growth and Yield Association (FGYA), a research partnership of 9 FRIAA members managed on their behalf by the Foothills Research Institute. The Director of the FGYA is R. W. Udell.

The Applicant will be represented with respect to this proposal by:

R.W. Udell, R.P.F.
Director
Foothills Growth and Yield Association
Foothills Research Institute
Box 6330
1176 Switzer Drive
Hinton, Alberta
T7V 1X6
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1.3. Background Information on the Applicant and Partners

The **Foothills Growth and Yield Association** provides overall guidance and technical direction to the project. The mission and mandate of the FGYA are to continually improve the assessment of lodgepole pine growth and yield in managed stands. Because of the threat posed by mountain pine beetle (MPB) attack to their tenures, the mandate has been extended to providing FGYA members monitoring and operational decision support services related to silvicultural management of threatened and attacked stands.

Nine companies holding Forest Management Agreements throughout the range of lodgepole pine in Alberta cooperate in the Association as voting members and sponsors (see Table 1). The Forest Management Branch of Alberta Sustainable Resource Development (SRD) and the Foothills Research Institute (FRI) participate as non-voting members, with the FRI acting as the coordinating agency.

The **Foothills Research Institute** (formerly Foothills Model Forest) provides administrative support and, through its Mountain Pine Beetle Ecology Program, funding and project management services to the project.

Alberta Sustainable Resource Development (SRD) is responsible for managing and protecting Alberta's forest resources. SRD is the crown land manager and sets forest management policy for planning and operations. SRD is partnering with the FGYA in this project as it addresses key forest management issues identified by the department.

1.4. Site Selection

240 sample plots have been identified for monitoring the effect of MPB on forest stands (see Map 1). All of these sites are existing permanent sample plots of both FMA holders and Alberta Sustainable Resource Development for which historical mensurational data are available for benchmarking stand development. MPB infestation status and other supplementary baseline data were collected on 149 sites during 2008. In 2009, 6 additional candidate sites were confirmed as infested in areas subjected to extreme MPB over-wintering success in the winter of 2008-2009. Under Phase 1 of the Project, a further 42 plots known or suspected to have high levels of MPB activity are being assessed in 2009 to monitor MPB impact.

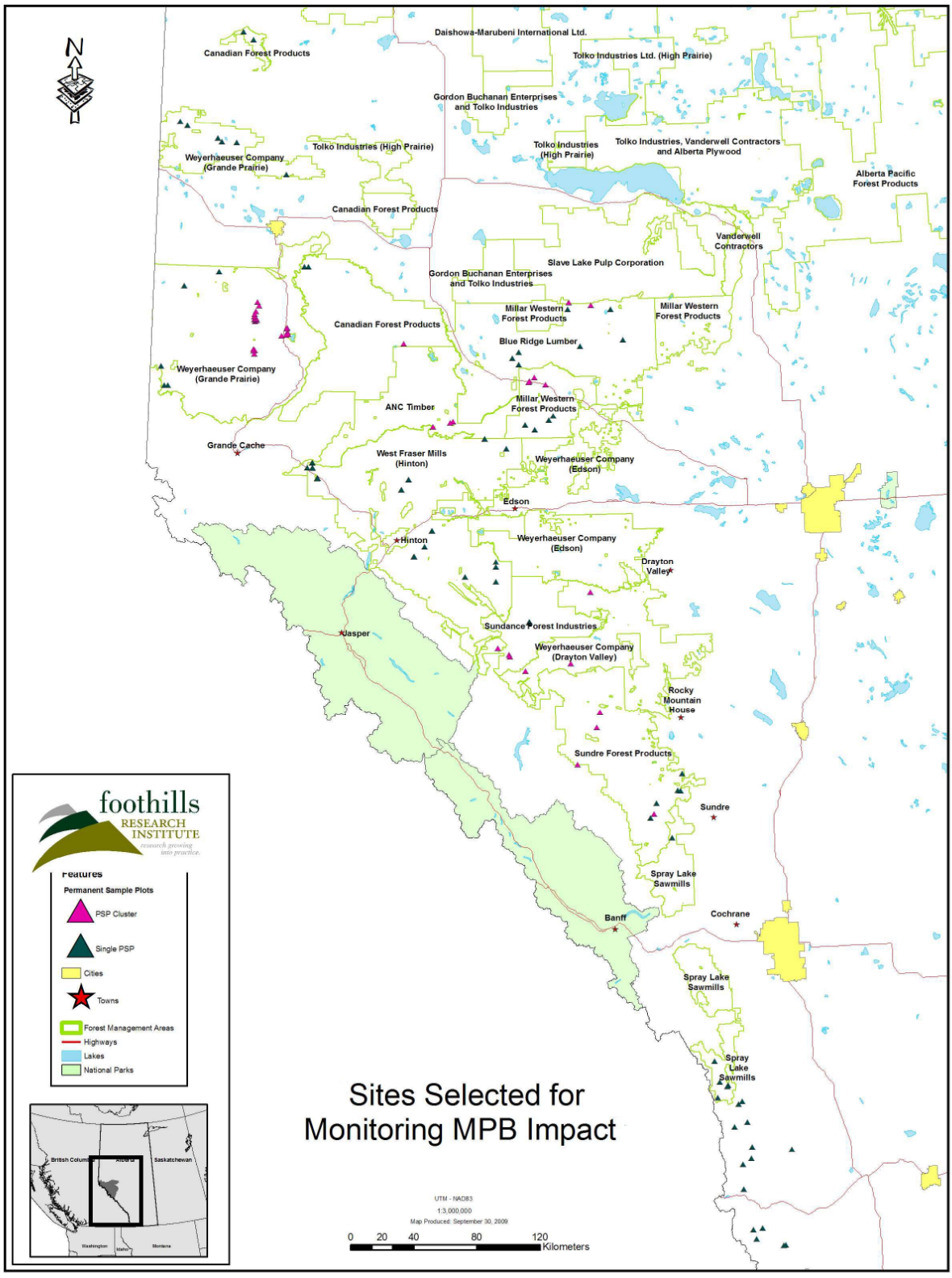
Table 1. Foothills Growth and Yield Association representatives and contacts (2009)

