Foothills Growth and Yield Association
BUSINESS AND WORK PLAN

Business Plan Updated Effective April 1, 2009
with Annual Work Plan for April 2009 – March 2010

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Table of Contents

List of Tables

1. Background

The Foothills Model Forest[1], responding to interest by industry and government, in 1999 facilitated collaboration among 9 companies holding Forest Management Agreements on the Eastern Slopes to create the Foothills Growth and Yield Association (FGYA) for co-operative forecasting and monitoring of managed stand growth and yield.

The FtMF appointed a part-time Director in June 1999, with the mandate to develop a growth and yield co-operative. A memorandum of agreement was developed and endorsed by 9 companies, the Land and Forest Service, and the Foothills Model Forest effective April 1, 2000. Nine companies presently participate in the FGYA as voting members. The Alberta Department of Sustainable Resource Development (ASRD) and the Foothills Research Institute (FRI) participate as non-voting members, with FRI acting as the coordinating agency.

The Foothills Model Forest, acting as applicant on behalf of the 9 sponsoring members, submitted a proposal to the Forest Resource Improvement Association of Alberta (FRIAA) in July 2000. A contract was issued (FOOMOD-01-01 – *Foothills Growth and Yield Association*) on July 25, 2000, facilitating use of FRIP (Forest Resource Improvement Program) funds to cover membership costs and project activities. The original contract had an initial term of 2 years, and was amended in September 2001, extending the term to 5 years (April 1, 2000 to March 31, 2005). In 2005 a second 5-year term was approved (April 1, 2005 to March 31, 2010) under FRIAA Project # FOOMOD-01-03. The Research and Development Associate of FGYA is developing a proposal for a further 5-year extension of the program.

During the 2001-02 fiscal year, the FGYA established a major project to forecast and monitor development of lodgepole pine regenerated after harvesting, and assessed opportunities and requirements for other cooperative projects. At the FGYA's March 2002 Annual Steering Committee Meeting the Committee reviewed and accepted a business plan that rationalized the Association's mission, strategies, projects and financial requirements for the next 5 years. The plan identified a total of 6 projects, all of which have been implemented and are now in various stages of completion. In 2007, a new project dealing with mountain pine beetle impacts was added. The plan has been updated each year since 2004.

This version of the plan covers the period commencing April 1, 2009, with projections 2-5 years ahead depending on project plans and expected durations. Costs, revenues, activities and deliverables are scheduled by year. Work is scheduled in detail for the coming year (April 1, 2009 – March 31, 2010).

[1] Effective spring 2008, the Foothills Model Forest changed its name to the Foothills Research Institute, in keeping with its new 5-year business strategy and to better represent the nature of the organization's mission.

2. Mission

The interests of the parties constituting the FGYA are stated in the Memorandum of Agreement among members as follows:

- The companies that are signatories of the Agreement wish to participate in a cooperative program for the forecasting and validation of managed stand growth and yield, particularly of lodgepole pine;
- The Alberta government wishes to promote the scientific development and validation of yield forecasts used by tenure holders in the development of forest management plans;
- The Foothills Research Institute (FRI) wishes to promote cooperation and shared responsibility in the improvement of sustainable forest management practices.

The mission and mandate of the FGYA are to continually improve the assessment of lodgepole pine growth and yield in managed stands by:

- Forecasting and monitoring responses to silvicultural treatments;
- Facilitating the scientific development and validation of yield forecasts used by members in managing their tenures;
- Promoting knowledge, shared responsibility and cost-effective cooperation.

The following indicators will measure success in performing the mandate, and may be used as criteria for evaluating and prioritizing project proposals and other FGYA activities.

1. *Forecasts*: stand-level timber yield forecasts are defensible and accepted by the scientific and regulatory communities.
2. *Validation*: recognized scientific, regulatory and certification standards for validation and monitoring of sustainable forest management practices are met.
3. *Knowledge*: managers' knowledge, and their abilities to predict responses to management practices, are improved, facilitating management by objectives rather than by arbitrary prescription.
4. *Awareness*: stakeholders influencing forest management decisions understand the probable effects of management interventions on stand development.
5. *Cost effectiveness*: investments in growth and yield assessment are cost effective, and there is no unnecessary duplication of effort.
6. *Equitable participation*: participants remain committed to the program, and share costs equitably.
7. *Relevance*: work is user-driven, results-focused, and directly applicable to management and crop planning.

3. Strategies

3.1. Project Development

The goals of the FGYA are being achieved through a series of projects developed cooperatively by members, in consultation with government agencies and other experts in growth and yield. Projects of the FGYA are designed to forecast and validate yields for treatment regimes and site conditions of interest to all members, in order to provide a credible and reliable basis for supporting and defending timber supply analyses and assumptions. *Yield forecasts* are defined here as quantitative estimates of future stand timber yields, agreed by the scientific and regulatory community as the most probable outcome of the treatment regime being applied to the range of stand and site conditions specified. *Validation* will involve the establishment or adoption of well-designed and replicated field trials, and their periodic re-measurement to compare actual results against forecasts.

Quantitatively, the benefit of a project to each member will vary, and will be determinable only by the individual member. It is expected that each member will bring to the table during project definition those questions, issues and priorities that relate to their particular interests, and will participate actively in design, approval, implementation, and evaluation of the project. By these means, the qualitative value of projects will be assured, and the benefits to be achieved through collective effort and pooled resources will far exceed the outcomes of individual efforts in similar endeavours.

The nature of tree growth requires the program to be long-term and ongoing. Continually improved forecasts will be made of the growth and yield parameters being tested, using the best models and data available when the project is initiated and each time it is re-measured. Recent amendments to Forest Management Agreements in Alberta emphasize the importance of growth and yield in support of detailed forest management planning.

Detailed methods will be specified in project plans and experimental designs. Measured variables will include (a) stand and site parameters prior to or at time of treatment, and silvicultural treatment parameters, and / or (b) stand and site parameters at benchmark stand development stages. These variables will include, or be stratified by, a common ecological site classification system. Forecast variables will include future stand conditions, and timber yields from intermediate (if applicable) and final harvests, at utilization standards agreed by the members.

Recognized scientific experts in growth and yield, silviculture, biometrics, tree nutrition, and forest ecology will review project plans and results, and / or participate in analyses. Meetings will be held at least once a year, to which experts will be invited to attend and participate. Formal peer review will be encouraged through the publication of project results. Use of field trials for demonstration and ancillary research purposes will be promoted.

3.2. Project Priorities

A review of voting members' opinions conducted in 2001 indicated that responses to planting, vegetation management and density regulation treatments in harvest-origin stands were the highest priorities for investigation, followed by density and nutrition management in fire-origin stands. All members agreed to proceed with investigations of spacing, tending and pre-commercial thinning in harvest-origin stands, but there were variable opinions on the importance of commercial thinning and fertilization. The primary focus has remained on forecasting the development of post-harvest managed stands, and has been emphasized and re-affirmed by current interests and urgency for the development of regeneration standards linked to growth and yield. Although post-harvest stand development is the first priority for growth and yield assessment, the Association recognizes that (a) much can be learned from experimentation and assessment in fire-origin stands that is relevant and necessary for yield forecasting and sound silvicultural decision-making in post-harvest stands, and (b) strategic management of existing fire-origin stands requires an ability to predict responses to potential interventions such as thinning and fertilization.

As a basis for determining what stand variables should be measured and forecast, the members were also asked to rate the importance (high, medium, low) of various forest management objectives, with the following results:

1. Timber volume (annual allowable cut) was rated high by all members;
2. Wood value (related to cost of production and / or price of product) was rated high by a majority of members;
3. Ecological (primarily biodiversity and habitat), protection, and risk management objectives were rated medium to high by a majority;
4. A majority rated social objectives (e.g. aesthetics) low.

Following strategic discussions in January 2007, further direction from the Steering Committee in February and the field tour in July 2007, a proposal entitled "Monitoring and Decision Support for Forest Management in a Mountain Pine Beetle Environment" was developed and accepted for FRIAA funding. This funding, and other funding committed by the FRI provides support for the new project described in Section 4.

As directed by the Steering Committee at their March 2008 meeting, the FGYA Technical Committee reviewed the priorities at its June 2008 meeting, and developed the following updated list of priorities (existing projects noted):

1. Responses to planting, vegetation management and density regulation treatments in harvest-origin stands.
   - Project 2 – Regenerated Lodgepole Pine
2. Mortality, forest health and risk management in regenerated stands following harvest, including the effects of climate change. This includes the impact of Mountain Pine Beetle on forest health and post-beetle regeneration and stand management strategies
   - Project 7 – Monitoring and decision support, MPB
   - Project 2 – Evaluation of the impacts of climate variation on regeneration performance is being added to this project. (This will focus on immediate effects, but results and link to climate models could also be applied to prediction of long term climate change impacts.
   - No other project on climate change impacts and strategies at present

3. Investigations of spacing, tending, nutrition and thinning in harvest-origin stands including application of results from density and nutrition management trials in fire-origin stands.
    - Project 3 – Post Harvest Stand Development conference and dialogues
    - Project 4 – Historic Research Trials
    - Project 6 – Enhanced Management of Lodgepole Pine
4. Impacts of density management on wood quality over time
    - No project at present

The above priorities are reflected in the identification and development of the projects described in Section 4.

3.3. Roles, Responsibilities and Assigned Tasks

The FGYA is a cooperative initiative involving voting members (industrial sponsors), ASRD and the Foothills Research Institute (as Coordinating Agency).

3.3.1. Voting Members

Voting members must be corporations or corporate divisions holding forest management tenures in Alberta. Responsibilities of the voting members will include:

- Installation and measurement of growth and yield trials (either directly or by financial and other support of work undertaken by contractors administered through the FRI) as specified in work and project plans approved by the Steering Committee;
- Provision of error-free data, in a format defined by the Coordinating Agency and the Technical Committee, from those measured under direct supervision of the member;
- Appointment of a representative to the Steering Committee with authority to vote and represent the Member's strategic and financial interests;
- Assignment of a representative to the Technical Committee with authority to represent the Member's technical views and interests;
- Payment of an annual membership fee approved by the Steering Committee to support the direct costs incurred by the Coordinating Agency in the management of the Association.

Field trials and associated silvicultural activities will be conducted under authority of the sponsors' timber tenures.

Overall control of management of the FGYA is vested in the Steering Committee, which will:

- Meet at least once each year;
- Elect from among the voting members' representatives a chairperson who calls and chairs meetings;
- Define, periodically review, and revise as necessary, a minimum project contribution level for voting members;
- Set, annually review, and revise as necessary, annual membership fees;
- Review and approve project plans, data standards, annual work plans, annual operating budgets, reports, and priorities for supporting research;
- Review and approve contracts for outside services, data sharing agreements, and other business arrangements proposed by the appointed Program Manager;
- Approve assignment to the FGYA of personnel hired or contracted by the Coordinating Agency;
- Approve the publication and dissemination of information resulting from FGYA projects.

Effective April 1, 2006, the term for the elected chairperson is 2 years i.e. the current Chairman's position will expire March 31, 2010.

The Technical Committee, supported by the Research and Development Associate, and Program Manager, will:

- Develop project plans, experimental designs and standards for approval by the Steering Committee;
- Assist the Program Manager in the development of work plans and budgets;
- Coordinate the installation and measurement of field trials;
- Monitor project implementation, quality control, and data delivery, and evaluate results.

