



# **Forest Genetics Council of BC Business Plan 2016 / 17**

Budgets list only funds provided by the  
provincial Land-Base Investment Strategy  
Tree Improvement Program

**Budgets approved  
by the Forest Genetics Council of BC on  
March 10, 2016**

Compiled and edited by

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FGC Program Manager

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## Message from the FGC Co-Chairs

We are pleased to present the Forest Genetics Council of BC's (FGC) 16th consecutive annual business plan. This plan is based on input from FGC's several advisory committees, approved by the FGC, and accepted by the Provincial Chief Forester.

This Business Plan sets out priorities and actions to enhance the conservation, resilience, and value of BC's forest genetic resources. FGC's select-seed-use targets, and its new performance measure for forest health, also contribute to the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) Service Plan goals for timber production.

Activities and budgets are grouped into subprograms, including select-seed production, tree breeding, genecology, genetic conservation, cone and seed pest management, decision support, and extension. This year's budget optimally balances expenditures across subprograms to achieve FGC's strategic objectives for the period 2015-2020.

Funding is provided by the Ministry's Land Base Investment Strategy (LBIS), SelectSeed Ltd., forest companies, the Canadian Forest Service, and universities. The LBIS allocation to forest genetics activities in 2016/17 is \$2.5 million, unchanged from the previous two years. FGC-owned SelectSeed Ltd. will contribute over \$240,000 to FGC program management, meetings, publications, species-plan development, consulting, and associated research. These funds from SelectSeed Ltd. will also support a Research Scientist (tree breeder) position in the MFLNRO Tree Improvement Branch (TIB).

A substantial budget shortfall was identified by Council and its technical committees. This shortfall was distributed across all program areas. Forest genetics research (field-trial establishment, maintenance, and measurement) in the TIB accounts for a large percentage of the total budget and has absorbed a disproportionate share of the budget shortfall. It is anticipated that this shortfall can be partially offset with unused funds from other subprograms.

This budget continues FGC's focus on developing the scientific information and the decision support tools needed for climate-based seed transfer. It is anticipated that adjustments to seed-use policies will result in changes to seed supply and demand, and private and public seed-orchard capacity. Restructuring of orchards will also be required to incorporate trees selected for pest resistance. Upcoming retirements will also spur changes. It is noteworthy that recruitment for a new FGC Program Manager/SelectSeed Ltd. CEO will commence this fiscal year.

We would like to thank all the people and organizations who contributed to this plan, and also those who contribute to the provincial forest genetics conservation and management program. We would also like to thank our partners and stakeholders in government, industry and academia for their support.

Mark Tamas, RPF  
FGC Co-chair  
Tolko Ltd.  
Resource Operations

Brian Barber, RPF  
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Ministry of Forests Lands and Natural

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## Table of Contents

<b>1.0</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Forest Genetics Council of BC.....	1
1.2	A Co-operative Effort.....	2
1.3	Land-Base Investment Strategy Tree Improvement Program .....	2
<b>2.0</b>	<b>Process for Business Plan Development.....</b>	<b>3</b>
2.1	The Role of Council and its TACs .....	3
<b>3.0</b>	<b>Subprogram Planning and Management.....</b>	<b>5</b>
3.1	Genetic Conservation Subprogram.....	5
3.2	Tree Breeding Subprogram.....	6
3.3	Operational Tree Improvement Program (OTIP) .....	8
3.4	Expansion of Orchard Seed Supply Subprogram (SelectSeed Co. Ltd.) .....	9
3.5	Extension and Communication .....	11
3.6	Decision Support Subprogram .....	11
3.7	Cone and Seed Pest Management Subprogram .....	12
3.8	Genecology and Seed Transfer Subprogram.....	13
3.9	Applied Tree Improvement and Biotechnology .....	14
3.10	Administration .....	15
3.11	Budget Summary .....	16
<b>4.0</b>	<b>Funding and Administrative Mechanisms .....</b>	<b>17</b>
4.1	Funding Agreements.....	17
4.2	Monitoring and Reporting.....	18
<b>Appendix 1:</b>	<b>Seed Planning Units and Categories.....</b>	<b>19</b>
<b>Appendix 2:</b>	<b>Forest Genetics Council and Technical Advisory Committee Members.....</b>	<b>20</b>
<b>Appendix 3:</b>	<b>Species Plans .....</b>	<b>22</b>

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## List of Figures

Figure 1	Relationship between the FGC Strategic Plan, Land Base Investment Strategy Tree Improvement Program, and business plan development through FGC subprograms. ....	3
Figure 2	Link between FGC objectives, planning processes, and the subprograms of the FGC Business Plan. ....	4
Figure 3	Organizational relationships among SelectSeed, Land Base Investment Strategy, Forest Genetics Council, and the B.C. Forest Genetics Society.....	9
Figure 4	Administrative mechanisms for the delivery of the LBIS Tree Improvement Program funding. ....	17

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## List of Tables

Table 1	Conservation subprogram budget for 2016/17. ....	6
Table 2	Breeding subprogram budget for 2016/17 by species and by coast / interior. ....	7
Table 3	Operational Tree Improvement Subprogram (OTIP) budget requested and approved for the coast and interior areas. ....	8
Table 4	SelectSeed Company Ltd. 2016/17 forecast income and expenses by category. ....	10
Table 5	Decision Support projects and budget for 2016/17.....	11
Table 6	Cone and Seed Pest Management Subprogram projects for 2016/17. ....	13
Table 7	Genecology and Seed Transfer projects. ....	14
Table 8	2016/17 budget summary for LBIS Tree Improvement Program contributions to subprograms. ....	16
Table 9	List of reports, responsibilities, distribution, and preparation dates for LBIS-supported projects. ....	18

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## 1.0 Introduction

This section overviews the relationship between the multi-stakeholder Forest Genetics Council and its co-operators in the planning and implementation of forest genetic resource management activities in British Columbia, and for the management and allocation of funds under the Land Base Investment Strategy (LBIS) Tree Improvement Program.