Role / Affiliation	First Name	Last Name	Telephone
Chairman	Dwight	Weeks	(780) 538-7745
Management:			
FRI General Manager	Tom	Archibald	(780) 865-8332
FGYA Director	Bob	Udell	(780) 865-4532
Research and Development Associate	Dick	Dempster	(780) 984-2509
Field Coordinator	Rand	McPherson	(780) 865-0220
Steering Committee:			
ANC Timber	Greg	Branton	(780) 778-7012
Alberta Sustainable Resource Development	Robert	Stokes	(780) 422-2690
Blue Ridge Lumber	Tim	Burns	(780) 648-6220
Canfor	Dwight	Weeks	(780) 538-7745
Foothills Research Institute Board	Murray	Summers	(780) 648-6325
Millar Western Forest Products	Tim	McCready	(780) 778-2221
Spray Lakes Sawmills	Ed	Kulcsar	(403) 932-2234
Sundance Forest Industries	John	Huey	(780) 723-3977
Sundre Forest Products	Bob	Held	(403) 638-4482
Hinton Wood Products	Richard	Briand	(780) 865 8181
Weyerhaeuser Canada	Greg	Behuniak	(780) 539-8207
Technical Committee:			
ANC Timber	Peter	Winther	(780) 778-7000
Alberta Sustainable Resource Development	Daryl	Price	(780) 422-0329
Blue Ridge Lumber	Colin	Scott	(780) 648-6200
Canfor	Melonie	Zaichkowsky	(780) 538-7720
Foothills Research Institute	Debbie	Mucha	(780) 865-8290
Millar Western Forest Products	Tim	McCready	(780) 778-2221
Spray Lakes Sawmills	Ed	Kulscar	(403) 932-2234
Sundance Forest Industries	Pat	Golec	(780) 723-3977
Sundre Forest Products	Bob	Held	(403) 638-4482
Hinton Wood Products	Glenn	Buckmaster	(780) 490-2307
Weyerhaeuser Grande Prairie	Greg	Behuniak	(780) 539-8207
Weyerhaeuser Pembina	Tim	Gylander	(780) 733-4206

1.5. Application Form

Submitted separately.

Map 1. Project Area



2. Proposal Objectives

The overall objective of the project (Phase 1 and 2) is to provide operational decision support to forest managers assessing silvicultural treatment options for stands attacked by mountain pine beetle in Alberta. This infestation has the potential to overwhelm our capacity to cope with it through conventional salvage and treatment options. Thus it is critical to the mid and longer term survival of the forest industry as well as forest-dependent communities that salvage, treatment and remediation decisions are based on the best available information and Decision Support Tools – which is the focus of this project. The importance of monitoring and evaluation is critical to the development of these tools.

Achievement of the objective was commenced in Phase 1 by assembling baseline data and applying the best predictive capability immediately available to making projections from these data, while recognizing the need for ongoing monitoring in a second phase.

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, has created the urgent need for monitoring an expanded network of sites during 2010 and 2011. Failure to conduct such monitoring could incur an irretrievably lost opportunity for timely acquisition of critical information. Unfortunately, the increased MPB activity is coinciding with the economic downturn, threatening both the monitoring activities in the short-term, plus the longer term availability of forestry workers with the specialist skills required to conduct such work on an ongoing basis.