3.3.2. Alberta Sustainable Resource Development

The Forests Division (FD) of ASRD has undertaken to:

- Assign the Executive Director of Forest Management, or other authorized senior official, to participate on the Steering Committee in a non-voting advisory capacity;
- Assign a technical expert, or experts, knowledgeable in forest planning and yield forecasting, to the Technical Committee to provide advice on matters pertaining to project planning, experimental design, quality control, data acquisition, model development and validation, project evaluation, and regulatory requirements for yield forecasting and validation.

3.3.3. Foothills Research Institute (FRI)

The Foothills Research Institute, as Coordinating Agency for the FGYA, will be responsible for:

- Administration of the Association;
- Appointment of a representative of the Foothills Research Institute Board of Directors to the Steering Committee in a non-voting capacity;
- Dissemination of information to, and continuing education of, FGYA members in matters relevant to the Association;
- Preparation and submission of the reports.

The Foothills Research Institute will also:

- Retain the services of a Program Manager to manage the Association and to coordinate and ensure quality control of field services undertaken by contractors;
- Retain or assign other required staff and contract services;
- Administer the annual operating budget of that portion of the Association's program for which it is directly responsible;
- Control expenditures in accordance with the approved operating budget, generally accepted Canadian accounting practices, and FRIAA requirements;
- Maintain books of account of all funds contributed and dispersed on behalf of the Association, in accordance with generally accepted Canadian accounting practices, and subject to annual independent audit;
- Procure and maintain equipment and supplies required by the Association;
- If applicable, procure, own, and maintain equipment requiring capital expenditures, and lease such equipment to the Association at rates not exceeding fair market value;
- Maintain a secure repository of all FGYA data.

3.3.4. Program Manager (Director of Operations and Field Coordinator)

The Program Manager will be a firm or one or more individuals retained to undertake the following duties:

- Preparation of annual work plans and budgets, and annual updating of a 5-year business plan;
- Chairing of a Technical Committee consisting of representatives from 11 member organizations, and consultation with the members regarding the development and management of projects;
- Ensuring that project proposals, plans, experimental designs, and data standards are developed in a timely manner;
- Control of data quality consistent with plans and standards approved by the Steering Committee;
- Oversee loading (including quality control), compilation and maintenance of FGYA project databases;
- Ensuring that projects are implemented in a timely manner consistent with approved program and project plans and quality standards;
- Planning, supervision and quality control of field research and measurements, including the overseeing and auditing of contracts and the coordination of inputs by technical representatives;
- Dissemination to FGYA members of relevant information, including a minimum of one educational meeting or field trip per year;
- Preparation of progress reports every six months or as otherwise requested by the Steering Committee, and of annual program and project reports;
- Collaboration and cooperation with other agencies as appropriate and necessary to further the interests of the Association.

The Program Manager will:

- Enter into a one-year renewable employment agreement or services contract with the Foothills Research Institute to undertake the above duties;
- Retain or sub-contract any additional personnel required to fulfill the list of duties specified above;
- Report to the FGYA Steering Committee and the General Manager of the Foothills Research Institute;
- Work closely with the FGYA Research and Development Associate;
- Be provided data management and financial accounting support by the Foothills Research Institute.

The required level of input is expected to be approximately 75 man-days per year, and to be split between professional program direction and technical field coordination by one or more registered forestry professional(s). Funding, implementation and extent of the services are subject to initial and annual approval by the Steering Committee.

3.3.5. Research and Development Associate (Technical Director)

A Research and Development Associate will be retained on a part-time basis under a rolling 2-year contract by the Foothills Research Institute to provide analytical and technical direction services to the members and the Program Manager. He / she will be a registered professional forester holding an advanced forestry degree with extensive research and operational experience in growth and yield, and will undertake the following duties:

- Selection and development of analytical and modeling techniques for predicting the establishment, performance, growth and yield of lodgepole pine in managed stands;
- Selection or development (as appropriate), testing, and validation of stand-level growth and yield models which best represent the experimental sites, practices and data evaluated;
- Analysis of data from FGYA field trials;

- Reporting of technical results of projects to FGYA members;
- Evaluating and, if appropriate, recommending continued support for research projects and trials a minimum of two years prior to any planned termination of support or maintenance;
- Development and testing of decision-support tools for application by Association members;
- Preparation of technical reports and papers for dissemination or publication;
- Liaison and communication with Association timber supply planners and silvicultural practitioners, and with researchers in collaborating agencies, as required for effective exchange of knowledge and ideas.

The required level of input is expected to be approximately 80 days per year. The Associate will report to the Program Manager on program responsibilities and administration and directly to the Steering and Technical Committees on technical results and products.

3.3.6. Field Services Contractors

A roster of suitably qualified field contractors will be maintained to assist the Program Manager in project implementation and quality assurance. These services are required for the installation and measurement of research trials: Planned project implementation will require the services of qualified contractors with proven experience in forestry field measurements, sample plot layout, and / or experimental silviculture.

Only contractors recommended or endorsed by FGYA member companies will be listed and engaged. Selection for projects will be competitively bid, or may be sole-sourced in situations where only one contractor is available with the required skills and experience. In the latter case, financial proposals will be evaluated by at least 2 technical representatives in addition to the Program Manager.

Member companies of the FGYA will contract directly with the field contractors for the remeasurement of the Regenerated Lodgepole Pine plots, and submit the data to the Association for analysis.

If the Field Coordinator is a member of a consulting firm providing technical services to the FGYA either directly or through a member company, he must separate himself from direct involvement in field service provision whether through direct measurements or supervision of field crews doing the work.

3.4. Allocation of Effort and Costs

Each voting member will be charged an equal annual membership fee. The total amount levied will be sufficient to cover costs incurred by the Coordinating Agency in carrying out its responsibilities as defined in Section 3.3.3 above. Requirements are discussed in Section 5.1 and projected in Table 7, but will be subject to Steering Committee review and approval each year.

Unless otherwise provided for under special agreements with external sponsors and cooperators, the costs or direct effort for installing, maintaining, treating and measuring field trials will be shared among voting members. Costs and effort will be allocated according to the net operable pine-leading land area in the members' tenures. Where the member shares annual allowable cut (AAC) for a management unit, the contributing land base for that unit will be calculated as the total AAC land base multiplied by the member's portion of the AAC. Table 1 shows areas and percentage allocations as calculated in 2002. The allocation will be updated when significant changes occur to any member's net area. The re-allocation will take effect in the fiscal year following the change being reported, and will not be applied retroactively.

Situations have arisen where members have already collected growth data from permanent sample plots (PSPs), potentially contributing to an FGYA project with considerable timesaving. Such contributions may be recognized and encouraged by crediting and offsetting the value of the data against the contribution that the member would otherwise make to the project under the allocation formula. The Technical Committee will assess the value of such contributions relative to the cost of new data collection, and make recommendations to the Steering Committee regarding what value should be credited to the member contributing data. The Steering Committee will make the final determination of the value to be credited. The FGYA will not normally reimburse the member directly, or allow credits to be accumulated from one project to another, so the maximum value that can be recognized is the project cost that would otherwise be allocated to the member for collecting new data. In the event that such an offset is made, the cost of new data collection will be shared among the other members, in proportion to their net areas.

Table 1. Work Allocation Based on Pine-leading Area

Member	Net area (ha)	% of total
Alberta Newsprint Company	106,870	5.2
Blue Ridge Lumber	180,323	8.8
Canadian Forest Products	106,271	5.2
Millar Western Forest Products	112,406	5.5
Spray Lake Sawmills	114,988	5.6
Sundance Forest Products	121,848	6.0
Sundre Forest Products	293,655	14.4
Hinton Wood Products	451,713	22.1
Weyerhaeuser Canada	557,433	27.3
Total	2,045,507	100.0

3.5. Collaboration with External Institutions

Cooperation with external agencies (i.e. non-FGYA members) is desirable and necessary for meeting the mandate and mission of the FGYA. However, a clear collaboration strategy is necessary to ensure that such cooperation is beneficial to the Association and its members, equitable, and an efficient expenditure of the Association's time and resources.

The FGYA may collaborate with other agencies in order to:

- Obtain expert advice on the design, analysis and interpretation of projects;
- Obtain assistance in the analysis of data and publication of results;
- Encourage independently funded supplementary research supporting and building on FGYA projects;
- Access relevant information sources, including through sharing and exchange of data where clearly in the FGYA's interest and approved by the Steering Committee;
- Improve communication between researchers and practitioners where such communication will benefit members and enhance the assessment of lodgepole pine growth and yield in managed stands.

Where collaboration involves data sharing, significant costs, publication of FGYA information, and / or formal commitment to deliverables, the Program Manager will obtain the approval of the Steering Committee before proceeding. If deemed necessary and appropriate by the Steering Committee, the FGYA will enter into a formal memorandum of cooperation and / or collaborative research signed by the FGYA's chairperson. Such an agreement between the FGYA and cooperator will specify:

- Purpose and scope of the cooperation;
- Administrative roles and responsibilities;
- Contributions (financial and / or in-kind);
- Data ownership and access;
- Appropriate provisions and clarifications regarding liability, indemnification, amendment, notice, and dispute settlement;
- Term of agreement and time schedule for work commencement and completion;
- Schedule of committed deliverables.

No provisions in any such agreement may conflict with, encumber or supersede provisions contained in the Memorandum of Agreement between FGYA members or this Business Plan.

Collaborative arrangements in existence or planned include:

- *Canadian Forest Service*: The FGYA, the Northern Forestry Centre of the CFS, and the Land and Forest Division (LFD) of Alberta Sustainable Resource Development entered into an agreement in July 2002 for the cooperative management of historic lodgepole pine research trials. This agreement was renewed in 2008 through to March 31, 2013, with the purpose remaining to be working arrangements for collaboration and continuing access to and use of historic trials for the purpose of improving knowledge of growth, yield, silviculture and fibre qualities
- *University of Alberta*: On April 1, 2005 the University and FGYA entered into a collaborative agreement to participate in implementation of the *Enhanced Management of Lodgepole Pine* Project, this Agreement was updated in 2008, and extended until March 31, 2010 with the addition of a new project linked to the FGYA's Mountain Pine Beetle project #7. This new project, funded by U of A, examines the effect of managing stand vigour to increase resistance and reduce the impact of Mountain Pine Beetle. The Agreement also makes provision for the effects of thinning and fertilization on MPB to be studied using the EMLP 1 and 2 sites.
- *British Columbia*: Informal dialogue with the B.C. Ministry of Forests Research Branch has proven extremely helpful without requiring specific or formal commitments on the part of the FGYA. The Research Branch of BCMOF has been supportive of the FGYA effort through providing access to the Tree and Stand Simulator (TASS) model for growth and yield analysis. This dialogue will be continued and extended to regional Ministry staff such as those knowledgeable and involved in the management of regeneration following mountain pine beetle infestations, who were instrumental in organizing the July 2007 MPB tour.
- *Loblolly Pine Growth and Yield Research Cooperative*: The FGYA visited the Virginia-based Cooperative in 2006 to learn about its research, operation and structure. Members concluded that maintaining and building on the link established was desirable. The application of loblolly pine models and thinning practices to lodgepole pine, based on "scaling" and "similarity analysis" approaches discussed and demonstrated during the tour, is of particular interest. The FGYA will consult with the Cooperative to investigate the application of these approaches.
- *Mixedwood Management Association (MWMA)*: The FGYA will continue to support the efforts of the MWMA to promote collaboration among Alberta forestry co-operatives. (In 2006 we provided information on our objectives and structure, and participated in formal consultations with representatives from the MWMA and other agencies.)

