



# FIVE-YEAR BUSINESS PLAN AND 2019-20 ANNUAL WORK PLAN

*Forest Growth Organization of Western Canada*

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## BACKGROUND

The Forest Growth Organization of Western Canada (FGrOW) began operating in April 2015 as an amalgamation of four growth and yield associations: Alberta Forest Growth Organization (AFGO), Foothills Growth and Yield Association (FGYA), Mixedwood Management Association (MWMA) and Western Boreal Growth and Yield Association (WESBOGY), which joined January 1, 2016. The intent of the amalgamation was to increase efficiencies and to attract more funding to growth and yield in Western Canada. As of April 1, 2016, Tree Improvement Alberta (TIA) became a project team under FGrOW.

Members of the founding associations place a high value on continuation of existing projects and research, but also recognize the advantages of coordinating efforts to increase opportunities for funding and to raise the profile of growth and yield in western Canada.

FGrOW is an association under fRI Research (formerly the Foothills Research Institute) which acts as coordinating agency, providing accounting and administrative support.

This document contains both the FGrOW business plan for the period from April 1, 2019 to March 31, 2024 and a detailed work plan for the 2019-20 business year.

## VISION AND MISSION

Finalized in 2016, the FGrOW Vision and Mission document is intended to provide a common understanding of FGrOW and its intended outcomes. It acts as a standard against which FGrOW can measure its success and provides guidance in initiating new activities. It is also a communication tool to be used by members and to help establish an identity for FGrOW. The Vision and Mission of FGrOW are as follows.

**Vision:** FGrOW is the leader in cooperative growth and yield research, model development and data management in western Canada. FGrOW drives the advancement of the science of forest growth and provides information to support policy development and changes in forestry practices.

**Mission:** FGrOW serves its members by providing access to better forest growth data and knowledge, and to tools that support forest management decision-making. FGrOW facilitates collaboration, seeks partnerships, identifies efficiencies for its members, and pursues alternative funding sources to advance member-defined priorities.

Success in achieving its mission will be measured by the following:

1. **Defensible data:** Quality data collected to agreed-upon standards maximizes its potential utility.
  - **Target:** PSP measurements are submitted to the Provincial Growth and Yield Initiative (PGYI) database for all Forest Management Areas (FMAs) in Alberta.

2. **Application of results:** Research is completed, models and tools are developed, and knowledge is transferred to members.
  - **Target:** A minimum of 5 tech-transfer products, such as QuickNotes or workshops, are produced annually.
3. **Reduced costs:** Association activities and strategic collaborations will lead to efficient use of member investments.
  - **Target:** One new collaborative activity, project, or partnership annually.
4. **Enabling informed decision making:** Scientifically defensible results support choices made by practitioners and support policy development.
  - **Target:** Two papers published in peer-reviewed journals annually.
5. **Training:** Members gain knowledge through participation; training of new practitioners to develop skills needed to contribute to future research.
  - **Target:** 100% of member organizations have staff attending at least one training session annually.
6. **Membership:** Value of FGrOW is recognized by its members and within the growth and yield community.
  - **Target:** FGrOW membership is stable or growing.

## PROJECT PRIORITIES

Continuation of the work of the founding associations continues to be a focus for FGrOW. The FGrOW Vision and Mission and its associated goals guide the work of the association and assist in identification of new projects.

FGrOW will continue to maintain a list of research priorities (Appendix 1) and review them with members at least every second year. Further review of priorities will be carried out as needed when opportunities to seek additional funding are identified.

An increasingly important focus for FGrOW is ensuring that the results of its research can be implemented by practitioners. FGrOW continually seeks opportunities for tech transfer and to communicate with its members and other interested parties about its research.

## MANAGEMENT AND DECISION MAKING

### PLENARY COMMITTEE

Decision-making will be carried out by the membership as a whole through the Plenary Committee, which approves a business and work plan at each annual general meeting. The Plenary Committee is composed of one representative from each voting member. New projects or initiatives introduced in advance of completed work plans will be included in the work plan and will require approval by members. Where projects or initiatives are identified following approval of the work plan, they will be

tabled with the Plenary Committee for vote. If approved they will be reported on in the Annual Work Plan Report and, if appropriate, included in the next work plan.

As described below, the membership delegates certain authorities to the Executive Council and Management Team (Figure 1).

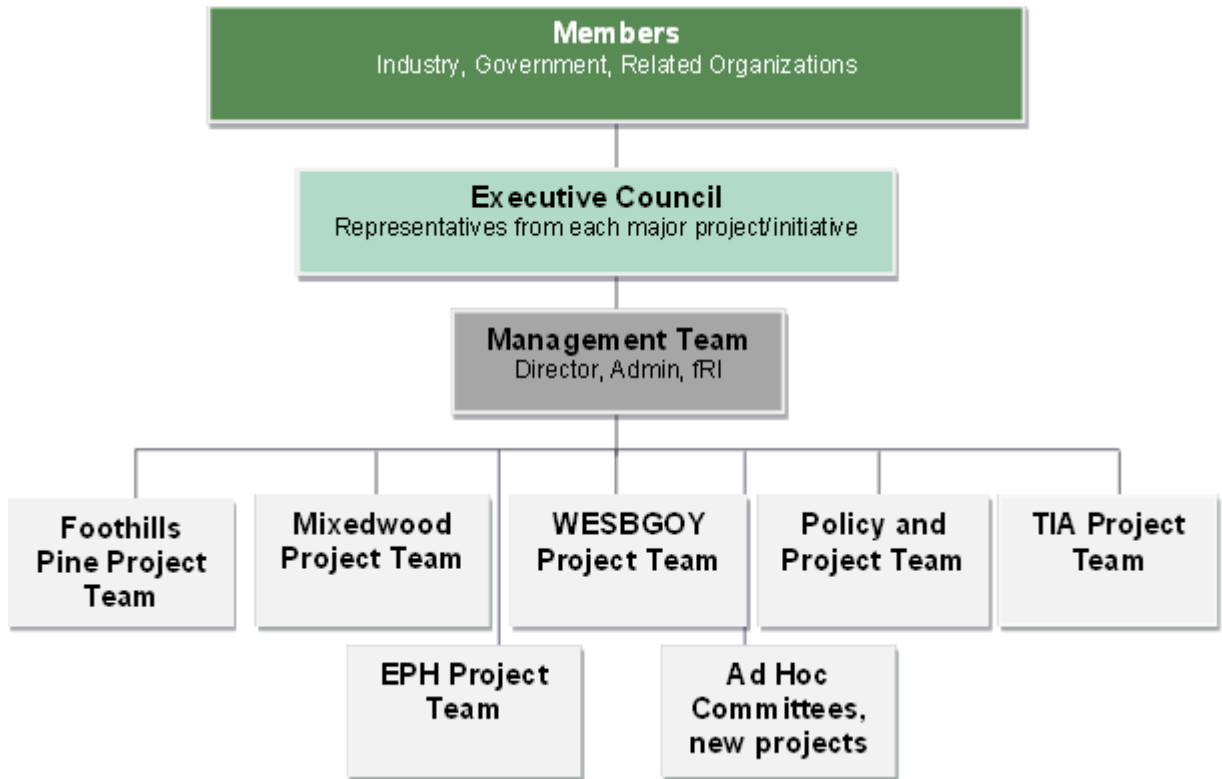


Figure 1. FGrOW Organizational Structure.

## EXECUTIVE COUNCIL

The Executive Council will manage the ongoing affairs of FGrOW as directed by the membership. Q A primary function of the Executive Council is to oversee the Management Team. The Executive Council may coordinate broader discussions among the membership and others about the science of growth and yield in western Canada. The Executive Council may initiate ad-hoc committees as necessary.

The Executive Council Chair is also chair of the Plenary Committee. The Chair leads Executive Council meetings and records its decisions and key activities.

## MANAGEMENT TEAM

The Management Team will consist of a Director and an Administrative Assistant who manage the day-to-day affairs of the organization. As the coordinating agency, fRI Research will provide accounting and administrative support. The Management Team will operate under the direction of the Executive Council and strictly within the conditions laid out in the FGrOW MOU. The roles of the Director and Administrative Assistant are as follows:

Director:

- Complete annual reports, business plans and work plans
- Communications with members and stakeholders
- Represent the organization and act as an initial point of contact for external requests
- Have a high-level knowledge of the timing and logistics of all projects
- Sit on the Executive Council and act as secretary
- Make decisions in delivering the projects and initiatives as identified in the business plan
- Provide support to projects as requested by Project Teams

Administrative Assistant:

- Maintain website site on an ongoing basis
- Support the Director in preparing annual reports, business plans, and work plans
- Maintain the records of the organization
- Organize meeting and tours
- Take minutes at AGMs and plenary meetings
- Provide support to projects as requested by Project Teams

## FINANCIAL MANAGEMENT

The management of finances is primarily carried out by the Management Team, with the Director carrying ultimate responsibility for managing revenues and expenses, and reporting variances to the Executive Council. Projects are expected to have a project plan and budget, either included or referred to, in the business plan that is approved by members and implemented by the Management Team. In the case of projects or programs managed at the University of Alberta, finances other than dues can either be provided directly to the University or channelled through FGrOW to the project. New accounts will be established at fRI Research for each project or initiative to manage its revenues (grants, contributions etc.).

## PROJECT TEAMS AND COMMITTEES

Project Teams and committees are established to carry out specific tasks or to oversee specific projects and initiatives. There are two types of teams or committees:

- **Project Teams:** Ongoing Project Teams will be established to manage one project or multiple projects of a similar nature that involve the delivery of work being funded or overseen by members. Initially, the Project Teams were the programs of the four founding associations (i.e. AFGO, FGYA, MWMA, and WESBOGY). Two new project teams have been added: the Empirical Post Harvest Assessment Project Team and Tree Improvement Alberta Project Team. Additional Project Teams will be established as needed when additional projects or initiatives are added.
- **Ad-Hoc Committees:** Ad-hoc committees may be established for reviewing and recommending new projects or to address emerging growth and yield issues.

## COLLABORATION AND PARTNERSHIPS

The University of Alberta, an Associate Member of FGrOW, is a key partner in the delivery of FGrOW's program. In addition to housing the WESBOGY Project Team, it plays a key role in growth and yield research and training of new growth and yield practitioners. FGrOW will work with the university in three main areas:

- **Training.** Work with the university to ensure that students are receiving the practical education needed to fully understand the collection and analysis of tree and forest measurements.
- **Continuing education and extension.** Ongoing training and updating of practitioners regarding best practices and the use of growth and yield tools. FGrOW will work with the University to ensure timely and applicable transfer of knowledge to practitioners.
- **Research.** Engage in a dialogue with the U of A to ensure that their research program addresses industry needs while building capacity and experience.

FGrOW will also look to the rest of Canada for partnership and collaboration opportunities. Expertise in growth and yield exists in other parts of the country, notably British Columbia, New Brunswick, Ontario, and Quebec. FGrOW's long-term goal is to benchmark these programs, building on their experiences and identifying potential partners.

## COMMUNICATIONS PLAN

FGrOW's primary audience for communications is its members. It conducts communications in four main ways:

1. Producing reports and summaries of findings from research and other projects.
2. Maintaining a website which makes reports and plans available to members and other interested parties.
3. Hosting an Annual General Meeting to report on results, discuss priorities, and approve work plans.
4. Holding workshops and field tours to enable tech transfer.



## ADMINISTRATION AND MANAGEMENT

One of the intents of forming FGrOW was to increase efficiencies in administration. Much of the administrative work that used to be carried out by founding associations is now performed by FGrOW for all members, and the amount of time spent on administering and managing the association is tracked independent of project work. Administration and management includes reporting, website maintenance, and communications and extension work conducted by the Director and Administrative Assistant that is not directly tied to any of the other projects. Funds to support administration and management come from FGrOW membership dues and project team contributions (Table 1).

Appendix 2 provides details of membership dues payable in 2019-20. Each project team will contribute 1.75% of its total income, or a minimum of \$2,000. Future FGrOW projects with external funding will be expected to plan to contribute an agreed upon amount, which by default is 3.0%, to support the administration and development of FGrOW and to recognize FGrOW inputs into the process of identifying new research and developing proposals. An additional 2% will be required on new projects for fRI Research administration fees.