The primary objectives of Phase 2 are therefore:

1. Monitor dynamics of MPB-attacked stands in order to validate, inform and improve projections used in critical post-attack forest management decisions;
2. Provide experience and direct employment opportunities for Alberta forestry workers, thereby maintaining and enhancing their capacity to undertake specialized forest management activities in a MPB environment.

The proposal contributes significantly to the objectives of the Fire Hazard Reduction and Forest Health Program. It:

- Will provide direct employment opportunities for Albertans;
- Will help sustain forestry businesses by providing information on how best to direct scarce resources to planning, salvage and mitigation activities;
- Can be started immediately;
- Reduces the potential loss to Alberta forest-based communities through appropriate treatments to minimize impacts of MPB – while recognizing that losses will still occur;
- Will provide essential information for sustaining forest resources, selecting appropriate silviculture and reforestation treatments, and reducing potential losses to fire, insects and diseases; and therefore will mitigate the risk of loss to key forest resources from MPB;
- The proposal is directly targeted at forest health, arose from a key recommendation of a task force of leading ecologists convened to advise Alberta SRD on post-beetle strategies[1], and is advancing with active support and participation of SRD specialists and data;

[1] (SRD draft report, 2007, *Dynamics of Alberta's Pine Dominated Ecosites Following Mountain Pine Beetle,* ed. J. Stadt)

- Will be highly cost effective because it pools effort and resources across all the major lodgepole pine tenures in Alberta;
- Will be managed by applicants with the proven ability to manage and deliver such projects.

3. Project Information

3.1. Objectives

See Section 2 above.

3.2. Methods, Plan and Activities

(See also Section 4.3 – Work Plan and Schedule)
Decision Support Tool Development

Note: this component of the project is already funded and proceeding, but is included here to provide context for the proposed operational monitoring program.

It is clear, both from the recommendations of the Alberta expert panel mentioned earlier, as well as from observations and reports from areas already hit by MPB, that the post-beetle stand trajectories of Lodgepole pine will be substantially different from those developing either fire or normal harvest and reforestation. Therefore, the development of a Decision Support Tool to inform alternative choices for salvage and treatment is critical.

Consistent with the original Phase 1 proposal, the development of this Decision Support Tool (DST) will involve initial projection of baseline stand conditions under a range of mortality, secondary structure and regeneration scenarios. This will be followed by a synthesis of the projections and other expert knowledge to produce a Decision Support Tool suitable for planners scheduling harvests and silvicultural operations in forests under MPB attack.

The activities involved in development of the preliminary DST are:

1. **PSP data compilation**: summarization of baseline (pre-attack) data already loaded into the project database, as required for input into selected tree and stand models;
2. **Projection** of stand development using 3 growth and yield models (GYPSY, MGM and TASS) and results of other research, for a simulation matrix of site strata, stand conditions and treatment options;
3. **DST construction**: incorporation of projections into a user-friendly web based tool allowing users to select from a range of site types, stand conditions, and operational interventions; and evaluate future stand development.

Needs for a preliminary DST were clarified and elaborated at a workshop held in Hinton June 26, 2009.[2] The DST will take into account site conditions, pre-attack stand structure, and operational interventions to provide managers with forecasts of:

- Shelf-life and fall-down of killed timber (important for prioritizing harvest to extend the salvage "window" as long as possible);
- Post-attack regeneration;
- Growth response of the residual stand and post-attack regeneration;

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

- Non-tree vegetation responses (also important for both wildlife habitat and water conservation considerations).

In the preliminary system, projections will be made for user-specified levels of tree mortality (mild, moderate, severe). The system will be enhanced in 2011-12, incorporating the field measurements proposed below to:

- Predict tree mortality from susceptibility, climate, site and / or other risk factors;
- Improve characterization of relevant pre-attack stand conditions;
- Validate initial response predictions

3.2.1. *Monitoring Program and Methods*

The original monitoring program design prescribed a framework of 240 plots distributed across 8 ecological strata, and assembled a list of candidate permanent sample plots (PSPs) suitable for this purpose. Higher than expected costs for plot measurements led to a reprioritization and netting down of plots to be measured. In 2008, baseline mensurational data were assembled and supplementary field data were collected for 149 of the candidate plots. Further baseline measurements have not been made in 2009 pending development of the preliminary DST, assessment of beetle over-wintering success and summer flight activity, and review of funding priorities and limitations.

