Forest Genetics Council of British Columbia

Business Plan 2018/2019

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Message from the FGC Co-Chairs

This is the 19th annual business plan of the Forest Genetics Council of BC (FGC). This document describes FGC's programs, activities and budget allocations for fiscal 2018/19. This business plan lays out a set of projects and activities designed to advance FGC's goals and objectives as described in its 2015-2020 Strategic Plan.

The tree improvement program continues to deliver significant benefits to British Columbians. Due to the coordinated efforts of a wide range of organizations across the sector, approximately 70% of the trees planted in BC are improved seedlings which have been bred, tested and selected to provide increased growth or pest resistance. We thank the many individuals working collaboratively to carefully manage the province's forest genetic resources and regenerate healthy, productive, and valuable forests for the future.

This year's plan is supported by a $2.5 million annual allocation from the Ministry's Land-Based Investment Strategy (LBIS). This contribution represents approximately 25% of the estimated $10 million that government, forest industry, and other agencies spend on forest genetics research and operations in British Columbia each year.

Projects and budget recommendations for the 2018/19 LBIS allocation were vetted through FGC's technical advisory committees (TACs). Following a review in 2017, the number of TACs was reduced to three (Genetic Conservation, Coastal and Interior) and business planning processes were streamlined. Shane Ford, Ministry, was appointed Genetic Conservation TAC (GCTAC) chair. We are grateful to Dr. Pia Smets, UBC, for leading GCTAC over the past several years. In June 2018, Mark Tamas stepped down as Industry Co-chair after a three-year term. The provincial Chief Forester appointed Domenico Iannidinardo, TimberWest, as the new Industry Co-Chair.

FGC and TAC members have played a key role in the development and implementation of Climate-Based Seed Transfer (CBST). CBST enables BC foresters to select and deploy seedlots that will help maintain forest health and productivity in a changing climate.

This year's business plan does not include updated Species Plans. CBST alters the deployment area of seed orchards and seedlots in storage. Also, future seed needs are expected to change significantly in response to recent wildfires and insect outbreaks, reductions in timber harvesting and shifts in reforestation practices. New CBST-based Species Plans are required. In the interim, the 2017/18 Species Plans, SPAR and CBST seedlot selection tool can be used for seed planning and to identify suitable seedlots for reforestation.

For decades, organizations in BC have worked together to deliver a coordinated forest genetics program. We thank the numerous people involved in advancing FGC's goals and contributing to its various programs. We would also like to thank forest companies for their support of staff time and other in-kind contributions, and Diane Nicholls, Provincial Chief Forester, Shane Berg, Deputy Chief Forester, and the Ministry's Land Base Investment Strategy (LBIS) program for their continued support of this collaborative program.

Original signed by

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Director, Forest Improvement and Research Management Branch,
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1. Introduction

Forest genetic resource management in BC is a collaborative effort between government, industry and academia. These activities have been coordinated through the Forest Genetics Council, established in 1998, and its predecessors including Coast and Interior Tree Improvement Councils and the Plus Tree Board for more than 60 years.

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. No genetic engineering is involved. Orchard managers sell their tree seed to persons with reforestation obligations and to government programs.

Forest genetics research is undertaken by the Ministry, Canadian Forest Service, universities and others to inform seed use standards, orchard and seed management practices, responses to climate-change and forest health challenges, and conservation activities. Forest companies provide logistical support for field trials, and provide input on research priorities, funding, and Ministry policies and standards via FGC.

Provincial regulations and standards require that all tree seed 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. They must also use seed in accordance with transfer standards prescribed by the Chief Forester. These Standards help the Province realize it's investments in tree improvement and to reduce the risk of seedlings being genetically-maladapted to the climate of their planting site.

Collectively, the above activities and policies serve to enhance the value, resilience and conservation of BC's forests. Although it is not possible to guarantee these desired outcomes in a dynamic natural environment, some can be estimated. For example, the use of select seed contributes over 50% of the Ministry's 2018/19 Service Plan target of 9 million cubic meters of additional timber volume expected in 65 years from incremental silviculture investments.

Reforesting stands with high quality genetically-selected stock is a good investment and contributes to sustainable forest management. As such, tree improvement is supported by governments and forest companies around the world, including by those here in British Columbia.

2. Forest Genetics Council of British Columbia

FGC is a multi-stakeholder advisory group appointed by the Provincial Chief Forester with 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 develops strategic and annual plans, and provides advice to the Ministry regarding policies, practices, and the allocation of funds to forest genetics research and operations. FGC is supported by three technical advisory committees (TACs) to develop program plans and budgets, to coordinate activities, and to engage a broad group of stakeholders in advancing forest gene resource management.

Additional information regarding FGC can be found at: www.fgcouncil.bc.ca

2.1 Vision, Objectives and Performance Measures

FGC's vision, goals, objectives and performance measures are described in its Strategic Plan 2015-2020. This plan guides the development of annual business plans and forest genetics activities.

FGC's vision statement 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 combination 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.