3.6. Data Sharing

New data collected and / or funded by a member specifically as part of an approved cooperative project will be provided to the FGYA and made available to all Association members. The Association's use of the data will be limited to that specified in project and work plans approved by the Steering Committee (unless otherwise directed by the Steering Committee). Digital files and data bases funded through FRIAA may be subject to access through provincial freedom of information legislation. Otherwise data will not be distributed outside the FGYA without the agreement of the contributing member or members. Section 8 of the Memorandum of Agreement among members imposes restrictions on the use of cooperative project data by individual members, including that no member shall disseminate data collected by other members, or information derived from such data, to non-members without the approval of the Steering Committee. Dissemination of information within a member's organization, including other divisions and the parent corporation, is permitted.

If individual members or external agencies contribute data not collected directly as part of a cooperative project, such data will not be released to third parties, including individual members of the Association, without the agreement of the owner. Such data would not be accessible through provincial freedom of information legislation unless directly funded through FRIAA. Analytical results, including crop performance reports and yield forecasts, will be shared among members. The data and results obtained will not be further distributed or published without the approval of the Steering Committee. This consent will not be unreasonably withheld. Reports and scientific manuscripts for projects funded through FRIAA will ultimately be accessible to the public.

3.7. Justifications for External Funding

Members may elect to sponsor their contributions to the FGYA from FRIP (Forest Resource Improvement Program). The FGYA's program fulfils the proposal evaluation criteria of FRIAA, and is not a regulatory responsibility of the industrial members. Funding or collaboration will also be sought from other sources, given the program's:

- Alignment with provincial forest management and research priorities;
- Alignment with federal and provincial priorities for science and technology transfer and sustainable forest management;
- Opportunities for research and demonstration provided by field trials.

Justifications and qualifications for funding through FRIAA and other sources are summarized as follows.

3.7.1. Application of Results

The FGYA's activities are enhancing the management of forest resources by providing a continually improved, scientific, quantitative, and credible basis for:

- Linking regeneration standards and practices to timber yield objectives;
- Evaluating and selecting silvicultural regimes and crop plans to enhance management of lodgepole pine;
- Forecasting the sustainable supply of timber from forest tenures containing lodgepole pine, and validating estimates of allowable cut;
- Improving the sustained yield of these forests through enhanced forest management;

- Providing decision-support tools for the management of stands attacked by mountain pine beetle.

Results apply directly to over two million hectares of tenured and operable pine stands with a current allowable cut of about 5 million cubic metres per year, within the forest tenures of the 9 member companies of the FGYA. Information gathered is being used to assess, develop, and approve strategies for enhanced and sustainable forest management within these forest tenures. It will be incorporated into regeneration standards, silvicultural prescriptions, crop plans, managed stand yield tables, and forest management plans. Because trials are stratified on an ecosystem basis, rather than just by tenure, the results will be generally applicable to the natural range of lodgepole pine in Alberta.

The FGYA is enhancing the integrated and sustainable management of forest ecosystems through:

- Improved assessment of ecosystem productive capacity;
- Improved assessment capability of the sustainable use levels of a biological resource;
- Promotion of cooperation, partnership, and shared responsibility among forest managers and researchers;
- Increased levels of knowledge and awareness of sustainable forest management;
- Continual improvement of sustainable forest management practices including the impacts of alternative silviculture practices on growth and yield and allowable annual cuts;
- Stand-level data providing the basis for assessing impacts of enhanced forest management practices on biological diversity, natural ecosystem processes, fire spread, and contributions to global ecological cycles;
- Development of decision support tools to mitigate the impacts of mountain pine beetle on sustainable timber supplies;
- Bridging basic research to market-driven applications such as prototype forestry practices and decision-support tools, demonstration, and feasibility investigation

3.7.2. Relationship to Existing Responsibilities

The work undertaken by the FGYA pertains to the voluntary enhancement of forest management information and practices, and is not the responsibility of the industrial sponsors under any legislation, regulation, tenure, policy or specific agreement. The program will assist the Government of Alberta in meeting its responsibilities for sustainable resource management, by providing improved assessment of forest growth and yield through the development of scientifically rigorous data and third-party evaluations.

3.7.3. Standards

Standards of experimentation will meet those accepted by the scientific community for biometric research. This is being achieved by third-party participation in project planning, and / or review of experimental designs by recognized experts at the Canadian Forest Service, University of Alberta, or other recognized centres of excellence. Measurement standards will follow or exceed those used by the Canadian Forest Service (CFS) and ASRD for assessing stand dynamics. Standards for forest site classification and evaluation are based on the latest published and government-approved field guides for west central and southwestern Alberta. High standards of analysis will be ensured by use of qualified personnel, extensive networking with growth and yield analysts and modelers, and peer review of results.

The FGYA's activities will not have any adverse impacts on any other forest resource values or users.

3.7.4. Fair Market Value

Work will be undertaken using a combination of contractors and employees of the Foothills Research Institute and sponsors. General benchmarks, used to ensure that fair market value is obtained for planned expenditures, will include:

- Technical and operations directors: Prevailing consulting or salary rates for senior registered professional foresters with formal post graduate qualifications in forest science and twenty or more years relevant experience.
- Field co-ordination and quality control: Prevailing contract rates for a registered professional forester or technologist with a minimum of five years experience in forest field measurements.
- Other contractors and field personnel: Prevailing contract or wage rates based on the respective categories of work. Work will normally be competitively bid. Where competitive bidding is not practical (e.g. because of specialized requirements for uniquely held skills), assignments may be sole sourced. Proposals for services to be sole sourced will be scrutinized by at least 2 FGYA member organizations, in addition to the Director, for fair value.

4. Projects and Deliverables

The activities of the FGYA during the term of this Plan will focus on 5 of the following 7 projects:

1. Development and management of the Association;
2. Lodgepole pine regeneration;
3. (Comparison of pre-harvest and post-harvest stand development; No further activity is planned for Project 3);
4. Cooperative management of historic research trials;
5. (Regional yield estimators; No further activity is planned for Project 5)
6. Enhanced management of lodgepole pine;
7. Regeneration management in a MPB environment.

Justification, purpose, methods, deliverables, required levels of effort and cost for active projects are addressed below.

4.1. Development and Management of the Association

4.1.1. Justification and Purpose

The Memorandum of Agreement among members of the FGYA requires a Coordinating Agency to administer the Association and a Director (program manager) to plan, develop and manage the Association's program, as directed by the Steering Committee and with the assistance of the Technical Committee.

4.1.2. Methodology

Section 3.3 describes the methodology adopted for developing and managing the Association, including the assigned roles, responsibilities and tasks.

4.1.3. Deliverables

- Annually updated 5-year business plan and annual work plan, with budgets by year for each project;
- Project proposals, plans, designs, reports and publications;
- Information exchange meetings, field tours and technical sessions (minimum of 1 meeting per year), cooperative arrangements with collaborating agencies;
- Active publicly-accessible web site;
- Mid-year and annual progress reports;
- Financial statements (annually and / or as required);
- Documented recommendations of the technical committee;
- Steering committee meeting minutes.

4.1.4. Finance

The development and management of the Association, including direction, field coordination and research and development tasks will be funded centrally and supported through a membership fee approved each year by the Steering Committee. FRIP funding for membership fees was approved by FRIAA for the periods April 1, 2000 to March 31, 2005 (FRIAA Project FOOMOD-01-01) and April 1, 2005 to March 31, 2010 (Project FOOMOD-01-03).

Table 2 shows financial projections for 5 years from April 1, 2009. In the projection the annual membership fee as approved in previous plans has been extended for one year to 2012-13 at the same rate.

Table 2 does not include the following contributions by members and collaborating agencies:

- FRI administrative and financial services;
- Participation on technical, steering and project committees;
- Attendance of meetings;
- Review of minutes, reports, proposals, experimental designs and scientific papers;
- Identification of candidate sampling and experimental sites;
- Contribution of existing information and data;
- Measurement and reporting of installations in Project 2 Regenerated Lodgepole Pine
- Provision and support of existing models;
- Protection of research installations;
- Analysis and interpretation of data.

Table 2. Financial Projections for Project 1 - Development and Management of the Association

Income / Expenditure	2008-9 (forecast)	2008-9 (actual)	2009-10	2010-11	2011-12	2012-13
Membership fee (per voting member)	15,000	15,000	18,500	21,000	21,000	21,000
Income						
Prior year balance forward	114,450	114,449	88,001	40,701	50,901	61,101
Membership fees - FRIP (FRIAA contract)	97,500	97,500	129,500	147,000	147,000	147,000
Membership fees - non-FRIP	30,000	30,000	37,000	42,000	42,000	42,000
Total income	241,950	241,949	254,501	229,701	239,901	250,101
Expenditures						
Director	35,067	30,600	40,000	40,000	40,000	40,000
Field Coordinator	32,880	32,880	30,000	30,000	30,000	30,000
Research and Development Associate	80,000	80,000	75,000	75,000	75,000	75,000
GIS and misc. services	0	1,023	50,000[2]	15,000	15,000	15,000
Office and field supplies	1,045	445	2,500	2,500	2,500	2,500
Meetings and tours		0	7,000	7,000	7,000	7,000
Contingency (5%)	9,300[3]	9,000	9,300	9,300	9,300	9,300
Total expenses	158,292	153,948	213,800	178,800	178,800	178,800
Ending Balance	83,658	88,001	40,701	50,901	61,101	71,301

4.2. Lodgepole Pine Regeneration

4.2.1. Justification and Purpose

The purpose of the Project is to forecast and monitor the growth and yield of lodgepole pine, regenerated after harvesting, in relation to site, initial spacing of planted stock, natural ingress and mortality, competing vegetation (brush), and density regulation (pre-commercial thinning). These effects and factors were considered by all members of the Association to be the highest priority for project development, given their implications for silvicultural prescriptions, crop planning, regeneration standards, and allowable cut, and the lack of controlled data currently available for assessing alternative practices.

Since the Project's inception, the linking of early crop condition and treatment to subsequent growth and yield has assumed a high priority among FGYA members who are seeking to develop stratum-specific reforestation standards based on the yield objectives contained in their forest management plans. This requires linking crop performance (e.g. as measured in performance surveys 8-14 year performance surveys) to growth and yield predictions, and forecasting crop performance from site and treatment variables and from early crop attributes (e.g. as measured by 4-8 year establishment surveys). The project is entering a critical period over the next 5 years, during which the RLP trials will reach the 12-14 year performance survey window, and it will contribute substantially to meeting these requirements through the development of regeneration models. These decision support tools will allow managers to predict establishment and performance results based on site, stand, site preparation, planting, and vegetation management factors.

[2] Major upgrade and enhancements to RLP database and QC procedures, 2009
[3] Contingency used for 2008-09 EMLP1 measurement and analysis costs

4.2.2. Methodology

The Project consists of a long-term field trial, established in 2001, and interim forecasting of effects using available models and data. The trial is a three-level split-plot design. The basic balanced design consisted of 90 field installations (5 ecosites x 6 spacings x 3 replications), with each installation split 2 ways into 4 treatment plots (weeding, thinning, weeding and thinning, no weeding or thinning). Twelve additional installations (6 spacings x 2 replications) were added in the modal ecosite category, to produce a total of 102 installations (408 plots). Details of the design, installations and procedures are provided in an *Establishment Report* (April 2003) and a periodically updated field manual. FRIP funding for the Project was approved by FRIAA for the period April 1, 2000 to March 31, 2005 (FRIAA Project FOOMOD-01-01). Continued funding to March 31, 2010 is provided for under FRIAA Project FOOMOD-01-03).