It is now urgent that the monitoring program be expanded to a total of 240 PSPs as originally planned, providing representation across the full range of ecological strata and operational areas under threat, and an improved ability for tracking impacts of an increasingly widespread and aggressive attack. **The expansion of this monitoring program is the focus of this project proposal**, to improve accuracy and reliability of this much-needed Decision Support Tool for Alberta forestry managers and the Province..

Appendix 1 lists the 240 candidate PSPs.

"Basic" monitoring will be conducted to measure the level of MPB attack and associated tree mortality. All candidate PSPs were prioritized based on (a) previous reports of infestation in the plot and / or surrounding stand, (b) over-wintering success of MPB in 2008-2009, as indicated by interpretive mapping of R-value surveys conducted by SRD in the Spring of 2009, and (c) recent status updates from SRD (e.g. *Beetle Bulletin*, August 16, 2009), and communications from FGYA member companies (e.g. Hinton Wood Products, personal communication, August 18, 2009).

Priorities identified for basic monitoring of PSPs are:

1. Extreme 2008-2009 over-wintering success;
2. High over-wintering success AND infestation previously reported;
3. Infestation previously reported 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.

Basic monitoring will be scheduled as follows by the above priority classes:

- 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

Checks will be made in the actual PSPs, plus in the buffer area and / or surrounding stand. (The latter requirement may be dropped in the event of very heavy infestation and where plots are already known to be infested.) Procedures within plots will be the same regardless of plot design or ownership. Procedures for checking the surrounding stand will differ between SRD 4-plot groups and single plot samples.

Within the PSP, for those trees showing symptoms of MPB attack, the following data will be recorded:

- Tag number, species, DBH;
- Count of pitch tubes (by three categories: < 20, 20 – 50, > 50);
- Attack stage (green, fader, red, grey) and condition.

If MPB attack has progressed beyond the green stage anywhere in the plot, horizontal digital photographs will be taken in each of the 4 cardinal directions from the plot centre to illustrate the stand condition, especially the presence or absence of understorey and other sub-canopy vegetation.

The stand area buffering the plot will be walked through in parallel sweeps close enough together to allow detection of any red or grey attacked trees, and not more than 20 m apart. For red or grey attacked trees, species, DBH, and attack stage will be recorded. The presence and frequency of observed green attack (number of live trees observed with pitch tubes), or faders will also be noted Any changes in stand conditions suspected to be caused by MPB-related tree mortality (gaps, increased light, vegetation response), will be photographed.

Detailed baseline measurements have already been assembled for 149 plots. This involved:

- Compilation of the most recently available measurements collected by the plot owners (see Section);
- Supplementary measurements of site, saplings, regeneration, non-tree vegetation, tree mortality, arboreal lichens, and cone serotiny.

Similar supplementary measurements will be repeated 2 years following MPB attack for plots already “baselined”, and within 2 years of attack for any additional plots. The measurement protocol will:

- Assess the level of MPB attack and associated tree mortality;
- Assess survival/growth response of understorey trees for the purposes of growth and yield modeling;
- Document new tree regeneration;
- Document effects of MPB attack on cone serotiny and seed viability in lodgepole pine (trees killed by MPB and remaining live trees in stands that have been affected by MPB);
- Document changes in cover of non-tree vegetation including vascular and non-vascular plant species and ground and arboreal lichens.

Detailed measurements are scheduled in 2010 for plots reported as infested in 2008. Final reports of infestation in 2009 will not be available until March 31, 2010, but in the interim schedules for 2011 have been 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;

- Are in areas that incurred high levels of both 2008-09 over-winter survival and summer 2009 flight activity.

3.2.2. *Miscellaneous*

Data compilation tasks will be conducted by a qualified Alberta consulting firm, and will be funded separately from this proposal. Technical management will be provided by the FGYA, and also funded externally to this proposal.

3.3. Areas To Be Treated

(Not applicable.)

3.4. Employment

Table 2 shows estimated direct employment for the fieldwork portion of the project only. It excludes analytical and research tasks, which are not part of the financial proposal to the FRIAA Forest Health Program.

Table 2. Person day inputs for fieldwork by year

Year			Total
2009	2010	2011	
156	195	388	739

The fieldwork will be sub-contracted to 3 or more Alberta firms providing field services to the forest industry.

3.5. Involvement

In addition to the field services sub-contractors, the project will involve 9 holders of forest management agreements. Table 3 shows the number of plots by tenure holder of the forest management area where the plots are located.

Table 3. Number of monitoring plots by forest management area

FMA Holder	# Plots
ANC Timber	12
Blue Ridge Lumber	15
Canfor	8
Hinton Wood Products	25
Millar Western	20
Sundance Forest Industries	12
Sundre Forest Products	21
Spray Lakes Sawmills	6
Weyerhaeuser Canada	107
Outside FM areas	14
Total	240

3.6. Review of Soundness

This project proposal has been reviewed for soundness by technical representatives of the 9 participating FMA holders and SRD.