The above goals and performance measures are supported by two 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, annual report, and annual project report.

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

2.2 Governance and Business Planning

FGC and its activities are guided by provincial regulations, standards, and direction from the Provincial Chief Forester[3]. FGC's Bylaws describe its membership, roles and responsibilities, committees, meetings and plans. FGC business is also conducted in accordance with traditions, practices and the following Guiding Principles as described in its Strategic Plan 2015-2020.

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

[2] Genetic gain or genetic worth for volume (GVO) 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.

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

In October 2017, FGC adopted a streamlined governance structure and business planning process. The number of TACs were reduced, and FGC's programs, plans and budgets were aligned under FGC's goals and objectives (see Figure 1).

This new model also aligned FGC's budget planning cycle with that of the Ministry, and clarified roles and responsibilities, while maintaining stakeholder interest and engagement opportunities. This model is intended to allow FGC to better track progress towards its performance measures and reallocate resources between programs, as required.

Process	FGC Strategic Plan 2015-2020				
Goals	Conservation	Resilience	Value		
Objective # and Performance Measure	1. Adequately conserve genetic diversity of all tree species…	2. By 2020 selection and transfer of all tree seed guided by CBST	3. Increase select seed use to 75% of total sown by 2020	4. Increase avg. genetic gain of select seed to 20% by 2020.	5. Increase use of seed with genetic gain for pest resistance to 50% of select seed sown by 2035.
Programs	1. Conservation	2. Resilience	3. Tree Breeding 4. Operational Tree Improvement (OTIP)		
Plans	2017-2022 Conservation Strategy	Genecology 5- year plan including AMAT	1. Species Breeding Priority Ranking and Matrix 2. 5-year Breeding Plans by Species or Spp. groups 3. Species Plans – included in annual business plans (seed supply and demand; orchard production targets)		
Budget lines within Program (examples)	Conserv. Catalogue Ex situ collections Whitebark Pine Extension	Provenance trials by spp. (Coast/Interior) AMAT, CBST , CoAdapTree Ext. & Dec. Support	Progeny trials by spp. - Coast and Interior OTIP Projects – Coast and Interior Extension and Decision support		
Governance	**Forest Genetics Council of BC (FGC)**				
Technical Advisory Committees	Genetic Conservation (GCTAC)	Coastal and Interior TACs (CTAC & ITAC)			
Subcommittees		Species Committees – Coast and Interior OTIP Review Committee – Provincial			

Figure 1. FGC's New Business Planning and Governance Structure, adopted October 2017

FGC is now supported by three TACs: Genetic Conservation TAC (GCTAC), Coastal TAC (CTAC), and Interior TAC (ITAC). GCTAC develops conservation strategies, and identifies priorities and budgets for the Conservation Program, including *in situ* and *ex situ* activities. It reviews updates to the forest genetic conservation catalogue maintained by UBC's Centre for Forest Conservation Genetics.

CTAC and ITAC review and advise the Ministry on its proposed activities and budgets for tree breeding and resilience program activities, including progeny and provenance field testing. Several CTAC and ITAC members also contribute to the Operational Tree Improvement Program (OTIP), a call-for-proposal-based program that increases the quantity and quality of select seed used for Crownland reforestation.

The CTAC and ITAC chairs are appointed by the Chief Forester and serve on Council. FGC appoints the GTAC chair directly. TAC chairs are responsible for appointing TAC members and seeking balanced representation from relevant agencies. TAC members and their affiliations are listed in Appendix 1.

FGC may also establish *ad hoc* committees to address shorter-term needs and projects.

3. Funding and Support

Funding for FGC-coordinated activities is derived from several sources:

- Ministry allocations, including Base and Land Based Investment Strategy (LBIS) funds.
- Revenue derived the sale of seed from public and private seed 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, and other agencies.
- Research grants and contracts from government and non-profit organizations.

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

LBIS funds allocated to FIRM are used to support FGC's annual business plan. LBIS recognizes that FGC's program contributes to government's goals of increasing the 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 program 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 such as Vernon Seed Orchard Co., Tolko, Western Forest Products, TimberWest, and 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, required to establish a free growing stand under the Forest and Range Practices Act.

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, pelleting and stratification, are provided to clients on a fee-for-service basis.

Private companies 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 the Natural Sciences and Engineering Research Council of Canada (NSERC), Genome Canada, and Genome BC.

Examples of projects supported by Genome Canada and Geneome BC include *CoAdapTree: Healthy trees for future climates project* and *Cedar Durability and Resistance* (CeDAR) projects.

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 provided financial support to the Ministry for a tree breeder succession position under a multi-year agreement.

Administrative support is also provided by FIRM staff, who assist with meetings, preparing calls for proposals, and issuing and administering contracts.

4. Program Activities and Budgets

Activities and budgets for the 2018/19 fiscal year were identified through a comprehensive business planning process. In January 2018, the FGC Co-chairs requested TAC Chairs develop program activities and budgets to align with two funding scenarios: $2.5M and $2.7M, respectively.