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### 1.1 Forest Genetics Council of BC

The Forest Genetics Council of BC (FGC) is a multi-stakeholder group representing the forest industry, Ministry of Forests Lands and Natural Resource Operations (MFLNRO), universities and the Canadian Forest Service. Council's mandate is to lead a provincial forest genetic resource management (GRM) and tree improvement program that encompasses the conservation, controlled use, and value-enhancement of the genetic resources of forest tree species, and to advise the Provincial Chief Forester on forest genetic resource management policies and budgets.

The FGC reports to the Provincial Chief Forester, and provides a forum for stakeholder representatives to set objectives and to oversee the development and delivery of a cooperative Business Plan to fulfill these objectives. The vision statement and objectives set out in the FGC Strategic Plan for the period 2015 to 2020, are:

**Vision statement:**

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

Objectives and performance measures:

1. The genetic diversity of all indigenous tree species is adequately maintained to support their continued evolution while providing environmental services and social and economic values.
2. Trees are well adapted to the climate of areas in which they are planted, contain adequate genetic diversity, and form part of diverse forest ecosystems across the landscape.
3. Sufficient seed of high genetic value is produced in provincial seed orchards to meet select-seed-use objectives of 75 percent of the provincial total sown by 2020.
4. Provincial tree breeding and orchard programs provide selected trees with sufficient genetic gain and diversity to improve the average volume-growth potential of select seed used for Crown land reforestation to 20% by the year 2020.
5. Provincial tree breeding and orchard programs provide sufficient seed with genetically-based pest resistance to address forest health issues and to supply 50% of select seed sown provincially by 2035.
6. Secure resources and coordinate stakeholder activities to efficiently meet Business Plan priorities.
7. Monitor and report progress for genetic resource management activities.

This Business Plan defines the annual set of activities and budgets needed to achieve these objectives.

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## 1.2 A Co-operative Effort

Forest genetic resource management in BC is a co-operative effort. The MFLNRO leads tree breeding activities, while both private industry and the MFLNRO manage seed orchards for the operational production of select seed. Genecology research is undertaken by the MFLNRO and universities in support of seed transfer policy, climate-change response, and genetic conservation. Industry provides logistical support for field trials and input on the development of priorities. Universities contribute through research in genetic conservation, genomics, climate modeling, and other aspects of GRM. Policy development for Crown lands is the responsibility of the MFLNRO, with advice provided to the Provincial Chief Forester through the FGC.

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## 1.3 Land-Base Investment Strategy Tree Improvement Program

The Land-Base Investment Strategy (LBIS) encourages investments in the forest resource that maximize productivity and value while supporting forest resilience. The Tree Improvement Program supports specific implementation priorities related to timber supply, pest resistance, and adaptation to climate change.

FGC objectives align with MFLNRO and LBIS objectives for the enhancement of provincial timber supply and forest stewardship, and are set out in the FGC Strategic Plan for 2015 to 2020. The MFLNRO administers funding through the subprogram areas identified in the FGC Strategic and Business Plans (Figure 1).

Business planning carried out through the existing FGC-led process, includes Technical Advisory Committees (TACs) undertaking specific planning activities, developing budgets, and making operational recommendations (Figure 2). The FGC reviews and makes final recommendations for subprogram budgets and activities, and ensures the overall program meets MFLNRO and LBIS objectives and administrative requirements. The program is coordinated by the FGC Program Manager on behalf of the FGC, with substantial input from FGC Co-Chairs, Technical Advisory Committee (TAC) Chairs, and others.

In addition to LBIS Tree Improvement Program investments and MFLNRO direct program investments through staff and in-kind support, private companies also fund activities under Council's Business Plan. The species plans found in Appendix 3 outline general strategies, predict orchard seed production and gain, summarize conservation status, and provide key seed-use and availability statistics for individual species and seed-zone combinations known as seed planning units (SPU).

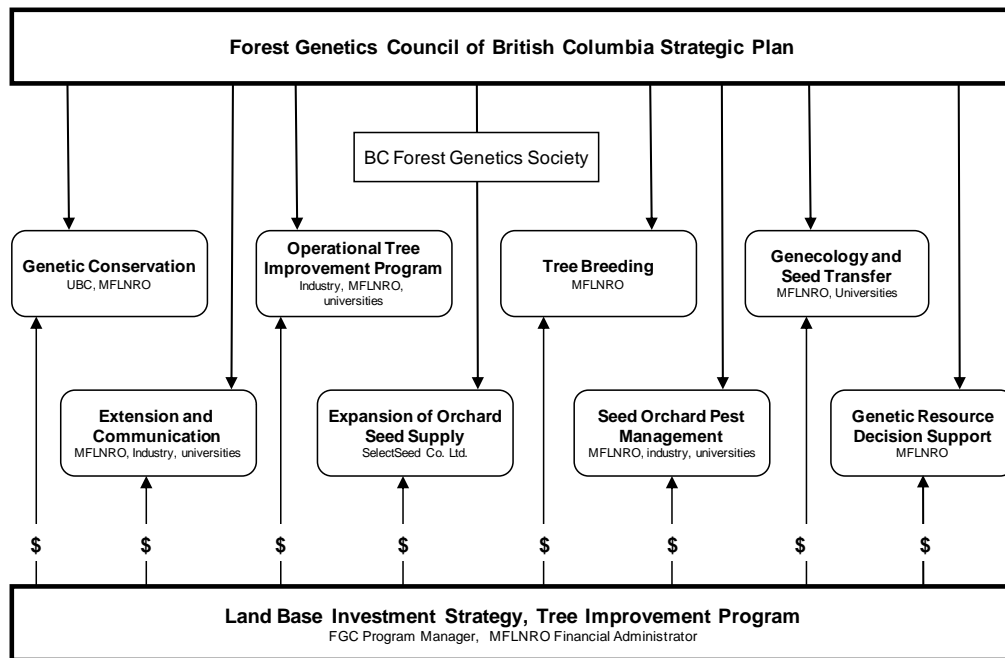


Figure 1 Relationship between the FGC Strategic Plan, Land Base Investment Strategy Tree Improvement Program, and business plan development through FGC subprograms.