4.2.3. Deliverables

Deliverables of the Project for the period April 1, 2007 to March 31, 2010 are shown in Table 3.

Note that installation status and measurements are the responsibilities of individual members, whereas other deliverables are the responsibility of the FGYA. Consistent with the Memorandum of Agreement, the project database was managed by the FtMF until 2007, when a member company assumed responsibility for database design, improvement and management on a temporary basis for 2007 and 2008.

Annual status (mortality) checks and bi-annual full measurements will be continued for the first 12-14 growing seasons, subject to annual re-assessment of their importance. Table 4 shows a breakdown of scheduled measurements for the 102 installations by year, number of growing seasons elapsed since planting, and forest management area (FMA). A more detailed schedule will be developed each year before commencement of fieldwork, and reviewed with technical representatives and contractors at a pre-season meeting.

No further fill-planting will be undertaken unless installations fail completely. Continued tending beyond the 10th year is not expected to be necessary. Pre-commercial thinning is tentatively planned for 2013, subject to assessments of mortality, ingress and growth in 2010 and 2012.

Table 3. Delivery Schedule for *Lodgepole Pine Regeneration* Project

Deliverable	Progress / Next Steps	Reference
Measurement and treatment schedule (Annually by June 15)	Completed requirements analysis and schedule	RLP measurement schedule (spreadsheet), June 2008.
Field measurements Status checks – annual Full measurements – bi-annual (data submission by October 31)	QC problems encountered and most addressed. Tagging of sample ingress trees in non-planted installations incomplete.	Responses to questions on QC, November 2008. Error report, February 2009.
Summary status and verification reports (January 31, prior to final payments to sponsors by FRIAA)	Distributed November 2008.	Audit and work verification reports, November 2008.
Digital database (updated annually, December 31)	2008 update complete. High incidence of errors detected, mostly correctable. Task force established to upgrade database and QC procedures	RLP Error report and recommendations, February 2009.
Field treatments	5 treatment plots herbicided	Herbicide program summary report, November 2008.
Initial crop performance report (3-4 growing seasons)	Delivered December 2005 for performance up to March 31, 2005	Crop Performance Report, 2005.
Crop performance report and regeneration establishment model (5 growing seasons) (March 31, 2008)	Distributed April, 2008.	RLP 5-year crop performance report, model and metadata (distributed April, 2008).
Crop performance report (8 growing seasons), regeneration performance model (8-9 growing seasons) and Project (Phase 2) final report (March 31, 2010)	Phase 2 (10 year) report March 31, 2010 including crop performance and regeneration model.	
Assess feasibility of linking mortality and growth to climate; prediction of climate impacts on mortality	Feasibility confirmed and mortality probabilities preliminarily predicted.	Interim Technical Note: Effects of Climate on Mortality of Young Planted Lodgepole Pine, February 2009.
If linkage feasible, assess predictability of drought, frost, and winter desiccation impacts using CFS and local gridded climate data sets	First iteration using 5 year RLP results : December 31, 2008 2nd iteration with 7 year RLP results: done	As above
Compare mortality and ingress results with other studies; Assessment of Ives and Rentz data,	Not completed. Preliminary assessment indicated importance of including latest (2008) field data	Papers by Ives, Johnstone, Crossley and Alfero

Deliverable	Progress / Next Steps	Reference
FGYA pine-aspen results etc. (September 30, 2008)	in comparison. Rescheduled to June 2009.	
Extend regeneration model to 7 growing seasons (March 31, 2009)	Not completed. Requires further data corrections first.	Error report, February 2009.
Development and testing of mathematical models by external institutions (June 30, 2008)	Solicitations of interest started, more enquiries in progress. Andreas Hamann (UofA) reviewed climate results.	
Interpretation of results by knowledgeable practitioners	Two FGYA members provided feedback and field review of results and 5-year regeneration model. More interest is expected when model projections are extended to natural regeneration and performance survey age.	
Extension of model to other species and ecosystems	Informal proposals made; interest expressed but no progress.	
Plan for continued trial measurement and treatment (February 28, 2009)	Done	Information note: Regenerated Lodgepole Pine Trial: Proposal and Priorities for Measurement and Treatment: March 2009

The crop performance reports include:

- Growth, ingress, competition and mortality statistics by treatment plot and growing season (or time since planting), with summaries by ecosite, treatment, FM area and growing season;
- Preliminary analyses to assess how much of the observed variation can be explained by controlled factors (ecosite, initial density, brushing);
- Preliminary exploratory analyses and strategy to develop regeneration models.

The regeneration establishment model predicts stocking, density, ingress, mortality and height and diameter growth over the first 5 years. It is applicable to forecasting results of establishment surveys. The regeneration performance model will extend prediction of these variables to beyond 8 years, and will be linked to full-rotation growth and yield models. It is applicable to forecasting the outcome of performance surveys, and placing stands on forecast long-term growth trajectories. The variables and factors evaluated for making predictions will include: ecosite, planting density, vegetation control, various competition indices, time since planting, elevation and natural sub-region, pre-harvest site index, physiographic site, planting season, site preparation and cone count. The preliminary model based on the first 5 growing seasons and developed in 2007-08 will be updated in 2009-10 to include measurements for the 7th growing season.

The RLP trials are currently scheduled for final measurements in 2009 (Table 4). In 2008/09 the R&D Associate prepared a proposal for continuing RLP trial measurement and treatments through to the critical 12-14 year “performance survey” stage of development, which was reviewed with the FGYA

Steering and Technical Committees at their March 20, 2009 meetings. See Appendix 2. Regenerated Lodgepole Pine Trial: Proposal and Priorities for Measurement and Treatment. March 2009

In view of combination of growing interest in the effects of climate change on regeneration survival and growth, and observed variation in crop performance likely to be linked to local climate, during 2007 a project was proposed to explore the feasibility of linking growth and mortality during the first 5 years of the trial to regional and locally-interpolated climate records. A first look at this by the R & D Associate was completed and the work was expanded to incorporate 7-year results (Interim Technical Note, February 2009). This will be followed by a more complete report on the issue in 2009.

Table 4. *Lodgepole Pine Regeneration* Project – Elapsed Growing Seasons and Scheduled Measurement Type by Year and FMA

FMA	# of installations	2009	2010	2011	2012	2013
ANC Timber	6	8 (SC)	9(FM)	10(SC)	11(FM)	12(SC)
Blue Ridge Lumber	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Canfor	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Hinton Wood Products	12 10	9 (FM) 8 (SC)	10 (SC) 9 (FM)	11(FM) 10(SC)	12(SC) 11(FM)	13(FM) 12(SC)
Millar Western	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Spray Lakes	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Sundance	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Sundre	14	9 (FM)	10 (SC)	11(FM)	12(SC)	13(FM)
Weyerhaeuser D.V.	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Weyerhaeuser Edson	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Weyerhaeuser G.P.	2 16	9 (FM) 8 (SC)	10 (SC) 9 (FM)	11(FM) 10(SC)	12(SC) 11(FM)	13(FM) 12(SC)
Total Full Measurements		28	74	28	74	28
Total Status Checks		74	28	74	28	74
Total	102	102	102	102	102	102

FM = full measurement, SC = status check

4.2.4. Finance

Costs of fieldwork are incurred directly by each member for those installations (clusters of experimental plots) located on their forest management area. Work is administered directly by the member, with the FGYA playing a coordination and quality control role. FRIP funding for continuation of the Project was approved by FRIAA for the period April 1, 2005 to March 31, 2010 (FRIAA Project FOOMOD-01-03).

Members wishing to use FRIP funds to cover their inputs will submit to FRIAA:

- A supplementary proposal summary application referencing the umbrella proposal;
- A proposed payment schedule;
- Annual financial and work verification reports.

Estimated measurement costs shown in Table 5 for Project 2 are approximate expectations based on the work schedule shown in Table 4, and should be regarded as only indicative orders-of-magnitude of the actual costs to be incurred by members. Assumed measurement costs per installation (cluster of 4 plots) are assumed at $3000 and $600 for full measurements and status checks respectively. Costs for

continued tending are not specifically included, but may be covered by the assumed contingency allowance.

Table 5. Estimate of Remaining Costs[4] to be Incurred by Members for the *Lodgepole Pine Regeneration* Project

Cost item	2009	2010	Total
Status checks	44,000	13,200	57,200
Full measurements	81,000	210,000	291,000
Total measurements	125,000	223,200	348,200
Contingency	15,000	15,000	30,000
Total	**140,000**	**238,200**	**378,200**

4.3. Comparison of Pre-harvest and Post-harvest Stand Development

4.3.1. Justification and Purpose

The FGYA has completed a comparison of pre-harvest and post-harvest site indices, and no further expenditures are planned at this time. In 2004 results were presented at a major international forestry conference and published in the conference proceedings.[5] The specific purpose of the comparison was to provide credible and reliable forecasts of post-harvest site index, for the main site types of interest to members, relative to pre-harvest values. The study demonstrated that regeneration practices following harvesting are capable of increasing site index and fibre production relative to that of fire-origin stands, most likely because of differences in initial stand densities relative to those of fire-origin stands. However, these shifts are not without associated risks and residual uncertainties. Priorities were identified for enhancing productivity, managing risks, and reducing uncertainties. Although the original objectives of the project have been met, the FGYA will undertake or encourage further work to:

1. Validate the initial results;
2. Confirm the role of stand density management in the observed differences;
3. Explore the implications to yield forecasting of post-harvest stands having different stocking-density relationships to fire-origin stands;
4. Integrate knowledge from the disciplines of genetics, silviculture and forest health into the prediction of yield following harvesting.

4.3.2. Methodology

1. *Validation.* ASRD will continue to collaborate with the FGYA in comparing site index changes observed in the FGYA study with trends observed in other datasets, and computed with later improved site index models.
2. *Effect of stand density.* Stand height development at different densities in CFS spacing trials will be compared with the observed shifts in site index between fire-origin and managed stands to assess whether the latter shifts can be explained in terms of managed densities.
3. *Stocking-density relationships and spatial effects.* Initial densities in post-harvest stands may not need to be as high as indicated by models based on fire-origin stands if regeneration is better distributed over the site as a result of reforestation treatments. The GYPSY program of ASRD is

[4] Estimated cost per plot – full measures $3,000; status checks $600

[5] Dempster, W.R. and Huang, Shongming. Enhanced Fibre Production and Management of Lodgepole Pine. CIF/SAF Joint 2004 annual general meeting and convention., October 2-6, Edmonton, Alberta, Canada

making excellent progress in modeling these effects. The FGYA will therefore not duplicate this effort, but will monitor closely and assist where possible.

4. *Integration of interdisciplinary knowledge.* The FGYA and FtMF, in conjunction with the Alberta Forest Genetic Resources Council (AFGRC) hosted a conference on post-harvest stand development in January 2006. The FGYA will continue to cooperate with the AFGRC and other participants in following through on recommendations developed by the conference.