Budget targets for these two scenarios were assigned to FGC's four programs: 1. Conservation; 2. Resilience, which includes genecology research and CBST; 3. Tree Breeding for volume and pest resistance; and 4. Operational Tree Improvement Program (OTIP), which includes Coast and Interior seed orchard projects, technical projects, and pest management trials. TAC Chairs were also asked to link program budgets to FGC's program goals.

TAC meetings occurred between January and March 2018, at which project proponents, including Ministry scientists, presented their proposed activities and budgets. The Ministry also issued the OTIP Call for Proposals. OTIP Proposals submitted were evaluated by a team consisting of Ministry staff and CTAC/ITACLBIS members.

Project summaries and budget recommendations for each program were compiled, reviewed and discussed by FGC on March 15, 2018. FGC subsequently passed a motion recommending to the Chief Forester that the Ministry allocate **$2.7M** of LBIS funds to support FGC's programs and recommended activities.

In its letter to the Provincial Chief Forester, FGC acknowledged the Ministry is solely responsible for allocating LBIS funds, including those used to fund FGC's programs and activities. The Ministry was also provided with information to guide internal financial decisions should the total LBIS funds allocated to tree improvement be less than the requested $2.7M.

The Ministry allocated **$2.5M** LBIS funds to Forest Improvement and Research Management Branch (FIRM) to support FGC's tree improvement program for 2018/19. This is the same amount allocated the previous four years. FIRM allocated this LBIS funding to gene resource management programs based on information provided by the various TACs (see Table 1). Funding may be shifted between programs during the fiscal year subject to project status and surpluses, and other needs/opportunities.

Table 1 FGC Program Budgets for 2017/18 and 2018/19

FGC Program	2017/18 Allocation	Budget Targets 2018/19		TAC Recommendations		FGC Recommends		FIRM Allocations April 2018
		Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2	
Genetic Conservation	$ 164,094	$ 200,000	$ 220,000	$ 199,994	$ 219,845	$ 199,994	$ 219,845	$ 193,994
Tree Breeding (Volume & Pests)	$ 1,341,238	$ 1,400,000	$ 1,500,000	$ 1,680,750	$ 1,680,750	$ 1,453,847	$ 1,610,338	$ 1,521,006
Resilience (e.g. CBST)	$ 571,085	$ 550,000	$ 580,000	$ 521,159	$ 521,159	$ 521,159	$ 521,159	$ 460,000
Operational Tree Improvement (OTIP)	$ 423,584	$ 350,000	$ 400,000	$ 314,892	$ 348,658	$ 325,000	$ 348,658	$ 325,000
Total	**$ 2,500,000**	**$ 2,500,000**	**$ 2,700,000**	**$ 2,716,795**	**$ 2,770,412**	**$ 2,500,000**	**$ 2,700,000**	**$ 2,500,000**

4.1 Genetic Conservation Program

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. Conservation activities include *in situ*, *ex situ,* and *intra situ* conservation, research, monitoring and reporting.

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 program activities are planned and coordinated through FGC's Genetic Conservation TAC (GCTAC). GCTAC's five-year strategic plan (2015-2020) supports FGC's conservation objective and guides annual project plans and priorities. 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), the Ministry and others.

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) updating the *in situ* conservation status catalogue of BC's native tree species; 2) conducting population genetic structure and genecology research; 3) maintaining ClimateBC and ClimateWNA; and 4) producing climate change forecasts.

The Ministry undertakes basic forest conservation genetics research, and maintains *ex situ* seed collections at the Provincial Tree Seed Centre and *intra situ* clone banks and field tests for many native tree species.

Whitebark pine (*Pinus albicaulis*), a species at risk, has been receiving special attention due to threats from blister-rust, mountain pine beetle and climate change, and circulation of the Federal government's proposed recovery strategy. Conservation activities for this species are being undertaken by the Ministry, CFCG and others including the Whitebark Pine Ecosystem Foundation of Canada.

4.1.3 Activities and Budget

The 2018/19 LBIS allocation to Genetic Conservation Program activities was **$193,995** (Table 2). The CFCG was allocated $52,595 for its conservation research and supporting activities, excluding funding for Dr. Tongli Wang in support of his work updating the genetic conservation catalogue (and climate-modelling used in support of CSBT). The Forest Enhancement Society of BC (FESBC) funded Dr. Wang the previous fiscal. The Ministry secured alternative funding for Dr. Wang this fiscal.

The balance of LBIS Conservation Program funds were directed to Ministry-led activities. This includes $25,000 for planting and maintaining whitebark pine field tests, and $5000 for identifying the locations of purportedly resistant parent trees.

Dr. Michael Murray, Pathologist, Ministry South Area, will receive $25,000 to continue inoculating and screening whitebark pine seedlings for rust resistance at the Kalamalka Forestry Centre in Vernon. Dr. Murray will also lead a study in collaboration with licensees and BCTS examining the retention of mature whitebark pine trees in cutblocks and to inform best-management practices for conserving this species during harvesting operations.