## 2.0 Process for Business Plan Development

### 2.1 The Role of Council and its TACs

FGC members, representing the MFLNRO, forest companies, universities, the Canadian Forest Service, and small timber-tenure holders, provide strategic direction to the provincial forest genetic resource management program. FGC Technical Advisory Committees provide technical and policy information to Council and contribute to the development of FGC plans and associated budgets. The FGC Business Plan consolidates the subprogram plans and budgets into a comprehensive set of activities that address Council’s objectives.

Council’s seven TACs lay the groundwork for the FGC Business Plan:

- The Coastal and Interior TACs review and advise on Tree Breeding and Operational Tree Improvement Program (OTIP) subprograms, and provide input to species plans that guide work done by SelectSeed Company Ltd.
- The Genetic Conservation TAC (GCTAC) advises Council on issues related to genetic conservation, and identifies required activities and budgets under the Genetic Conservation Subprogram.
- The Seed Transfer TAC develops a strategy and activities for genecology research and climate-based seed transfer policy.
- The Extension TAC (ETAC) mandate is currently under review by the FGC. Extension remains a priority across all program areas.

- The Pest Management TAC (PMTAC) identifies information and research needs, and guides both research and extension activities for the control of insect and disease pests impacting seed orchards and seed production.
- The Genetic Resources Decision Support TAC (GRDS) oversees activities and budgets that aid access to information for seed users and others who are managing, using, or assessing seed inventories and the genetic resource. Tools for climate-based seed transfer is a current priority.

In addition, Council establishes other committees as needed to advise on shorter-term projects.

Program financial administration is led by the MFLNRO Tree Improvement Branch. Program management, including business plan and annual report compilation, is led by SelectSeed Company Ltd. (SelectSeed), on behalf of Council (see section 3.4 for more information on SelectSeed Ltd and its relationship to the FGC).

Council reviews all strategies, plans, or recommendations from its TACs and from SelectSeed for approval (or revision) before incorporating them into the FGC Business Plan. Figure 2 illustrates this hierarchical structure and the link between FGC objectives, planning processes, and the seven subprograms through which it is implemented. The process for defining activities and budgets for each subprogram is discussed in Section 3. Subprogram leaders are authorized to reallocate funds within their subprograms as necessary throughout the fiscal year, subject to limits and review process.

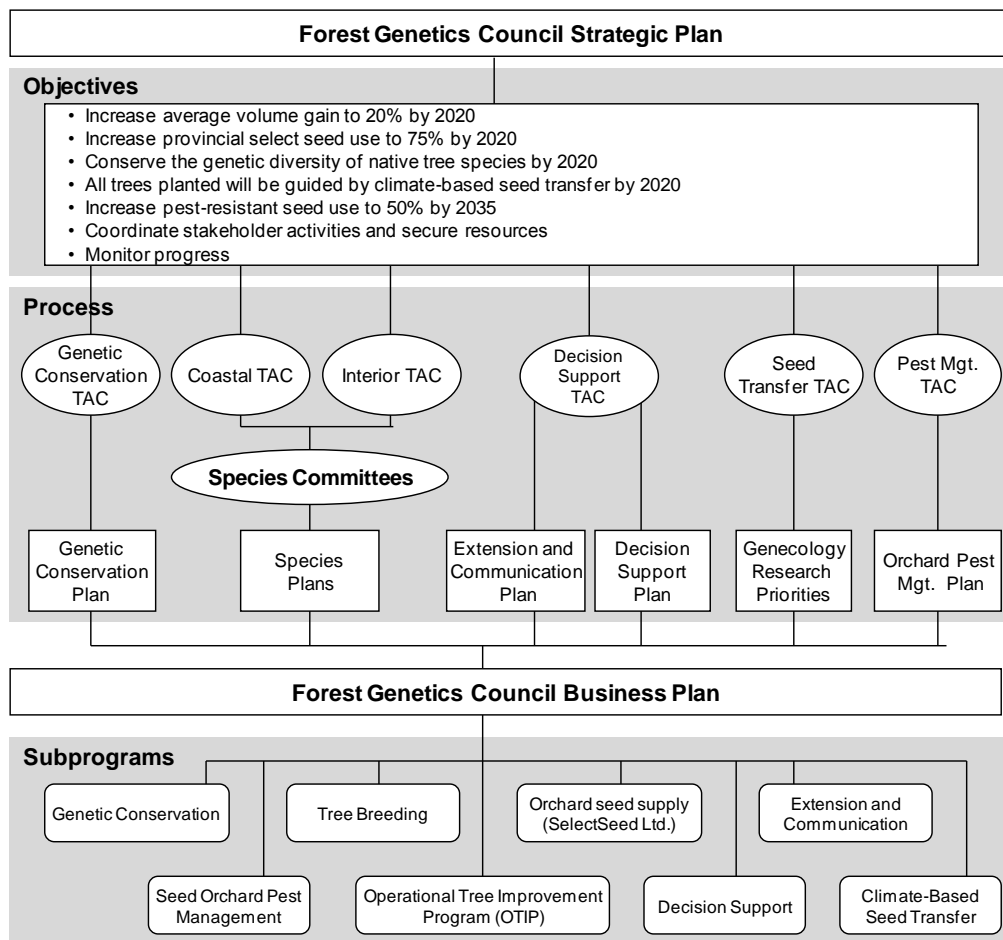


Figure 2 Link between FGC objectives, planning processes, and the subprograms of the FGC Business Plan.



