FGC Forest Genetics Council of British Columbia

Business Plan
2017/18

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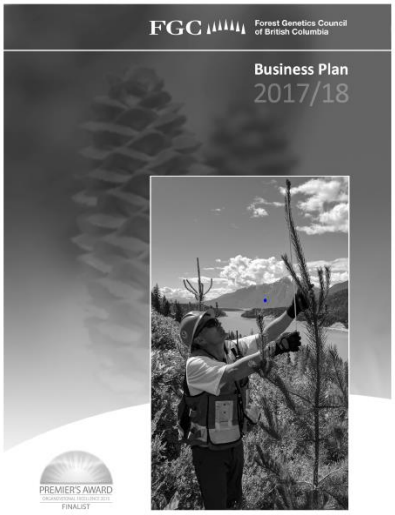
Cover Figure

Scott King, RPF, Silviculture Forester, Louisiana Pacific Ltd., and member of the Forest Genetics Council of BC. Scott is measuring the terminal leader of a lodgepole pine within an Assisted Migration and Adaptation Trial (AMAT) test site located North of Golden, BC. June 2017.

Photo: Brian Barber



Forest Genetics Council of British Columbia

Business Plan 2017 / 18

Compiled and edited by:

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Program Manager, FGC
CEO, SelectSeed Co. Ltd.

Message from the FGC Co-Chairs

We are pleased to present the 18th annual business plan on behalf of the Forest Genetics Council of BC.

This business plan provides an overview of FGC and its strategic objectives for enhancing the conservation, resilience and value of BC's forests. It also identifies the activities by subprogram - and their associated budgets - to be undertaken in support of FGC's goals.

Patrick Martin is excited to be involved with Council as its new government co-chair, and serving as the new Director of the Ministry's Forest Improvement and Research Management Branch – a new name which reflects an expanded mandate for the branch previously known as Tree Improvement.

Brian Barber, former co-chair and branch director, succeeded Jack Woods as FGC Program Manager and SelectSeed CEO. Jack has agreed to assist in the transition. We are grateful for his leadership and contributions over the years, and pleased he remains involved. is assistance includes producing the annual Species Plans found in Appendix 3, which are indispensable for tree breeders, seed producers and seed users alike.

FGC launched a streamlining review this fiscal year to simplify its annual business planning process. We envision a new governance model with fewer technical advisory committees (TACs)and better alignment of activities and budgets with FGC's strategic objectives. This year we will also engage SelectSeed's Board of Directors regarding its future revenues and investment options.

One significant undertaking continues to be the development of a new climate-based seed transfer (CBST) framework to increase the resilience of our forests in response to climate change. FGC and its TACs will be fully engaged in assessing the policy and implementation issues associated CBST this coming year. Critical to the success of this work, and to ensure we understand how to address future landscape level events, will be an assessment of the impacts of the 2017 wildfires on seed supply.

We would like to thank the Diane Nicholls, Chief Forester and ADM, and Shane Berg, Deputy Chief Forester, for supporting and empowering FGC. We are also grateful to the administrators of the Ministry's Land Base Investment Strategy (LBIS) program for continuing to recognize and support forest genetics activities. Also, we extend our thanks to the Forest Enhancement Society for supporting climate modelling work at UBC, which benefits the tree improvement program and all British Columbians.

Finally, we would like to thank all those involved in FGC and its committees, and those who contribute to advancing forest genetics research and operations in BC.

Patrick Martin, RPF
FGC Co-Chair (Government)
Director, Forest Improvement and Research Management Branch,
Ministry of Forests, Lands, Natural Resource Operations and Rural Development

Mark Tamas, RPF
FGC Co-chair (Industry)
Chief Forester
Tolko Forest Industries

Table of Contents

List of Figures

List of Tables

1. Introduction

This is the 18th annual business plan of the Forest Genetics Council of BC (FGC). This document is published in support of FGC's 5-year strategic plan (2015-2020), and describes activities and their budget allocations for fiscal 2017/18. It also serves to provide transparency and accountability for coordination and use of funds that support Provincially-funded forest genetics activities in the Province.

Section 2 provides an overview of FGC's goals, governance, and structure. Organizations who contribute funding and support for this business plan are outlined in Section 3. FGC subprogram activities and budgets for 2017/18 follow in Section 4.

The largest section of this document is Appendix 3 – Species Plans. These plans outline the general tree breeding, genecology and conservation strategies, and seed production and use forecasts for each commercial tree species in the Province.

Species plans and other information about FGC including a glossary of terms can be found at: www.fgcouncil.bc.ca

2. Forest Genetics Council of British Columbia

The FGC is a multi-stakeholder advisory group appointed by the Provincial Chief Forester. FGC includes representatives from forest tenure holders, the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, (Ministry), universities, and the Canadian Forest Service. See Appendix 1 for a list of FGC members and their affiliations.

FGC's mandate is to lead and coordinate provincial forest genetics activities to enhance the conservation, resilience and value of BC's forests. FGC establishes objectives and performance measures, and provides advice to the Ministry regarding policies, practices, and the allocation of funds to research and operations.

FGC was established in 1998 following a program review and merger of the Coastal and Interior Tree Improvement Councils. FGC's goals and objectives are described in its Strategic Plan 2015-2020, which guide the development of annual business plans and forest genetics activities.

2.1 Vision, Objectives and Performance Measures

FGC's vision statement, set out in its 5-year Strategic Plan for the period 2015 to 2020, is:

> BC's forest genetic resources are diverse, resilient, and managed to provide multiple values for the benefit of present and future generations.

FGC's five main **objectives** and their *performance measures* include:

1. **Genetic conservation:**
   Adequately conserve the genetic diversity of all forest tree species native to BC by 2020 through a combinate of in situ, ex situ and intra situ conservation.

2. **Resilience and climate-based seed transfer**
   By 2020 the selection and transfer of all tree seed used to reforest Crown land in BC will be guided by a climate-based seed transfer system that is regularly updated with new genecology and climate research information.

3. **Use of select seed for reforestation**
   Increase select seed[1] use to 75 percent of the provincial total sown by 2020.

4. **Increase genetic gain[2] for growth**
   Increase the average volume gain of select seed used for Crown land reforestation to 20% by 2020.

5. **Use of pest resistance seed for reforestation**
   Increase the use of seed with genetic gain for pest resistance to 50% of select seed sown by 2035.

Achievement of the above goals and performance measures is supported through the following enabling objectives:

6. **Secure resources and coordinate stakeholder activities** to efficiently meet business plan priorities.

7. **Monitor and report progress** for genetic resource management activities, including production of annual business plan, reports and project reports.

Progress towards achievement of FGC's performance measures, and other accomplishments and highlights, are summarized in FGC's annual reports, which are available on-line.

2.2 Governance and Structure

The FGC is governed by a set of bylaws, whose articles describe its membership, roles and responsibilities, committees, meetings and plans. FGC and its activities are also guided by provincial regulations, standards, and direction from the Provincial Chief Forester[3]. FGC business is also conducted in accordance with traditions and practices that have evolved over the past six decades.

Forest genetic resource management in BC continues to be co-operative effort between government, industry and academia. The Ministry leads tree breeding activities for a dozen commercial tree species. Parents selected through breeding and progeny field tests are included in seed orchards managed by the Ministry, private companies, and SelectSeed Co., which is owned by FGC.