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. As 2018 is anticipated to be a good cone and seed year, additional wild stand collections will be undertaken where opportunities arise.

Table 2 Conservation Program LBIS Budget 2018/19

Center for Forest Conservation Genetics	**Allocation**
Genetic conservation catalogue update with climate change projections	Other Ministry
BEC units correspondence to adaptive variation - Mahony	$ 25,000
Genecology and population genetics of Garry oak - land rent	$ 1,676
Whitebark pine blister rust phenotypes - Reid	$ 14,000
Minor spp. projects - Juniperus	$ 500
Extension, office, lab, travel, website, and overhead	$ 18,419
CFCG Subtotal	**$ 59,595**
Ministry Forest Genetics Section	
Field screening of whitebark pine rust resistance	$ 25,000
Whitebark parent tree marking and stand rust hazard assessment	$ 5,000
Brush ex situ reserves at Cowichan (Oak and Yew)	$ 2,000
Collection of Rust Resistant Whitebark Pine Seed	$ 7,500
Subtotal	**$ 39,500**
Ministry South Area	
Identifying and promoting disease-resistance for Whitebark Pine	$ 25,000
Develop BMP for Healthy Cone-bearing Whitebark Pine in Harvest Units	$ 20,000
Subtotal	**$ 45,000**
Ministry Provincial Tree Seed Centre	
Seed Collections for ex situ conservation seed bank	$ 32,000
Seed Sample Testing of moisture content and Drying	$ 13,000
Subtotal	**$ 45,000**
Fall Meeting - Update Conservation Priorities and Whitebark Pine Strategy	$ 4,900
GCTAC TOTAL	**$ 193,995**

4.2 Tree Breeding and Resilience Programs

Tree breeding and resilience programs (and their budgets) were previously vetted through separate committees: ITAC & CTAC, and the Genecology & Seed Transfer TAC, respectively. This fiscal, based on the streamlining review recommendations, the proposed activities and budgets for these two programs were vetted through ITAC and CTAC. Furthermore, an attempt was made to divide the tree breeding budgets for volume and pest resistance (forest health), respectively.

For practical reasons, FIRM combined the Ministry's breeding (vol and forest health) and resilience budget by species. These two programs and their budgets have therefore been combined in this section.

The **Tree Breeding Program** supports FGC's objectives: 3) increasing the use of select seed; 4) increasing genetic gain for growth, and 5) increasing use of pest resistance seed. (OTIP also contributes to these three objectives.)

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 cuttings hedges to produce seedlots or cuttings lots for reforestation, respectively. The genetic worth of a seedlot is derived from the weighted mean of 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 being placed on breeding for pest resistance in response to FGC's new objective (#5). In 2018/19, new breeding value codes will be assigned for specific traits.

The **Resilience Program** supports FGC's second objective for implementing a new climate-based seed transfer (CBST) system by 2020. Activities in this program include genecology and provenance trials, genomics studies, and the development of CBST decision-support tools.

Genecology is the study of genetic differentiation among populations of a species as it relates to patterned environmental factors such as temperature, precipitation and latitude. BC uses genecology studies to establish seed transfer standards, which restrict how far seed can be moved from its climatic and ecological source (as opposed to geographic source) to a planting site. New CBST standards, based on biogeoclimatic zone variants, will help maintain forest health and productivity in a changing climate.

4.2.1 Planning

Tree breeding and genecology priorities have been established for each commercial species and seed planning unit (SPU). Tree breeding priorities are based on an investment model that considered the number of seedlings planted, potential timber supply benefits, and breeding program costs and feasibility. This investment priority matrix was last updated in 2012 and included climate change criteria. Each SPU was assigned an investment program category (1 to 3) and ranked (see Appendix 2). Genecology studies and investments are also guided by a 10-year plan, whose criteria also includes seedlings planted by SPU.

Ministry tree breeders and others present their proposed activities for the coming fiscal year to ITAC and CTAC members. Priorities and budgets are identified for coastal and interior species, respectively. Provincial projects are reviewed by both TACs. TAC members provide feedback, confirm alignment with program 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, based, in part, on feedback received from the TACs.

4.2.2 Delivery and Partners

The Ministry leads all tree breeding and genecology activities within the Province. The Ministry maintains numerous progeny and provenance field trials consisting of 1000s of trees throughout Western North America.

The Ministry's field work is supported by licensees and BC Timber Sales, seed orchards and contractors, and others (including those in neighboring jurisdictions), who assist with seed collections, and establishing, maintaining, and measuring field trials.

The Ministry also leads the development and implementation of tree seed regulations and standards, including CBST. Proposed changes are vetted through FGC and its TACs, as well as stand-alone advisory committees established by the Ministry.

Ministry staff work with staff at Universities, Natural Resources Canada, FP Innovations, Genome Canada and Genome BC to advance scientific knowledge and applications, including the use of genomic tools for selecting parent trees for specific traits.

4.2.3 Activities and Budget

The combined LBIS budget for the Tree Breeding and Resilience Programs is **$1,981,006.** The budgets for breeding projects (for volume and pest resistance) is $1,521,006, and resilience projects is $460,000, respectively.