The basis for the project, both Phase 1 and Phase 2, was the report of the expert panel convened by SRD to provide advice on management issues surrounding the looming MPB infestation (*Lodgepole Pine Stand Dynamics in Alberta Following Mountain Pine Beetle*, J. Stadt and K. Greenway, SRD Forest Management Branch, Forestry Division, October 2007). The panel strongly recommended establishment of a monitoring system to test and validate its initial hypotheses, through the establishment of a Post-Mountain Pine Beetle Stand Development Program.

The FGYA provided further strong justification and reference information for the program, as documented in the project proposal: *Monitoring and Decision Support for Forest Management in a Mountain Pine Beetle Environment* submitted to the FRIAA-07-08 Provincial Projects Initiative, October 9, 2007.

A workshop was held in June 2009, bringing together experts from across Canada and Alberta forest managers to discuss the development of Decision Support Tools for MPB. The workshop served to clarify and refine program refinements, and identified important and relevant reference information, as described in the document: *MPB-Silviculture Decision Tools Workshop Report*, Friday, June 26, 2009, Hinton, Alberta, (available from FRI and FGYA).

The need and timing for a second phase of the project was predicated on expansion of the beetle infestation in Alberta and, unfortunately, this now appears to be the case as described in the recent status updates from SRD (e.g. *Beetle Bulletin*, August 16, 2009), and communications from FGYA member companies.

3.7. Funding Requested and Overall Budget

Table 4 shows activities, requested funding and the overall project budget for the period October 1, 2009 – March 31, 2012. Note that:

- Only the costs indicated in bold type are requested for funding under the Fire Hazard Reduction and Forest Health Program.
- "Year" refers to the operating period from April 1 to March 31 of the following calendar year, except for 2009, for which the plan covers the period September 1, 2009 to March 31, 2010.
- Existing funding for Phase 1, originally scheduled for completion in 2010, will be extended through 2011.

Table 4. Costs ($) by activity, year and proposed funding source

Funding	Activity	Costs				
		Per Plot	**2009**[3]	**2010**	**2011**	**Total**
Phase1 / MPBEP (already committed)	Preliminary Decision Support Tool		73500			73500
	Enhanced Decision Support Tool				26500	26500
	Measurement - basic (to 31/12/09)	735	30870			30870
	Data compilation		8715	8925	15855	33495
	Technical management		15960	15960	15960	47880
	Vegetation specialist		15750			15750
Subtotal Existing Phase 1 / MPBFEP Funding		735	144795	24885	58315	227995
Requested	**Monitoring - basic**	**735**	**30135**	**45570**	**65415**	**141120**
	Monitoring - detailed	**1575**	**0**	**36225**	**97650**	**133875**
Subtotal FRIAA Forest Health Funding			**30135**	**81795**	**163065**	**274995**
Total All Funding Sources			174930	106680	221380	502990

3.8. Other Funding and In-kind Contributions

Activities conducted prior to October 1, 2009, and thereafter ongoing research and development work, will be funded by the Forest Research Institute Mountain Pine Beetle Fire Ecology Program and the FGYA, with support for Phase 1 of the Project already provided under the FRIAA Open Funds Program.

The Foothills Research Institute will administer the proposed project. It has financially supported components of the baseline assessment and the simulations and projections that provided direction to the development of the Decision Support Tool and whole project.

Inputs by the FGYA will be partly supported by FRIP funding under FRIAA Project # FOOMOD-01-03 (*Foothills Growth and Yield Association – Second Five-year Term*) and partly by FGYA industrial sponsors. The FGYA has committed 24 days per year of input by its Director and Research and Development Associate (RDA). This will be continued.

3.9. Sub-contracts

Field work will be contracted to qualified local contractors with proven track records working for FGYA members in their forest management areas. Such contractors will be identified and approved by FGYA members, and / or selected by competitive bidding. All requested funds identified in Table 4 will be dispersed in this way.

3.10. Project Management

Overall responsibility for project implementation will reside with the Project Manager. The Project Manager will be Don Podlubny, RPFT, the MPB Ecology Program Leader of the Foothills Research Institute.

The project management responsibilities include:

[3] Only a portion of the 2009 fiscal year is included: October 1, 2009 – March 31, 2010.

- Recruitment and direction of required staff and sub-contracted services;
- Financial administration of the project;
- Ensuring that work is completed on time and within budget;
- Ensuring that work is coordinated with related initiatives being conducted in Alberta and elsewhere.