Orchard managers sell their tree seed to persons with reforestation obligations and to government programs (e.g. Forest for Tomorrow). Scientific research is also undertaken by the Ministry and universities to inform seed use standards, responses to climate-change, and conservation efforts.

Forest companies also provide logistical support for genetic field trials, and provide input on ministry program priorities, funding, policies and standards via FGC.

Provincial policies and standards require that all tree used for Crown land reforestation be registered, tested and stored at the Ministry's Tree Seed Centre. Persons with reforestation obligations must use select seed with a genetic worth of 5% or greater, if available. These persons must also use seed in accordance with transfer standards prescribed by the Chief Forester.

[1] "Select seed" is seed assigned a level of genetic gain greater than zero for a trait of interest.

[2] Genetic gain or genetic worth (GW) for volume is the expected percentage increase in timber volume available at harvest compared to using wild unselected seed.

[3] Example: Chief Forester's Guiding Principles Respecting Public and Private Seed Orchard Management in BC, July 2010.

Many of the above activities and policy discussions are coordinated under the auspices of FGC and its technical advisory committees (TACs). TACs provide operational and technical advice to FGC, and develop plans, project proposals and budgets for FGC's subprograms. These TACs include

- **Genetic Conservation TAC (GCTAC)** who develop five-year strategies and identify required *in situ* and *ex situ* conservation activities and budgets to achieve the conservation objective.
- **Coastal** and **Interior TACs (CTAC** and **ITAC)** who review and advise on species plans, and budget recommendations for the tree breeding and Operational Tree Improvement Program (OTIP) subprograms to achieve the three select seed objectives,
- **Pest Management TAC (PMTAC)** who identify information and research needs respecting insect and disease control in seed orchards and seed production to support achievement of the three select seed objectives.
- **Seed Transfer TAC (STTAC)** who develop a strategy and activities for genecology research (e.g. provenance tests) and climate-based seed transfer policy to achieve the resiliency objective.
- **Decision Support TAC (DSTAC)** oversees activities aimed at improving information and tools for seed users to enable achievement of all FGC objectives. New tools for climate-based seed transfer are a current priority.

The CTAC and ITAC chairs are appointed by the Chief Forester to serve on Council. FGC appoints other TAC chairs directly. All TAC chairs are responsible for appointing persons to their committees, seeking representation from stakeholder groups. TAC members and their affiliations are listed in Appendix 1.

FGC may establish other sub-committees to address shorter-term projects and needs. For example, in March 2017, FGC appointed a Streamlining Subcommittee to review its governance and annual business planning process. This review will lead to changes for fiscal 2018/19.

Figure 1 illustrates FGC's governance structure, including TACs and subprogram linkages to FGC objectives. Subprogram activities and budgets are described in Section 4.

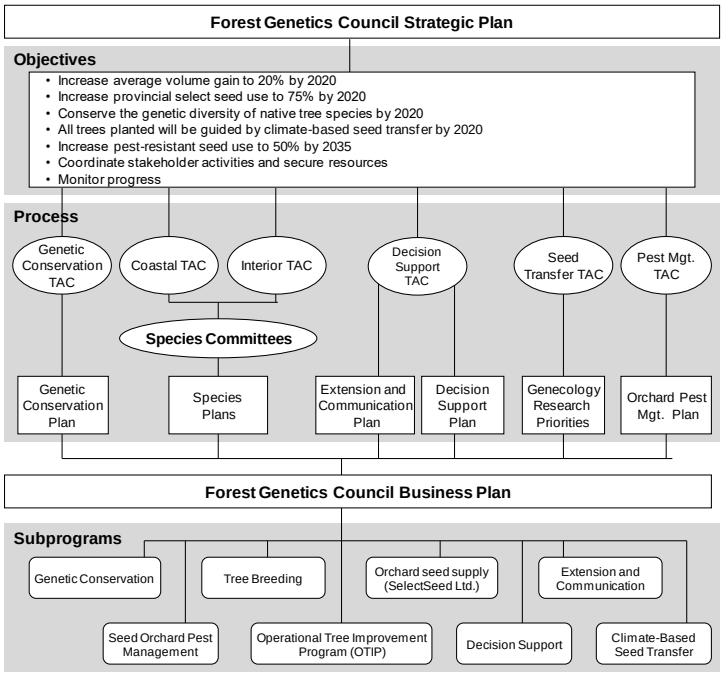

Figure 1 FGC Objectives, Process (Technical Advisory Committees), and Subprograms

3. Funding and Support

Funding to support activities directed or coordinated by FGC is derived from several sources:

- Ministry core and Land Based Investment Strategy (LBIS) funds.
- Seed sales from Ministry, private and SelectSeed orchards, and fees for cone and seed services provided by the Ministry's Tree Seed Centre.
- Direct and in-kind contributions from private companies (including forest tenure holders), FP Innovations and Natural Resources Canada.
- Research grants and contracts from non-profit organizations such as Genome Canada, Genome BC and the Natural Sciences and Engineering Research Council of Canada (NSERC), and the recently formed Forest Enhancement Society of BC.

Provincial government funds (core and LBIS) used in support of forest genetics activities are allocated to Forest Improvement and Research Management Branch (FIRM). Core funds, which total approx. $3 million per year, support FIRM's operations and salaries. FIRM is also periodically allocated capital and other funds for vehicles and equipment purchases, building improvements, information systems, and external grants.

A portion of the ministry's Land Based Investment Strategy (LBIS) funds are allocated to FIRM and used to support FGC's annual business plan. LBIS recognizes FGC's program contributes to government's commitment to increase mid-term timber supplies through investments in incremental silviculture, forest health and tree improvement. LBIS funding used to support FGC's business plan have been $2.5M per year since 2014/15. The FGC subprogram activities and budgets described in Section 4 are largely, but not exclusively, funded by LBIS.

A significant source of revenue supporting forest genetics activities is derived from the sale of tree seed. Seed orchards owned and operated by the Ministry, private companies (Vernon Seed Orchard Co., Tolko, Western Forest Products, TimberWest, PRT Growing Services, and SelectSeed Co, owned by FGC) recover their operating costs through seed sales to government programs (e.g. BC Timber Sales and Forest for Tomorrow) and forest tenure holders. The purchase of tree seed is considered part of basic reforestation costs, which include seedling production, planting and stand management to free growing.

All seed used for Crownland reforestation must be registered, tested and stored at the Ministry's Tree Seed Centre. These services, plus seed withdrawals and shipments to nurseries, are funded by the Ministry (base funds). Cone and seed processing, which include kilning, extraction, cleaning and stratification, are provided to clients on a fee-for-service basis.

Private companies also provide direct and in-kind support to the ministry's tree breeding and genecology research, and to universities. For example, forest tenure holders assist with the identification, establishment, and maintenance of progeny and provenance test sites. Private financial support is used to leverage additional funds from research granting agencies such as NSERC, Genome Canada, and Genome BC. Recent examples include Genome Canada's *CoAdapTree: Healthy trees for future climates project* led by Drs. Aitken (UBC), Yeaman (Calgary) and Hamlin (UBC/Laval), and Genome BC's investment in Cedar Durability and Resistance (CeDAR) project led by Drs. Bohlman (UBC) and Russell (Ministry).