4.3.3. Deliverables

1. A scientific paper covering item 1 above was begun under the direction of the ASRD Senior Biometrician, who invited the FGYA Research and Development Associate to participate as a co-author. This work is delayed pending the development of new Site Index Models expected in March 2009.
2. Work covering item 2 will be scheduled and reported under Project 4 (see 4.4. below)
3. Results from items 1, 2 and 3 will be incorporated into the models and yield forecasts developed under the *Lodgepole Pine Regeneration* and *Enhanced Management of Lodgepole Pine* projects.
4. Collaborative efforts through the 3 Dialogue initiatives arising from the 2006 Stand Density Management Conference have been suspended until the Chairs indicate a need to meet again.

4.3.4. Finance

No further costs are anticipated.

4.4. Cooperative Management of Historic Research Trials

4.4.1. Justification and Purpose

In August 2001, representatives of the FGYA, the CFS, and ASRD (Alberta Sustainable Resource Development) visited historic CFS lodgepole pine trials. They concluded that these trials were invaluable resources for forecasting, monitoring and demonstrating the effects of nutrition and density management, and that links should be forged to ensure their ongoing protection, measurement and interpretation. In 2002 the Director General of the Northern Forestry Centre, the Executive Director of the ASRD Forest Management Branch, and the Chairman of the FGYA, signed a Letter of Agreement facilitating the collaborative arrangements necessary to provide forest managers in Alberta with the full and continued benefit of relevant long-term field trials established to assess the responses of lodgepole pine to nutrition and density management.

The initial term of the Agreement was from July 1, 2002 – June 30, 2007, and a five-year renewal was proposed in 2007. By then, responsibility for these trials had passed from the CFS' Northern Forestry Centre to the Canadian Fibre Centre of the CFS and its representatives requested changes in the Agreement to reflect their interests in the trials. An interim renewal was signed to April 30, 2008 while a new five year renewal was negotiated. This is now complete and it runs through to March 31, 2013 to facilitate working arrangements for collaboration and continuing access to and use of historic trials for the purpose of improving knowledge of growth, yield, silviculture and fibre qualities.

4.4.2. Methodology

The Project involves 3 main tasks:

1. Maintenance and protection of the field installations;
2. Analysis of historic data and synthesis of results;
3. Ongoing measurement.

This is a cooperative effort shared between the FGYA, CFS and ASRD. Details of proposed objectives, data sharing arrangements, activities, level of effort, and contributions are contained in the Letter of Agreement. The FGYA's main role is re-measurement and maintenance of the trials on a prioritized schedule agreed by the 3 parties. Methods, schedules and sponsorship for this component of the project are specified in the approved FRIAA proposal: *Measurement and Maintenance of Historic Research Trials* (April 2003, FRIAA Project # FOOMOD-01-02). The original agreement approved by FRIAA specified FRIP payments for the first year (2003), but provided for multi-year extensions upon receipt and approval of amended work plans, budgets, reporting and payment schedules. The funding of measurements is subject to annual review of priorities by all 3 parties (FGYA, ASRD and the CFS), approval each year by the FGYA Steering Committee, and acceptance by FRIAA.

Table 6 shows a measurement schedule for the 5-year period 2009 – 2013. The trials indicated for measurement from 2009 onwards have been scheduled based on a priority assessment of plots, and discussion surrounding the renewal of the Letter of Agreement (FGYA, CFS, SRD). Plots shown as "low" priority will not be scheduled for remeasurement except under extraordinary circumstances, e.g. change in risk status. Table 6a shows FGYA measurements on the plots during the period 2003-2008.

Table 6. Re-measurement Schedule for Historic Research Trials

Trial	2009[6]	2010	2011	2012	2013
MacKay thinning 1954					x
Swan Lake thinning 1977					x
Teepee Pole Creek spacing (flat, north) sites 1967					x (low)
Gregg spacing 1963			x		
McCardle fertilization& thinning 1984	X (defer)				
Kananaskis heavy thinning (K-57) 1941			x (low)		
Gregg spacing 1984 medium site	x				
Gregg Spacing 1984 low/high sites	x (low)				
Clearwater fertilization & thinning 1968		x			
Ricinus fertilization after thinning 1975		none			
Strachan thinning		x (low)			
Teepee Pole Creek strip thinning					x (low)
Kananaskis European thinning (K-3) 1938				x	
Kananaskis economic thinning (K-58) 1950				x	
Edson fertilization and thinning (Takyi) ASRD Trial	x[7]				

[6] In 2009, supplemental funding under a contribution agreement with the Canadian Forest Service supported the remeasurement of the Teepee Pool Creek plots as well as the McCardle and Gregg (low/high sites) plots.
[7] The Takyi Trial remeasurements are SRD responsibility

Table 6a. Re-measurements during first Letter of Agreement 2003-07 and 2008

Trial	2002	2003	2004	2005	2006	2007	2008
MacKay thinning 1954		x					x
Swan Lake thinning 1977		x					x
Teepee Pole Creek spacing 1967		x					
Gregg spacing 1963					x		
McCardle fertilization&thinning 1984			x				
Kananaskis heavy thinning (K-57) 1941					x		
Gregg spacing 1984			x				
Clearwater fertilization & thinning				x			
Ricinus fertilization after thinning				x			
Strachan thinning				x			
Teepee Pole Creek strip thinning	defer						
Kananaskis European thinning (K-3) 1938						x	
Kananaskis economic thinning (K-58) 1950						x	

4.4.3. Deliverables

Deliverables originally scheduled for the period April 1, 2002 – March 31, 2008 are listed in Table 7.

The 2006 measurements of the 1963 Gregg spacing trials were analyzed to compare effects of controlled density on stand development with differences previously reported between post-harvest and fire-origin stands. The intent was to obtain and report an improved understanding of the cause and implications of developmental differences between stands of harvest versus fire origin. A "Quicknote" in 2008 provided a report and insights into the significance of these differences to the membership. A paper will be prepared by the Research and Development Associate and the Field Coordinator in cooperation with the CFS if results merit publication.

A project originally begun by the CFS was completed by the FGYA in 2008/09. In 2007, Gregg River and MacKay trials were reviewed against to growth & yield models used in Alberta (MGM and GYPSY) in two reports submitted by contract analyst Andria Dawson. Further work is needed and planned to evaluate the Gregg River and MacKay data against TASS and the new version of GYPSY proposed for May 2009.

Table 7. Delivery Schedule for *Cooperative Management of Historic Research Trials*

Deliverable	Progress/ Next Steps	Reference
Ongoing measurements	Compiled data from scheduled measurements	See Table 6a.
Maintenance and protection of trials (shared responsibility) (Ongoing)	All trials marked and signed; Registration updated; Descriptions posted on internet; regional managers briefed; Prompt response to inquiries and trespass	
Analysis and publication of results (CFS)	4 publishable synthesis papers including management interpretations. Papers originally scheduled 2007/08, three proposed for Spring 2009, fourth for Winter 2009/10.	
	Compendium information report describing all trials and results	Published 2006
Analysis and Publication of Results (FGYA)	Used Gregg trial data to verify interpretation of Project 3 pre- and post-harvest density results. Validations of GYPSY (2001) and MGM completed but require further assessment before final reporting. Analysis and reporting of Gregg and MacKay trials against latest available versions of GYPSY and TASS • GYSPY - recommend GYPSY project team provided data for validation • TASS – no new model release, recommend same approach with data as for GYPSY Extension of validation to other trials and TASS not done.	Quicknote 10: Effects of juvenile spacing on lodgepole pine stand height, April 2008. Interim contractor reports: Gregg and MacKay trials, September 16, 2008; Gregg trial, October 27, 2008.
Verbenone treatment review	Complete. Trials to be monitored, key trials to be protected under FRIP MPB program subject to funds	

4.4.4. Finance

Table 8 shows estimated costs for the next 5 years, following the re-measurement schedule indicated in Table 6.

Table 8. Cost Schedule for FGYA Contribution to *Cooperative Management of Historic Research Trials* Project

Trial	Man-days	2008 Budget	2008 Actual*	2009	2010	2011	2012	2013	Total 2009-13
Income									
Balance Forward		12,131	12,131	18,629	629	(321)	(321)	(321)	
Member Contribution[8]		10,000	10,000	0	6,550	9,825	7, 205	11,462	
FRIAA		20,537	20,537	0	13,450	20,175	14,795	23,538	
Total Income		42,668	42,668	18,629	20,629	29,629	21,629	34,679	
Expense									
McCardle 1984 fertilization & thinning (NOR-405)	36			18,000 (defer)					18,000 (defer)
MacKay thinning (A34)	56	20,000	19,425					20,000	20,000
Swan Lake thinning 1977	8	5,000	Inc with McKay					5,000	5,000
Gregg spacing 1963 (CFS A-100)	46					20,000			20,000
Gregg spacing 1984 (NOR-4-02) (Medium site)	11			6,000					6,000
Kananaskis European thinning (K-3)	18						9,000		9,000
Kananaskis economic thinning (K-58)	4						3,000		3,000
Clearwater fertilization & thinning 1968	22				11,000				11,000
Fertilization and Thinning Takyi Trials (SRD)	75			n/c[9]					
Evaluation of G&Y Models against HRT measurements (New, Aug 2007)		3,500	4,614						
Gregg Trial analysis (March 2008)		3,500		2,000					
Contingency, signage and maintenance		10,000	0	10,000	10,000	10,000	10,000	10,000	50,000
Total Annual Expense		**42,000**	**24,039**	**18,000**	**21,000**	**30,000**	**22,000**	**35,000**	**124,000**
Ending Balance		668	18,629	629	(321)	(321)	(321)	(271)	
Annual Expenses plus		42,668	42,668	18,629	20,629	29,679	21,679	34,629	

[8] Assumes two members pay direct, other seven members direct FRIP funds to project.
[9] Takyi Trials are SRD measurement responsibility

Ending Balances									

Costs incurred by the FGYA in implementing the project will continue to be allocated among voting members as per Section 3.4 and Table 1 of this plan. The original agreement approved by FRIAA: *Measurement and Maintenance of Historic Research Trials* (April 2003, FRIAA Project # FOOMOD-01-02) specified FRIP payments for the first year (2003), but provided for multi-year extensions upon receipt and approval of amended work plans, budgets, reporting and payment schedules. The funding of measurements is subject to annual review of priorities by all 3 parties (FGYA, ASRD and the CFS), approval each year by the FGYA Steering Committee, and acceptance by FRIAA.

The priorities for remeasurement of historic research trials will be reviewed by the F&D Associate in 2009, thus the proposed remeasurement of the McCardle Creek 1984 fertilization and thinning trial will be deferred pending completion of that review.

The Association has signed a renewed Letter of Agreement between the Association, the Canadian Forest Service and Alberta Sustainable Resource Development for the period 2008-2013.

4.5. Regional Yield Estimators

4.5.1 Justification and Purpose

ASRD wished to produce generalized stock, stand volume, and yield tables for each natural region, differentiated by broad AVI (Alberta Vegetation Inventory) cover groupings, enabling the Department to report credibly on both the current state of provincial timber resources, and their rate of growth. The Executive Director of Timber Management requested the FGYA's support.[10] The FGYA was interested in an improved basis for crop planning, evaluation of regeneration standards, sensitivity analysis, timber supply analysis and monitoring.

4.5.2 Methodology

The approach taken was to develop prototype compatible yield and growth estimation techniques for lodgepole pine cover types in a pilot study involving:

1. Assignment of ASRD analytical staff to the Project, with ASRD's Senior Biometrician, Shongming Huang, taking the lead role in conducting the analyses;
2. FGYA (Director and technical sub-committee) participation in project design, identification of suitable data sources, progress review, assessment of results and prototypes;
3. Provision of data through direct bilateral arrangements between FGYA member companies and LFD;
4. Analyses quantifying the relationships between mapped AVI (Alberta Vegetation Inventory) attributes, input variables for ASRD's *GYPSY* growth and yield projection system, and direct estimates of stand yield;
5. Development by ASRD of prototype applications for testing by FGYA members.