**Table 1. FGrOW administrative funds income summary**

<b>Income</b>	<b>2019-20</b>	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>Total</b>
Balance carry forward	6,945	-6,562	15,890	16,029	19,062	51,364
Membership dues	30,081	44,347	44,347	44,347	44,347	207,467
Foothills Pine Project Team	2,835	3,115	3,395	2,835	2,835	15,015
Mixedwood Project Team	2,000	2,000	2,000	2,000	2,000	10,000
Policy & Practice Project Team	2,000	2,000	2,000	2,000	2,000	10,000
Tree Improvement Alberta	2,000	2,000	2,000	2,000	2,000	10,000
WESBOGY Project Team	2,520	2,520	2,520	2,520	2,520	12,600
MPB PSPs	1,500	22,230	13,193	9,328	0	46,250
<b>Total</b>	<b>49,881</b>	<b>71,650</b>	<b>85,344</b>	<b>81,058</b>	<b>74,763</b>	<b>362,696</b>

FGrOW will annually provide the following deliverables to its members:

- Annually updated business and work plans
- Annual report
- Mid-year report
- Annual General Meeting
- Annual Business Meeting
- An up to date public website

Estimated costs for administration, management and development of FGrOW are detailed in Table 2.

**Table 2. FGrOW administration expense summary**

<b>Expense</b>	<b>2019-20</b>	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>Total</b>
fRI Admin fees*	20,347	22,164	33,220	28,400	26,332	130,462
Computer network	5,485	5,485	5,485	5,485	5,485	27,426
Insurance	2,211	2,211	2,211	2,211	2,211	11,053
Director	19,000	19,000	19,000	19,000	19,000	95,000
Administrative Assistant	3,500	3,500	3,500	3,500	3,500	17,500
Meetings and tours	2,000	2,000	2,000	2,000	2,000	10,000
Supplies	400	400	400	400	400	2,000
Communications	1,000	1,000	1,000	1,000	1,000	5,000
Glossy report	2,500	0	2,500	0	2,500	7,500
<b>Total</b>	<b>56,442</b>	<b>55,760</b>	<b>69,316</b>	<b>61,996</b>	<b>62,428</b>	<b>305,941</b>
<i>Balance</i>	<i>-6,562</i>	<i>25,900</i>	<i>28,400</i>	<i>25,900</i>	<i>28,400</i>	

\*Reflects new MOU with fRI Research for hosting services.

## PROGRAM

The FGrOW Program is carried out by its six Project Teams: Empirical Post-Harvest, Foothills Pine, Mixedwood, Policy and Practice, Tree Improvement Alberta, and WESBOGY. The Project Teams are responsible for developing a work plan, timeline, and budget for each of their projects, as well as for annual reporting. Project Teams will decide how best to carry out their project(s) and the extent to which the Director and Administrative Assistant will be involved either in project support or technical work. The use of the Director and Administrative Assistant for project-specific support is to be funded via the project-specific funding.

An overview of each of the Project Teams and their key projects is given below.

### EMPIRICAL POST HARVEST ASSESSMENT PROJECT TEAM

The Empirical Post Harvest Assessment (EPH) Project Team was initiated in December 2015 to deliver the new project supported through FRIAA Open Funds: *Empirical Post-Harvest Stand Growth Assessment: Stand Structure Development and Growth*. It builds on a 2008 project which collected data from post-harvest stands, with a focus on obtaining paired observations that represented growth trajectories in the 0-30 age range.

This extension of the 2008 project is focused on using these and newly collected data to improve our understanding of how juvenile post-harvest stands change over time, and what impacts silviculture treatment has on these stands; specifically:

1. Changes in stand succession and forest structure over time, important for providing non-timber (social and ecological) values in addition to wood production.
2. The ability of growth models to forecast post-harvest conditions relative to observed growth patterns and silviculture treatments.

- An understanding of the impacts of management interventions (site preparation, reforestation methods and vegetation control) on reforestation success and growth.

The EPH II project has assembled 2006-2015 RSA Performance Survey data with ARIS silviculture activity information from almost all Alberta companies. Six companies were also able to submit matching establishment surveys in digital format. Several other datasets such as Growth and Yield Monitoring Plots, Paired Site Index Study and Hinton 1 ha Pine Trial were also obtained. WESBOGY members gave permission to use their data, and the PGI database will also deliver valuable data for the analysis. All data have been formatted and added to the EPH database. Fifty-five of the previously re-measured 58 openings were re-measured, adding a third observation over a more than 20-year growth period. Thirty-eight additional openings were selected from the early RSA surveys and re-measured. These openings were in the Central Mixedwoods Natural Subregion, were planted with white spruce and had DC or CD stratum targets. Silviculture treatments were plant and tend; and site prepare, plant and tend.

All new data has been added to the database and analysis is underway. Delays caused by greater than expected efforts in data quality control and assembly mean that the project is now scheduled for completion by December 31, 2019.

Total funding for the project is \$491,500. Table 3 outlines projected expenses for the EPH Project Team for the period April 1, 2015 to March 31, 2020.

**Table 3. EPH Project Team Expense Summary**

Expense	2015-16 (Actual)	2016-17 (Actual)	2017-18 (Actual)	2018-19 (Actual)	2019-20 (Plan)	Total 2015-19
Project Management/ Communications	8,231	16,767	15,383	4,138	10,362	54,880
Data assembly	-	39,674	26,321	0	0	65,995
Field work	-	3,649	206,656	0	0	210,305
Analysis	-	-	2,430	38,042	111,247	151,719
FGrOW Administration	-	8,600	0	0	0	8,600
<b>Total</b>	<b>8,231</b>	<b>68,690</b>	<b>250,789</b>	<b>42,180</b>	<b>121,609</b>	<b>491,500</b>

## FOOTHILLS PINE PROJECT TEAM

The Foothills Pine Project Team (FPPT) continues the work of the Foothills Growth and Yield Association (FGYA), which was formed in 2000 to co-operatively forecast and monitor managed stand growth and yield in lodgepole pine. It was run as an association under fRI Research; its membership consisted of 9 companies holding Forest Management Agreements on the Eastern Slopes of Alberta. Details of the work completed by the FGYA can be found in annual reports and other technical documents, as well as in *Progress and Achievements: Foothills Growth and Yield Association the First Decade April 2000 to March 2010*. All of these documents are available on the fRI Research website.

The focus of the FPPT, which was assumed from the FGYA, is:

- 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 Foothills Pine Project Team will have five active projects in 2019-20:

- The Regenerated Lodgepole Pine (RLP) Project;
- Cooperative Management of Historical Research Trials;
- Stand Dynamics after MPB Attack;
- Effect of harvesting and site preparation methods on reforestation performance; and
- PSP Network to Monitor Stand Dynamics and Establish Yield Curves for Stands Killed by MPB.

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## REGENERATED LODGEPOLE PINE

The FPPT's primary focus continues to be the Regenerated Lodgepole Pine (RLP) project which assessed site and treatment effects on stand development following harvesting and planting of lodgepole pine, including:

- The effects of site, planting density and weeding on early crop performance;
- The effects of site, planting density, weeding and thinning on subsequent growth and yield;
- The link between early crop performance and subsequent growth and yield.

The RLP project consists of a long-term field trial, established in 2000 and 2001, and interim forecasting of effects using available models and data. Details of the design, installations and procedures are provided in an *Establishment Report* (April 2003) and a periodically updated field manual.

Details of the trial and its results to date are reported in the annual crop performance report, the most recent of which is *Regenerated lodgepole pine trial: crop performance report 16 year results, March 18 2018*.

The RLP trial has led to the development and review of a decision support tool (FRIPSY: the Foothills Reforestation Integrated Planning System) that allows managers to predict establishment and performance results based on site, stand, site preparation, planting, vegetation management, and climate factors. A multi-disciplinary task force of 8 growth and yield and silvicultural practitioners reviewed the tool in 2013 and provided invaluable advice on its development. Enhancements to the user interface, establishment survey projection and top height projection were completed in June 2014. Enhancements made in 2015 included: aspen performance prediction, site preparation responses, prediction to 14 years after cut, and extended range of planting years.

In 2016, adjustments were made to FRIPSY version 3 based on results of operational validation and 2016 data. A workshop was held on June 2, 2016 to present and obtain feedback on FRIPSY, the impacts on

climate on lodgepole pine regeneration, and the *Stand Dynamics after MPB Attack* project. Following the workshop, stocking adjustments and model corrections were made to FRIPSY and the batch processor was updated to incorporate enhancements. A climatic risk variable which improved mortality predictions was added to the base model as result of climate study discussed below. A release of FRIPSY that is integrated with GYPSY was completed in June 2017.

Based on initial work with the 16-year measurements of the RLP data, changes to the FRIPSY long term plan were approved in October 2017. Sub-models were developed for the 16-year extension as well as initial sub-models for spruce; both are reported in the 2018 Crop Performance report. Also contained in the report is an analysis of integrated yield projections using FRIPSY and GYPSY. Release of Multi-species FRIPSY on a new platform is schedule for completion by April 20, 2020.

In view 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, exploratory analyses were conducted during 2007 linking growth and mortality during the first 5 years of the trial to regional and locally-interpolated climate records. Following a preliminary study of the RLP trial planted stock results (Interim Technical Note, February 2009), the work was expanded to include data from an earlier study of natural regeneration conducted by the CFS (*Technical Note 2010-3*, February 2010). Further analyses were conducted in 2010 and 2011, and a draft scientific paper was presented for membership review in March 2012. Results have been used in development of the regeneration model and to map health and mortality risks throughout the foothills region. In 2015-16, an in-depth analysis of the impacts of climate on juvenile lodgepole pine mortality was completed (*Impact of Climate on Juvenile Mortality and Armillaria Root Disease in Lodgepole Pine*). Based on direction from members at the June workshop, the report was adapted for submission to the Forestry Chronicle and was published in 2017<sup>1</sup>.

A strategy for transition from the regeneration phase measurements to measurements in the growth phase of stand development was prepared in 2015 (*Strategy for Continuation of the Foothills Growth and Yield Association's Regenerated Lodgepole Pine Trial*, W.R. Dempster, January 19, 2015). Three companies piloted the new growth phase measurements in 2015 and the data collected was assessed (*Foothills Pine Project Team—Regenerated Lodgepole Pine Trial—Assessment of Data Collected in 2015*). Modifications to the field protocols for the 2016 and subsequent field seasons were approved by members based on this assessment.

Based on analysis of the 2017 and 2018 measurements, recommendations will be made regarding future measurement schedule. This plan assumes continuation of the current 2-year measurement interval, but a longer interval may be determined upon discussion of recommendations with members.

Costs of fieldwork are incurred directly by each member for the installations (clusters of 4 experimental plots) located on its forest management area. Work is administered directly by the member, with the

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<sup>1</sup> Dempster, W. Richard. "Impact of climate on juvenile mortality and Armillaria root disease in lodgepole pine." *The Forestry Chronicle*. **93**:148-160. 2017.

FPPT playing a coordination and quality control role. Members wishing to use FRIP funds to cover their trial measurements are responsible for directly applying to FRIAA for project approval.

Estimated measurement costs shown in Table 4 for the RLP Trial are approximate expectations based on the work schedule shown; they should be regarded as only indicative orders-of-magnitude of the actual costs to be incurred by members. Measurement costs per installation are assumed at \$8,000.

**Table 4. Regenerated Lodgepole Pine project –Scheduled measurements by FMA and estimated measurement costs.**

Agency	2019	2020	Measurement Costs 2019	Measurement Costs 2020
ANC	-	6	0	48,000
BRL	-	6	0	48,000
CFPGP	-	6	0	48,000
MWFP	-	6	0	48,000
SDA (EFP)	-	6	0	48,000
SLS	-	6	0	48,000
SPI	14	-	112,000	0
WEYDV	-	6	0	48,000
WEYED	-	6	0	48,000
WEYGP	2	16	16,000	128,000
WWC (HWP)	12	9	96,000	72,000
<b>Total</b>	<b>28</b>	<b>73</b>	<b>224,000</b>	<b>584,000</b>

Estimated costs for the RLP project for the period April 1, 2019 to March 31, 2024 are summarized in Table 5. A detailed summary of deliverables and next steps is in Appendix 4.

**Table 5. Regenerated Lodgepole Pine project expense summary.**

Expense	2019-20	2020-21	2021-22	2022-23	2023-24	Total
R&D Associate	97,180	87,180	87,180	87,180	87,180	445,900
Coordinator	9,000	9,000	9,000	9,000	9,000	45,000
Field Auditor	10,000	20,000	10,000	20,000	10,000	70,000
Database	12,000	12,000	12,000	12,000	12,000	60,000
Other technical	85,000	30,000	10,000	10,000	10,000	145,000
Meetings	2,000	1,000	2,000	2,000	2,000	9,000
<b>Total</b>	<b>215,180</b>	<b>159,180</b>	<b>130,180</b>	<b>140,180</b>	<b>130,180</b>	<b>774,900</b>

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## COOPERATIVE MANAGEMENT OF HISTORICAL RESEARCH TRIALS

Beginning in the late 1930 and ending in 1980s, the Canadian Forest Service (CFS) established a number of trials in lodgepole pine stands throughout Alberta. These trials are considered invaluable resources for monitoring and demonstrating the effects of nutrition and density management. Since 2002, the FGYA, Alberta Agriculture and Forestry (AF) and the Canadian Wood Fibre Centre (CWFC) of the CFS

have had a signed agreement for cooperative management of the trials. The FGYA was responsible for measurements, maintenance and support for analytic work; the FGrOW FPPT has assumed these responsibilities. Detailed information on the trials is found in *Long-term Lodgepole Pine Silviculture Trials in Alberta: History and Current Results*. Details on measurements conducted by the FGYA are contained in their annual reports.