FGC program management and support, including meeting organization, preparation of annual business plans and annual reports, is provided by SelectSeed, under the terms of a multi-year agreement with the Ministry. Since 2014, SelectSeed has also provided financial support to the Ministry for a tree breeder succession position.

Administrative support for FGC and its TACs is also provided by FIRM staff, whom assist with meeting logistics, preparing call for proposals, and issuing and administering external contracts.

4. Subprogram Activities and Budgets

Activities and budgets for the 2017/18 fiscal year were identified through a comprehensive business planning process. The FGC Co-chairs instructed Technical Advisory Committee (TAC) chairs to develop subprogram proposals and budgets for two funding scenarios: $2.5M and $2.8M, respectively. Chairs were asked to clearly identify project priorities, funding amounts and linkages to FGC's program goals, so Council members would not be required to delve into details if and when subprogram allocations need to be adjusted to balance the overall budget.

TAC meetings occurred between January and March 2017. Chairs worked with TAC members and the FGC Program Manager to prepare options for FGC's consideration. Calls for proposals were also issued and evaluated for the Operational Tree Improvement and Cone and Seed Pest Management subprograms.

The FGC reviewed the TACs' proposals and budget recommendations for each subprogram on March 14, 2017. The initial amount requested under all subprograms totaled over $3.27M.

FGC subsequently recommended the Ministry allocate $2.9M of LBIS funds to its subprograms and activities as outlined in Table 1 below.

Table 1 FGC Subprogram budgets for 2016/17 and 2017/18

FGC Subprogram	2016/17		2017/18	
	Approved	Est. Expenditures	Requested	FGC Recommends
Genetic Conservation	$ 188,700	$ 180,000	$ 266,658	$ 266,658
Tree Breeding	$ 1,180,000	$ 1,210,000	$ 1,415,500	$ 1,415,500
Operational Tree Imp. Prog.	$ 424,000	$ 380,000	$ 513,991	$ 396,085
Cone and Seed Pest Mgt.	$ 137,000	$ 110,000	$ 108,186	$ 91,521
Seed Transfer & Decision Support	$ 505,300	$ 540,000	$ 718,500	$ 718,500
Applied Tree Impr. and Biotech.	$ 55,000	$ 60,000	$ 242,781	$ -
Administration	$ 10,000	$ 20,000	$ -	$ -
Total LBIS	**$ 2,500,000**	**$ 2,500,000**	**$ 3,265,616**	**$ 2,888,264**
FLNR risk managed	$ 300,000	$ 180,000		
Total	**$ 2,800,000**	**$ 2,680,000**		**$ 2,888,264**

In its recommendation letter to the Provincial Chief Forester, FGC acknowledged the Ministry is solely responsible for allocating LBIS funds, including those used to fund FGC's subprograms and activities. The Ministry was also provided with subprogram details to guide its internal financial decisions should the total LBIS funds allocated to tree improvement be less than $2.9M.

Due to other ministry priorities and program demands, LBIS funds allocated to FGC's tree improvement program was $2.5M (same as the previous three years). Additional funds were also obtained from the Forest Enhancement Society of BC to support Climate Western North America maintained by Dr. Tongli Wang, UBC, totaling$150,000/year. The Ministry subsequently readjusted FGC subprogram funding levels based on the LBIS available funds and information provided by the various TACs.

The following sections outline the specific activities and budget allocations for each subprogram for 2017/18.

4.1 Genetic Conservation

Genetic diversity is the foundation of biodiversity. Conserving genetic diversity is essential for a species to survive, reproduce and evolve in response to environmental pressures including insects, disease, and climate change.

The Genetic Conservation subprogram supports FGC's first objective to adequately maintain the genetic diversity of all indigenous tree species. "Adequately conserve" is defined as conserving representative populations of a species that are of sufficient size and redundancy so existing levels of genetic variation can be maintained indefinitely. Conservation activities includes *In situ*, *Ex situ,* and *Intra situ* conservation, research, monitoring and reporting, and genetic diversity standards.

> ***In situ*** conservation is the protection of species in its natural habitat. Protected areas include Federal and Provincial parks, ecological reserves, old growth management units, and other area where industrial activities are prohibited.
>
> ***Ex situ*** conservation is the preservation of geographically representative populations or individuals outside the species natural habitat. Examples include seed collections, clone banks, tissue culture and germplasm.
>
> ***Intra situ*** conservation includes establishing and maintaining plantations consisting of representative populations of a species within and beyond its natural range. Examples include progeny and provenance field tests.

Conservation research includes developing conservation methods and strategies specific to the biology of each species, understanding levels and patterns of genetic diversity, and predicting and monitoring the impacts of environmental pressures including climate change on species and populations.

Information collected from the above conservation activities and research can be used to estimate, monitor and report the conservation status of a species, and identify needs and priorities. Genetic diversity research is also used to inform genetic diversity standards for tree-breeding, seed collections and reforestation practices. For example, all seedlots used for Crownland reforestation must have an effective population size of 10 or greater.

4.1.1 Planning

Genetic Conservation subprogram activities are planned and coordinated through FGC's Genetic Conservation TAC (GCTAC). GCTAC's five-year strategic plan (2015-2020) advances FGC's conservation objectives and ensures the most recent scientific procedures are followed. GCTAC meets at least twice a year to develop an annual budget and review progress of projects underway. The 5-year strategy and GCTAC minutes are available at http://www.fgcouncil.bc.ca/geco-area1506.html

4.1.2 Delivery and Partners

Genetic Conservation activities are delivered by the Centre for Forest Conservation Genetics (CFCG) and the Ministry and its contractors.

The CFCG, located at the University of British Columbia, was established in 2001 to advance FGC's conservation goals and objectives, with start-up funding provided by the Ministry through annual grants. The CFCG is responsible for 1) cataloguing the *in situ* conservation status of BC's native tree species; 2) conducting population genetic structure and genecology research; 3) maintaining ClimateBC and ClimateWNA; and 4) produced climate change forecasts.

The Ministry undertakes basic forest conservation genetics research and maintains *ex situ* and *intra situ* collections of many native tree species, including clone banks and the Provincial Tree Seed Centre's conservation seed bank. Funding for the Ministry-led activities is provided through core and LBIS funds.

Whitebark pine (*Pinus albicaulis*), a Federally listed species at risk, has been receiving special attention due to threats from blister-rust, mountain pine beetle and climate change. Conservation activities for this species are being undertaken by the Ministry, CFCG and others involved with the Whitebark Pine Ecosystem Foundation of Canada and its US partner http://www.whitebarkpine.ca/

4.1.3 Activities and Budget

The LBIS allocation to Genetic Conservation activities totals $164,094. The CFCG will receive $52,094 for its conservation research and associated activities. This is less previous years, as funding for climate modelling was provided by the Forest Enhancement Society of BC. The CFCG's work in support of the Genetic Conservation strategy will include producing species distribution maps and validating the Catalogue's modelling approach for rare (uncommon) tree species.