[10] D. Sklar, Executive Director, Forest Management Branch, personal communication to H. Lougheed, January 23, 2002

4.5.3 Deliverables

The project is intended to provide, and has provided:

- Prototype stratum-based stock and stand table estimators for lodgepole pine ecosystems, compatible with stratification, and with forward and retrospective projection capability.
- Associated estimates of the precision of forecasts and the variability within strata.
- A report describing the estimation system and including technical recommendations for application of the system.

An *Interim Report on the Development of Yield Estimators for Pure Lodgepole Pine Stands in Alberta* was prepared by Yuqing Yang and Shongming Huang of the Forest Management Branch, ASRD, and edited and amended with input from the FGYA Director. It was circulated to members and included suggestions for further analysis and testing. The document will be published as is on the FGYA website as a technical information report. No further work is envisioned under the auspices of the FGYA (SRD will solicit support directly from FMA holders in the event it undertakes further work and requires further inputs).

4.5.3 Finance

Cost incurred in the provision of sample plot data (FGYA members) and analyses of data (ASRD) are not included in the FGYA budget. No direct revenues or expenditures are currently scheduled for this project.

4.6. Enhanced Management of Lodgepole Pine

4.6.1. Justification and Purpose

The project "*Enhanced Management of Lodgepole Pine*" ((FRIAA # OF-02-16) commenced in 2004 and was scheduled to run until March 31, 2009. It is focused on filling information gaps in nutrition and density management of both fire-origin and post-harvest stands. It is complementary to the 5 projects already initiated by the FGYA to improve the assessment of lodgepole pine growth and yield in managed stands, and other work being conducted in Alberta and B.C.

The project objectives are to:

1. Develop techniques and yield tables to predict the growth response of stands to density and nutrition management practices with potential for enhancing timber volume, economic value, and / or forest health.
2. Produce stand assessment guidelines and interpretative criteria for selecting nutrition and density management treatments.
3. Establish a network of sample plots for demonstrating and monitoring actual versus predicted growth responses.
4. Assess impacts of enhanced forest management practices on stand composition, structure, biodiversity, susceptibility to fire and insect damage, and wood quality.

The Project is divided into 2 sub-projects aimed at addressing the main information gaps limiting achievement of the objectives. The 2 sub-projects are: (1) lodgepole pine nutrition and (2) pine-aspen

density management. Separate experimental designs have been developed for each sub-project, and are described in detail elsewhere.[11]

4.6.2. Methodology for Sub-project 1: Lodgepole Pine Nutrition

This study focuses on providing members the ability to determine:

1. Which stands on their forest management areas are most likely to respond best to fertilization;
2. What yield increases can be expected from the stands most likely to respond.

The sub-project involves sub-sampling and selective treatment of 30 stands reconnoitered in 2004, of which 15 are young (10 – 30 years of age) post-harvest, and 15 mid-late (30-80 years) fire-origin. Baseline assessments were completed in May 2005.

Fixed-area treatment plots were established in the Fall and winter of 2005 in 15 stands across a selected range of stand conditions (16 stands were budgeted but one delayed). Treatments include thinning to 2500 stems per ha (in 8 post-harvest stands only) and fertilization (300 kg per ha N plus blend) plus controls (2006). Tree, stand and foliar variables were measured prior and after treatment, and will be measured at 3, 6, and 9 years following treatment. (Only measurements up to year 3 were included in the funding request.) In February 2006 the Steering Committee approved additional funding to extend the above experimental treatments to a total of 30 sites. The additional sites were established, and all fertilization treatments applied, by the end of May 2006. First-year post-fertilization foliar analyses were conducted in the winter of 2006-7.

4.6.3. Methodology for Sub-project 2: Pine-aspen Density Management

The study assesses, on pine sites subject to hardwood competition, what density management alternatives are expected to provide the best total and coniferous timber productivity.

The sub-project involved selection of 18 post-harvest pine-aspen stands between 10 and 40 years of age, partitioning the stands into areas of high, medium and low aspen density, and measuring 6 plots in each stand. Plots were tree-mapped and measured in detail. A sub-sample of 3 plots in each of 9 of the stands was destructively sampled to obtain retroactive data on height and diameter increment for both pine and aspen. The remaining plots are being maintained for re-measurement. The analysis involves assessment of competition indices and responses useful for developing or validating whole-stand, individual-tree, and/or distance-dependent growth models. The resulting models will be used to provide the required forecasts within the project term, while the maintained plots will allow for longer-term monitoring of actual versus forecast growth and yield.

[11] Project OF-02-16 Annual Report (2004), Work Plan (2005-2008), and Detailed Project Design

4.6.4. Deliverables

Table 9 shows the schedule of activities by fiscal year (April 1 – March 31) from 2006 onwards. Activities are shown as "done" if completed, or as "x" if scheduled for 2008.

Table 9. Activity Schedule for *Enhanced Management of Lodgepole Pine* Project

Activity	2006	2007	2008	2009
Sub-project 1: lodgepole pine nutrition				
Installation and pre-treatment measurement	done			
Thinning, fertilization and post-treatment measurements	done			
1-year post-fertilization foliage analysis	done			
3-year growth response measurements [12]			Part Done	
3-year post-fertilization foliage analysis			Done	
Analysis (3-year results and projections)				X
Sub-project 2: pine-aspen density management				
Stand selection	done			
Field sampling		done		
Analysis		Part Done		X
Analysis, synthesis of results and reporting				
Scientific paper (pine-aspen results)			X	
Information reports (2) (EMLP1 and 2 Est. Reports)		done		
Information report (EMLP1 3rd Year Foliar Response)				X

Final deliverables and results of the Project will be reported as follows, as summarized in Table 10:

- Detailed technical reports will be submitted to FRIAA and the FGYA membership at the end of the second and fifth years, including details of trial establishment (done), techniques applied, responses measured, responses forecast, predictive models developed, and conclusions regarding factors influencing responses.
- At least one scientific paper will be prepared for peer review and publication in a recognized scientific journal.
- At least 2 information reports, one including managed stand yield tables, and one including stand assessment guidelines and interpretative criteria for thinning and fertilization, will be prepared and published.

[12] Fire-origin stands were not measured because of extraordinary costs in establishment and stem mapping. If needed, funding for these measurements will be sought through other proposals, though at this time, no measurements are proposed.

Table 10. Delivery Schedule for Project *Enhanced Management of Lodgepole Pine*

Deliverable	Progress/ Next Steps	Reference
Sub-project 1. Nutrition and thinning trial		
Remeasurements for 3rd year growth and foliage analysis	Remeasurements completed for post-harvest sites, but not undertaken for fire-origin sites. Foliar sample collections made from all sites and analyzed.	Access database submitted by contractor, February 2009.
Analysis, projections and technical / information report	Not done. Proposed for completion in 2009 by Dr. V. Lieffers, U of A.	
Sub-project 2. Pine-aspen density management		
Report and paper	1. Analysis and preliminary paper prepared by Dr. P. Comeau, UofA 2. Summarized in Quicknote. Final report and scientific paper proposed for 2009.	Interim technical note: Effects of trembling aspen growth on lodgepole pine growth, August 2008. Quicknote #11: Effects of trembling aspen on lodgepole pine growth, August 2008.

4.6.5. Finance

The project (FRIAA # OF-02-16) is supported with FRIP funding to a maximum of $442,800, provided under FRIAA's *Open Funds* initiative. This amount was augmented by $108,810 of supplementary funding in 2006, and a $9,300 transfer from Project 1 contingency funds in 2008 to increase the total budget to $560,910. Table 11 shows costs by year. Note that this schedule applies to the whole project term, which was initially from April 1, 2004 to June 30, 2009. Actual amounts expended are shown for 2004-2008 and projected expenditures are shown for 2009.

FGYA costs for analysis from 2007 onwards (primarily time inputs by the Research and Development Associate) are covered under Project 1. The Associate will work with scientists from the University of Alberta, whose costs will be absorbed by the University.

Table 11. Cost Schedule for *Enhanced Management of Lodgepole Pine* Project

Item	2004 (actual)	2005 (actual)	2006 (actual)	2007 (actual)	2008 (actual)*	2009 (planned)	Total (funded)
Income							
Balance Forward		65,269	45,587	34,588	3,043	(5,410)	143,077
FRIAA	126,200	126,900	202,110	6,300	39,024	5,010	505,544
Other funds			6,066				6,066
Transfer from project 1			**40,000**		**9,000**		**49,000**
Total Annual Income	**126,200**	**192,169**	**293,763**	**40,888**	**51,067**	**(400)**	**703,691**
Net Income Over Project[13]							**560,610**
Expense							
Sub-project 1 (nutrition)	44,734	120,950	148,406	0	56,477[14]		370,537
Sub-project 2 (pine-aspen)	0	21,354	108,497	37,845	0		167,694
Design and analysis	16,197	4,278	2,272	0	0		22,747
Total Expense	**60,931**	**146,582**	**259,175**	**37,845**	**56,477**	**0**	**561,010**
Ending Balance	**65,269**	**45,587**	**34,588**	**3,043**	**(5,410)**	**(400)**	**(400)**

4.7. Regeneration Management in a Mountain Pine Beetle Environment

4.7.1. Justification and Purpose

The project *Regeneration Management in a Mountain Pine Beetle Environment (*FRIAA Open Funds Project # OF-07-P019) began in late 2007. The objective of this project is to provide tools for assessing treatment options (e.g. salvage, partial-cutting, site preparation, re-planting, fertilization, density management) and their growth and yield implications, for pure and mixed-species lodgepole pine stands attacked by mountain pine beetle.

The development of the project is predicated on the expectations that:

- High levels of infestation and mortality in member's forest management areas are probable and imminent;
- Knowledge of regenerated stand dynamics and growth performance will be critical to mitigation / amelioration;
- Regeneration and stand development pathways and options will be more complex than those so far studied by the FGYA;
- Maintenance of forest values and a viable forest enterprise may be enhanced by appropriately selected, and in some cases intensified, silvicultural practices;
- Urgency and the required scope of data capture and analysis in threatened stands and research installations are increased;

[13] Net Income is total annual less "balance forwards" to avoid double accounting lines 1 and 2 re FRIAA
[14] Measurements $47,334, foliar analysis $9,143

- Members will urgently need expert system / decision-support tools incorporating disparate information and knowledge;
- The FGYA is positioned to significantly contribute.

4.7.2. Methodology

Stage 1:

- Assess experience, research and data from B.C. and the U.S.A, and from stands in southern Alberta regenerated after earlier MPB infestations;
- Identify and profile susceptible stand types most important to member's timber supplies.

Stage 2:

- Assemble and develop relevant data and growth and yield models (e.g. for mixed species, short rotation, variable density, nutrition options) for projecting post-attack development of the most important stand types;
- Consolidate these into an expert system / decision-support tools, linked to landscape, timber-supply, regeneration and cost factors, that can be used to forecast the results and effectiveness of treatment options.

If / when and where major attacks occur, the project may involve a third phase to:

- Assess susceptibility factors and post-attack stand conditions;
- Monitor actual versus forecast outcomes.