Ministry tree breeding activities on the Coast and in the Interior this fiscal include site preparation, establishment, maintenance and measurements of progeny field tests; breeding including pollen collection and controlled-crosses; seedling production; pest-resistance trials (insects and disease); and maintenance of clone banks and breeding arboretums. Wood quality traits, such as wood density in Douglas-fir and heartwood rot resistance in western redcedar, are also to be assessed. An overview of these tree breeding programs can be found on the Ministry's Forest Genetics website.

Ministry-led Resilience program activities include maintenance (e.g. staking, brushing, maintaining access), measurements and climate data collection at provenance field tests, including the extensive Spruce (Sx) and Assisted Migration Adaptation Trial (AMAT).

The Ministry's CBST project activities consist of planning and reporting, development of GIS tools, revisions to SPAR and RESULTS, and extension. The CBST budget does not include climate modelling analysis conducted by Dr. Tongli Wang, UBC, which supports the CBST project. Funding for Dr. Wang's climate modelling and conservation work is provided separately through the Ministry. The new CBST standards were formally introduced by the Chief Forester on April 1, 2018.

LBIS funds in this subprogram also partially support *CoAdaptTree*, a large-scale applied genomics project co-led by Drs. Sally Aitken, Sam Yeaman and Richard Hamelin. This project, now in its 3rd year, investigates the genomics of climate adaptation in lodgepole pine, Douglas-fir, and western larch. Majority of funding for this project is provided by Genome Canada and Genome BC. Financial support provided by VSOC, TimberWest and Western Forest Products meets end-user requirements for external funding.

Table 3 below outlines the LBIS budget recommendations and allocations for the Tree Breeding and Reslience Programs by area, species and/or project. Not included are the aforementioned 'leveraged' funds, other direct and in-kind contributions, nor Ministry salaries. Most Ministry salaries and some research station costs are funded through the Ministry base-fund allocations. SelectSeed also supports one tree breeding position through an MoU with the Ministry.

Tree breeding and genecology activities are subject to biological processes and environmental conditions. Weather conditions may affect flowering success for breeding. Site access can also be compromised. Some planned field activities may be deferred for a year. In these cases, funding is directed to other activities at the discretion of the Ministry.

Table 3 Tree Breeding and Resilience Program Budgets by Area and Species 2018/19.

Area and Species	Budgets Recommended by TACs				FIRM Allocations (April 2018)
	Tree Breeding		Resilience (CBST)	Total by Spp or Project	
	Forest Health	Value			
Interior					
Hybrid Spruce	$ 35,000	$ 164,000	$ -	$ 199,000	$ 176,382
Western Larch	$ -	$ 233,000	$ -	$ 233,000	$ 206,518
Douglas-fir (interior)	$ 20,000	$ 137,000	$ -	$ 157,000	$ 139,156
White Pine (interior)	$ 47,000	$ -	$ -	$ 47,000	$ 41,658
Lodgepole Pine	$ 195,000	$ 105,000	$ -	$ 300,000	$ 265,902
Pest Lab Support (Strong)	$ 5,750	$ -		$ 5,750	$ 5,096
Interior subtotals	**$ 302,750**	**$ 639,000**	**$ -**	**$ 941,750**	**$ 834,712**
Coast					
Western redcedar	$ 64,000	$ 260,000	$ 70,000	$ 394,000	$ 349,219
Douglas-fir (coast)	$ 50,000	$ 98,000		$ 148,000	$ 131,179
White pine (coast)	$ 55,000			$ 55,000	$ 48,749
Hemlock		$ 44,000	$ 22,000	$ 66,000	$ 58,499
Yellow cedar		$ 18,000	$ 25,000	$ 43,000	$ 38,113
Sitka spruce	$ 55,000			$ 55,000	$ 48,749
Hardwoods		$ 35,000	$ 35,000	$ 70,000	$ 62,044
Abies spp.			$ 54,000	$ 54,000	$ 47,862
Forest Health Assessments	$ 60,000			$ 60,000	$ 53,180
Coast Subtotal	$ 284,000	$ 455,000	$ 206,000	**$ 945,000**	**$ 837,593**
Provincial					
AMAT/Spruce (genecology)		$ -	$ 144,800	$ 144,800	$ 128,342
CoAdaptree			$ 50,359	$ 50,359	$ 50,359
CBST Project	$ -	$ -	$ 120,000	$ 120,000	$ 80,000
Provincial subtotal			**$ 315,159**	**$ 315,159**	**$ 258,701**
FIRM Reserve					$ 50,000
Grand Total	**$ 586,750**	**$ 1,094,000**	**$ 521,159**	**$ 2,201,909**	**$ 1,981,006**

4.3 Operational Tree Improvement Program (OTIP)

The OTIP supports projects undertaken in seed orchards operated by the Ministry and private companies. It also supports technical projects aimed at improving orchard management practices and addressing impediments to delivering genetic gain to the field (e.g. insects and diseases).