Other projects undertaken by the CFCG include completion of research comparing natural (Class B) and seed orchard (Class A) seedlots of lodgepole pine and interior spruce for adaptation and genetic diversity. This research was part of the *AdapTree* Project funded by Genome Canada, Genome BC and other agencies (funding totaled $4.7 million). The CGCG will also revisit the whitebark pine assisted migration experiments established in 2008, and measure a Garry oak provenance trial.

The Forest Genetics section of the Ministry's Forest Improvement and Research Management Branch is provided $42,500to continue field-testing whitebark pine for blister-rust resistance. The Ministry's South Area will receive $24,500 to continue inoculating and screening whitebark pine seedlings for rust resistance. Selected parents will be grafted and may subsequently be used to establish a rust-resistant seed orchard.

The Ministry's Tree Seed Centre will receive $45,000 to acquire additional *ex situ* seed collections to fill gaps in the existing conservation seed bank, and to test and maintain the existing seed-bank inventory. Target species for collections this year include cascara, bitter cherry, big leaf maple, Douglas maple, and dogwood.

Table 2 Conservation subprogram budget

Center for Forest Conservation Genetics	**Allocation**
Genetic Conservation Catalogue and species range projections - Wang	FES*
Adaptive diversity in seed orchard lots - MacLachlan	$ 6,000
Whitebark pine assisted migration trial - Chourmouzis	$ 24,000
Garry Oak provenance test maintenance and measurements	$ 1,675
Office, travel, website, administration and overhead	$ 20,419
CFCG Subtotal	**$ 52,094**
Ministry - Forest Genetics Section	
Field testing whitebark pine rust resistance	$ 42,500
Ministry - South Area	
Rust screening whitebark pine seedlings in nursery etc.	$ 24,500
Ministry - Provincial Tree Seed Centre	
Ex-situ collections and seed bank maintenance	$ 45,000
Total	**$ 164,094**

*FES – funding provided by Forest Enhancement Society of BC

4.2 Tree Breeding

This subprogram directly supports FGC's select seed use objectives: 3) increasing the use of select seed; 4) increasing genetic gain for growth, and 5) increasing use of pest resistance seed.

Tree Breeding involves identifying, testing and breeding trees with desirable traits to improve timber volumes, tree health, and stand resilience. Activities include identifying candidate parents in wild stands and progeny tests, propagation (clone banks), mating (breeding arboretums and controlled crosses), data management, and establishing, maintaining and measuring field trials. Field trials include realized-gain trials established to validate growth and yield projections for select seed. This subprogram also includes associated research such as quantitative genetics, genomics, biology, wood science, entomology and pathology. No genetic engineering is involved.

Selected parent trees are assigned breeding values and grafted into seed orchards or cutting hedges to produce seedlots or cutting lots for reforestation, respectively. The genetic worth of a seedlot is subsequently derived from the breeding values of parent trees contributing to that seedlot.

Breeding strategies and improvements for volume gain and pest resistance advancements vary among species and seed zones. More emphasis is now being placed on breeding for pest resistance in response to FGC's new objective (#5). See individual species plans in Appendix 3 for breeding program details.

4.2.1 Planning

Tree Breeding priorities are established for each commercial species and seed planning unit based on potential timber supply impacts, start-up or incremental program costs, and climate change projections. CTAC and ITAC periodically review these criteria, and update ranking and program categories for each seed planning unit. See Appendix 2.

Ministry tree breeders present their proposed activities to ITAC and CTAC annually. Funding requirements are identified for each species on the coast and interior, respectively. TAC members provide feedback regarding specific breeding activities, confirm alignment with client needs and FGC objectives, and recommend budget allocations to FGC. If available funds are inadequate to cover the recommended budget, adjustments to breeding activities are made internally by the Ministry.

4.2.2 Delivery and Partners

The Ministry leads all tree breeding activities within the Province. Much of their work is delivered with the assistance of forestry contractors identified and selected through a prequalified bidders process. Seed orchard managers, forest companies and BC Timber Sales also provide logistical and in-kind support by assisting with breeding, identifying, preparing, maintaining, and, in some cases, measuring field trials. The Ministry also works with Canadian Forest Service, FP Innovations, universities (around the world), Genome Canada and Genome BC to advance scientific knowledge and applications.

4.2.3 Activities and Budget

The 2017/18 Tree Breeding subprogram budget allocation totals $ 1,350,261. These LBIS funds are used to support tree breeding operations that include selections, controlled crossing, field test establishment, maintenance, and measurements, data analysis and associated research. Allocations by species and area were not available at the time of publication. See Table 3.

The Ministry funds full-time tree breeding salaries. One job-shadow tree breeding position is also funded by SelectSeed Co. Ltd. through a 3-year MoU with the Ministry. The LBIS allocation does not include these salaries nor in-kind contributions provided by the subprogram's partners identified above.

Table 3 Breeding subprogram budget by species and region

Species	2017/18 TAC Recommended	Actual $ Allocations
Coast		
Coastal D-fir	$107,000	
Redcedar	$333,000	
Yellow cedar	$31,000	
Western hemlock	$42,000	Not available
Sitka spruce	$45,000	at printing
White pine - coast	$15,000	
Alder	$35,500	
Other		
TOTAL COAST	**$608,500**	
Interior		
Lodgepole pine	$300,000	
White pine	$53,000	
Interior spruce	$61,000	Not available
Interior D-fir	$166,000	at printing
Western larch	$227,000	
Ponderosa Pine	$0	
Broadleaves	$0	
TOTAL INTERIOR	**$807,000**	
Coast + interior	**$1,415,500**	**$1,341,238**

Since tree breeding activities are subject to the uncertainties of biology and environmental conditions, some activities may not be undertaken as planned. Funds allocated to cancelled projects are usually directed to other tree breeding or genecology activities at the discretion of the Ministry.

4.3 Operational Tree Improvement Program (OTIP)

Seed orchards are established and operated on a cost-recovery basis, with seed sales supporting production costs. As the *Chief Forester's Standards for Seed Use* require persons to use seedlots with a genetic worth of 5% or greater, if available, there are few incentives for orchard managers to further upgrade existing orchards when higher genetic gain parent trees are identified by tree breeders. Replacing orchard parent trees to increase genetic gain can reduce seed production and seed sales revenues in the short-term. Providing some financial support helps to facilitate orchard upgrades, increase the amount of high gain select seed produced, and realize FGC's select seed use objectives.

The OTIP subprogram supports activities that increase the quality and quantity of select seed produced in orchards operated by the Ministry and private companies for those Seed Planning Units (SPU) where need is identified. It also supports technical projects aimed at improving orchard management practices and addressing impediments to delivering genetic gain to the field (e.g. nursery practices).

4.3.1 Planning

OTIP activities are identified through a robust planning process coordinated through the Interior and Coastal TACs. Species plans (Appendix 3) are used to determine potential gaps in seed supply and genetic gain for each SPU. Activities eligible for funding are identified, and, in some cases, standardized costs are specified. Eligible orchard activities include orchard upgrades (grafting, ramet replacement, roguing), cone induction (growth hormones and girdling), pollen collection and application, and pest management and monitoring.