The trial measurement schedule was review in 2016-17 in cooperation with the Canadian Wood Fibre Centre. As a result, only 7 of the trials are being maintained on an active measurement schedule; the others were treated long enough ago that repeated measurements are unlikely to provide useful information. Three of the trials which are being retained have been moved to a 10-year measurement interval. The current schedule is presented in Table 6.

Costs of re-measurements for the Historic Research Trials (HRT) are split between Foothills Pine Project Team members based on the area of pine leading stands in their FMAs, as shown in Appendix 5.

**Table 6. Cost schedule for FGYA contribution to Cooperative Management of Historic Research Trials.**

Trial	Man days	2019-20	2020-21	2021-22	2022-23	2023-24	Total
McCardell 1984 fertilization & thinning	36	0	0	0	0	0	0
MacKay thinning (A34)	56	0	0	0	0	56,000	56,000
Swan Lake thinning 1977	8	0	0	0	0	0	
Teepee Pole Spacing 1967	20	0	20,000	0	0	0	20,000
Gregg spacing 1963	46	0		46,000	0	0	46,000
Gregg spacing (Medium)	11	0	0	0	0	0	0
Fertilization and Thinning Takyi Trials <sup>1</sup>	75	0	0	0	0	0	0
Quality Control	2	0	3,000	3,000	0	2,000	8,000
<b>Total Annual Expense</b>		<b>0</b>	<b>23,000</b>	<b>49,000</b>	<b>0</b>	<b>58,000</b>	<b>130,000</b>

<sup>1</sup>Measurement costs are the responsibility of Alberta Agriculture and Forestry.

Table 7 summarizes FPPT costs for the HRT for the period April 1, 2019 to March 31, 2024.

**Table 7. Project Team costs for *Cooperative Management of Historic Research Trials*.**

	2019-20	2020-21	2021-22	2022-23	2023-24	Total
<b>Income</b>						
Member Contribution	0	20,000	46,000	0	56,000	122,000
FRIAA	11,928	0	0	0	0	11,928
<b>Total Income</b>	<b>11,928</b>	<b>20,000</b>	<b>46,000</b>	<b>0</b>	<b>56,000</b>	<b>133,928</b>
<b>Expense</b>						
R&D Associate	1,000	3,000	3,000	1,000	3,000	11,000
Coordinator	1,000	1,000	2,000	1,000	2,000	7,000
Field Auditor	0	3,000	3,000	0	2,000	8,000
Measurements	0	20,000	46,000		56,000	122,000
<b>Total Expense</b>	<b>2,000</b>	<b>27,000</b>	<b>54,000</b>	<b>2,000</b>	<b>63,000</b>	<b>148,000</b>

#### STAND DYNAMICS AFTER MPB ATTACK

The mountain pine beetle monitoring project, *Stand Dynamics after MPB Attack*, was originally called *Regeneration Management in a Mountain Pine Beetle Environment* and was initiated as a result of a field tour to MPB-attacked areas around Prince George, BC in 2007. This project included 1) development of a Decision Support Tool intended to help managers decide on priorities for salvage and treatment in MPB attacked stands using the best available information, and 2) monitoring of PSPs attacked by MPB to assess stand response. The Decision Support Tool was completed in 2012 (*Enhanced Mountain Pine Beetle Decision Support Tool Application Development*, ForCorp Solutions, December 2012).

Funding for two field seasons of measurements was provided by the fRI Research Mountain Pine Beetle Ecology Program (MPBEP) Final deliverables to the MPBEP will be a scientific description of analyses and results, including quantitative models of mortality and regeneration trends (manuscript prepared for Canadian Journal of Forest Research or other peer reviewed publication) and a description of results and management implications (manuscript prepared for Forestry Chronicle or other professional journal). These are scheduled for completion by December 31, 2019.

Funding to roll this project into the MPB PSP program described below has been obtained.

Table 8 summarizes expenditures for the Stand Dynamics after MPB Attack for the period April 1, 2019 to March 31, 2024.

**Table 8. Expense summary for *Stand Dynamics after MPB Attack*.**

Expense	2017-18	2018-19	2019-20	2020-21	2021-22	Total
R&D Associate	18,800	42,966	5,000	0	0	66,766
Coordinator	5,000	4,493	3,000	0	0	12,493
<b>Total Expenses</b>	<b>23,800</b>	<b>47,459</b>	<b>8,000</b>	<b>0</b>	<b>0</b>	<b>79,259</b>



ESTABLISHMENT OF PSP NETWORK TO MONITOR STAND DYNAMICS AND ESTABLISH YIELD CURVES FOR STANDS KILLED BY MPB

In 2015 a project to establish a PSP network to monitor stand dynamics and develop yield curves for stands killed by MPB was initiated with funding from the FRIAA Mountain Pine Beetle Rehabilitation Program. The initial establishment 118 new plots and remeasurement of 32 existing PSPs was completed in 2016. The objectives of this project are:

1. To create a permanent sample plot network in pine dominated stands with existing high rates of MPB-caused mortality that have not had any post-MPB attack treatment. This will provide statistically sound data regarding stand dynamics, regeneration recruitment, and growth rates across a range of natural sub-regions and ecosites at varying rates of mortality.
2. To provide predictive ability for assessing recovery rates for ecosystem function through analysis of the plot data through time. This is critical for prioritizing stands for rehabilitation.

A second measurement of these plots is being funded through a new project with the FRIAA MPB Rehabilitation Program and will commence in 2019-20. An amendment to the project was obtained in January 2019 to include plots from the Stand Dynamics after MPB Attack project. Details of planned expenditures are outlined in the following table.

**Table 9. Expense summary for MPB PSP project.**

	2019-20	2020-21	2021-22	2022-23	2023-24	Total
<b>Income</b>						
FRIAA MPB Grant	40,000	592,800	351,800	246,150	0	1,230,750
<b>Total</b>	<b>40,000</b>	<b>592,800</b>	<b>351,800</b>	<b>246,150</b>	<b>0</b>	<b>1,230,750</b>
<b>Expense</b>						
Field measurements		500,000	300,000	283,000	0	1,083,000
Project management	5,000	10,000	10,000	10,000	0	35,000
Field auditing	0	10,000	15,000	10,500	0	35,500
Database management	10,000	2,000	1,500	1,000	0	14,500
Admin, supplies, travel	2,000	5,000	5,000	4,500	0	16,500
FGrOW Admin	700	10,374	6,157	4,360	0	21,590
fRI Admin	800	11,856	7,036	4,968		24,660
<b>Total Expenses</b>	<b>18,500</b>	<b>549,230</b>	<b>344,693</b>	<b>318,328</b>	<b>0</b>	<b>1,230,750</b>

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## EFFECT OF HARVESTING AND SITE PREPARATION METHODS ON REFORESTATION PERFORMANCE

A trial originally established by Sundance Forest Industries (now Edson Forest Products) in the Upper Foothills in 2001 is being re-measured and assessed to evaluate the effects of alternative harvesting and site preparation methods on the growth and health of planted and naturally regenerated lodgepole pine, and on resulting stand and soil conditions, 17 years after harvesting. The trial provides a unique and cost-effective opportunity to assist forest managers in the selection of harvesting and site preparation practices aimed at improving forest yields and minimizing risks of crop failure. Results will be used in conjunction with related and supplementary research to predict the effects of site preparation on long-term sustained yield and associated climatic and health risks throughout the Foothills region.

A detailed re-measurement of the trial was completed in November of 2017 and included assessing tree health, mortality of planted stock, ingress of natural regeneration (all timber species, including hardwoods if present), tree growth performance, vegetative competition, and soil development.

*Armillaria* has been identified as possibly a serious risk to lodgepole pine regeneration across the Alberta foothills and special attention will be paid to assessing it. *Armillaria* assessment is being based both on the visual health assessment and the results of a trap log survey. The trap-log method<sup>2</sup> will be used for detecting the presence and abundance of *Armillaria* root pathogens in the soil. Traps were placed in the summer of 2017 and will be recovered in the summer of 2018. Presence and abundance of *Armillaria* is also being sampled in the Lower Foothills sub-region in selected areas with and without site preparation where mortality from this disease is prevalent.

A preliminary technical report on stand development was completed in April 2018. An interim report on *Armillaria* was prepared based on observations at the time of trap log installation.<sup>3</sup> The final technical reports for the project, one focused on stand development and the other on *Armillaria*, will be completed in 2019-20. A scientific paper will be prepared for submission to a peer reviewed journal.

Project costs are outlined in Table 10. Funding for the project is provided through a FRIAA Open Funds project supported by Hinton Wood Products.

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<sup>2</sup> Mallett, K. (1991). The trap-log method of detecting *Armillaria* root rot pathogens in forest soils. Forestry Canada Forest Management Note 52.

<sup>3</sup> Ramsfield, T. *et al.* (2018). Effects of harvesting and site preparation methods on reforestation performance—*Armillaria* root diseases assessment, Interim report.

**Table 10. Income and expense summary for Site Preparation Methods project.**

	2017-18 (Actual)	2018-19 (Actual)	2019-20 (Plan)	2020-21	2021-22	Total
<b>Income</b>						
Hinton Wood Products	160,587	40,793	22,722	0	0	224,102
<b>Total Income</b>	<b>160,587</b>	<b>40,793</b>	<b>22,722</b>	<b>0</b>	<b>0</b>	<b>224,102</b>
<b>Expenses</b>						
Field measurements	129,844	0	0	0	0	129,844
<i>Armillaria</i> assessment	20,000	0	0	0	0	20,000
Analyses and reporting	10,742	31,009	6,472	0	0	48,223
Data management	12,915	0	0	0	0	12,915
Project management	2,441	2,894	2,000	0	0	7,335
Field auditing	1,312	0	0	0	0	1,312
FGrOW Admin	4,473 <sup>1</sup>	0	0	0	0	4,473
<b>Total Expenses</b>	<b>181,727</b>	<b>33,903</b>	<b>8,472</b>	<b>0</b>	<b>0</b>	<b>224,102</b>

<sup>1</sup>Includes \$420 insurance expenses.

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FOOTHILLS PINE PROJECT TEAM FINANCIAL SUMMARY

Table 11 summarizes the income and expenditures of the Foothills Pine Project Team for the period April 1, 2019 to March 31, 2024.

**Table 11. Foothills Pine Project Team financial summary.**

	2019-20	2020-21	2021-22	2022-23	2023-24	Total
<b>Income</b>						
Balance carry forward	63,463	16,732	42,437	59,224	-6,468	175,388
Membership dues	44,000	162,000	162,000	162,000	162,000	792,000
HRT Management	11,928	20,000	46,000	0	56,000	133,928
MPB PSP	40,000	592,800	351,800	246,150	0	1,230,750
Site Prep Trial	22,722	0	0	0	0	22,722
<b>Total Income</b>	<b>282,113</b>	<b>791,532</b>	<b>602,237</b>	<b>467,374</b>	<b>211,532</b>	<b>2,354,788</b>
<b>Expenses</b>						
RLP Project	215,180	159,180	130,180	140,180	130,180	774,900
HRT Management	2,000	27,000	54,000	2,000	63,000	148,000
MPB Monitoring	8,000	0	0	0	0	8,000
MPB PSPs	18,500	549,230	344,693	318,328	0	1,230,751
Site Prep Trial	8,472	0	0	0	0	8,472
R&D Associate	1,000	1,000	1,000	1,000	1,000	5,000
Coordinator	8,000	8,000	8,000	8,000	8,000	40,000
FGrOW Admin	2,729	3,185	3,640	2,835	3,815	16,204
Wesolowsky Scholarship	1,000	1,000	1,000	1,000	1,000	5,000
Meetings	500	500	500	500	500	2,500
<b>Total Expenses</b>	<b>265,381</b>	<b>749,095</b>	<b>543,013</b>	<b>473,843</b>	<b>207,495</b>	<b>2,238,826</b>
<i>Balance</i>	<i>16,732</i>	<i>42,437</i>	<i>59,224</i>	<i>-6,468</i>	<i>4,037</i>	

## MIXEDWOOD PROJECT TEAM

The Mixedwood Project Team (MPT) continues the work of the Mixedwood Management Association (MWMA). The MWMA officially came into existence in the summer of 2001 with the signing of the Memorandum of Understanding between the eight companies and Alberta Sustainable Resource Development (now Alberta Agriculture and Forestry). Originally hosted by the Alberta Research Council, it resided at the University of Alberta from June of 2003 until March 2015. The MWMA supported numerous projects completed through the University of Alberta and provided more than \$750,000 of direct funding. Details of research completed are summarized in *Mixedwood Management Association Historic Report 2001-2015* (March 2016). The MWMA's two long-standing projects, the Dynamic Aspen Density Experiment (DADE) and the Strip Cut Understory Protection Trial (SCUP) are being continued by the MPT.