Seed orchards are operated on a cost-recovery basis, with seed sales revenues used to cover annual maintenance and production costs. Upgrading orchards to increase the genetic gain can reduce seed production and revenues in the short-term. The Operational Tree Improvement Program (OTIP) therefore provides financial support to offset costs associated with orchard projects to increase the quality and quantity of seed produced, and to advance FGC's objectives for select seed use and genetic gain.

In accordance with the streamlining review recommendations, the Coastal and Interior OTIP and the Pest Management Subprogram – and their respective calls for proposals and review processes - were combined in fiscal 2018/19. The total LBIS allocation for all OTIP activities in 2018/19 is **$325,000.**

4.3.1 Planning

OTIP activities are identified through a comprehensive planning process led by the Ministry and supported by the Interior and Coastal TACs. 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. Proponents are responsible for demonstrating how their project supports the objectives of the call. This includes identifying gaps in seed supply and opportunities to increase genetic gain for a SPU. Proponents are also responsible to calculate reasonable costs associate with their proposed activities and key performance indicators (KPIs). Technical projects may be undertaken by persons without orchards if the project is supported by an orchard manager.

In the fall of each year, the Ministry invites OTIP applications through an annual Call for Proposals. Documents and prescribed templates are posted on the Ministry's OTIP website. Proposals submitted are reviewed by a committee consisting of Ministry staff and Coastal and Interior TAC members. The committee evaluates proposals against FGC's objectives, SPU priorities, and (based on their technical merit) the proposal's impact, value, and cost. Projects may be recommended at requested or reduced budgets.

The TAC Chairs, supported by the Ministry OTIP lead, presented a summary of the OTIP proposals and their budget allocation recommendations 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

FGC co-chairs established two budget targets for OTIP of $350,000 and $400,000 in consideration of the previous year's total allocation of $423,584 to OTIP and the Pest Management subprogram.

The OTIP review committee evaluated all orchard and technical proposals and supported all but two of them for funding. Recommended funding for projects was adjusted in some cases for consistency between projects and proponents. The committee also deferred questions regarding the eligibility for some Interior orchard grafting projects to FGC and the Ministry for decision.

The OTIP project requests and allocations by area are identified in Table 4, and by proponent in Table 5.

Table 4 Operational Tree Improvement Program (OTIP) Projects and Allocations by Area

Area	Total Approved 2017/18	Proposals Received	Total Requested	Projects Recommended	Recommended Option 'A'	Recommended Option 'B'	FIRM Allocations (April 20 2018)
Coast	$ 116,049	8	$ 52,514	8	$ 45,345	$ 45,345	$ 45,345
Interior	$ 217,152	36	$ 287,081	35	$ 244,877	$ 211,111	$ 221,219
Technical*	$ 90,383	6	$ 61,536	5	$ 58,436	$ 58,436	$ 58,436
Total	$ 423,584	50	$ 401,131	48	$ 348,658	$ 314,892	$ 325,000

*Technical projects in 2017/18 were funded through the Pest Management subprogram.

Table 5 Operational Tree Improvement Program (OTIP) Allocations by Proponent

OTIP Proponent	FIRM Allocations (April 2018)
Coastal Orchards	
Ministry - Sannich	$ 16,838
TimberWest	$ 5,112
Western Forest Products	$ 23,395
Coastal Subtotal	**$ 45,345**
Interior Orchards	
Ministry - Kalamalka	$ 8,821
Ministry - Bailey	$ 32,782
PRT Armstrong	$ 32,122
Ministry - Skimikin	$ 18,929
Hansinger - Kettle Valley	$ 7,888
Vernon Seed Orchard Co	$ 83,674
Tolko - Armstrong	$ 25,312
Sorrento Nursery	$ 11,691
Interior Subtotal	**$ 221,219**
Technical Projects	
Pine shoot moth pesticide trial (Lanthier)	$ 5,181
Sequio Pitch Moth (Lanthier)	$ 6,825
Ministry - Kal. pest labs supplies etc.	$ 20,000
Fdc seedling pathogens (Noshad)	$ 22,181
Movento pesticide trials (Giampa)	$ 4,249
Technical Subtotal	**$ 58,436**
OTIP Grand Total	**$ 325,000**

4.4 SelectSeed Co. Ltd.

Select Seed Company Ltd. (SelectSeed) was established 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. See relationship diagram in Figure 2 below.

SelectSeed was provided start-up capital funding from Forest Renewal BC and later by 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 been financially self-sufficient by generating a positive net income or by drawing on its cash reserves.

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.