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## 3.0 Subprogram Planning and Management

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### 3.1 Genetic Conservation Subprogram

Genetic conservation activities monitor and catalogue genetic resources for indigenous tree species, research conservation methods and needs, provide background genecology information for non-commercial species, and provide guidance to the FGC and the MFLNRO on policy development.

#### 3.1.1 Planning

Genetic conservation activities are developed through the FGC Genetic Conservation TAC (GCTAC), with programs and spending approved by the FGC.

#### 3.1.2 Management

Subprogram delivery is primarily shared by the Centre for Forest Conservation Genetics at the University of BC (CFCG), and the Tree Improvement Branch of the MFLNRO. The Provincial Tree Seed Center (Tree Improvement Branch) maintains an ex-situ seed inventory. The GCTAC sets broad objectives and provides budget recommendations to the FGC.

The CFCG receives funding from the MFLNRO under the LBIS Tree Improvement Program. In addition, the Centre collaborates with other groups and agencies, and seeks funding from other sources as opportunities arise. Significant adjustments in technical objectives or budgets for projects receiving annual funding through the LBIS must be approved by the GCTAC.

#### 3.1.3 Activities and Budget

Investments through the CFCG allow the leveraging of funds with other provincial, national, and international agencies in the area of conservation genetics. Projects include updating climate-change projections and species range maps for the Genetic Conservation Status Catalogue, assessing the adaptive diversity in seed orchard seed, Garry oak genecology, and maintenance of extension information on the CFCG websites. Support for climate modeling (ClimateBC and ClimateWNA) is transferred to the Seed Transfer subprogram for 2016/17. The CFCG also leverages funds provided through this program with other research funding provided by Genome Canada and GenomeBC. In addition to research, the CFCG provides training for graduate students.

In the 2016/17 fiscal year, the Centre will receive \$91,250 for projects listed in Table 1. In addition, the Centre will continue to provide expertise on climate change impacts, seed-transfer options, and ongoing planning and policy developments related to climate change.

A budget of \$40,000 is allocated to the Forest Genetics section of the Tree Improvement Branch for field-testing for whitebark pine blister-rust resistance and for marking whitebark pine parent trees used in the testing program. Funding of \$38,000 will be provided to the Ministries Provincial Tree Seed Center for additional *ex situ* seed collections to fill gaps in the existing conservation seed bank and for sample testing and maintenance of the existing seed-bank inventory. The Southern Interior Region of the MFLNRO will receive \$19,450 for nursery inoculations on whitebark pine seedlings as part of a project to test and select for increased rust resistance in naturally-occurring whitebark pine populations.

Table 1 Conservation subprogram budget for 2016/17.

<i>Project</i>	<b>2016/17 budget</b>
<b><i>UBC Center for Forest Conservation Genetics</i></b>	<b>B</b>
Adaptive diversity in seed orchard lots	15,000
Gen.Cons.Catalog update (clim.chg. projections & range maps)	45,000
Whitebark pine assisted migration	-
Genecology and population genetics of Garry oak	3,000
CFCG website update	1,000
Extension	2,000
Office, lab and computing	7,000
<b>Total project costs</b>	<b>\$73,000</b>
UBC overhead at 25%	<b>\$18,250</b>
<b>Total for UBC Center for Forest Conservation Genetics</b>	<b>\$91,250</b>
<b>MFLNRO Tree Improvement Branch - Forest Genetics Section</b>	
Field testing whitebark pine rust resistance	35,000
Whitebark parent tree survival, demarcation & rust hazard of accessible popul	5,000
Brush ex-situ reserves at Cowichan: oak and yew	-
<b>Total for Forest Genetics Section</b>	<b>40,000</b>
<b>MFLNRO Tree Improvement Branch - Provincial Tree Seed Centre</b>	
Ex-situ sample maintenance (moisture content determination)	\$13,000
Ex-situ seed collections for the genetic conservation seed bank	\$25,000
<b>Total for Provincial Tree Seed Center</b>	<b>\$38,000</b>
<b>MFLNRO S. Interior Region - Whitebark Pine Rust Screening</b>	
Nursery inoculations of rust on whitebark pine seedlings; maintenance of pl:	\$16,450
Publications and extension	\$3,000
<b>Total for MFLNRO S. Interior Region</b>	<b>\$19,450</b>
<b>Total FGC approved budget</b>	<b>\$188,700</b>

## 3.2 Tree Breeding Subprogram

The Tree Breeding Subprogram focuses on the continued development of parent trees selected for traits that will enhance timber supply, tree health, and stand resilience. Selected parent trees are used for the production of seed and vegetative material. Tree breeding activities include selecting parents in wild stands, propagation, field-testing offspring, mating, establishing/maintaining/measuring trials, and support research. No research effort or funding is for the development of genetically modified trees. Breeding strategy and level of advancement vary among species and seed zones, but all breeding programs are well into field testing and selection at either the first, second, or third generation. In support of a new objective in the 2015-2020 FGC Strategic Plan, increased focus is given to the development of inherent resistance to key pests that impact health and timber supply. This Subprogram also includes realized-gain trials that quantify area-based gains in timber production. The tree breeding subprogram is implemented by the Forest Genetics Section of the MFLNRO Tree Improvement Branch .