In 2018-19, the MPT met twice to discuss its mandate and priorities. The result is a renewed focus for the project team as reflected in its revised mandate and goals. The Mixedwood Project Team (MPT) mandate is to act as a forum to collectively address practical and scientific issues concerning the management of mixedwood stands to sustain their mixed species characteristics. The MPT supports development of growth models with the intent of gaining better understanding of stand dynamics and treatment responses. MPT plays a key role in bridging the gap between research and implementation through facilitating training and tech transfer. Its goals are to:

1. Support the ongoing development and implementation of growth models, including standardization of processes for developing yield curves and facilitating feedback to modelers.
2. Advocate for ongoing the development for reforestation standards for understory protection and other non-clearcut treatments.
3. Working with Alberta Agriculture and Forestry, support development of criteria for selecting stands for understory protection and validation of criteria and corresponding treatments.
4. Ensure research is implemented operationally by working with researchers and partners to deliver training, workshops, and other tech transfer.

As a result of priority setting in 2018-19, MPT is initiating new work in 2019-20. In addition to scoping two potential projects as described in the following sections, MPT will develop a plan for extension and tech transfer.

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### SCOPING OF POTENTIAL PROJECTS

A priority agreed to by MPT was development of a regeneration model for mixedwoods. The first step will be to conduct a pre-feasibility study, which would include a discussion of considerations for development of a regen model and a literature review to identify existing information and gaps. Dick Dempster and Milo Mihajlovich have indicated their willingness to participate in the pre-feasibility study. Pending its results, MPT will decide whether or not to initiate a new project for model development.

MPT members recognize the importance on capitalizing on existing research projects to increase knowledge of mixedwood management options and to support tool development. Several trials have been identified that are of potential value; information on these trials as well as previous measurement data will be collected and used to determine if repeated measurements would be valuable and feasible.

Projected expenses for the regeneration model pre-feasibility study and for assessing value of existing research trials is outline in Table 12.

**Table 12. Project scoping expense summary.**

Expense	2019-20	2020-21	2021-22	2022-23	2023-24	Total 2019-24
Pre-feasibility study	17,500	0				17,500
Existing research	5,000	0	0	0	0	5,000
<b>Total</b>	<b>22,500</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>22,500</b>

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#### DYNAMIC ASPEN DENSITY EXPERIMENT

The Dynamic Aspen Density Experiment (DADE) was established beginning in 2008, with funding provided through FRIAA Open Funds. Its objectives are to determine:

1. the thresholds in hardwood density that determine stand conditions during each of two stand development stages;
2. the survival and growth of white spruce in different stand conditions during each of two stand development stages; and
3. the opportunity cost to hardwood production of optimizing white spruce survival and growth.

Seven 17- and seven 22-year old stands were selected with aspen densities greater than 10,000 stems per hectare and planted white spruce at densities of at least 1000 stems per hectare. Five aspen density treatments were conducted in each stand: 0, 1000, 2500 or 5000 stems per hectare and an un-thinned plot served as control. In the center of each treatment, a 400m<sup>2</sup> Permanent Sample Plot (PSP) was installed and densities, heights and diameters of aspen and spruce were measured pre- and post-thinning.

The experimental design is described in detail in *Dynamic Aspen Density Experiment for Crop Planning in the Boreal Mixedwoods of Alberta, Project Manual*, Revised December 2009. Details of analyses completed to date are contained in the DADE annual reports, the most recent of which is *Dynamic Aspen Density Experiment 2015 Final Report, OF-06-P013*, January 2016. The 2011 and 2012 annual reports contain results of analysis and comparisons with GYPSY and MGM projections. These documents are available on the FGROW website. Three of the 14 original installations were destroyed in 2010 by herbicide application. Replacement installations were established, two in 2013 and one in 2015

A project plan was developed for DADE in 2017. It describes trial history and measurement protocols and will be used to guide the timing of measurements, analysis and extension activities. Analysis of the

8-year results for the 11 remaining original installations is scheduled for was originally scheduled for 2018. It has been deferred to 2019-20 to coordinate with development of a post-doc position at UofA. The analysis will include:

- Comparison of rates of mortality in spruce and aspen by treatment;
- Comparison of rates of height and diameter increment by treatment; and
- Comparison to modelled trajectories from GYPSY and MGM.

The DADE measurement schedule is shown in Table 13. Table 14 summaries planned expenditures for the period April 1, 2019 to March 31, 2024.

**Table 13. DADE measurement schedule.**

Company FMA	Installation Number	2019	2020	2021	2022	2023 <sup>1</sup>
Al-Pac	CM 17-1		13-year			
Al-Pac	CM 17-2		13-year			
Weyco	CM 17-3				13-year	
Weyco	CM 17-4				13-year	
Weyco	CM 17-5				13-year	
Weyco	CM 17-6				13-year	
Weyco	CM 17-7				13-year	
Al-Pac	CM 22-2		13-year			
DMI	CM 22-5			13-year		
DMI	CM 22-6			13-year		
DMI	CM 22-7			13-year		
MWFP	CM 22-8			8-year		
MWFP	CM 22-9			8-year		
Tolko	CM 22-10					8-year

<sup>1</sup>Measurements must be completed prior to the start of the growing season.

**Table 14. DADE expense summary.**

Expense	2019-20	2020-21	2021-22	2022-23	2023-24	Total 2018-23
Measurements	0	38,250	65,100	66,400	13,600	183,350
Analysis	15,000	0	0	0	0	15,000
Coordinator	2,000	6,000	6,000	6,500	3,000	23,500
Field Auditor	0	2,500	2,500	2,500	2,500	10,000
<b>Total</b>	<b>17,000</b>	<b>46,750</b>	<b>73,600</b>	<b>75,400</b>	<b>19,100</b>	<b>231,850</b>

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## STRIP CUT UNDERSTORY PROTECTION TRIAL

While strip-cut understory protection harvesting is being increasingly adopted across Alberta, there is a lack of information on how residual spruce in removal strips respond to release and how aspen regeneration occurs on the extraction trails. The Strip Cut Understory Protection Trial (SCUP) project was initiated in 2005 to help fill the information gap required for growth and yield projection of aspen-dominated mixedwood stands treated with strip cut understory protection harvest. Its objectives are to provide:

1. A measurement protocol to collect statistically valid data for describing the block-level stand performance following Strip Cut Understory Protection harvesting;
2. A protocol that is sufficiently flexible in order to be used by numerous companies, and to account for operational differences in the application of Strip Cut Understory Protection systems;
3. Re-measured data to quantitatively describe the post-harvest development of stands after Strip Cut Understory Protection harvest treatments;
4. Information required for growth model development and/or model calibration, with the potential for future use in process-based modelling; and
5. A monitoring protocol that is acceptable to the Alberta Agriculture and Forestry, for use in monitoring and yield curve validation.

A total of 18 understory protection PSP installations were established: 5 in 2005 and 13 in 2007. The SCUP measurement schedule is in Table 15. Table 16 summarizes planned expenses for SCUP for the period April 1, 2019 to March 31, 2024.

A project plan was developed for SCUP in 2017. It describes trial history and measurement protocols and will be used to guide the timing of measurements, analysis and extension activities. Analysis of the 10-year results is scheduled for 2019 and will include:

- Spruce response to release;
- Rates of mortality in residual spruce and aspen;
- Rates of ingress in extraction and removal areas; and
- Comparison to modelled trajectories from GYPSY and MGM.

**Table 15. SCUP measurement schedule.**

Company FMA	Installation Number	Number of Plots	2019 <sup>1</sup>	2020	2021	2022	2023
Vanderwell	7012	6		15-yr			
Al-Pac	27131	6		15-yr			
Al-Pac	19191	6		15-yr			
Al-Pac	29691	6		15-yr			
Al-Pac	16751	6		15-yr			
Al-Pac	11911	6			15-yr		
Al-Pac	22361	6			15-yr		
Al-Pac	36551	6			15-yr		
Al-Pac	36271	6	10-yr				
Al-Pac	36381	6	10-yr				
Al-Pac	34591	6					15-yr
Al-Pac	27631	6					15-yr
Al-Pac	15571	6					15-yr
Ainsworth	572	2	10-yr				
Tolko HL	330	2	10-yr				
Tolko HL	2212	2	10-yr				
Al-Pac	17781	6					15-yr
Al-Pac	20631	2					15-yr

<sup>1</sup>Measurements must be completed prior to the start of the growing season.

**Table 16. SCUP expense summary.**

Expense	2019-20	2020-21	2021-22	2022-23	2023-24	Total
Measurements	50,939	122,400	75,000	0	112,600	360,939
Analysis	20,000	0	0	0	0	20,000
Coordinator	6,000	6,000	6,000	2,000	6,000	26,000
Field Auditor	4,000	4,000	4,000	4,000	4,000	20,000
<b>Total</b>	<b>80,939</b>	<b>132,400</b>	<b>85,000</b>	<b>6,000</b>	<b>122,600</b>	<b>426,939</b>



## MIXEDWOOD PROJECT TEAM FINANCIAL SUMMARY

Table 17 summarizes planned income and expenditures for the Mixedwood Project Team.

**Table 17. Mixedwood Project Team financial summary.**

	2019-20	2020-21	2021-22	2022-23	2023-24	Total
<b>Income</b>						
Balance carry forward	117,842	88,403	40,253	12,653	62,253	321,404
Membership dues	100,000	140,000	140,000	140,000	140,000	660,000
<b>Total</b>	<b>217,842</b>	<b>228,403</b>	<b>180,253</b>	<b>152,653</b>	<b>202,253</b>	
<b>Expenses</b>						
SCUP Project	80,939	132,400	85,000	6,000	122,600	426,939
DADE Trial	17,000	46,750	73,600	75,400	39,100	251,850
Project Scoping	22,500	0	0	0	0	22,500
Coordinator	7,000	7,000	7,000	7,000	7,000	35,000
FGrOW Admin	2,000	2,000	2,000	2,000	2,000	10,000
<b>Total</b>	<b>129,439</b>	<b>188,150</b>	<b>167,600</b>	<b>90,400</b>	<b>170,700</b>	<b>746,289</b>
<i>Balance</i>	<i>88,403</i>	<i>40,253</i>	<i>12,653</i>	<i>62,253</i>	<i>31,553</i>	

## POLICY AND PRACTICE PROJECT TEAM

The Policy and Practice Project Team (PPPT) continues the work of the Alberta Forest Growth Organization (AFGO), which was created in 2009 by a partnership between the Alberta forest companies forming the MWMA, along with Hinton Wood Products, Sundre Forest Products and Blue Ridge Lumber. AF was involved from the beginning as a non-voting member but subsequently joined AFGO as a full member, as did Edson Forest Products and Canadian Forest Products. AFGO's mandate was to expedite and co-ordinate the development of a recognized, secure and well-funded forest growth and yield sector in Alberta that operates effectively and efficiently to address emerging issues in all of Alberta's natural resource management sectors that require growth and yield knowledge and expertise for solutions. This mandate is now being carried out by FGrOW.

The Policy and Practice Project Team (PPPT) continues the AFGO initiatives that centered on improving forest management practice and influencing Alberta policy, including ongoing communications with the Alberta Forest Products Association and other agencies. The PPPT provides a venue for discussing forest management concerns. It is also hoped that the resulting policy recommendations will have applicability in other jurisdictions in Western Canada.

The PPPT will have three active projects in 2019-20:

- Provincial Growth and Yield Initiative
- Growth and Yield Model Support
- Compendium of Alberta Research

The Cutblock Inventory Classification Subcommittee (CICS) is no longer active but is retained in the Business Plan pending a response from AF.

A PPPT meeting was held to identify priorities for the project team. Based on response of a follow-up poll, two potential projects have been identified for further scoping and possible initiation.

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## PROVINCIAL GROWTH AND YIELD INITIATIVE

The objective of the Provincial Growth and Yield Initiative (PGYI), fondly referred to as “piggy”, is to collectively obtain data on tree growth through repeated measurements of Permanent Sample Plots (PSPs) to develop, calibrate, and validate growth models for forest management yield curve development. This collaborative data collection is intended to benefit participating companies and AF by reducing their individual data collection requirements, as well as producing a superior dataset.