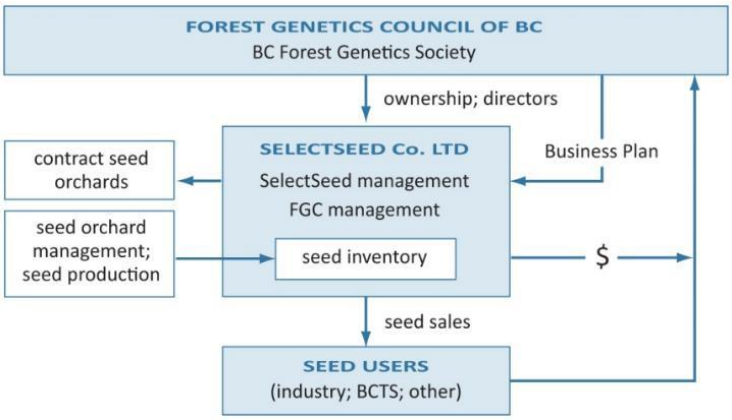

Figure 2 SelectSeed's ownership, relationships and activities

4.4.1 Planning

The CEO prepares the company's annual business plan, which includes forecast seed production, expenditures and revenues, for the Board's and FGC's approvals in March of each calendar year for the subsequent fiscal year. Annual reports and the company's audited financial statements are also reviewed by the Board and FGC at company's annual general meeting held in June.

Any new investments in seed 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 (VSOC). 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 on a first-come, first served basis to the Ministry (BC Timber Sales, Forests for Tomorrow) and licensees at prices set periodically by the Board of Directors.

4.4.3 Activities and Budget

In April 2018, SelectSeed and VSOC agreed to terminate its management agreements for two lodgepole pine (Pli) seed orchards, Bulkley Valley #234 and Prince George #236, as the orchards were not producing near their expected targets. New Pli orchards located in a more favorable climates are required to replace this lost capacity.

VSOC, the Ministry, and SelectSeed are interested in establishing new Pli orchards to fill the significant gap between seed demand and supply in the northern SPUs. SelectSeed will prepare a Pli seed orchard business case for FGC's consideration this fiscal. The allocation of Pli scion/grafts will be informed by FGC recommendations, and Ministry decisions regarding new CBST Pli breeding zones and parent tree selections.

SelectSeed's 2018 cone crop is forecast to be moderate, with potential for higher yields of Douglas-fir (Fdi) and Spruce (Sx). Table 6 shows the 2017 actuals and 2018 forecast cone crop estimated in the spring 2018. The amounts shown represent SelectSeed's share of the cone crops.

Table 6. SelectSeed Seed Production by Species - 2017 Actuals and 2018 Forecasts.

Spp	2017 Actuals			2018 Forecast Prod.		
	cones (hl)	seed (kg)	value ($000s)	cones (hl)	seed (kg)	value ($000s)
Pli	169	28	$ 234	101	23	$ 188
Fdi	19	5	$ 20	100	58	$ 222
Sx	0	0	$ -	52	30	$ 134
Total	**189**	**33**	**$ 253**	**253**	**111**	**$ 544**

Table 7 below summarizes the company's estimated expenditures and income for the previous and current fiscal years.

Table 7 SelectSeed Co. Ltd. Forecast Expenditures and Income for 2017/18 and 2018/19

Category & Description	2017/18 Budget	2017/18 Estimates	2018/19 Budget
EXPENDITURES			
Select Seed	$ 665,500	$ 588,736	$ 634,900
Forest Genetics Council	160,700	187,326	143,900
Multi-year agreement	90,000	91,399	95,000
TOTAL EXPENDITURES	**$ 916,200**	**$ 867,461**	**$ 873,800**
INCOME			
Seed Sales	800,000	944,440	500,000
Other	$ 37,000	$ 42,700	$ 15,000
TOTAL INCOME	**$ 837,000**	**$ 987,140**	**$ 515,000**
NET INCOME	**$ (79,200)**	**$ 119,679**	**$ (358,800)**

A net income loss of $358,800 is forecast for 2018/19. Seed sales are forecast to generate approximately $500,000 in income, as seed inventory carried forward from the previous fiscal year was limited. Other income totaling $15,000 includes rental of the company's mechanical orchard pruner.

The company's total projected cost for SelectSeed's operations is estimated to be $634,900. These costs include orchard management expenses associated with the company's 13 partnership orchards, company salaries & fees, travel expenses, accounting and legal fees. SelectSeed's expenditures in support of FGC, which include half the CEO's salary, meeting expenses, publications, and professional fees are projected to be $143,900, similar to the previous year. SelectSeed will also continue to provide up to $95,000 to the Ministry in support of a tree breeding succession position under second three-year agreement.

If the 2018 seed crop is larger than forecast, Select Seed's expenditures (e.g. crop management & harvest costs), and seed sales income will be higher than budgeted. Seed not sold for sowing in 2019 will remain in inventory and be available for sales and sowing in 2020.

The company retains over $2M in cash reserves and 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 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.

4.5.1 Resources and Efficiency

Funding from a variety of sources is critical to support this long-term cooperative program. FGC's strategic plan, annual business planning processes and plans assist with securing $2.5M annually from the Ministry's Land Based Investment Strategy (LBIS).

FGC reports and activities also assist with securing direct and in-kind support from other funding sources. Fiscal pressures remain, and new monies are difficult to obtain, so existing allocations must be used effectively and efficiently.