### 3.2.1 Planning

Priorities for breeding activities are set among seed planning units using value traits related to timber supply, expected future impact under climate change, and logistical considerations such as ease (cost) of operating breeding and seed orchard activities. Breeding, genecology, and genetics research strategies developed by MFLNRO tree breeders were reviewed by FGC Interior and Coastal TACs, and direction was given to ensure alignment with FGC strategic objectives and with ongoing operational needs and programs.

Tree Breeding Subprogram budgets were developed at the SPU level by the MFLNRO breeder responsible and reviewed by TAC members. These budgets were then adjusted by the Manager, Forest Genetics, MFLNRO Tree Improvement Branch to find efficiencies and to meet the total expected Subprogram budget allocation.

### 3.2.2 Management

The MFLNRO manages Tree Breeding Subprogram activities, with progress reported to cooperators through the FGC. The Manager of Forest Genetics, MFLNRO Tree Improvement Branch, has authority for project re-allocations in support of FGC objectives. Substantial re-allocations between seed planning units or from breeding activities to technical support activities require the agreement of the Director, Tree Improvement Branch and the FGC Program Manager.

### 3.2.3 Activities and Budget

The 2016/17 Tree Breeding Subprogram budget of \$1.18 million is summarized in Table 2 by species. Some risk management may be undertaken on the assumption that contingencies will not allow some projects to proceed as expected. It is also anticipated that funds made available through under-spending or projects not proceeding in other subprogram areas will be directed to tree breeding projects.

A summary of breeding strategies for each seed planning unit is provided in species plans shown in Appendix 3. Funds provided under this subprogram support a wide variety of activities, including progeny test establishment, maintenance, and measurement, data analysis and selection of parent trees for breeding and orchard populations, support research, and the development and maintenance of breeding arboreta and clonebanks.

Table 2 Breeding subprogram budget for 2016/17 by species and by coast / interior.

<b>Coast</b>		<b>Interior</b>	
Coastal D-fir	110	Lodgepole pine	234
Redcedar	224	White pine	32
Yellow cedar	24	Interior spruce	111
Western hemlock	38	Interior D-fir	209
Sitka spruce	41	Western larch	75
White pine - coas	32	Broadleaves	-
Alder	49		
<b>Total coast</b>	<b>518</b>	<b>Total interior</b>	<b>\$ 662</b>
<b>Total budget - coast and interior</b>			<b>\$ 1,180</b>

### 3.3 Operational Tree Improvement Program (OTIP)

The OTIP subprogram supports FGC objectives to increase the quality and quantity of select seed produced from existing private and MFLNRO seed orchards. It also provides technical support for orchard production and management.

#### 3.3.1 Planning

OTIP investment is based on input from the Interior and Coastal TACs and on species plans (Appendix 3) that outline seed production strategies within each SPU. Based on these strategies, and on priority lists approved by the TACs, a formal call for proposals is issued.

Committees set up by the Interior and Coastal TACs review and rank all proposals against FGC objectives and SPU priorities, based on technical merit, impact, value, and cost. OTIP projects are selected to increase the genetic gain in seed made available for reforestation and to increase the quantity of seed produced from existing orchards. They support FGC short-term objectives for gains in the growth rate, pest resistance, and wood quality of reforestation materials. They also support FGC long-term objectives through the replacement of trees in existing seed orchards with trees of higher genetic value. The total budget allocation for OTIP is recommended by the FGC to the provincial Chief Forester and LBIS managers in the MFLNRO.

#### 3.3.2 Management

The MFLNRO Tree Improvement Branch administers OTIP in accordance with recommendations from the FGC. Requests for re-allocations or for new funding are considered by the MFLNRO Tree Improvement Branch Director in consultation with the appropriate TAC Chair and the FGC Program Manager. All projects report on key performance indicators to enable tracking of planned activities.

#### 3.3.3 Activities and Budget

The 2016/17 OTIP budget is \$424,418 (Table 3). Approved projects primarily focus on activities such as protecting cone and seed crops from pests, improving the genetic worth of orchards through the ramet replacement with higher-gain material, and technical support to find solutions to ongoing seed orchard management problems. Due to budget limitations, the FGC imposed reductions on OTIP projects for this fiscal year. These reductions were structured by review committees to ensure key project work proceeded. Project details, performance indicators, and support levels are available upon request from the Tree Improvement Branch.

Table 3 Operational Tree Improvement Subprogram (OTIP) budget requested and approved for the coast and interior areas.

Area	No. proposals received	Total funding requested	Total approved funding	No. proposals receiving some level of funding
Interior	46	\$377,617	\$290,318	43
Coast	18	\$161,063	\$134,100	18
<b>Total cost</b>	<b>64</b>	<b>\$538,680</b>	<b>\$424,418</b>	<b>61</b>

### 3.4 Expansion of Orchard Seed Supply Subprogram (SelectSeed Co. Ltd.)

SelectSeed Company Ltd. (SelectSeed) is a registered company that is wholly owned by the Forest Genetics Council through the B.C. Forest Genetics Society. All Society members are on Council. The SelectSeed Board of Directors is elected by Society members (Figure 3). SelectSeed’s mission is to “support Forest Genetics Council objectives for the development of seed orchard facilities to meet the provincial demand for high quality, genetically adapted tree seed through investments, cooperative work with FGC members and effective program management.”