The PGYI subcommittee was established in 2011 and currently consists of the following participants: Darren Aitkin (AF), Vashti Dunham (Weyerhaeuser), Katrina Froese (AF), Bob Held (SFP), Shongming Huang (AF), Tim McCready (Millar Western), Kerri MacKay (Weyerhaeuser), Sharon Meredith (FGROW), and Melonie Zaichkowsky (Canfor). Their work has included:

- Developing a document describing the proposed initiative and presenting it to interested organizations (*Provincial Growth and Yield Initiative*, September 2012).
- Producing a framework document describing how participation in PGYI fits with FMA holders’ requirements for a growth and yield plan (*Framework for Alberta Growth and Yield Plans*, September 2012).
- Developing a “Best Practices Manual” to facilitate uniformity and consistency of data submitted by different companies and AF (*Minimum Standards and Suggested Protocol and Priorities for Establishing and Measuring Permanent Sample Plots in Alberta*, July 2015).
- Completing a gap analysis comparing existing PSPs with desired PSPs to fill a matrix of natural subregion and stratum combinations.
- Completing plot assignments for participating companies allowing trades between companies to utilize as many of the existing PSPs as possible.
- Developing *Data Preparation Guidelines and User’s Manual* (March 2016).
- Hosting a workshop to allow FGROW members to provide feedback on AF’s *Guidelines for Growth and Yield Programs* (October 2016).
- Contracting development of a web-based application for loading historic PSP measurements into the PGYI database.
- Drafted consolidated documentation so that all the above documents are in one location.

Most participating companies had reloaded their historical data and submitted metadata by March 31, 2017 and an extensive validation for the data was conducted by AF in preparation for its use in a GYPSY development project.

In 2019-20, the PGI Subcommittee will:

- Complete revised documentation of minimum standards, data preparation guidelines and data loading.
- Continue to work with participating organizations on full implementation of the program, including assembling metadata, and assessing submitted data.
- Transition to member support for the database being provided through FORCORP.

Table 18 summarizes planned expenditures for the PGI project.

**Table 18. PGI expense summary.**

<b>Expense</b>	<b>2019-20</b>	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>Total</b>
Database hosting	3,780	3,780	3,780	3,780	3,780	18,900
Database improvements	15,000	15,000	15,000	15,000	15,000	75,000
Program support	6,000	6,000	6,000	6,000	6,000	30,000
Coordinator	6,000	6,000	6,000	6,000	6,000	30,000
<b>Total</b>	<b>30,780</b>	<b>30,780</b>	<b>30,780</b>	<b>30,780</b>	<b>30,780</b>	<b>153,900</b>

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#### CUTBLOCK INVENTORY CLASSIFICATION SUBCOMMITTEE

The Cutblock Inventory Classification Subcommittee was initiated in January 2015 to continue the work of the AFGO Strata Subcommittee. The Strata Subcommittee was formed in September 2012 to answer questions about the accuracy of the photo interpreted labels developed through Reforestation Standard of Alberta (RSA) performance survey programs, and whether the rules used to assign sampling units into strata were suitable for use in landbase stratum assignment.

The subcommittee's final report, *Report to AFGO Members from the Strata Subcommittee*, included a series of recommendations that were submitted to the AF RSA Management Committee, entitled:

- *Current and potential uses of RSA data and limitations;*
- *Use of MAI as a link between early stand performance and stand yield;*
- *Differentiating use of aerial stratification data for MAI assessment and for stratum assignment for timber supply analysis and strata reconciliation; and*
- *Use of stocking to assign RSA sampling units to strata.*

The Cutblock Inventory Classification Subcommittee (CICS) was formed to answer outstanding questions identified by the Strata Subcommittee. Its work focused on developing recommendations to Alberta Agriculture and Forestry on changes to the strata balancing and reconciliation processes. It met with representatives of AF on August 25, 2015 to present its proposal (*Proposed Changes to Strata Balancing and Reconciliation—Recommendations from the Cutblock Inventory Classification Subcommittee*).

CICS meet with AF representatives twice in 2016-17 but have not had a formal response to the proposal that was made in 2015. AF continues to work on its response but has not indicated its planned completion date.

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## GROWTH AND YIELD MODEL SUPPORT

Growth and yield models that accurately forecast stand development and future yield are gaining more relevance as the forest is transitioning from un-managed, fire origin stands to managed, post-harvest stands. Since only a few managed stands are close to 50 years old, not enough data are available to enable the development of empirical yield curves. Hence, growth and yield models that were built based on natural stand data but can be calibrated using the early stand development managed stand data are the best option to forecast managed stand development and yield.

Two models, which have different strengths and weaknesses, are currently used by the Alberta forest industry for yield curve development: the Growth and Yield Projection System (GYPSY) and the Mixedwood Growth Model (MGM). FGrOW will work with the model developers to support and facilitate enhancements through existing and new projects and data sharing. A first step to ensure this occurs is for the PPPT Coordinator to attend meetings of the GYPSY Advisory Committee and the MGM Strategic Development Team.

Until additional activities are agreed upon, the costs to conduct this project (Table 19) are limited to the Project Team Coordinator attending approximately 6 meetings per year and providing a synopsis to members on pertinent information arising from the meetings. The usefulness of the Coordinator attending these meetings will be evaluated over time.

**Table 19. Growth and Yield Model Support project expense summary.**

<b>Expense</b>	<b>2019-20</b>	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>Total</b>
Coordinator	6,000	6,000	6,000	6,000	6,000	30,000
<b>Total</b>	<b>6,000</b>	<b>6,000</b>	<b>6,000</b>	<b>6,000</b>	<b>6,000</b>	<b>30,000</b>

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## COMPENDIUM OF ALBERTA RESEARCH

The forest industry in Alberta has a legacy of extensive research in applied silviculture and growth and yield. However, knowledge of this research is dispersed through many organizations and held largely by individuals who are nearing retirement. This project will assemble and summarize information on existing research including trial applicability, limitations and potential barriers to implementation.

In 2016-17, a project plan was developed with an initial focus on assembling and synthesizing trial information. The ultimate goal of the project will be to develop a publicly assessable, searchable on-line database to allow practitioners and the general public to access this information. In 2018-19, the project was scoped by a subcommittee of the PPPT and as a result FORCORP was asked to create an

online database for tracking research information. The database allows reports and data to be stored along with trial metadata.

Initial work is underway to populate the database and additional information has been gathered from CFS and UofA. AAF staff have volunteered to enter information on their trials. In 2019-20 a consultant will be engaged to begin synthesizing and entering additional trial information.

Table 20 summarizes projected expenses on the Compendium.

**Table 20. Compendium of Alberta Research project expense summary.**

<b>Expense</b>	<b>2019-20</b>	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>Total</b>
Synthesize and enter trial information	29,370	9,370	9,370	9,370	9,370	66,850
Database	630	630	630	630	630	3,150
<b>Total</b>	<b>30,000</b>	<b>10,000</b>	<b>10,000</b>	<b>10,000</b>	<b>10,000</b>	<b>70,000</b>

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## SCOPING OF POTENTIAL PROJECTS

A meeting of the PPPT was held on December 4, 2018 to discuss priorities and potential new projects. Based on discussions at the meeting a poll was developed to rank areas of interest and identify project team priorities. Of the items on the poll, 7 were considered high priority for FGrOW by the majority of respondents (PPPT\_PollFollowUP.docx); three of these are already being addressed through other initiatives. The four that warrant additional attention are:

1. Loss of herbicide at a tool. Members expressed interest in quantifying outcomes of not herbiciding. Milo Mihajlovich is willing to meet with the PPPT to discuss a potential project. If members wish to pursue this project, the next step would be to develop a FRIP proposal.
2. Implementation of Enhanced Forest Management. Meet to discuss the important questions and how they should be addressed. If there is agreement, next steps will be determined.
3. Remote sensing and other technology. Look for opportunities to support projects that are of interest and are within FGrOW's mandate.
4. Guidelines/best practices for data cleaning. This will be undertaken without initiating a new project.

A budget of \$20,000 has been allocated to support project scoping and is showing in Table 21.

## POLICY AND PRACTICE PROJECT TEAM FINANCIAL SUMMARY

Table 21 summarizes income and expenditures for the Policy and Practice Project Team from April 1, 2018 to March 31, 2023.

**Table 21. Policy and Practice Project Team financial summary.**

	2019-20	2020-21	2021-22	2022-23	2023-24	Total
<b>Income</b>						
Balance carry forward	98,554	57,136	67,037	76,937	86,838	396,502
Membership dues	50,000	60,000	60,000	60,000	60,000	290,000
PGYI DB Cost-sharing	4,613	5,931	5,931	5,931	5,931	28,335
<b>Total</b>	<b>153,166</b>	<b>133,067</b>	<b>132,967</b>	<b>142,868</b>	<b>152,768</b>	<b>714,836</b>
<b>Expenses</b>						
PGYI	30,780	30,780	30,780	30,780	30,780	153,900
G&Y Model Support	6,000	6,000	6,000	6,000	6,000	30,000
Compendium	30,000	10,000	10,000	10,000	10,000	70,000
Project Scoping	20,000	0	0	0	0	20,000
Coordinator	7,000	7,000	7,000	7,000	7,000	35,000
FGrOW Admin	2,000	2,000	2,000	2,000	2,000	10,000
Meetings	250	250	250	250	250	1,250
<b>Total</b>	<b>86,030</b>	<b>66,030</b>	<b>56,030</b>	<b>56,030</b>	<b>56,030</b>	<b>320,150</b>
<i>Balance</i>	<i>57,136</i>	<i>67,037</i>	<i>76,937</i>	<i>86,838</i>	<i>96,738</i>	

## TREE IMPROVEMENT ALBERTA

Tree Improvement Alberta (TIA) started in 2011 with an adhoc group of companies interested in tree improvement at a time following a period of severe economic downturn for the forest industry. Industry participants concerned over the continuity of funding program activities due to perceived insufficient return on investment and lack of clarity on how benefits of tree improvement might be realized. The group identified the need for greater communication and coordination amongst industry, government and academic representatives to create clear objectives for tree improvement in Alberta and mechanisms for achieving them. On November 8<sup>th</sup>, 2011 a workshop was held including senior level representatives from industry, government and academia to generate and discuss ideas towards a new tree improvement model for Alberta. In April of 2012, Tree Improvement Alberta became a consortium of industry and government representatives under fRI Research.

Tree Improvement Alberta was established to facilitate the delivery of programs or projects related to forest genetics in Alberta. The initial project under TIA authority was the three-year *Tree Species Adaptation Risk Management* project funded by Climate Change and Emissions Management Corporation (CCEMC). In 2016, TIA membership voted to transition into a project team of FGrOW. A new Terms of Reference for TIA was ratified by members in March of 2016 with subsequent amendment in February 2018. TIA's purpose is to:

- Advance forest genetics and tree improvement in Alberta by coordinating, implementing, or supporting collaborative research projects in forest genetics and operational tree improvement activities to maximize efficiency among its members and collaborators.
- Promote communication among members through business meetings, workshops and field excursions, which enhance learning and knowledge transfer making it easier for members and other stakeholders to coalesce to common tree improvement priorities in Alberta.
- Provide an avenue for constructive dialogue between forest companies involved in tree improvement and the Alberta government.
- Promote and facilitate communication among Forest Genetics, Growth and Yield, and Silviculture practitioners on all forest genetics related matters.
- Maintain communication and collaboration with the Alberta Forest Genetic Resources Council and other stakeholders with interest in the management of forest genetic resources in Alberta.

The role and function of TIA will continue to evolve to accommodate changes, emerging challenges and potential opportunities. Additional programs, projects, or other related work may be added in consultation with TIA membership.

The five year plan for TIA is to strengthen the purpose of TIA through pursuing funding opportunities to further the work started on climate change and adaptation as well as other forest genetics and tree improvement activities of interest to the membership. The current projects underway for TIA are:

1. *FRIAA Realized Gain Trials* project – the objectives are to support the Controlled Parentage Programs (CPPs) in assisting with validation of the expected gain (area-based volume at rotation) from deployment of improved stock through the installation of operational realized gain trials. These are the first trials of their kind installed in Alberta, requiring significant dialogue with Government of Alberta (Alberta Agriculture and Forestry) staff to ensure that the design and subsequent results will be recognized as valid for integration into growth and yield models as these programs mature. All seedlots to be tested and produced from these programs, and their associated seed orchards, are for operational deployment with the intent of enhancing the value of the forest resources in Alberta. In addition, given the increasing constraints on the landbase due to mountain pine beetle and climate change in general and energy expansion in particular, genetic gain improvements may be necessary to sustain the current yields for the forest resources in Alberta through deployment of genetic superior seed. This FRIAA project will wrap up in November 2019.
2. *FRIAA Expanded Provenance and Progeny Trials for Climate Change Adaptation in Alberta* project – the objective is to further test populations for adaptability to climate change. A primary forest management objective is to improve or sustain forest productivity and fibre supply. Climate change may reduce the productive forest landbase or render local populations unsuitable to a changed environment. Climate change adaptation activities mitigate against potential loss of productivity and fibre supply. Populations suitable for future climate may come from other CPP regions or other parts of the province and is therefore necessary to have comprehensive testing across CPP regions.