A formal call for proposals is subsequently prepared and issued by the Ministry. Interior and Coastal TACs establish subcommittees, consisting of seed producers and users, to review proposals received and rank

them against FGC's objectives and SPU priorities, and on their technical merit, impact, value, and cost. In some cases, activities may be supported by the reviewers with reduced funding. The ITAC and CTAC chairs present OTIP budget recommendations, respectively, to FGC.

4.3.2 Delivery and Partners

The Ministry administers the OTIP Call for Proposal process in accordance with government's financial policies and procedures. OTIP proponents include seed orchard managers (Ministry and private), their partners, and other eligible applicants. All project managers are required to report on key performance indicators and expenditures through interim and final reports.

4.3.3 Activities and Budget

The OTIP budget for 2017/18 is identified in Table 4. A thorough review of the applications reduced the requested funding from $513,991 to $333,201. Project details, performance indicators, and funding by agency are available from Forest Improvement and Research Management Branch upon request.

Table 4 Operational Tree Improvement Subprogram (OTIP) budget by area

Area	No. proposals received	Total requested	Actual $ Allocations	# of Proposals funded
Coast	17	$180,034	$ 116,049	17
Interior	38	$333,957	$ 217,152	36
Total	55	$513,991	$ 333,201	53

4.4 SelectSeed Co. Ltd.

Select Seed Company Ltd. (SelectSeed) was created by in 1999 to help FGC achieve its objectives to increase the production of genetically selected tree seed, and to provide program management services. SelectSeed is a registered company wholly owned by the FGC through the B.C. Forest Genetics Society (the Society). Only members of the FGC can be members of the Society. SelectSeed's management and affairs are directed by a Board of Directors elected by FGC. The Board presents its investment strategies, business plans and accomplishments to FGC.

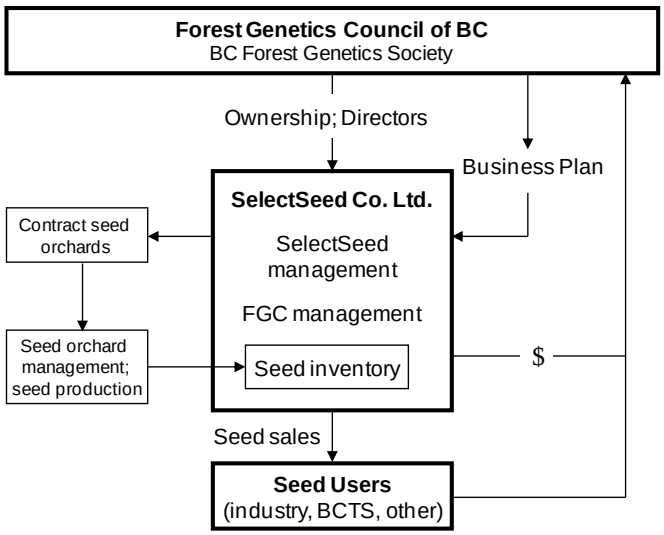

Figure 2 SelectSeed's ownership, relationships and activities

SelectSeed was provided start-up capital funding from Forest Renewal BC and later the Ministry under a multi-year agreement. SelectSeed used these funds to establish and maintain 15 seed orchards with several private partners. Seed produced through these orchard agreements is sold to those with reforestation obligations. Since 2013, SelectSeed has generated sufficient income through seed sales to cover its annual operating costs.

SelectSeed also provides management services to FGC. The FGC Program Manager (also CEO of SelectSeed) works with FGC's co-chairs to prepare meeting agendas and minutes, assists TAC chairs with their respective meetings, and produces FGC's business plan and annual report. The FGC program manager also represents FGC and BC's forest genetics community at workshops and events.

4.4.1 Planning

The SelectSeed CEO prepares an annual business plan for the Board's and FGC's approvals in March of each calendar year for the subsequent fiscal year. Annual business plans are developed in consideration of the company's mandate, long-term agreements with seed orchard partners and FGC's annual business plans. Species plans (Appendix 3), which identify current and planned orchard activities, also guide SelectSeed's investments. Any investment in new orchards must be approved by the FGC, informed by recommendations from TACs, and consistent with the Chief Forester's Guiding Principles Respecting Public and Private Seed Orchard Management in BC.

4.4.2 Delivery and Partners

SelectSeed has long-term orchard management agreements with five partners: Hansinger Irrigation (Kettle River), PRT Growing Services (Armstrong), Sorrento Nursery (Sorrento), Tolko (Armstrong) and the Vernon Seed Orchard Company (Vernon). Subject to the respective agreements' terms, partners may share management costs and retain a percentage of the total seed produced. SelectSeed sells its share of seed produced to the Ministry (BC Timber Sales, Forests for Tomorrow) and licensees at prices set by its Board of Directors.

4.4.3 Activities and Budget

SelectSeed's primary business is the joint management of 15 orchards, including cone collection and seed sales. Seed production for 2017 is forecast to be lower than the previous year. Table 5 shows the revised crop forecast based on the actual volume of cones harvested in August 2017. The amount shown represents SelectSeed's share of the 2017 crops.

Table 5 SelectSeed seed production forecasts by species for 2017.

Species	2017 Cone Crop Harvest			
	cones harvested (hl)	est. seed (kg)	est. seedlings (000s)	value ($000s)
Pli	169	39	6,613	$ 318
Fdi	19	12	535	$ 45
Sx	0	0	-	$ -
Total	**189**	**51**	**7,147**	**$ 362**

The total projected cost for managing SelectSeed's 15 orchards and harvesting crops (excluding partner costs), including salaries, accounting and legal fees, and expenses), is estimated to be $655,500 this fiscal year. SelectSeed costs for supporting FGC (salaries, expenses, publications) is projected to be $160,700. SelectSeed will also provide $90,000 to the Ministry in support of a tree breeding succession position for a third year under a three-year agreement.

Forecast seed sales from the 2017 crop and banked crops will generate approximately $800,000 in income. Other income totaling $37,000 includes rental of the company's mechanical orchard pruner and a pesticide trial contract with the Ministry (under the Cone and Seed Pest Subprogram). The net income for SelectSeed is forecast to be -$79,200, which will be drawn from the company's cash reserves.

Table 6 SelectSeed Company Ltd. forecast expenditures and income

Category & Description	2017/18 Budget
EXPENDITURES	
Select Seed (Management and Operations)	$665,500
Forest Genetics Council	$160,700
Ministry Salary Support	$ 90,000
TOTAL EXPENDITURES	**$916,200**
INCOME	
Seed Sales	$800,000
Other	$ 37,000
TOTAL INCOME	**$837,000**
NET INCOME	**$ (79,200)**

The company is forecast to generate positive net incomes over the next decade. During the current fiscal year, the Board will present the company's revenue and expenditure estimates to FGC along with its recommendations for future investments.

4.5 Extension and Communication

The Extension and Communication Subprogram supports FGC goals and objectives by

- providing client-focused solutions and training to seed users and tree improvement specialists,
- developing and disseminating reports and information on FGC programs and activities.

There has been no standing Extension and Communications TAC for the past four years, and no specific budget has been allocated to this subprogram. No technical annual project reports have been produced during this period.

Many extension and communications initiatives have, however, been carried out under the auspices of other TACs and subprograms. Examples include ITAC's annual extension meeting held in Vernon during January, presentations at silviculture committee workshops and field trips, and tree improvement field trips and workshops. A review of FGC's extension and communication needs is planned for fiscal 2018/19.