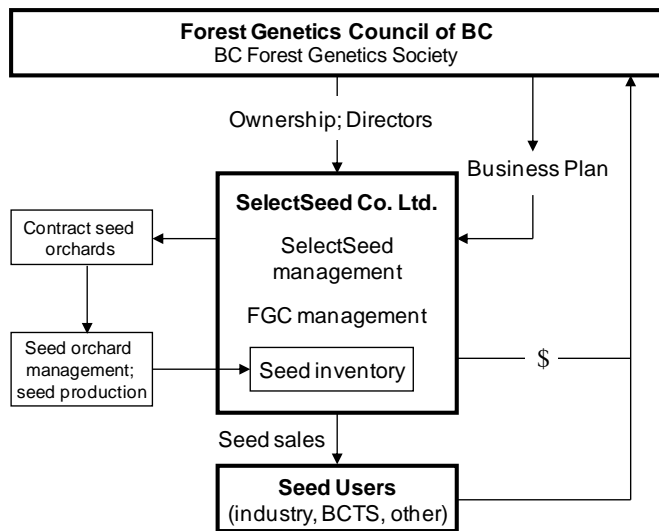


Figure 3 Organizational relationships among SelectSeed, Land Base Investment Strategy, Forest Genetics Council, and the B.C. Forest Genetics Society

#### 3.4.1 Planning

SelectSeed’s Business Plan and investments are based on the long-term Strategic Plan and annual business plans prepared by the FGC and its associated committees. Species plans (Appendix 3) contain analyses of projected orchard expansion needs that guide SelectSeed investments. Specific technical advice is sought as required from Species Committees or others.

#### 3.4.2 Management

Management discretion for spending lies with the SelectSeed Board of Directors, and is limited by the terms of the SelectSeed Multi-Year Agreement with the MFLNRO. Investments in new orchards will be approved by the FGC and follow FGC and TAC guidance, with emphasis on both the technical quality of developments and on cost. SelectSeed’s annual business plan was approved by the Forest Genetics Council on March 10, 2016.

#### 3.4.3 Activities and Budget

During the fiscal year, SelectSeed will focus on the management of 12 long-term orchard agreements covering the operation of 15 orchards (Table 5), including a new Douglas-fir orchard for higher elevations in the Thompson Okanagan zone that was established in the spring of 2015.

Seed orchard management activities to maximize seed crop production will continue in the 14 original orchards. Seed production for 2016 is forecast at 88 kilograms of lodgepole pine, 45 kilograms of Douglas-fir, and 47 kilograms of spruce. Expected gross revenue from seed sales are forecast at \$890,000.

Other activities will include program management on behalf of the Forest Genetics Council, including Business Plan and budget development, committee support, managing program development and subprogram interactions, and preparation of mid-term and annual reports. In addition, SelectSeed will make a contribution of \$100,000 to the MFLNRO to hire a new tree breeder for interior species. This is the second of a three year commitment to support this position within the MFLNRO.

Forecast spending for 2016/17 is \$874,000 (table 4), including \$143,000 for FGC management and support activities. Seed production forecasts are based on long-term production estimates for similar orchards, but annual production can vary widely.

Table 4 SelectSeed Company Ltd. 2016/17 forecast income and expenses by category.

Category description	Total	Q1	Q2	Q3	Q4
<b>SelectSeed costs</b>					
Orchard mgt contracts and capital investments	280,000	28,000	112,000	28,000	112,000
Propagation, holding, and orchard support	4,000	-	-	2,400	1,600
Crop management, seed extraction, sales	190,000	-	9,500	161,500	19,000
Management and administration	157,000	39,250	39,250	39,250	39,250
Support projects	-	-	-	-	-
<b>Total SelectSeed costs</b>	<b>\$ 631,000</b>	<b>\$ 67,250</b>	<b>\$ 160,750</b>	<b>\$ 231,150</b>	<b>\$ 171,850</b>
<b>FGC management and support</b>					
Management, legal, communication	143,000	35,750	35,750	35,750	35,750
MYA fees (Int. breeder support - FLNRO)	100,000	100,000	-	-	-
<b>Total FGC costs</b>	<b>\$ 243,000</b>	<b>\$ 135,750</b>	<b>\$ 35,750</b>	<b>\$ 35,750</b>	<b>\$ 35,750</b>
<b>Total expenditures</b>	<b>\$ 874,000</b>	<b>\$ 203,000</b>	<b>\$ 196,500</b>	<b>\$ 266,900</b>	<b>\$ 207,600</b>
Seed sales	890,000	-	-	178,000	712,000
Interest on investments	8,000	2,000	2,000	2,000	2,000
Pruner rental	5,000	-	-	-	5,000
<b>Total income</b>	<b>\$ 903,000</b>	<b>\$ 2,000</b>	<b>\$ 2,000</b>	<b>\$ 180,000</b>	<b>\$ 719,000</b>
<b>Net revenue without FGC costs</b>	<b>\$ 272,000</b>	<b>\$ (65,250)</b>	<b>\$ (158,750)</b>	<b>\$ (51,150)</b>	<b>\$ 547,150</b>
<b>Net revenue with FGC costs</b>	<b>\$ 29,000</b>	<b>\$ (201,000)</b>	<b>\$ (194,500)</b>	<b>\$ (86,900)</b>	<b>\$ 511,400</b>
Cash to (from) reserve	\$ 29,000				
Requested MYA Support	\$ -				

### 3.5 Extension and Communication

The Extension and Communication Subprogram supports FGC goals and objectives through:

- extension (providing client-focused solutions and training to seed users and tree improvement specialists),
- communication (developing and disseminating information on the program and its activities to all FGC target audiences),
- training.

At the current time, the Extension program is under review by the FGC. This review is organizational in nature and there is no expectation that extension work will be reduced or placed at a lower priority. For the 2016/17 fiscal year, no specific budget was allocated to extension work. However, extension projects normally carried out through other subprogram areas will continue.

### 3.6 Decision Support Subprogram

The Decision Support Subprogram supports FGC goals and objectives through the development of genetic information management systems. These systems assist clients in decision making, seed policy and planning, seed use, timber supply analysis, effectiveness evaluation, monitoring, and other GRM activities.