3. Operational Tree Improvement Monitoring Subcommittee: This subcommittee was formed in early 2018 to develop recommendations for growth monitoring of enhanced yield strata (specifically for tree Improvement applications) to meet the requirements of the Alberta Forest Management Planning Standard. This will include an assessment and documentation of the current realized gain trial progress and processes, identifying current knowledge gaps and potential data sources, and making recommendations on further work. Project charter is available for review and a final recommendations document will be completed Q4-2019.
  - a. Full day workshop will be organized after the RGT recommendations document is provided to Licensees for review. The purpose of the workshop will be to discuss the provincial RGT installation plan and how Licensees can work cooperatively to achieve.
4. The TIA board developed five project areas of interest that were initially reviewed at the December 4, 2018 Business Meeting. These project areas are still being developed and a recommendation will be sent to TIA membership in early 2019-20 to ask for support to carry forward one or more of the following:
  - a. Reforestation options for conifer family deployment
  - b. Prediction, yield forecasting and operational validation of genetic gain in mixedwood reforestation applications
  - c. Orchard fingerprinting and pollen contamination assessment using molecular markers
  - d. Silvics regimes to maximize gain on site
  - e. Orchard capacity / orchard productivity
5. TIA knowledge transfer activities such as workshops, field excursions, business meetings, as well as other activities are scheduled annually. Notices will be sent to the TIA membership when an event is organized.
6. Other opportunities as they arise.

**Table 22. Financial Summary for TIA Project Team.**

Category	2019-20	2020-21	2021-22	2022-23	2023-24	Total
Balance Forward	(\$305)	\$2,819	(\$181)	(\$181)	(\$181)	\$1,970
Membership dues <sup>1</sup>	\$13,000	\$15,000	\$18,000	\$18,000	\$18,000	\$82,000
Contribution to FGrOW Admin <sup>4</sup>	(\$2,000)	(\$2,000)	(\$2,000)	(\$2,000)	(\$2,000)	(\$10,000)
Program Manager <sup>2</sup>	(\$11,000)	(\$13,000)	(\$13,000)	(\$13,000)	(\$13,000)	(\$63,000)
PM Revenue from RGT Trials	\$6,124	0	0	0	0	\$6,124
Knowledge Transfer <sup>3</sup>	(\$3,000)	(\$3,000)	(\$3,000)	(\$3,000)	(\$3,000)	(\$15,000)
<b>Ending Balance</b>	<b>\$2,819</b>	<b>(\$181)</b>	<b>(\$181)</b>	<b>(\$181)</b>	<b>(\$181)</b>	<b>\$2,094</b>

<sup>1</sup>Currently at 15 paying industry partners. GoA and UofA are non-paying members. Dues for two members were paid during the 2018-19 fiscal year and are shown as income in that year

<sup>2</sup>Assumes 1.25 day/month, other PM expenses covered through projects or other funding sources.

<sup>3</sup>Assumes one to two knowledge transfer events (\$2500) and one business meeting (\$500) per year. Workshops and other knowledge transfer sessions to be funded through projects or other funding sources.

<sup>4</sup>FGrOW Admin \$2000 direct contribution.



## WESBOGY PROJECT TEAM

The Western Boreal Growth and Yield (WESBOGY) Association first met informally in the mid 1980's and established its Association Agreement at the University of Alberta and 5-year business plan in 1996. In 2015 WESBOGY consisted of 12 agencies involved in forest growth and yield, stand dynamics, inventory and planning in western Canada. The Association has worked to improve the efficiency of growth and yield research and development efforts; by facilitating data sharing; by supporting development of MGM and other growth and yield models; by developing and supporting the WESBOGY long-term study and by providing a forum for communication.

In the spring of 2014, AFGO (Alberta Forest Growth Organization), MWMA (Mixedwood Management Association), FGYA (Foothills Growth and Yield Association) and WESBOGY members agreed to restructure in order to have all programs coordinated by a single organization called the Forest Growth Organization of Western Canada (FGrOW). Under this new structure financial contributions from participating members are paid to the fRI Research (fRI), with funds moving from fRI to the University of Alberta to support WESBOGY Project Team initiatives. WESBOGY became a Project Team under FGrOW beginning January 1, 2016.

Under the new structure, a major component of the WESBOGY Project Team activities are still be undertaken at the University of Alberta.

Various agreements are in place that define the relationships, roles, responsibilities and restrictions between fRI Research, University of Alberta, FGrOW and its Member Agencies:

1. FGrOW and its Member Agencies, Memorandum of Understanding (April 15, 2015);
2. FGrOW and fRI Research, Memorandum of Understanding;
3. WESBOGY Project Team Member Agencies, Terms of Reference (July 30, 2015); and
4. University of Alberta and fRI Research, Research Study Agreement (November 12, 2015).

As part of its participation in the WESBOGY Project Team, the University is responsible for:

1. Designating a Principal Investigator to fulfill the roles and responsibilities of such, as outlined in the WESBOGY Project Team TOR, and
2. Provision and oversight of a Research Scientist to fulfill the roles and responsibilities of such, as outlined in the WESBOGY Project Team TOR.

WESBOGY Project Team has identified the following priority areas to help guide its activities over the next five years. These priorities are:

1. To continue analysis of the WESBOGY long-term study including:
  - a. Height, diameter, and density patterns for aspen in the natural plots;
  - b. Height and diameter growth of spruce and aspen in treated plots;
  - c. Mortality of spruce and aspen;
  - d. Recruitment (ingress) of new trees into natural and treated plots; and

- e. Preparation of manuals, reports, papers, extension notes and posters for distribution to Members and for journal publication.
2. To continue development of MGM to improve its ability to represent stand responses to silviculture. This will include:
  - a. refinement of mortality, breakup and maximum density functions for aspen;
  - b. evaluation of model sensitivity to site index;
  - c. natural regeneration and ingress of white spruce and aspen;
  - d. refine calibration for lodgepole pine;
  - e. calibrate MGM for black spruce, jack pine and balsam poplar;
  - f. model validation and publication of results; and
  - g. model demonstration and training.
3. To update and maintain the WESBOGY long-term study data collection manual, the database, and the WESBOGY website and SharePoint site.
4. To seek to expand the scope of WESBOGY activities and influence by:
  - a. identifying and approaching potential new Members;
  - b. seeking opportunities and developing proposals for potential complementary funding from other agencies; and
  - c. working with other groups and co-operatives and to promote WESBOGY activities and information in growth modeling, silviculture practices and forest management activities.
5. To organize WESBOGY Project Team meetings.
6. To review and update the list of priority and ongoing projects.
7. To undertake high priority Sponsored Research Projects as recommended by the Steering Committee and approved by the Members.
8. To work with Members in the development of proposals for high priority associated research projects.

Deliverables:

1. Annual work plans for WESBOGY project work – to be completed and submitted for approval by February 28 of each year (for the project year beginning April 1 of the year).
2. Annual reports of WESBOGY project activities completed at the University of Alberta – to be completed by March 31 of each year.
3. SharePoint site for WESBOGY Long-term study participants including up-to-date data and manuals.
4. MGM website – including current documentation and access to the current release of MGM.
5. Providing updates on WESBOGY Project Team activities at the FGrOW Annual General Meeting and Fall Business Meeting.

Tables 23 to 25 contain budget estimates for the WESBOGY Project Team for April 1, 2019 to March 31, 2020.

**Table 23. WESBOGY Project Team budget estimates for April 1, 2019 –March 31, 2020.**

<b>Planned Expenditures</b>	<b>2019/2020</b>
Research Scientist (12 months)	\$126,137
Field and office tech support	\$32,000
Grad Students/Research Projects	\$6,850
Travel (WESBOGY meetings and other business )	\$7,000
Supplies, Equipment, Communication, Vehicle rental	\$12,000
<b>Operating Expenditures (Subtotal)</b>	<b>\$183,988</b>
U of A Overhead (10% of \$128,618)	\$12,862
FGrOW Administration	\$2,520
<b>Administration Costs (Subtotal)</b>	<b>\$15,382</b>
<b>Total Expenditures</b>	<b>\$199,369</b>
<b>Funding</b>	
WESBOGY Member Dues	\$144,000
CFS-CWFC FIP Grant contribution towards data management for Big River	\$15,000
FRIP and other Outside Project Contributions to WESBOGY Expenses	\$30,000
<b>Total Funding</b>	<b>\$189,000</b>
<b>Balance of project revenues and expenditures for the year (2019-2020)</b>	<b>-\$10,369</b>
Opening Balance in WESBOGY Account April 1, 2019	\$69,528
Estimated Balance in WESBOGY Account March 31 2020	\$59,158

**Table 24. FRIP and other Outside Project Contributions to WESBOGY Expenses**

	<b>2019/2020</b>
U of A - payment for winter term teaching by Mike	\$9,500
FRIP MGM Project	\$20,500
<b>Total</b>	<b>\$30,000</b>

**Table 25. Severance Reserve**

	<b>2019/2020</b>
Opening Balance (April 1, 2019)	\$98,730
Contributions April 1 2019 – March 31 2020 (net)	\$10,572
Estimated Severance Reserve @ March 31, 2020 (net)	\$109,301

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#### FRIAA OPEN FUNDS AND OTHER EXTERNALLY FUNDED PROJECTS

In addition to the work directly supported by WESBOGY members, the project team contributes to the delivery of a number of other externally funded projects through the efforts of Drs. Bokalo and Comeau. These projects are included in the WESBOGY work plan but, as funding is external to FGrOW, financials and project details are not included. A number of these projects are funded by FRIAA Open Funds and arose as a result of discussions on research priorities by FGrOW members. These projects are examples of the benefits of collaboration through the combined FGrOW association.

## 2019-20 WORK PLAN

Table 26 lists deliverables and deadlines for all projects in 2019-20.

Table 26. 2019-20 deliverables and deadlines.

2018-19 Deliverables	Details and Deadlines
<b>FGrOW Management and Administration</b>	
<i>Administration</i>	
Annually updated business and work plan	Final 2018-19 Plan, June 30, 2018. Draft 2019-20 Plan, February 28, 2019.
Annual report	Draft 2018-19 Report, April 1, 2019.
Mid-year report	Delivered at Fall Business Meeting.
Annual General Meeting	April 2019.
Fall business meeting & tech session	September 2018.
An up to date public website	On-going updates and maintenance.
Invoice for membership dues	February 28, 2019.
Liaise with fRI Research	Attend program lead meetings. Complete work plans and updates as required by fRI Research.
<i>Development of FGrOW</i>	
Establish priorities for research and activities	Hold discussion of priorities biennially at AGM. Hold a workshop to discuss Open Funds proposals, annually, if needed
Identify other opportunities for funding	Maintain list of granting or funding organizations, ongoing.
Raise profile of growth and yield	Represent FGrOW at Western Mensurationists Meeting. Participate on Alberta Forest Genetic Resources Council (if it continues). Prepare glossy report on FGrOW.
<b>EPH Project Team</b>	
Analysis	Complete analysis as described in project plan. Prepare manuscripts for submission to peer-reviewed journals.
<b>Foothills Pine Project Team</b>	
<i>Regenerated Lodgepole Pine Trial</i>	
Communication of 2017/2018 results	Webinar to be scheduled upon completion of analysis
Complete scheduled measurements (This and subsequent tasks for the RLP Project are pending review of measurement schedule)	Pre-field season meeting for members and contractors, June, 2019. 2019 measurement schedule, June 3, 2019. Measurements completed by October 30, 2018.
Updated field manual	Update field manual based on feedback in the 2018 field season. Revised by June 15, 2019.
Updated digital database	Loading database provided to contractors by June 30, 2019.