4.7.3. Deliverables

FGYA Funding supports technical input by the Research and Development Associate as well as management activities by the Director, under Project 1 of the Work Plan. Table 12 shows the Delivery Schedule and current status of the stages of the project. FRI funding includes the time of the MPBEP Program head in managing the business and logistical aspects of the project.

Table 12. Delivery Schedule for *Forest Management in a MPB Environment*

Deliverable	Progress/ Next Steps	Reference
A report of the BC and US experience and research (based in part on tour of areas subjected to attack in BC)	Done.	Dempster, W.R. 2007. Tour of Mountain Pine Beetle Affected Areas in the Prince George Forest District, July 11 and 12, 2007: Draft Report and Recommendations. 20pp + Appendix.
A research proposal describing detailed project design	Done	Udell, R.W. and W.R. Dempster. 2007. Monitoring and Decision Support for Forest Management in a Mountain Pine Beetle Environment: Proposal. October 9, 2007. FRIAA-07-08 Provincial Projects Initiative. 24pp.
Assessment of PSP supplementary data requirements	Done	MacDonald, E., Development of sampling protocol to quantify / document vegetation responses to

Deliverable	Progress/ Next Steps	Reference
		MPB attack, June 25, 2008.
Pre-compilation of existing data and selection of candidate plots	Candidate list developed for 240 PSPs; 150 selected for baseline measurement in 2008.	Access database and Excel spreadsheets (including selection variables and criteria)
Baseline supplementary field measurements	149 plots were measured; MPB infestation status recorded: if correct (9 plots infected), this is too low for monitoring to proceed as planned (50 plots). 15 additional plots proposed for baseline measurement in 2009 with funding from FRI's Mountain pine beetle program	Pre-existing tree and new supplementary data input files (Excel) March 2009 Information note: Regeneration Management In a MPB Environment Priorities for Work in 2009.
Compilation of existing and new data – PSP database development	Data entered, verified, compiled and documented by contractor; no projections contracted or made.	Access database plus documentation: Data compilation report – 2008 surveys; Access database 2008 tables description; SAS programs description.
Dendrochronological measurements and analysis	Measurements and analysis conducted and reported for 20 plots (15 stands); no representation in southern portion Proposed to measure similar number of plots in southern portion pending funding approval.	Preliminary report: Alfero *et al*, Dendroecology and stand dymamics of a selection of PSPs in Alberta.
MPB population monitoring and status	Maps developed showing the locations of baseline and candidate plots relative to: 1) locations of red tree attacks surveyed in 2008; 2) R-values as surveyed in 2008; 3) stand susceptibility index based on AVI; 4) predicted MPB overwinter survival (to February 13, 2009).	Information note: Regeneration management in an MPB environment – priorities for PSP baseline assessment, February 2009.
Decision support tool, projections and synthesis report (March 31, 2010)	Not done. Interim deliverables: preliminary qualitative synthesis December 2009; quantitative projections March 2010.	

4.7.4. Finance

This project is supported by funding from the Foothills Research Institute's Mountain Pine Beetle Ecology Program, as well as FRIAA Open Funds (Project OF-07-PO19). An annual contribution by the FGYA to the project represents the time of the Research and Development Associate providing scientific and technical direction to the project, as well as some time by the Director. These costs are already accounted for under Project 1 – Development and Management of the Association. Funding and deliverables are for the three – year initial phase of the project. Depending on the results of this

research as well as the severity of the infestation, a further 2-year extension (phase 2) may be deemed important and further funding will be sought if such is the case.

5. Annual Work Plan (April 1, 2009 – March 31, 2010)

This work plan follows the general format specified for all FRI annual work plans by the FRI Board and Executive, but is cross-referenced to the main Business Plan to reduce duplication.

5.1. Objectives and Deliverables

The mission and mandate of the FGYA are described in Business Plan Section 2.

Objectives and deliverables for each FGYA project, all of which have multi-year terms, are detailed in Business Plan Section 4. The following is a list and description by project of deliverables for 2009-10.

5.1.1. Project 1 - Development and Management of the Association

- Annually updated 5-year business plan and annual work plan, with budgets by year for each project (April 1 2009 for approved 2009 plan; February 2010 for draft 2010 plan);
- Project proposals, plans, designs, reports and publications (see under individual technical projects);
- Meetings, field tours and technical sessions:
- Pre-season meeting of technical representatives and contractors (June);
- Steering Committee and annual meeting (February 2010)
- Active publicly-accessible web site (throughout year);
- Mid-year (October) and annual (year-end) progress and financial reports;
- Steering committee meeting minutes (March 31, 2010 latest).

(See also Business Plan Section 4.1.)

5.1.2. Project 2 - Lodgepole Pine Regeneration

Activities planned for 2009-10 include:

- Detailed fieldwork schedule (June 15 latest);
- Scheduled status checks (74 installations) and full measurements (28 installations) – October 31, 2009;
- Updated digital database – December 31, 2009;
- Audit and work verification reports – January 31, 2010;
- Crop performance report (8 growing seasons) and Project (Phase 2) final report;
- Continue and expand analysis of the linkage of growth and mortality to climatic factors, utilizing regional and local climate records and spatial interpolation techniques;
- Expanded regeneration model development, including incorporation of climate variables, projection to performance survey age, and (subject to availability of co-operators and funding) inclusion of other coniferous species.

(See also Business Plan Section 4.2.)

5.1.3. Project 3 - Comparison of Pre-harvest and Post-harvest Stand Development

Follow-up work to results previously reported for this project will be conducted and reported under Project 4 (see Section 5.4 below). A *Dialogues* initiative led by FRI Communications and Extension Program as an outcome of the *Post-harvest Stand Development Conference* held in 2006 has been concluded. Some activities arising from this initiative are ongoing. Work undertaken in 2008 under Project 4 to compare historical trial data with growth and yield model projections, and analyses of the Gregg spacing trial, will be consolidated to produce an information report or scientific paper on implied yield differences between fire-origin and managed stands.

5.1.4. Project 4 - Cooperative Management of Historic Research Trials

A five-year Agreement between the FGYA, Alberta Sustainable Resource Development and the Canadian Fibre Centre of the CFS for the remeasurement and maintenance of these trials has been renewed and extends to March 31, 2013.

A system for evaluating priority remeasurement has been developed, and all trials rated accordingly. Fieldwork will continue on trials rated as "medium" priority, and some "low" priority trials may be remeasured if at risk from Mountain Pine Beetle mortality. Fieldwork will continue only if re-measurement of the trials is determined to be useful for the development of analytical products, and the inter-agency agreement is renewed (see Business Plan Section 4.4).

Re-measurements are tentatively scheduled for the following CFS trials:

- McCardle fertilization& thinning 1984 – remeasurement deferred pending review
- Gregg spacing 1984 medium site
- Gregg Spacing 1984 low/high sites (low priority) – not proposed for measurement in 2009

Further testing of trial data against GYPSY and TASS will be conducted subject to the release of new versions of these models.

5.1.5. Project 5 - Regional Yield Estimators

No deliverables are currently scheduled for 2009.

5.1.6. Project 6 - Enhanced Management of Lodgepole Pine

Analytical work on the 3rd-year foliage analysis will be carried over to 2009. Remaining analyses and projections for the 2 trials established under this Project will be undertaken in cooperation with the University of Alberta during the 2009-10 year as required for completion of the final Project Report by June 30, 2010.

5.1.7. Project 7 – Regeneration Management in a Mountain Pine Beetle Environment

The intent of this project is to provide decision support tools that will assist FGYA members and others mitigate timber supply impacts of the mountain pine beetle in Alberta by using knowledge of growth and yield in the silvicultural treatment of threatened or attacked stands.

Funding for this project was acquired through FRIAA Open Funds (proposal submitted October 2007) and FRI's Mountain Pine Beetle Ecology Program. Work began in 2008. FRI's Mountain Pine Beetle Ecology Program is responsible for funds and project management, while the FGYA's Research and Development Associate is responsible for technical and analytical elements of the project. Subject to review and approval by the Technical and Steering Committees, activities and deliverables in 2009-10 are:

- Pending confirmation of infection status and generation of funds for the work, dendrochronological assessment work by the CFS may be extended to southern Alberta;
- Field work is scheduled to continue in 2009 and will consist of measurement of approximately 15 baseline plots and associated MPB status checks
- Existing and supplementary data for these plots will be compiled and combined with data collected in 2008 to produce a consolidated baseline database and baseline assessment report;
- Projections and a prototype decision-support tool will be made utilizing the combined baseline data and the latest available models;
- An expert-systems workshop will be held with project participants and co-operators to design the decision-support system.

FGYA Funding (Project 1) supports technical input by the Research and Development Associate as well as management activities by the Director. (See Business Plan Section 4.7.)

5.2. Extension and Communication

The FGYA Business Plan addresses the following aspects of extension and communication:

- Information exchange meetings, field tours and technical sessions;
- Maintenance of an active publicly-accessible web site;
- Technical reports, publications and bulletins;
- Collaboration with external institutions;
- Dissemination of information and sharing of data.

A Communications and Extension Strategy was prepared in August 2007 that includes the following activities for 2009-10:

- Technical Session to highlight Mountain Pine Beetle projects by FGYA and others;
- Website updates;
- Technical information reports for Projects 2 (Regenerated Lodgepole Pine), 3 (Pre- and Post-harvest Stand Development) and 4 (Historic Research Trials) and 7 (Mountain Pine Beetle Decision Support)
- Two *Quicknotes* providing non-technical summaries of project results and / or program activities

5.3. Inter-program Links

The following activities or projects will be undertaken in collaboration with other FRI and external programs:

- **Database management**: The FRI Data, Information and Knowledge Management Program is currently responsible for safe storage of the Association's data.
- **Website management**: The FGYA, as a FRI program, has a dedicated section of the FRI website, and relies on the FRI Communications and Extension Program for management of the website.
- **Climate change**: The FGYA maintains an interest in the FRI Climate Change sub-program and, subject to funding, will work linking analysis of climate impacts on lodgepole pine regeneration to climate change. Work has begun with U of A on examining the RLP data to determine relationships between growth, yield and mortality and climate change.
- **Historic research trials**: This project will continue to be conducted cooperatively through an inter-agency agreement with the Canadian Forest Service and Alberta Sustainable Resource Development.

- **Enhanced management of lodgepole pine**: The University of Alberta has participated in the design, and will participate on the analysis, of this project under a research collaboration agreement with the FGYA.

- **Regeneration Management in a Mountain Pine Beetle Environment:** This is a joint project with FRI, whereby FRI oversees the budgetary, contractual and field elements of the program and the FGYA's Research and Development Associate oversees research design and reporting as well as the technical and analytical elements of the program.

(See also Business Plan Section 3.5.)

5.4. Funding Sources

The following organizations are sponsoring members of the FGYA:

- Alberta Newsprint Company
- Blue Ridge Lumber
- Canadian Forest Products
- Millar Western Forest Products
- Spray Lake Sawmills
- Sundance Forest Products
- Sundre Forest Products
- Hinton Wood Products
- Weyerhaeuser Canada

All are companies or corporate divisions holding Forest Management Area tenures in the Foothills Natural Sub-regions of Alberta.

Each member contributes:

- An annual member fee of $21,000 (proposing $18,500 in 2009-10);
- In kind services, including measurement, treatment and maintenance of the *Regenerated Lodgepole Pine (RLP) Trial* (Project 2);
- Funding to other projects, pro-rated by pine-leading managed area according to a formula specified in the Business Plan Section 3.4.