4.6 Decision Support Subprogram

The Decision Support Subprogram supports FGC goals and objectives through the development of information management systems and tools, including improvements to the Seed Planning and Registry (SPAR) and SeedMap. These systems and tools are used by persons in government and the forest sector to assist with decision-making, policy development, seed-use planning and selection, timber supply analysis, monitoring, and reporting.

Over the past 3 years, emphasis has been placed on the development of a new climate-based seed transfer (CBST) system and tool in support of FGC's objective #2.

4.6.1 Planning

Decision Support projects are developed and guided by the Decision Support Technical Advisory Committee (DSTAC) comprised of Ministry, industry and academic representatives. DSTAC identifies projects and funding required to meet the needs of clients. Focus is currently on CBST.

4.6.2 Delivery and Partners

Most Subprogram activities are led by the Ministry's Forest Improvement and Research Management Branch in collaboration with Information Management Branch. External clients are also involved by providing advice and testing new tools and reports.

4.6.3 Activities and Budget

The Decision Support Subprogram budget for 2017/18 continues to be focused on developing a framework and tools for assessing a CBST framework. The CBST project includes developing a Geographic Information System (GIS) seedlot selection tool and deployment maps, engaging stakeholders and First Nations, and developing communication materials.

Table 7 Decision Support projects and budget

Project	Budget ($)
Climate Based Seed Transfer Project	$116,000

4.7 Cone and Seed Pest Management Subprogram

Cone and seed pests in seed orchards can cause significant damage and economic losses, and delay in meeting FGC objectives if they are not properly identified and controlled. The Cone and Seed Pest Management Subprogram supports activities to identify best pest control practices to reduce these losses and improve the health and productivity of orchard trees. These activities include operational research to understand pest biology, assess the efficacy of pesticides, and develop integrated pest management strategies.

4.7.1 Planning

The subprogram is guided by a Pest Management Technical Advisory Committee (PMTAC), with members consisting of seed orchard managers, the Canadian Forest Service, and universities. PMTAC identifies cone and seed pests of concern, and ranks potential projects based on current knowledge and gaps, potential losses and impact. The Ministry subsequently issues a call for proposals for specific pests and objectives in accordance with government's procurement policies and procedures.

Proposed projects must be conducted in a BC seed orchard and any pesticides must be used in accordance with federal and provincial regulations. Proposals submitted are reviewed and evaluated by PMTAC, which provides funding recommendations to FGC and the Ministry. PMTAC also recommends operating funds to support Ministry staff involved in cone and seed research and extension.

4.7.2 Delivery and Partners

Projects funded through this subprogram are delivered by seed orchard managers, entomologists and pathologists, and consultants. Interim and final project reports are submitted to PMTAC and the Ministry. Ministry cone and seed pest biologists also provide advice and information to seed orchard managers,

undertake operational trials, and liaise with the Canadian Pest Management Regulatory Agency and other organizations.

4.7.3 Activities and budget

The Pest Management subprogram budget for 2017/18 is $81,358 (Table 8). These funds were divided between several projects and Ministry operations.

Table 8 Cone and Seed Pest Management Subprogram projects and budget

Pests	Project Description	Allocations
European pine shoot moth - Rhyacionia bouliana	Determine the efficacy of Matador to control shoot moth in lodgepole pine orchards, and develop an operational management strategy for product and control timing.	$ 7,839
Needle rust - Lophodermella concolor	Project 1: Identify and test a successful fungicide product to control Lophodermella in lodgepole pine orchards	$ 9,025
Needle rust - Lophodermella concolor	Project 2: Reduce rate of fungal infections in orchard trees and develop an operational management strategy for monitoring, control timing and efficacy.	$ 22,300
Western conifer seed bug - Leptoglossus occidentalis	Compare and determine efficacy of Surround vs Matador, Delegate and/or Perm-up in lodgepole pine orchards to reduce seed losses attributed to Leptoglossus.	$ 28,555
Project subtotal		**$67,719**
FIRM - Ward Strong	Collaborative research and in-house projects.	$ 2,664
FIRM - Jim Corrigan	Cone and seed pest research, and extension	$ 20,000
FIRM subtotal		**$22,664**
TOTAL		**$90,383**

4.8 Genecology and Seed Transfer Subprogram

Genecology is the study of genetic differentiation among populations of a species and how this differentiation is patterned on environmental factors such as temperature, precipitation and latitude. Genecology studies are used to establish seed transfer standards, which restrict how far seed can be moved from its genetic source to a planting site. These standards help maintain forest health and productivity.

The purpose of the Genecology and Seed Transfer Subprogram is to identify and prioritize genecology and seed transfer projects that support FGC's resilience goal and its second objective for implementing a new climate-based seed transfer system by 2020.

4.8.1 Planning

The subprogram is guided by the Seed Transfer TAC (STTAC), with represents from the ministry, industry, and universities. Priorities for genecology and seed transfer activities are established in consideration of existing genecology and tree breeding trials and information gaps required to inform seed transfer policies and standards.

The STTAC reviews priorities and projects proposed by the ministry's forest genetics research scientists, and others. STTAC makes recommendations to the FGC regarding budgets, priorities, and delivery. The ministry directs approved funding internally and externally. If available funds are inadequate to cover the requested budget, adjustments are made internally by the ministry.

4.8.2 Delivery and Partners

The Ministry undertakes extensive genecology and seed transfer research. It has established and maintains numerous provenance trials consisting of 1000s of trees planted throughout Western North America. This work is undertaken with the assistance of forestry contractors identified and selected through a prequalified bidders process. Forest companies and BC Timber Sales, and others in neighboring jurisdictions (including Alberta, Yukon, Washington, Oregon and California) also provide logistical and in-kind support by identifying, preparing, maintaining, and, in some cases, measuring the field trials. Universities also pursues genecology studies, including genomics research supported by Genome Canada, Genome BC, and forest companies in addition to the ministry.

4.8.3 Activities and budget

The total budget allocated to the Genecology and Seed Transfer Subprogram for 2017/18 is $455,085. Ministry led activities include maintaining and measuring provenance field tests, including those established as part of the extensive Assisted Migration Adaptation Trial (AMAT).

LBIS funds in this subprogram also partially support *CoAdaptTree*, a large-scale applied genomics projects led by Dr. Sally Aitken, University of BC. This project investigates the genomics of climate adaptation in lodgepole pine, Douglas-fir, and western larch. These funds were used to leverage significant project funding from Genome Canada, GenomeBC, along with funds provided by several forest companies and others.

Table 9 Genecology and Seed Transfer projects and budget

Project	Description	Allocation
Genecology Projects (FIRM)	Provenance testing, maintenance, including AMAT	$ 413,235
Climate Modelling	Dr. Tongli Wang, UBC (0.5 FTE)	FES*
CoAdapTree (UBC)	Activites in support of this genomics project	$ 41,850
Total		**$ 455,085**

* Funding for climate modelling by Dr. Tongli Wang, in support of the Genetic Conservation and Genecology and Seed Transfer subprograms was funded this year by the Forest Enhancement Society of BC (FES).