	Data submitted to database manager by November 30, 2019. Data loaded to master by December 31, 2019. Master database cleaned and approved by January 31, 2020.
Crop performance report	Complete for delayed analysis of 2018 data by June30, 2019 Complete for 2019 data by March 31, 2020
FRIPSY	Compile 2017-18 RLP. Complete development of rationalized model, incorporating 2017-18 data, mixed species, PCT and other enhancements. Port FRIPSY to new platform. Validation and testing. Release multi-species FRIPSY.
Workshop	FRIPSY Workshop, fall 2019
Extension	Complete 2 Quicknotes on RLP project and its application.
<b><i>Cooperative Management of Historical Research Trials</i></b>	
Trial remeasurements	Measurement of Gregg 63 and 84 Medium sites.
<b><i>Stand Dynamics after MPB Attack</i></b>	
Analysis	Complete analysis of stand development to 7+ years since MPB attack, including mortality, residual structure and vegetation response. Internal report, May 30, 2019 Draft manuscript December 31, 2019
Communication of results	Present at April 23 & 24, 2019 MPBEP Forum Complete a minimum of one Quicknote on results, June 30, 2019.
<b><i>Site Preparation Trial</i></b>	
Complete project	Final technical report, April 30, 2019. Complete 2 Quicknotes, October 31, 2019. Scientific manuscript completed, August 31, 2019.
<b><i>MPB PSP Project</i></b>	
Phase two	Project Initiation, July 1, 2019. Database consolidation complete, March 31, 2020.
<b>Policy and Practice Project Team</b>	
<b><i>Provincial Growth and Yield Initiative</i></b>	
Review program	Review PGYI program to determine if it is meeting its original objectives and decide if any adjustments to the program are needed. March 31, 2020.
Database management	Ongoing
Program support	FORCORP to begin providing program support, including, answering questions about data preparation, tracking status of data submissions and liaising with companies.

<b><i>Growth and Yield Model Support</i></b>	
Coordinator to attend meetings	Attend GYPSY Advisory Committee and MGM Strategic Direction Team meetings as scheduled. Meeting minutes to be circulated to members with items of interest highlighted.
<b><i>Compendium of Alberta Research</i></b>	
Develop Compendium of Alberta Research	Engage consultant to synthesize available reports, paper and data, and to populate database. Continue to collect information about existing trials.
<b><i>Scope and initiate new priority projects</i></b>	
Quantify effects of herbicide	Interested members meet with Milo Mihajlovich to discuss potential project approach. If there is sufficient interest, develop FRIP proposal.
Implementation of Enhanced Forest Management	Meet to discuss if we should be pursuing activity related to EFM and if, so what it should be.
<b>Mixedwood Project Team</b>	
Tech transfer	Identify possible tech transfer initiatives for discussion at the fall business meeting.
<b><i>Dynamic Aspen Density Experiment</i></b>	
Re-measurements	None scheduled.
Analysis	Work with UofA to establish a post-doc position to conduct 8-year analysis.
<b><i>Strip Cut Understory Protection Trial</i></b>	
Complete second re-measurement on 5 installations, October 31, 2018	Complete second re-measurement on 5 installations, May 31, 2019
Updated database	Complete data cleaning and loading, December 31, 2018.
Analysis	Analysis of first and second re-measurements.
<b><i>Scope and initiate new priority projects</i></b>	
Mixedwood regeneration model	Conduct pre-feasibility study, September 30, 2019.
Build on existing research	Acquire data from existing trials, including Hotchkiss and understory planting. Determine value and feasibility of remeasurement.
<b>Tree Improvement Alberta Team</b>	
TIA project team focus areas	The TIA board developed five project areas of interest that were initially reviewed at the December 4, 2018 Business Meeting. These project areas are still being developed and a recommendation will be sent TIA membership in early 2019-20 to ask for support to carry forward one or more of the following: <ul style="list-style-type: none"> <li>• Reforestation options for conifer family deployment</li> <li>• Prediction, yield forecasting and operational validation of genetic gain in mixedwood reforestation applications</li> </ul>

	<ul style="list-style-type: none"> <li>Orchard fingerprinting and pollen contamination assessment using molecular markers</li> <li>Silvics regimes to maximize gain on site</li> <li>Orchard capacity / orchard productivity</li> </ul>
<b>Realized Gain Trials</b>	
Complete installation of outstanding PSPs	Weyerhaeuser-Pembina, August 31, 2019
Collect all data, ensure proper format, and store in gdb	August 31, 2019
<b>Operational Tree Improvement Monitoring subcommittee</b>	
Finalize Document and distribute to membership	May 31, 2019
Develop cooperative plan with licensees to meet RGT installation plan requirements	Finalize October 1, 2019
<b>FRIAA Expanded Provenance and Progeny Trials for Climate Change Adaptation in Alberta</b>	
FRIAA contract extended to July 31, 2020.	
Pine trial installations to be planted in spring 2019	Brooks, Blairmore, Machesis, Muskeg, Virginia Hills. June 15, 2019
White Spruce trial seedlings to be re-sown in 2019.	June 1, 2019. For planting in spring 2020.
<b>Knowledge Transfer Events</b>	
PART A: RGT Project Field Tour – 0.5 day	Hosted by WF-BRL, between Mid-July to early August (data TBD)
PART B: Along with the above field tour, 0.5 day RGT provincial program workshop with Licensees to focus on RGT installation plan	Hosted by WF-BRL, between Mid-July to early August (data TBD)
Workshop to showcase reports from the RES-FOR project	Date TBD
<b>WESBOGY Project Team</b>	
Prepare draft Work plan for 2020/21	FGrOW Fall 2019 Meeting
Finalize Work plan for 2020/21 activities	February 28, 2020
Prepare and provide annual report of activities for 2018/19	Prepared and provided by March 31, 2020
<b>WESBOGY Long Term Study</b>	
Long-Term Study Data Collection Manual	Maintain manual and provide guidance and direction relating to measurement and maintenance of installations. Ongoing
WESBOGY Long-Term Study Database	Maintain database and distribute data as required. Ongoing Complete tree level data cleaning by October 1, 2019.
Restructure the WESBOGY SharePoint site and move it to a new platform.	Maintenance ongoing.
Complete publication of results from LTS in a peer reviewed journal (treatment effects, treatment and climate interactions, MGM yield projections).	March 31, 2020 (draft manuscript)

Annual summary report	Distributed to members by October 1, 2018
<b><i>MGM Development and Support</i></b>	
Manage the Distribution of MGM to users	Ongoing
Maintain MGM Website and Documentation	Ongoing
Work with MGM Strategic Development Team in developing workplans and setting priorities for ongoing work on MGM	Ongoing
Support existing member MGM projects	Ongoing
Provide User support and training	Ongoing
<b><i>FRIAA “Developing and Enhancing” Project 2017-2020</i></b>	
Model Enhancements	Enhance and validate bivariate tree list generator; Evaluate, enhance, and validate the MGM adjacency functions; Continue to enhance and validate MGMs ability utilize the GYPSY height-age equations; Develop, test and refine functions for modelling genetic worth; March 31, 2020.
Documentation and Training	Final report to FRIAA, March 31, 2020. Development of Best Practices Documents, March 31, 2020. Update documentation, website and model distribution system, June 30, 2020. Training sessions to transfer knowledge and model functionality to users, February 27, 2020. Updated documentation and validation reports, March 31, 2020.
<b><i>Externally Funded Research Projects</i></b>	
Improving site index estimation for Alberta	Funding through FRIAA Open Funds, 2015-2019. To be completed by July 31, 2019.
Site index determination using remote sensing	Funding through FRIAA Open Funds, 2015-2019. To be completed by September 30, 2019.
Developing and Enhancing the Mixedwood Growth Model (MGM) for forest management planning	Funding provided by FRIAA, 2017-2020. To be completed by March 31, 2020.
Effects of pre-commercial thinning on dynamics and resilience of mixedwood stands	Funding from the Forest Innovation Program – Canadian Wood Fibre Centre, to be completed March 31, 2020.
SMARTFORESTS Canada: A network of monitoring plots and plantations for modeling and adapting forests to climate change – Installation and maintenance of dataloggers, weather and microclimate sensors in selected LTS installations	Funded by Canada Foundation for Innovation and Alberta Economic Development and Trade, to be completed March 31, 2021.



Table 26 summarizes FGrOW income and Expenditures for all Project Teams for 2019-20.

**Table 27. 2019-20 financial summary for all FGrOW Project Teams.**

<b>Income</b>								
	<b>Admin</b>	<b>EPH</b>	<b>FPPT</b>	<b>MPT</b>	<b>PPPT</b>	<b>TIA</b>	<b>WESBOGY</b>	<b>Totals</b>
Carry forward	6,945	23,319	63,463	117,842	98,554	3,462	69,528	383,113
Membership Dues	30,081	0	144,000	100,000	50,000	14,000	144,000	482,081
Other contributions	12,855	98,800	74,650	0	4,613	0	45,000	235,918
<b>Totals</b>	<b>49,881</b>	<b>122,119</b>	<b>282,113</b>	<b>217,842</b>	<b>153,166</b>	<b>17,462</b>	<b>258,528</b>	<b>1,101,111</b>
<b>Expenditures</b>								
Admin	56,442	0	13,229	9,000	9,250	3,500	15,382	107,259
Projects	0	122,119	252,152	120,439	86,780	13,500	183,988	778,978
<b>Total</b>	<b>56,442</b>	<b>122,119</b>	<b>265,381</b>	<b>129,439</b>	<b>96,030</b>	<b>17,000</b>	<b>199,370</b>	<b>885,781</b>
<i>Balance</i>	<i>-6,562</i>	<i>0</i>	<i>16,732</i>	<i>88,403</i>	<i>57,136</i>	<i>462</i>	<i>*59,158</i>	<i>215,329</i>

\*The WESBOGY financial summary has been simplified in this table due to the relationship with the UofA and the difficulty of including details around the severance reserve.

## APPENDIX 1: CURRENT PROJECTS AND OUTSTANDING RESEARCH QUESTIONS

This appendix is intended to:

1. Summarize the status of current research projects, including the group conducting the research, its status and the questions being answered by the research.
2. Act as a location to maintain a list of research questions of interest to FGrOW members which do not currently have a project associated with them.

The appendix will be updated annually or more frequently if needed.

Project	Group	Status	Research Questions
<b>Long-Term Trials</b>			
Dynamic Aspen Density Experiment	MPT	Ongoing	Spruce growth in response to thinning aspen to different densities.
Historic Research Trials	FPPT/CFS/AAF	Ongoing	Effect of density and nutrition management on lodgepole pine wood quality. Effect of density and nutrition management on lodgepole pine growth.
Long-Term Study	WESBOGY	Ongoing	Spruce and aspen growth in response to thinning aspen to different densities.
Realized Gain Trials	TIA, Blue Ridge Lumber (FRIAA)	Ongoing	Quantify gain from improved stock
Regenerated Lodgepole Pine Trial	FPPT	Ongoing	Influence of ecosite and treatment on lodgepole pine regeneration. Understanding of factors influencing conifer natural regeneration. Impact of temperature change on lodgepole pine regeneration.
Strip Cut Understory Protection Trial	MPT	Ongoing	White spruce release after understory protection. Stand development after strip cut understory protection harvesting. Effect of larger spruce on regenerating aspen. Site index for white spruce understory after release.
<b>Short-term projects</b>			
Empirical Post Harvest Stand Assessment II	FGrOW, Millar Western (FRIAA)	Ongoing	Managed forest response to silviculture. Prediction of mature stand condition based on early stand observations. Quantifying outcomes of silviculture practices commonly applied to mixedwood or spruce sites.

Project	Group	Status	Research Questions
<b>Short-term projects</b>			
Judy Creek	UofA/WESBOGY	Ongoing	Silvicultural prescriptions to maintain mixedwood stands. Impact of radial herbicide treatment and thinning.
Mortality curves for young aspen	UofA/WESBOGY	Ongoing	Juvenile aspen stand dynamics.
Site index determination using remote sensing	UofA, Canfor (FRIAA)	2017-2019	Evaluate and demonstrate use of LiDAR and digital photography for estimating site index.
Stand Dynamics after MPB Attack	FPPT/fRI Research	Complete 12/19	Impact of MPB attack on stand development, including tree mortality, regeneration, understory vegetation.
Expanded Provenance and Progeny Trial for Climate Change Adaptation in AB	TIA, Canfor (FRIAA)	Ongoing	Further test populations for adaptability to climate change.
Effect of harvesting and site preparation methods on reforestation performance	FPPT/CFS, Hinton Wood Products (FRIAA)	Complete 12/19	Effect of site preparation on incidence of <i>Armillaria</i> . Effect of site preparation on aspen and lodgepole regeneration growth and mortality.
<b>Model Development</b>			
FRIPSY	FPPT	Ongoing	N/A
GYPsy	AAF	Ongoing	N/A
MGM	WESBOGY	Ongoing	N/A
<b>Data management or collection</b>			
PGYI	PPPT	Ongoing	N/A
MPB PSP	FPPT/AAF	Ongoing	N/A
Research Database	PPPT	Ongoing	N/A

## Outstanding Research Questions

- Growth and yield implications of retention prescriptions
- Site preparation effects on early growth of white spruce
- Development of regeneration and updating of ingress models for use in MGM
- Incidental spruce replacement options—putting spruce on deciduous sites
- Technology and how it can be applied in growth and yield.
- Effect of nutrition management on tree growth.