The Project and Program Manager will be assisted by the Director of the Foothills Growth and Yield Association. The Director, R.W. (Bob) Udell, R.P.F., will oversee provide the linkages between the Project, the Program Manager and the Steering Committee of the FGYA. The Research and Development Associate of the FGYA, W.R. (Dick) Dempster, Ph.D., R.P.F., will be accountable to the Project Manager and FGYA Director for technical management of the project, including:

- Work planning, including twice-yearly review and (as necessary) revision of project schedules based on project results and other sources of information on infestation status;
- Technical specification of work contracts, and direction of contractors;
- Progress and technical reporting of project results.

3.11. Required Authorizations

All of the project field work will involve non-destructive field measurements endorsed by the plot owner. No further authorizations are required.

3.12. Impact on Other Resources and Users

The Project will not have any adverse impacts on any other forest resources or the environment.

3.13. Results and Outcomes

The project will provide information essential for forest managers making decisions in an MPB environment. The decisions of most importance are where (and where not) to salvage, and where and what other silvicultural interventions to make. The information required for these decisions are forecasts of post-attack stand development with or without salvage and / or other silvicultural treatments, and of the related effects on timber production and wildlife habitat.

The development and deployment of the Decision Support Tool will result in reductions in operating costs, management risks, and losses of timber and habitat values.

The proposed monitoring program will provide invaluable knowledge on the dynamics and impacts of the unprecedented infestation, improving over time the basis for critical post-attack forest management decisions, and thus further reducing costs, risk and losses.

The project will provide experience and direct employment opportunities for Alberta forestry workers, maintaining and enhancing their capacity to undertake specialized forest management activities in a MPB environment.

4. Project Schedules

4.1. Progress Reporting Schedule

Progress reports will be provided at approximately 6-month intervals as follows:

- April 30, 2010 (for the period October 1, 2009 to March 31, 2010);
- September 30, 2010 (mid-year report);
- April 30, 2011 (year-end report for the period April 1, 2010 to March 31, 2011);
- September 30, 2011 (mid-year report);
- April 30, 2012 (year-end report for the period April 1, 2011 to March 31, 2012).

4.2. Proposed Payment Schedule

It is proposed that FRIAA will forward Project funds to the Foothills Model Forest in advance of expenditures (see Table 4) on an annual basis, subject to:

• Submission of an annual work plan (for the period April 1 to March 31 of the following year);

• Submission of the annual report as per Section 4.1 (applicable for operating years 2010 and 2011);

• A holdback of 10% each year, pending submission of the annual report and any other deliverables scheduled for the year.

This would result in the following payment schedule, consistent with Table 4 after holdbacks:

- On approval: $27,121
- April 1, 2010: $73,615
- April 1, 2011: $146,758
- January 31, 2012: $27,501 (final payment 10% hold back)
- Total Project: $274,995

4.3. Work Plan and Schedule

Table 5 shows project activities scheduled by year and funding source for the period October 1, 2009 – March 31, 2012. Note that, as in Table 4: "year" refers to the operating period from April 1 to March 31 of the following calendar year, except for 2009, for which the plan covers the period September 1, 2009 to March 31, 2010.

The monitoring component of the plan will be reviewed, and re-scheduled if necessary, each year based on results of spring SRD R-value surveys and project monitoring activities conducted in the Fall and winter.

Table 5. Project activities by year

Funding Source	Activity	Activity Year / Number of Plot Measurements			
		2009	2010	2011	Total
Phase1 / MPBFEP (already funded)	Preliminary Decision Support Tool	x			
	Enhanced Decision Support Tool			x	
	Measurement - basic (to 31/12/09)	42			42
	Data compilation	x	x	x	
	Technical management	x	x	x	
	Vegetation specialist	x			
Requested - FRIAA	**Monitoring - basic**	**41**	**62**	**89**	**192**
	Monitoring - detailed	**0**	**23**	**62**	**85**