4.9 Resources, Coordination, Monitoring and Reporting

Securing resources, coordinating activities, and monitoring and reporting progress enable FGC to achieve its primary objectives for conservation, resilience and value. The development of strategies, programs and business plans is also guided by a set of guiding principles that include the following:

- Foster a cooperative and collaborative approach amongst stakeholders, while respecting their independence.
- Respond proactively to environmental, social, economic and technological changes,
- Purse the best science to inform and guide policy,
- Employ best management practices and continually improve policy and practices, and
- Measure and manage performance.

4.9.1 Resources and Efficiency

Funding from a variety of sources is critical to support this long-term cooperative program. FGC's strategic plan and annual business plans assist with securing $2.5M annually from the ministry's Land Based Investment strategy, and other direct and in-kind support from other sources. New monies are difficult to obtain, so existing allocations must be used effectively and efficiently.

To this end, the FGC struck a streamlining subcommittee to review its governance and business planning process during 2017/18. The goals of this review are to

1. Reduce the number of committees, meetings and resources required to develop FGC's priorities and annual budget.
2. Improve synchronization with Ministry's annual budget planning cycle.
3. Establish a robust, accountable, and durable process and clarifies roles and responsibilities of the parties involved.
4. Maintain interest and opportunities for stakeholder involvement and collaboration.
5. Improve ability for FGC to achieve its goals and objectives

The subcommittee will prepare a report and recommendations for FGC. It is anticipated the results of this review will modify the FGC governance model and business planning process for next fiscal year.

4.9.2 Monitoring and Reporting

Progress towards FGC's primary objectives are monitored at the provincial level and reported in FGC's annual business plans. This includes graphs tracking select seed use and genetic gain over time.

Project proponents are also required to provide interim and final reports as part of the terms of their contract with the ministry. Activities are also periodically audited by the ministry, including site visits. Reports (presentations and written) are also reviewed by the applicable Technical Advisory Committees, in addition to the ministry's administrator and FGC Program Manager.

SelectSeed Company Ltd. also produces an annual report including its performance indicators, financial statements, and audit reports, for review and approval by its sole shareholder, FGC.

4.10 Budget Summary

The following table outlines the LBIS allocation of $2.5 million that support FGC's annual business plan and subprogram activities described above, for fiscal 2017/18.

Table 10 LBIS budget allocation to FGC subprograms for 2017/18

Subprogram		Allocation
Genetic Conservation	$	164,094
Tree Breeding	$	1,341,238
Operational Tree Improvement Program (OTIP)	$	333,201
Cone and Seed Pest Management	$	90,383
Genecology and Seed Transfer	$	455,085
Genetic Resource Decision Support	$	116,000
Total LBIS contribution	**$**	**2,500,000**

In addition to the above funds, SelectSeed will contribute $160,000 to FGC program support, and $90,000 to the ministry for a tree breeding position. The Forest Enhancement Society of BC will also contribute $150,000 for climate modelling work that directly supports conservation and climate-based seed transfer objectives.

Funds from the aforementioned, forest companies and others have also leveraged considerable funds from Genome Canada and Genome BC in support of several genomics projects that also contribute to FGC's objectives.

All considered, the total expenditures of the provincial forest genetics program – including LBIS, ministry and company salaries, seed orchard operations – is estimated to exceed $10 million per annum.

Appendix 1: Forest Genetics Council and Technical Advisory Committee Members

Forest Genetics Council of BC

Name	Representing	Affiliation
Patrick Martin	Co-chair - FLNRO	FIRM, FLNRO
Mark Tamas	Co-chair - Industry	Tolko Industries Ltd.
Annette van Niejenhuis	Coastal TAC (Chair)	Western Forest Products Inc.
Anthony Hopkin	Natural Resources Canada	Natural Resources Canada
Dan Peterson	Regional Operations-FLNRO	South Area, FLNRO
Domenico Iannidinardo	Coast seed producers	TimberWest Forest Corporation
Gernot Zemanek	Woodlot Licensees	Roserim Nurseries Ltd.
Jeff Mycock	Interior seed producers	West Fraser Timber Co. Ltd.
Jennifer Davis	LBIS - FLNRO (*ex officio*)	Resource Practices Branch, FLNRO
Joe LeBlanc	Coast seed users	International Forest Products Ltd.
Kori Vernier	Interior TAC (Chair)	Canfor Corporation
Mark Hay	BC Timber Sales - FLNRO	BC Timber Sales, FLNRO
Rob Guy	Universities	Faculty of Forestry, University of British Columbia
Scott King	Interior seed users	Louisiana Pacific Ltd.
Shane Ford	Research - FLNRO	FIRM, FLNRO

Coastal Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Annette van Niejenhuis (Chair)	Western Forest Products Inc.	Dr. Sally Aitken	University of BC
Bevin Wigmore	TimberWest Forests Corp.	Jimmy Hodgson	Island Timberlands LP
Charlie Cartwright	FIRM, FLNRO	Lauchlan Glen	BC Timber Sales Ltd.
Dave Kolotelo	FIRM, FLNRO	Nicholas Ukrainetz	FIRM, FLNRO
Dr. Alvin Yanchuk	FIRM, FLNRO	Stefan Zeglen	FLNRO
Dr. John Russell	FIRM, FLNRO	Stephen Joyce	FIRM, FLNRO
Dr. Michael Stoehr	FIRM, FLNRO		

Interior Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Kori Vernier (Chair)	Canfor Corporation	Hilary Graham	SelectSeed Co. Ltd.
Alan Rasmussen	BC Timber Sales Ltd.	Krista Copeland	Tolko Industries Ltd.
Barry Jaquish	FIRM, FLNRO	Lance Loggin	West Fraser Timber Co. Ltd.
Dan Gaudet	Vernon Seed Orchard Co.	Mike Brown	PRT Growing Services Ltd.
Dan Livingston	PRT Growing Services Ltd.	Nicholas Ukrainetz	FIRM, FLNRO
Dave Kolotelo	FIRM, FLNRO	Stephen Joyce	FIRM, FLNRO
Dr. Greg O'Neill	FIRM, FLNRO	Tia Wagner	Vernon Seed Orchard Co.
Gary Giampa	FIRM, FLNRO	Todd Schmidt	West Fraser Timber Co. Ltd.

Genetic Conservation Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Dr. Pia Smets (Chair)	University of BC	Dr. Jun-Jun Liu	Canadian Forest Service
Alan Vyse	Independent	Dr. Michael Murray	South Area, FLNRO
Charlie Cartwright	FIRM, FLNRO	Dr. Sally Aitken	University of BC
Dave Kolotelo	FIRM, FLNRO	Dr. Tongli Wang	University of BC
Dr. Alvin Yanchuk	FIRM, FLNRO	Dr. Tory Stevens	Ministry of Environment
Dr. Andreas Hamann	University of Alberta		

Pest Management Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Tia Wagner (Co-Chair)	Vernon Seed Orch. Co.	Dr. Ward Strong	FIRM, FLNRO
Corey Mathieson	TimberWest Forests Ltd.	Gary Giampa	FIRM, FLNRO
Dr. Jean Turgeon	Canadian Forest Service	Hilary Graham	Independent
Dr. Jenny Cory	Simon Fraser Univ.	Mike Brown	PRT Growing Services Ltd.