**APPENDIX 2. MEMBERSHIP AND PROJECT TEAM DUES BY ORGANIZATION FOR 2019-20.**

Full Member	Project Team Dues					Membership Dues	Total
	PPPT	FPPT	MPT	WESBOGY	TIA		
Alberta-Pacific Forest Industries Inc.	5,000	0	20,000	16,000	1,000	2,350	44,350
Alberta AF	5,000	0	20,000	16,000	0	2,300	43,300
Alberta Newsprint Company	0	18,000	0	0	1,000	2,049	21,049
Blue Ridge Lumber Inc.	5,000	18,000	0	0	1,000	2,250	26,250
Canadian Forest Products Ltd.	5,000	18,000	0	16,000	1,000	2,250	42,250
Edson Forest Products	5,000	18,000	0	0	0	2,200	25,200
Hinton Wood Products	5,000	18,000	0	0	1,000	2,250	26,250
Louisiana-Pacific Canada, Ltd., Manitoba*	0	0	0	9,479	0	525	10,004
Louisiana-Pacific Canada, Ltd., Dawson Creek*	0	0	0	9,479	0	525	10,004
Manning Diversified	0	0	0	18,959	1,000	1,149	21,108
Mercer International	5,000	0	20,000	16,000	1,000	2,350	44,350
Millar Western	5,000	18,000	20,000	0	1,000	3,250	47,250
Norbord Inc.	0	0	0	0	1,000	1,100	2,100
North Central Woodlands (WF)	5,000	0	20,000	18,959	1,000	2,391	47,350
Northlands	0	0	0	0	1,000	1,100	2,100
Saskatchewan ENV	0	0	0	18,959	0	1,050	20,009
Spray Lake Sawmills	0	18,000	0	0	0	1,999	19,999
Sundre Forest Products	5,000	18,000	0	0	1,000	2,250	26,250
Tolko, High Level	5,000	0	20,000	0	1,000	2,391	28,391
Vanderwell	0	0	0	0	0	5,266	5,266
Weyerhaeuser Company, Alberta Forestlands	5,000	18,000	20,000	16,000	2,000	3,349	64,349
<b>Total Dues</b>	<b>60,000</b>	<b>162,000</b>	<b>140,000</b>	<b>155,836</b>	<b>15,000</b>	<b>44,347</b>	<b>577,183</b>

\*Shared membership.

### APPENDIX 3. MEMBER CONTACT INFORMATION AND PROJECT TEAM AFFILIATION

The follow list of FGrOW members includes member representative contact information, Project Team Affiliation and FGrOW Role, if any.

M= Main contact and voting member

A=Additional contact that should be included in communications

Organization	Contact	FGrOW Role	FGrOW	FPPT	MPT	PPPT	TIA	WESBOGY
Alberta Agriculture and Forestry	Darren Aitkin darren.aitkin@gov.ab.ca 780-644-5581	FGrOW Executive	M		A	M		M
Alberta Agriculture and Forestry	Lee Charleson lee.charleson@gov.ab.ca 780-656-5052		M				M	
Alberta Agriculture and Forestry	Rweyongeza Deogratias Deogratias.rweyongeza@gov.ab.ca 780-638-2855		A				A	
Alberta Agriculture and Forestry	Lee Martens lee.martens@gov.ab.ca 780-644-3851		A		M			A
Alberta Plywood	Richard Chemago Richard.Chemago@westfraser.com 780-805-3734		A		A		A	
Alberta Plywood	Tracey Courser Tracey.Courser@westfraser.com 780-804-3715		M		M	M	M	M
ANC	Ian Daisley iand@albertanewsprint.com 780-778-7000		M	M				
Al-Pac	Roger Butson roger.butson@alpac.ca		A		A	M		A

Organization	Contact	FGrOW Role	FGrOW	FPPT	MPT	PPPT	TIA	WESBOGY
Al-Pac	Dave Cheyne dave.cheyne@alpac.ca 780-525-8261		M		M	A		M
Blue Ridge Lumber	Shane Sadoway Shane.sadoway@westfraser.com 780-648-6220	FGrOW Executive TIA Project Team Chair	M	M		M		
Canfor	Christine Quinn christine.quinn@canfor.com 780-538-7738		A				M	
Canfor	Melonie Zaichowsky Melonie.Zaichkowsky@canfor.com 780-538-7740	FGrOW Chair	M	M		M		M
DMI	Frazer Butt FButt@dmi.ca 780-624-7427		M		M	M	A	M
DMI	Peggy Pike ppike@prpddmi.com 780-624-7429		A				M	
DMI	Gord Whitmore GWhitmore@dmi.ca 780-624-7036		A		A	A		A
Edson Forest Products Hinton Wood Products	Hal Jackson Hal.jackson@westfraser.com 780-865-8986		M	M		M		
Edson Forest Products Hinton Wood Products	Jeff Morris Jeff.morris@westfraser.com 780-865-8938		A				M	
Edson Forest Products Hinton Wood Products	Byron Vriend byron.vriend@westfraser.com 780-865-8913		M	M		M		

Organization	Contact	FGrOW Role	FGrOW	FPPT	MPT	PPPT	TIA	WESBOGY
FGrOW	Sharon Meredith Sharon@sugarloafconsulting.ca 780-865-5458	Director	M	M	M	M	M	M
Foothills Pine Project Team	Dick Dempster wr.dick.dempster@btinternet.com 44 7885 683608	Research and Development Associate	M	M				
Lousiana Pacific - Manitoba	Paul Leblanc Paul.Leblanc@lpcorp.com 204-734-7724		M					M
Manning Forest Products	Steve Blanton Steve.Blanton@mdfp.ca 780-836-5397		M				M	M
Millar Western	Tim McCready tmccready@millarwestern.com 780-778-2221 ext 2207	FGrOW Executive PPPT Chair	M	M	M	M	M	
Millar Western	Charlotte Ratcliff cratcliff@millarwestern.com			A			A	
Norbord Inc.	Colleen Braconnier colleen.braconnier@norbord.com 780-831-2507						A	
Norbord Inc.	Fred Radersma fred.radersma@norbord.com 780-831-2516		M				M	
Northland Forest Products Ltd.	Garry Ehrentraut garry@nfpl.ca 780-417-9646		M				M	
Northland Forest Products Ltd.	Dave Harman dave@nfpl.ca 780-743-3773		A				A	

Organization	Contact	FGrOW Role	FGrOW	FPPT	MPT	PPPT	TIA	WESBOGY
Saskatchewan Government	Dave Lindenias Dave.lindenias@gov.sk.ca 306-953-2442		A					A
Saskatchewan Government	Phil Loseth Phil.Loseth@gov.sk.ca 306-953-3567		M					M
Spray Lake Sawmills	Matt Denney Matt.denny@spraylakesawmill.com 403-851-3315	FPPT Chair	M	M				
Sundre Forest Products	Karalee Craig karalee.craig@westfraser.com 403-638-6210		A	A		A	M	
Sundre Forest Products	Bob Held Bob.Held@westfraser.com 403-638-6207	FGrOW Executive	M	M		M		
TIA Board	Jeremy Beal jbeal@forsite.ca 587-487-1740 (Ext. 1531)	TIA Project Team Coordinator	M				M	
Tolko	Grant Glessing Grant.Glessing@tolko.com		M		M	M		
Vanderwell	Mike Haire m.haire@vanderwell.com 780-805-3060		M					
WESBOGY	Mike Bokalo Mike.Bokalo@ualberta.ca 780-492-9038	WESBOGY Research Scientist	M					M
WESBOGY	Phil Comeau Phil.Comeau@ualberta.ca 780-492-1879	WESBOGY Chair	M					M



Organization	Contact	FGrOW Role	FGrOW	FPPT	MPT	PPPT	TIA	WESBOGY
Weyerhaeuser	Vashti Dunham Vashti.dunham@weyerhaeuser.com 780-518.9545		M	M	A	A		M
Weyerhaeuser	Kerri MacKay Kerri.Mackay2@weyerhaeuser.com 780-621-5537		M	A		M		A
Weyerhaeuser	Dave Swindlehurst dave.swindlehurst@weyerhaeuser.com 780-542-8074	MWPT Chair	A		M		M	

#### Associate Members

Organization	Contact	FGrOW Role	FGrOW	FPPT	MPT	PPPT	TIA	WESBOGY
Canadian Wood Fibre Centre	Jim Stewart Jim.Stewart@NRCan-RNCan.gc.ca 780-435-7224		M	M				
Canadian Wood Fibre Centre	Derek Sidders Derek.Sidders@NRCan-RNCan.gc.ca 780-435-7355		M	A				M
University of Alberta	Ellen MacDonald emacдона@ualberta.ca 780-492-3070		M		M			
University of Alberta	Sarah Gooding sarah.gooding@ualberta.ca 780-492-8313		A					
University of Alberta	Barb Thomas bthomas@ualberta.ca 780-492-8016		A					

**APPENDIX 4. SUMMARY OF DELIVERABLES AND PROGRESS FOR THE REGENERATED LODGEPOLE PINE TRIAL.**

Deliverable	Progress / Next Steps	Reference
Measurement and treatment schedule (annually by June 15)	Completed for 2019. Future plans will be discussed at the FPPT workshop in October, 2019.	<i>Installation Status.xlsx</i>
Field measurements	Continue measurements according to the decision made by members based on assessment of 2018 data.	<i>RLP Field Manual</i>
Summary status and verification reports	Will be distributed annually by January 31.	Individual company audit and work verification reports
Digital database (updated annually, December 31)	Loading database provided to contractors annually by June 30. Field data uploaded to database by March 21, 2019. Master database requires loading, clean-up and approval.	RLP Task Force Report, July 10 2009.  Latest database version:
Field treatments	None scheduled.	None.
Crop performance report (updated annually, March 31)	Annual updates will be made based on the most recent field measurements. To be completed for 2018 measurements by October, 2019.	<i>Crop Performance Report 16-Year Results, March 18, 2018</i>
Regeneration model deployment plan	Last revised March 2015. Revise annually under direction of FRIPSY task force. Long-term plan for FRIPSY development approved in September 2016. Changes to FRIPSY LTP plan approved October, 2017.	FRIPSY Enhancement and Deployment Schedule-Update for 2015, February 2015 <i>FRIPSY Conceptual Long-term Plan, October 2016 to September 2019</i> <i>FRIPSY_LTP_SuggestedUpdates.docx</i>
Regeneration model: demonstration and distribution	Workshop on application of operational research, September, 2018 Workshop to be held in fall 2019.	
Regeneration model enhancement	FRIPSY Version 3 integrated with GYPSY Sub-models developed for 16-year extension.  Initial sub-models developed for spruce Calibrated version of FRIPSY distributed July 20, 2018.	-FRIPSY_BP_2017.xlsm <i>Crop Performance Report 16-Year Results, March 18, 2018</i> As above -FRIPSY_BP_2018b.xlsm

Deliverable	Progress / Next Steps	Reference
	<p>Complete development of rationalized model, incorporating 2017-18 data, 16-year extension, mixed species, and other enhancements. March 31, 2020.</p> <p>FRIPSY Version 3 integrated with GYPSY Sub-models developed for 16-year extension.</p> <p>Initial sub-models developed for spruce Calibrated version of FRIPSY distributed July 20, 2018.</p> <p>Complete development of rationalized model, incorporating 2017-18 data, 16-year extension, mixed species, and other enhancements. March 31, 2020.</p>	<p>-FRIPSY_BP_2017.xlsm <i>Crop Performance Report 16-Year Results, March 18, 2018</i> As above -FRIPSY_BP_2018b.xlsm</p>
Assessment of climate effects	Incorporation of climate related variables in the regeneration model is still under investigation. An updated report was prepared in 2015, and was published in the Forestry Chronicle in 2017.	<i>Dempster, W. Richard. "Impact of climate on juvenile mortality and Armillaria root disease in lodgepole pine." The Forestry Chronicle. 93:148-160. 2017.</i>

**APPENDIX 5. FOOTHILLS PINE PROJECT TEAM WORK AND COST ALLOCATION BASED ON PINE-LEADING AREA**

<b>Member</b>	<b>Net area (ha)</b>	<b>% of total</b>
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
Edson Forest Products	121,848	6.0
Sundre Forest Products	293,655	14.4
Hinton Wood Products	451,713	22.1
Weyerhaeuser Canada	557,433	27.2
<b>Total</b>	<b>2,045,507</b>	<b>100.0</b>