Appendix 1. Permanent Sample Plot Monitoring Schedule

Map #	Sample Id	Owner	FMA holder	# of plots	Assumed initial attack year	Basic monitoring priority	Basic monitoring year	Detailed monitoring year	UTM east	UTM north	Stratum
1	8	SRD	MWF	4		3	2009		545641	6017568	7
2	9	SRD	MWF	4		5	2010		548819	6019846	3
3	14	SRD	MWF	4		5	2010		555752	6015362	1
4	16	SRD	BRL	4		5	2010		570482	6067316	4
5	20	SRD	BRL	4		5	2010		584521	6065659	2
6	55	SRD	WEY	4	2009	2	2009	2011	371689	6055401	5
7	56	SRD	WEY	4	2008	2	2009	2010	372613	6056259	7
8	58	SRD	WEY	4	2009	3	2009	2011	371289	6056657	8
9	59	SRD	WEY	4	2009	3	2009	2011	372015	6057123	3
10	65	SRD	WEY	4	2008	2	2009	2010	372207	6061676	7
11	68	SRD	WEY	4	2008	1	2009	2010	374281	6065429	7
12	70	SRD	WEY	4	2009	1	2009	2011	373217	6067664	5
13	86	SRD	WEY	4	2009	2	2009	2011	392166	6048521	5
14	87	SRD	WEY	4	2008	2	2009	2010	392537	6047247	7
15	88	SRD	WEY	4	2008	2	2009	2010	391231	6046780	8
16	89	SRD	WEY	4	2009	3	2009	2011	388357	6046276	3
17	101	SRD	WEY	4		6	2011		525496	5848517	1
18	105	SRD	SDA	4		6	2011		532684	5844328	4
19	106	SRD	SDA	4		6	2011		533277	5843237	4
20	111	SRD	WEY	4		6	2011		543003	5833892	2
21	135	SRD	WEY	4		6	2011		571804	5838793	6
22	144	SRD	SFP	4		6	2011		576224	5774505	1
23	156	SRD	SFP	4		6	2011		590453	5807889	7
24	162	SRD	SFP	4		6	2011		588333	5798056	1
25	167	SRD	SFP	4		6	2011		624514	5743217	2
26	176	SRD	WEY	4		6	2011		584322	5884101	3
27	461	SRD	NA	1		6	2011		675795	5544789	1

Map #	Sample Id	Owner	FMA holder	# of plots	Assumed initial attack year	Basic monitoring priority	Basic monitoring year	Detailed monitoring year	UTM east	UTM north	Stratum
28	488	SRD	NA	1	2008	3	2009	2010	687543	5479418	7
29	508	SRD	NA	1		6	2011		708084	5469667	4
30	512	SRD	NA	1		6	2011		706830	5469622	4
31	522	SRD	NA	1		6	2011		678209	5559152	4
32	531	SRD	SLS	1		6	2011		662996	5586305	4
33	532	SRD	SLS	1		6	2011		671747	5571038	4
34	12023-F	BRL	BRL	1		5	2010		604807	6043671	3
35	13273-F	BRL	BRL	1		5	2010		577588	6039766	4
36	14508-F	BRL	BRL	1		5	2010		538675	6035897	3
37	15788-F	BRL	BRL	1		5	2010		534795	6032014	3
38	5588-F	BRL	BRL	1		5	2010		597026	6063124	1
39	G0101NW	CAN	CAN	1	2009	2	2009	2011	405387	6090136	5
40	G0103NE	CAN	CAN	1	2009	2	2009	2011	403001	6090166	1
41	R431601	CAN	CAN	1	2008	1	2009	2010	364261	6239204	4
42	R463101	CAN	CAN	1	2009	1	2009	2011	370721	6234161	4
43	1010214	HWP	HWP	1		6	2011		468927	5955147	8
44	1010216	HWP	HWP	1		6	2011		469062	5955009	8
45	3010288	HWP	HWP	1		6	2011		524293	5903349	3
46	3010331	HWP	HWP	1		6	2011		524318	5900124	3
47	3010447	HWP	HWP	1		6	2011		524367	5890593	8
48	4010077	HWP	HWP	1		6	2011		483691	5922852	4
49	4010078	HWP	HWP	1		6	2011		483833	5922855	4
50	4010289	HWP	HWP	1		6	2011		472239	5906659	6
51	4010290	HWP	HWP	1		6	2011		472388	5906669	6
52	4010291	HWP	HWP	1		6	2011		472387	5906529	6
53	5010003	HWP	HWP	1		6	2011		407969	5965685	2
54	5010004	HWP	HWP	1		6	2011		407825	5965696	2
55	5010005	HWP	HWP	1		6	2011		404767	5962729	2
56	581624A	MWF	MWF	1		5	2010		548893	5986634	4