4.5.2 Monitoring and Reporting

Progress towards FGC's primary objectives and performance measures (see Section 2.1) are monitored at the provincial level and reported in FGC's annual report. This includes graphs tracking select seed use and genetic gain over time.

Project proponents are required to provide interim and final reports as part of the terms of their contract with the Ministry. Funded activities are periodically audited by the Ministry, including site visits. Reports (presentations and written) are 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 and audited financial statements for review and approval by its sole shareholder, FGC.

Collectively, this monitoring and reporting serve to demonstrate the value of public investments in forest genetics activities and provides for openness, transparency and accountability.

4.6 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 2018/19.

Table 8 LBIS Budget Allocations to FGC Programs - 2018/19

Program	Allocation
Genetic Conservation	$ 193,994
Tree Breeding (Vol & Pests)	$ 1,521,006
Resilience (e.g. CBST)	$ 460,000
Operational Tree Improvement (OTIP)	$ 325,000
Total LBIS contribution	**$ 2,500,000**

Appendix 1: FGC Members and Seed Orchard Contacts

The following tables reflects FGC and Technical Advisory Committee memberships on **April 1, 2018**. FGC's current members are listed on the FGC Contacts website: http://www.fgcouncil.bc.ca/con.html

Forest Genetics Council of BC (FGC)

Name	Representing	Affiliation
Patrick Martin	Co-chair – FLNRORD	FIRM, FLNRORD
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, FLNRORD
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.
Joe LeBlanc	Coast seed users	International Forest Products Ltd.
Kori Vernier	Interior TAC (Chair)	Canfor Corporation
Mark Hay	BC Timber Sales	BC Timber Sales, FLNRORD
Rob Guy	Universities	Faculty of Forestry, University of British Columbia
Scott King	Interior seed users	Louisiana Pacific Ltd.
Shane Ford	Research – FLNRORD	FIRM, FLNRORD

* In June 2018, Mark Tamas stepped down as Industry co-chair, and Domenico Iannidinardo was appointed to this position by Diane Nicholls, Provincial Chief Forester.

Coastal Technical Advisory Committee (CTAC)

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

Interior Technical Advisory Committee (ITAC)

Members	Affiliation	Members	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, FLNRORD	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, FLNRORD
Dave Kolotelo	FIRM, FLNRORD	Richard Reich	College of New Caledonia
Dr. Greg O'Neill	FIRM, FLNRORD	Stephen Joyce	FIRM, FLNRORD
Gary Giampa	FIRM, FLNRORD	Todd Schmidt	West Fraser Timber Co. Ltd.
Katherine Spencer	FIRM, FLNRORD	Tia Wagner	Vernon Seed Orchard Co.

Genetic Conservation Technical Advisory Committee (GCTAC)

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

BC Seed Orchards and Contacts

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

Abbreviations:

FIRM Forest Improvement and Resource Management Branch
FLNRORD BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development

Appendix 2: Seed Planning Units

Seed Planning Units (SPUs) have historically been used to develop breeding and seed orchard strategies for BC's commercial tree species. SPUs are unique to a species and consist of an area (zone) and elevation range. For example, SPU #17 Pli BV Low is the SPU for interior lodgepole pine in the Bulkley Valley area at elevations below 1100 m.

ITAC/CTAC Species Committees identify and rank potential economic benefits from establishing or advancing a tree improvement program for each SPU. The criteria used for analysis 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.

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. Refer to the FGC's Species Plans for further information about breeding, orchards and seed use in SPUs with program categories 1-3.

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 and Seed Transfer

Species Plans for each commercially important tree species and seed planning unit (SPU) (see Appendix 3) were last updated November 2017 and are available online at:
http://www.fgcouncil.bc.ca/doc-04-speciesplans.html

Species plans include information about breeding activities and seed orchards for each SPU. They include the status of each orchard producing for the SPU and their associated genetic gain and production forecasts. The plans also include historical seedling needs and forecasts, sowing factors, seed inventory in storage, and the species' genetic conservation status.

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

Seed inventories change frequently with addition of new cone crops and withdrawals for sowing requests. SPUs – and their associated orchards and seed supply and demand forecasts - do not align with new Climate-based seed transfer standards (CBST) introduced by the Provincial Chief Forester on April 1, 2018.

During a two-year transition period, persons can select and use tree seed in accordance with the geographic-based seed transfer standards (and their SPUs) or the new CBST standards.

Seed users should obtain training on CBST, and check SPAR the new CBST tool for seed suitability for operating areas. Users are also encouraged to consult seed orchard managers (see Appendix 1) to confirm orchard status, seed availability and CBST deployment area of use prior to collecting wild seed or purchasing seed.

Species plans will be updated to reflect CBST the following year based on analysis of seed supply and supply implications and following consultations with seed producers and users.

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

Contact email for SPAR, CSBT and spatial data: FORHTIP.SEEDHELP@gov.bc.ca

***Note:** References to Tree Improvement Branch on SPU maps should now read Forest Improvement and Research Management Branch.