Seed Transfer Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Margot Spence (Chair)	FIRM, FLNRO	Lance Loggin	West Fraser Timber Co. Ltd
Annette van Niejenhuis	Western Forest Products Inc.	Leslie McAuley	FIRM, FLNRO
Dr. Greg O'Neill	FIRM, FLNRO	Nick Ukrainetz	FIRM, FLNRO
Dr. Sally Aitken	University of BC	Scott King	Louisiana Pacific Ltd.
Dr. Tongli Wang	University of BC		

Decision Support Advisory Committee

Name	Affiliation	Name	Affiliation
Margot Spence (Chair)	FIRM, FLNRO	Kori Vernier	Canfor Corp.
Cathy Cook	Western Forest Products Inc.	Susan Zedel	FIRM, FLNRO
Dan Gaudet	Vernon Seed Orchard Co.		

Abbreviations:
FIRM = Forest Improvement and Resource Management Branch
FLNRO = BC ministry of Forests, Lands, Natural Resource Operations, and Rural Development

Appendix 2: Seed Planning Units

Seed Planning Units (SPUs) are geographic areas used to develop strategies and plans, and organize breeding, seed production and seed planning. SPUs are unique to a trees species and include a seed planning zone and elevation range. For example, SPU #17 Pli BV Low is the SPU for interior lodgepole pine in the Bulkley Valley seed planning zone area at elevations below 1100 m.

ITAC/CTAC Species Committees determined the potential economic returns from establishing or advancing a tree improvement program for each SPU. This assessment includes costs associated with breeding (for volume or pest resistance) and seed orchards, current and forecast seed demand (based on seedlings planted), feasibility, and potential changes due to climate change. SPUs are subsequently ranked according to their return on investment and assigned a program category (1 to 4).

Program categories include: 1. Advanced-generation; 2. First-generation only; 3. genecology research only; and 4. No genetics program recommended.

The following table listed SPUs by number and program category. Species Plans for SPUs with program categories 1-3 are listed in Appendix 3 by species group.

Seed planning unit (SPU)				Program
#	Species	SPZ	Elev. band (m)	category
1	Fdc	M	1-900	1
2	Cw	M	1-700	1
3	Hw	M	1-600	2
4	Sx	NE	1000-1700	1
5	Sx	NE	1700-2100	2
6	Ss	M	1-500	2
7	Pli	NE	700-1600	1
8	Pw	M/SM	1-1000	1
9	Ba	M	1-1000	3
10	Pli	TO	700-1400	1
11	Yc	M	1-1100	2
12	Pli	PG	700-1400	1
13	Lw	NE	450-1600	1
14	Sx	PG	600-1400	1
15	Pw	KQ	500-1400	1
16	Pli	TO	1400-1600	2
17	Pli	BV	700-1400	1
18	Pli	CP	700-1300	1
19	Fdc	SM	200-1000	2
20	Pli	NE	1600-2000	2
21	Fdi	NE	400-1200	1
22	Fdi	NE	1000-1800	2
23	Sx/Ss	SM/NST	All	3
24	Hw	M	600-1100	2
25	Sx	EK	750-1900	2
26	Pli	PG	1400-2000	3
27	Cw	SM	200-1000	2

Seed planning unit (SPU)				Program
#	Species	SPZ	Elev. Band (m)	category
28	Sx	TO	1300-2100	2
29	Pli	EK	1500-2000	2
30	Sx	TO	700-1500	1
31	Fdc	M	900-1200	2
32	Pli	EK	800-1500	2
33	Cw	M	700-1500	2
34	Lw	EK	800-1700	1
35	Sx	BV	500-1400	2
36	Bg	M	1-700	3
37	Fdi	QL	700-1400	2
38	Hw	M north	1-600 (part of SPU 3)	2
39	Fdi	EK	700-1400	2
40L	Sx	PR low	250-650	2
40M	Sx	PR mid	650-1200	2
41	Fdi	PG	700-1200	2
42	Sx	PG	1200-1550	2
43	Fdi	CT	600-1400	2
44	Sx	NE	1-1000	1
45	Pli	BB/CHL	All	3
46	Bl	all int.	All	3
47	Bn	M	All	3
48	Broadleaves	Interior	-	3
49	Broadleaves	Coast	-	3
50	Lw	NE	1200-1800	2
51	Py	S. Interior	300-1000	2
52	Fdi	TO	600-1100	2
53	Fdi	TO	1100-1600	2
54	Alder	M	1-700	2

SPU spatial data (geodatabase format) for use in ArcGIS and other mapping software can be downloaded from: https://www.for.gov.bc.ca/ftp/HTI/external/!publish/AOU/ClassA/CLASS_A_by_SPU/

Appendix 3: Species Plans

Species plans follow for each commercial tree species or species group and seed planning unit (SPU) with active or planned breeding programs, seed orchards, genecology studies, and/or conservation activities (program categories 1-3).

Species plans includes breeding strategies (where applicable), seed orchard gain and production forecasts, seed use trends, seed in storage, genetic conservation status, and genecology/seed transfer projects.

These Species Plans were compiled by Jack Woods, SelectSeed Co., based on information provided by tree breeders, seed orchards managers, and seed use and inventory records in the ministry's Seed Planning and Registry system (SPAR) as of August 2017.

Note: SPUs and seed production and use projections in these Species Plans **DO NOT** necessarily correspond with **Climate-based seed transfer (CBST)** introduced by the Chief Forester in September 2017.

For more information regarding CBST go to:
https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/seed-planning-use/climate-based-seed-transfer

Check SPAR, the new CBST tool or consult with seed orchard managers (see Table 11) to confirm orchard status, select seed availability and area of use prior to collecting wild seed or purchasing seed.

Table 11 Seed Orchard Contacts

Acronym	Agency Name	Contact	Email
FLNRO	BC Ministry of Forests…	Stephen Joyce	Stephen.Joyce@gov.bc.ca
PRT	PRT Growing Services	Dan Livingston	Dan.Livingston@prt.com
SelectSeed	Select Seed Co. Ltd	Brian Barber	bbarber.fgc@shaw.ca
Tolko	Tolko Industries Ltd	Rod Massey	Rod.Massey@Tolko.com
TW	TimberWest Forest Corp.	Bevin Wigmore	wigmoreb@timberwest.com
VSOC	Vernon Seed Orchard Co.	Dan Gaudet	Dan@vsoc.ca
Vernon private	Coldstream Seed Orchards	Barry Kasdorf	kasdorffamily@gmail.com
WFP	Western Forest Products Inc.	Annette van Niejenhuis	AVanniejenhuis@westernforest.com
YPP	Yellow Point Propagation	Don Pigott	ypprop@shaw.ca

Species plans by SPU are also available online at:
http://www.fgcouncil.bc.ca/doc-04-speciesplans.html

SPU spatial data (geodatabase format) for use in ArcGIS and other mapping software can be downloaded from: https://www.for.gov.bc.ca/ftp/HTI/external/!publish/AOU/ClassA/CLASS_A_by_SPU/

Note: References to Tree Improvement Branch on the SPU maps should read Forest Improvement and Research Management Branch. Contact email: FORHTIP.SEEDHELP@gov.bc.ca