Project 1, Development of the Association is supported by the membership fees of the nine member companies and includes the management and field coordination of the FGYA programs as well as the research development, design and technical services of the Research and Development Associate.

Project 2, Regenerated Lodgepole Pine is supported by in-kind services of the membership (plot measurement) as well as the annual membership fees paid.

Project 4, Historic Research Trials is supported by annual membership contributions pro-rated based on the proportional representation of lodgepole pine stands within individual FMAs compared to the total lodgepole pine stand area in the cumulative member FMAs.

Project 6, Enhanced Management of Lodgepole Pine, is supported with FRIAA Open Funds.

Project 7, Regeneration Management in a Mountain Pine Beetle Environment is supported with FRIAA Open Funds, with funding from FRI's MPBEP and with in-kind support from SRD and the FGYA.

Table 13 summarizes funding sources for 2008. Appendix 1 contains details and allocations of cash contributions from sponsoring members.

Table 13. Scheduled income for 2009-10

Project (Accounting Code)	Contributing Organization	Carry Forward	Cash Committed	Total Funding[15]	In-kind Support	Comments
Project 1 FGYA (235)	Members	88,001	166,500	254,501		Member fees
Project 2 - RLP	Members				140,000	Fieldwork
Project 4 - HRT (235.1)	Members	18,629	0	18,629		Historic research trials
Project 6 - EMLP (235.2)	FRIAA Open Funds OF-02-16	(5,410)	5,010[16]	(400)		Enhanced management of lodgepole pine
Project 7 – MPB	FRI and FRIAA Open Funds					Reported under FRI's MPBEP
Total FGYA		**101,220**	**171,510**	**272,730**	**140,000**	

Details on the annual and projected income and expenditures for each of these projects may be found as follows:

Project 1 – Management of the Association -	Table 2
Project 2 – Regenerated Lodgepole Pine -	Table 5
Project 3 – Comparison of Pre- and Postharvest Stand Development -	No direct costs
Project 4 – Historic Research Trials -	Table 8
Project 5 – Regional Yield Estimators -	No Activity
Project 6 - Enhanced Management of Lodgepole Pine -	Table 11

FGYA technical and analytical input by the Research and Development Associate to the various projects are covered under Project 1.

5.5. Program Key Members and Responsibilities

Roles and responsibilities for the FGYA program are described in Business Plan Section 3.3. Note that effective 2007 responsibilities for project management, field coordination, and analytical research and development have been re-allocated (see Sections 3.3.4 and 3.3.5).

Management staff and corporate representatives are identified with their contact information in Table 14.

[15] Updated from 2007/08 Business and Work Plan rev Aug 2007
[16] Final FRIAA payment pending submission/acceptance of final reports

5.6. Environmental and Occupational Health and Safety Permits

With the exception of supervision, administration and data management tasks conducted directly by FRI staff, the FGYA program and projects are implemented by contractors. Contracts are administered by the FRI and stipulate statutory compliance of the contractor with the laws of Alberta, explicitly including the Occupational Health and Safety Act.

Field trials and associated silvicultural activities are conducted and permitted under authority of the sponsors' timber tenures.

Table 14. 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
Canfor [17]	Jill	Ashley	(780) 538-7793
Foothills Research Institute	Debbie	Mucha	(780) 865-8290

[17] Replacing Melonie Zaichowsky fall 2009

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

Appendix 1. Financial Allocations and Authorizations for the Period April 1, 2009 – March 31, 2010

Appendix 1.1. Project FOOMOD-01-03 – Foothills Growth and Yield Association Membership Fees

This is confirmation of our intent as a voting member of the Foothills Growth and Yield Association ("the Association") to support the continued development and management of the Association by payment of an annual membership fee.

We agree that the membership fee for the period April 1, 2009 – March 31, 2010 be set at $18,500 and made payable to the Foothills Research Institute who as Coordinating Agency for the Association will administer the project on our behalf.

Authorization for Billings and FRIAA Transfers:

Company	Representative (print name)	Signature	Method of payment	
			FRIAA Transfer	Direct Billing
Alberta Newsprint Company	Greg Branton			
Blue Ridge Lumber	Tim Burns			
Canfor	Dwight Weeks			
Millar Western Forest Products	Tim McCready			
Spray Lakes Sawmills	Ed Kulcsar			
Sundance Forest Industries	John Huey			
Sundre Forest Products	Bob Held			
Hinton Wood Products	Richard Briand			
Weyerhaeuser Canada	Greg Behuniak			

Appendix 1.2. Project FOOMOD-01-02 – Measurement and Maintenance of Historic Research Trials – April 1, 2009 – March 31, 2010

This is confirmation of our intent as a voting member of the Foothills Growth and Yield Association ("the Association") to support the continued measurement and maintenance of the Historic Research Trials. The fees to be paid are proportionate to the representation of Lodgepole Pine leading stands on our respective landbases, as set forward in the tables below and made payable to the Foothills Research Institute who as Coordinating Agency for the Association will administer the project on our behalf.

Company	Area (ha)	% of total	Allocation To be paid	Method of Payment t.b.a.
Alberta Newsprint Company	106,870	5.22	835	
Blue Ridge Lumber	180,323	8.82	1,411	Payment
Canfor	106,271	5.2	832	deferred for 2009
Millar Western Forest Products	112,406	5.5	880	pending review
Spray Lakes Sawmills	114,988	5.62	899	and evaluation of
Sundance Forest Industries	121,848	5.96	954	historic trials
Sundre Forest Products	293,655	14.36	2,298	status and
Hinton Wood Products	451,713	22.08	3,533	priorities for
Weyerhaeuser Canada	557,433	27.25	4,360	remeasurement
Total	2,045,507	100	16,000	

Authorization for Billings and FRIAA Transfers:

Company	Representative (print name)	Signature	Method of payment	
			FRIAA Transfer	Direct Billing
Alberta Newsprint Company	Greg Branton			
Blue Ridge Lumber	Tim Burns			
Canfor	Dwight Weeks			
Millar Western Forest Products	Tim McCready			
Spray Lakes Sawmills	Ed Kulcsar			
Sundance Forest Industries	John Huey			
Sundre Forest Products	Bob Held			
Hinton Wood Products	Richard Briand			
Weyerhaeuser Canada	Greg Behuniak			

Appendix 2

Foothills Growth and Yield Association
Information Note
Regenerated Lodgepole Pine Trial
Proposal and Priorities for Measurement and Treatment
March 2009

Background

The long-term trial was designed to forecast and monitor the growth and yield of harvest-origin lodgepole pine in relation to site, initial spacing of planted stock, natural regeneration, mortality, vegetation control (weeding), density regulation (pre-commercial thinning). In the shorter-term, including during the current term of FRIAA Project FOOMOD-01-03 ending in 2010, the main value of the project and focus of data collection and analysis are to provide an improved basis for forecasting achievement of establishment and performance targets associated with regeneration standards being developed or adopted by the FGYA members.

The trial was established between the summer of 2000 and the spring of 2002, and results for the first 5 growing seasons were reported in detail in April, 2008.[18] Table 1 shows the age of the installations as of the end of 2008. (Each group within each eco-class consists of 5 installations planted at different densities, and one non-planted installation.)

Table 15. Current installation ages (from harvest and planting)

Eco-class	Group	Block age (years)	Growing seasons since planting
1	1	9	7-8
	2	9	7
	3	9	8
2	1	9	8
	2	8	7
	3	8	7
3	1	9	7
	2	8	8
	3	8	7
	4	8	7-8
	5	8	7
4	1	8	8
	2	8	7
	3	8	7
5	1	8	7
	2	7	7
	3	7-9	7-8

[18] *Regenerated lodgepole pine trial, analysis of crop performance 5 growing seasons after planting*, 4 April 2008. FGYA Technical Report.

Priority 1. Checks, Corrections and Maintenance

The 4 highest priorities for 2009 are listed below.

- ***Insufficiently sampled natural regeneration***. Ensure sampling of natural regeneration in non-planted installations conforms to the project design as specified in the field manual. As documented in the 2008 Error Report, there are 16 treatment plots with less than 50 sample trees (the number specified in the manual), but in which counts indicated more than 50 trees present. In at least some of these plots, failure to follow the tagging procedure is suspected. They should all be checked in 2009, and more trees tagged and tallied where applicable.
- ***Missing trees.*** Installations where the % of missing trees is very high (approaching or exceeding 4%) should be checked to ascertain whether the trees can be assumed dead.
- ***Selective mortality assessments.*** Analysis of mortality data highlighted trends with climate that have important implications and have not previously been reported elsewhere. Visits by experts in silviculture and forest health to a small number of selected plots on different site types (*Ledum* and non-*Ledum*) showing high or anomalous mortality rates may shed important light on the observed results.
- ***Plot maintenance.*** Ensure installation demarcation and tree tags are in good order.

Priority 2. Continued Measurements

Continuation of essentially the same data collection protocol as applied over the last 2 years is desirable for a further 5-7 years. Table 2 shows the schedule for the next 5 years.

Table 16. Elapsed Growing Seasons and Scheduled Measurement Type by Year and FMA

FMA	# of installations	2009	2010	2011	2012	2013
ANC Timber	6	8 (SC)	9(FM)	10(SC)	11(FM)	12(SC)
Blue Ridge Lumber	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Canfor	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Hinton Wood Products	12	9 (FM)	10 (SC)	11(FM)	12(SC)	13(FM)
	10	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Millar Western	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Spray Lakes	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Sundance	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Sundre	14	9 (FM)	10 (SC)	11(FM)	12(SC)	13(FM)
Weyerhaeuser D.V.	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Weyerhaeuser Edson	6	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Weyerhaeuser G.P.	2	9 (FM)	10 (SC)	11(FM)	12(SC)	13(FM)
	16	8 (SC)	9 (FM)	10(SC)	11(FM)	12(SC)
Total Full Measurements		28	74	28	74	28
Total Status Checks		74	28	74	28	74
Total	102	102	102	102	102	102

FM = full measurement, SC = status (mortality) check

The scheduled work would provide data for modeling the entire regeneration phase, as well as a link to growth-phase models like GYPSY. Annual measurements are desirable. (The main value of checking the plots every year would be better and earlier mortality prediction and climate linkage.) Failure to

measure the plots at least every 2 years would result in a substantial loss in predictive information, de-valuation of the investment already made in the trial, and delay in development of prediction tools. After the next 5-7 years, i.e. once the trial has passed through the dynamic regeneration phase, the installations can be monitored on a less intensive basis during the growth phase of the rotation.

Priority 3. Treatments

No further fill-planting or weeding treatments are required. The project design calls for pre-commercial thinning of the designated treatment plots where natural regeneration has resulted in the target density being exceeded. While it is desirable to thin before significant crown-competition occurs, this operation should not be undertaken until ingress of natural regeneration is complete or at least declining, and irregular mortality has stabilized. Neither of these conditions has yet occurred. The trial appears to be generally conforming to ingress trends earlier reported by Crossley,[19] which would suggest that ingress may continue up to 14 years after peaking at about 7 years. On many installations mortality of planted stock shows no sign of declining, and trends of mortality in natural regeneration have not yet been confirmed. It is proposed to delay thinning until 2013, subject to assessments of mortality, ingress and growth in 2010 and 2012.

[19] Crossley, D.I. 1976. *The ingress of regeneration following harvest and scarification of lodgepole pine stands.* Forestry Chronicle.