#### 3.6.1 Planning

Decision Support projects are developed and guided by the Decision Support Technical Advisory Committee (DSTAC) comprised of ministry, industry and academic representatives.

#### 3.6.2 Management

The Decision Support TAC identifies short- and long-term goals that support the GRM information needs of clients. Significant project changes or re-allocations of funds from the approved Business Plan require approval of the TAC and the FGC Program Manager on behalf of the FGC.

#### 3.6.3 Activities and Budget

Priorities for the 2016/17 fiscal year are to continue to develop decision-support systems and information that will contribute to climate-based seed transfer (CBST) science and policy. This work will include Geographic Information Systems (GIS) support provided to Tree Improvement Branch for CBST and other projects that support FGC goals and objectives (Table 5). In addition, the CBST project will continue to receive support for management and facilitation, as well as funding to develop stakeholder and First Nations engagement processes and communications materials.

Table 5 Decision Support projects and budget for 2016/17.

Project	Budget (\$)
Climate Based Seed Transfer Project (project management, GIS systems support, stakeholder and First Nations engagement and communications materials)	\$76,500

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## **3.7 Cone and Seed Pest Management Subprogram**

The Cone and Seed Pest Management subprogram supports FGC objectives for the use and quality of select seed by reducing orchard seed losses to insect and disease pests through technical support, research, and the development of integrated pest management strategies in conjunction with orchard managers and pest management research and extension specialists.

### **3.7.1 Planning**

The subprogram is guided by a Pest Management Technical Advisory Committee (PMTAC), with membership from industry, the MFLNRO, the Canadian Forest Service, and universities. Issues are identified and ranked by the PMTAC based on perceived impact on seed losses, and the effect of these seed losses on FGC objectives. The TAC also makes recommendations to Council regarding subprogram organization, management, and budgets.

### **3.7.2 Management**

With direction from the PMTAC, research proposals and pest management support activities are developed by the MFLNRO cone and seed pest management specialists and reviewed by Pest Management TAC members. The PMTAC recommended projects and budgets to the FGC.

The MFLNRO Tree Improvement Branch manages budgets and the financial administration of projects recommended by the PMTAC and approved by the FGC. Significant priorities and changes during the fiscal year are made in consultation with the PMTAC and the FGC Program Manager.

### **3.7.3 Activities and budget**

The total Pest Management subprogram budget for 2016/17 is \$137,000 (Table 6). In-kind, staff time and other contributions by affiliated companies and agencies are incremental to this amount.



Table 6 Cone and Seed Pest Management Subprogram projects for 2016/17.

Project	Species impacted	Budget (\$)	Products
European Pine Shoot Moth ( <i>Rhyacionia bouliana</i> ) pesticide trials; Pli, Pw and Py pheromone-based control <sup>1</sup>		10,000	Project report
Fir coneworm ( <i>Diorystria abietivorella</i> ) operational scale pesticide trials	Primarily Fd, Sx, and Lw	15,000	Final report
Pine foliar diseases ( <i>Dothistroma</i> , <i>Lophodermella</i> , <i>Elytroderma</i> ). 1. Determine fungal species involved using PCR methods 2. Screen various fungicides for control efficacy	Pw, Pli	20,000 15,000	Final report Interim report
Cone midges ( <i>Contarinia oregonensis</i> , <i>Mayetiola thujae</i> , <i>Kaltenbachiola spp.</i> ). Small-plot trials of Movento in Cw; operational-scale trials in Fd.	Fd, CW, spruce	15,000	Interim report
Pest Biologist's operating funds for supplies, surveys, projects and travel.	All species	20,000	Ongoing pest bulletins and mgt. advice
Research lab budget for projects, supplies and travel		2,000	Reports; operations support
<i>Sydowia</i> seed fungi impact on Pli seed losses. Identify source and timing of infection, including insect vectoring (external call for proposals).	Pli	50,000	Progress report
<b>Total budget</b>		<b>\$ 137,000</b>	

## 3.8 Genecology and Seed Transfer Subprogram

The purpose of the Genecology and Seed Transfer Subprogram is to effectively direct funding to priority genecology and seed transfer projects in support of FGC strategic objectives and provincial seed transfer policy development.

### 3.8.1 Planning

The subprogram is guided by the Seed Transfer TAC (STTAC), with representation from MFLNRO, industry, and university stakeholders. Priorities for genecology and seed transfer information needs are set within the context of other work currently underway, such as in the Breeding Subprogram, existing genecology trials, and seed transfer policy needs. The STTAC reviews priorities and projects set out by MFLNRO Tree Improvement Branch (TIB) scientists, leads the development of a call for proposals for non-MFLNRO projects, and makes recommendations to the FGC regarding budgets, priorities, and delivery process.

### 3.8.2 Management

The STTAC developed a list of priorities for genecology and seed transfer projects by species and type of work. Based on these priorities, a strategy was compiled by TIB scientists and reviewed by a committee on behalf of the STTAC. Funding recommendations were made to the FGC.

The MFLNRO Tree Improvement Branch manages financial administration for approved projects through either direct spending within the Branch or through contracts with successful project proponents. Project financial and progress reporting is managed through the TIB, and incorporated in annual FGC reports.

<sup>1</sup> project dropped after FGC budget allocations - funds to be re-directed to other projects as needs arise]

### 3.8.3 Activities and budget

The total budget allocated to the Genecology and Seed Transfer Subprogram for 2016/17 is \$428,000 (Table 7). Projects include genecology work undertaken by scientists within the MFLNRO Tree Improvement Branch, including the Assisted Migration Adaptation Trial. Work will also be undertaken at the University of BC on climate modeling (ClimateBC/WNA)<sup>2</sup> and in support of a large scale genomics projects with lodgepole pine, Douglas-fir and western larch that will investigate climate-linked genetic diversity and correlate with long-term field trial data. The UBC work will be leveraged with other funds from Genome Canada, GenomeBC, and forest companies.