Map #	Sample Id	Owner	FMA holder	# of plots	Assumed initial attack year	Basic monitoring priority	Basic monitoring year	Detailed monitoring year	UTM east	UTM north	Stratum
57	581632A	MWF	MWF	1		5	2010		542893	5989686	5
58	591501A	MWF	MWF	1		5	2010		557886	5992660	3
59	BM601A	MWF	MWF	1		5	2010		560673	5995540	3
60	T-46-R-16-SW-NE	SDA	SDA	1		6	2011		545589	5864857	4
61	T-46-R-16-SW-NW	SDA	SDA	1		6	2011		545455	5864842	4
62	T-46-R-16-SW-SE	SDA	SDA	1		6	2011		545604	5864716	4
63	T-46-R-16-SW-SW	SDA	SDA	1		6	2011		545464	5864700	4
64	187	SFP	SFP	1		6	2011		642534	5769042	8
65	212	SFP	SFP	1		6	2011		626219	5750077	7
66	272	SFP	SFP	1		6	2011		622448	5740862	8
67	273	SFP	SFP	1		6	2011		639730	5758322	7
68	274	SFP	SFP	1		6	2011		641312	5758021	8
69	5291555	SLS	SLS	1	2008	3	2009	2010	666357	5573171	4
70	8251465	SLS	SLS	1		6	2011		665063	5563264	2
71	14263185	SLS	SLS	1		6	2011		636135	5728344	1
72	7	SRD	MWF	4		5	2010		545150	6016712	5
73	60	SRD	WEY	4	2009	3	2009	2011	372534	6057104	8
74	61	SRD	WEY	4	2009	3	2009	2011	371164	6058543	7
75	63	SRD	WEY	4	2009	3	2009	2011	371456	6059945	7
76	76	SRD	WEY	4		4	2010		370648	6037885	2
77	77	SRD	WEY	4		4	2010		371481	6037200	6
78	78	SRD	WEY	4		4	2010		370643	6036842	8
79	80	SRD	WEY	4		5	2010		371138	6034881	6
80	84	SRD	WEY	4	2009	1	2009	2011	392021	6051415	8
81	85	SRD	WEY	4	2009	3	2009	2011	391747	6050748	3
82	245	SRD	ANC	4		5	2010		497100	5991647	2
84	247	SRD	ANC	4		5	2010		495394	5990999	6
86	251	SRD	ANC	4		5	2010		484356	5988456	8
87	276	SRD	CAN	4	2009	3	2009	2011	466009	6041294	3

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88	429	SRD	NA	1		6	2011		686438	5524645	1
89	460	SRD	NA	1		4	2010		686881	5532092	1
90	479	SRD	NA	1		6	2011		712055	5530521	5
91	503	SRD	NA	1		4	2010		693473	5480338	7
92	511	SRD	NA	1		4	2010		689779	5473502	5
93	513	SRD	NA	1		6	2011		680927	5520682	4
94	516	SRD	NA	1		6	2011		683813	5547678	4
95	518	SRD	NA	1		6	2011		681658	5505120	7
96	529	SRD	NA	1		6	2011		680588	5561027	4
97	533	SRD	SLS	1		6	2011		671037	5570261	4
112	17078-F	BRL	BRL	1		5	2010		538676	6028094	8
113	5553-F	BRL	BRL	1		5	2010		569781	6063101	2
114	1010417	HWP	HWP	1		6	2011		464307	5948837	2
115	1010419	HWP	HWP	1		6	2011		464447	5948692	4
116	2010009	HWP	HWP	1		6	2011		517098	5980887	6
117	2010010	HWP	HWP	1		6	2011		517304	5980896	4
118	2010116	HWP	HWP	1		6	2011		531028	5974715	7
119	3010395	HWP	HWP	1		6	2011		504830	5893566	6
120	4010180	HWP	HWP	1		6	2011		479004	5913058	8
121	5010007	HWP	HWP	1		6	2011		407873	5962627	2
122	5010010	HWP	HWP	1		6	2011		407884	5962471	2
123	5010142	HWP	HWP	1		6	2011		411082	5956078	2
124	5010143	HWP	HWP	1		6	2011		411232	5956080	2
125	5010145	HWP	HWP	1		6	2011		411079	5955934	2
149	606113000001	WEY	WEY	1	2009	3	2009	2011	316334	6015045	2
150	606113000003	WEY	WEY	1	2009	3	2009	2011	313924	6015136	4
151	606213000016	WEY	WEY	1	2009	3	2009	2011	311941	6027367	4
152	606712000024	WEY	WEY	1	2009	2	2009	2011	326671	6077954	1
153	606809000019	WEY	WEY	1	2009	2	2009	2011	348850	6086906	1

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154	607505000004	WEY	WEY	1	2009	1	2009	2011	391422	6148664	5
155	607708000006	WEY	WEY	1	2009	1	2009	2011	360107	6169032	5
156	607709000006	WEY	WEY	1	2009	1	2009	2011	350508	6169391	7
157	607710000013	WEY	WEY	1	2009	1	2009	2011	348038	6171859	5
158	607812000001	WEY	WEY	1	2009	1	2009	2011	328846	6179883	5
159	607812000016	WEY	WEY	1	2009	1	2009	2011	324188	6182368	5