Table 7 Genecology and Seed Transfer projects.

Species	Project title	Budget (\$)	Performance indicator
All	Ongoing genecology field testing within the MFLNRO Tree Improvement Branch. Support for site establishment, maintenance and measurements	\$ 233,050	Reports
All	Assisted Migration Adaptation Trial (AMAT) led by the MFLNRO Tree Improvement Branch	\$109,500	Report
All	Climate modeling and support for climate-based seed transfer (ClimateWNA) (UBC Wang / Aitken) <sup>2</sup>	\$ 56,250	Report; model availability
Pli, Fd, Lw	Genomic analysis of climate adaptation and interpretation of results in support of CBST policy. Leveraged with a Genome Canada Large-Scale Applied Research Project and industry funding - UBC Aitken)	\$ 30,000	Progress report
<b>Total budget</b>		<b>\$ 428,800</b>	

## 3.9 Applied Tree Improvement and Biotechnology

The Applied Tree Improvement and Biotechnology research program considers proposals that support the objectives of the Forest Genetics Council of BC in the area of new technologies and their application to GRM in BC.

### 3.9.1 Planning

Project proposals receiving under this funding category are developed by proponents based on their knowledge of needs and opportunities within the broad provincial GRM program or on suggestions received from others active within the program. The intent is to provide a funding mechanism in support of projects that have the potential to contribute to FGC objectives but do not fit the more specific funding requirements of other FGC subprograms.

### 3.9.2 Management

Project proposal(s) are received by the FGC Program Manager and reviewed by a Steering Committee reporting to the FGC. Criteria for project evaluation include the potential to contribute to FGC objectives, probability of success, proponent ability to meet project objectives, and cost. The Steering Committee reserved the right to suggest modifications to project activities or scope and to modify budgets, where they felt it was appropriate.

<sup>2</sup> This project also supports the Genetic Conservation Subprogram and starting in 2016/17 is funded partially by each TAC.

### **3.9.3 Projects and budget**

One proposal was received from the University of Victoria and reviewed under this subprogram. A recommendation for support was approved for 2016/17 with funding of \$55,000. The approved project is a continuation of an ongoing project that also received funding in 2015/16. This work will continue to focus on hormonal treatment options to increase cone and seed production in Douglas-fir and lodgepole pine orchards.

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## **3.10 Administration**

Administration of the LBIS Tree Improvement Program is provided by the Tree Improvement Branch of the MFLNRO. There are three components to this work:

- the administration of LBIS funds allocated to subprograms managed by the MFLNRO, including Tree Breeding, OTIP, Genecology and Seed Transfer, Pest Management, and Genetic Resource Information Management,
- the administration of contracts with successful proponents through the OTIP, Genecology, Seed Transfer, and Applied Biotechnology subprograms,
- support for the business of the FGC, including meetings, assistance with information distribution, and dealing with queries and planning.

### **3.10.1 Costs**

MFLNRO administration costs are reviewed by the FGC, and a recommendation is made for support under LBIS. The administration budget is approved by the FGC in conjunction with other LBIS Tree Improvement Program budget items.

### **3.10.2 Management**

Overall program management is carried out on behalf of the Forest Genetics Council by the FGC Program Manager working for SelectSeed Company Ltd. This work includes planning, coordination of committees, Business Plan development, reporting, correspondence, and representing the FGC in daily business. The MFLNRO Tree Improvement Branch provides administrative support, overall financial management, and assistance with the coordination of FGC business.

### **3.10.3 Activities and Budget**

The 2016/17 budget for the Administration Subprogram is \$10,000. This amount includes all program administration costs incurred by the MFLNRO Tree Improvement Branch.

### 3.11 Budget Summary

A Land Base Investment Strategy Tree Improvement Program budget allocation of \$2.5 million is approved for the 2016/17 fiscal year, and is summarized in Table 8. An additional approximately \$243,000 will be contributed by Council-owned SelectSeed Ltd. to cover program management, meeting costs, website, publications, and other support work.

Table 8 2016/17 budget summary for LBIS Tree Improvement Program contributions to subprograms.

<b>Subprogram</b>	<b>Allocation</b>
Genetic Conservation	188,700
Tree Breeding	1,180,000
Operational Tree Improvement Program (OTIP)	424,000
SelectSeed Company Ltd.	0
Extension and Communication	0
Cone and Seed Pest Management	137,000
Genecology and Seed Transfer	428,800
Genetic Resource Decision Support	76,500
Applied Tree Improvement and Biotechnology	55,000
Administration (Tree Improvement Branch)	10,000
<b>Total LBIS contribution</b>	<b>\$ 2,500,000</b>
<b>SelectSeed Ltd. contribution</b>	<b>\$ 243,000</b>
<b>Total FGC budget</b>	<b>\$ 2,743,000</b>

## 4.0 Funding and Administrative Mechanisms

### 4.1 Funding Agreements

The Land Base Investment Strategy Tree Improvement program is administered by the Tree Improvement Branch of the MFLNRO. FGC Business Plan activities are supported through the following administrative mechanisms:

- MFLNRO/SelectSeed Co. Ltd. Multi-Year Agreement
- MFLNRO contracts
- MFLNRO/University grants and transfers
- MFLNRO direct management and administration

The subprograms associated with each of the mechanisms are shown in Figure 4. Resources from other agencies include in-kind facilities, staff and direct funds. Seed sales from orchards also provide revenue to support seed production. Only Land Base Investment Program funding and SelectSeed Ltd. budgets are detailed in this Business Plan.

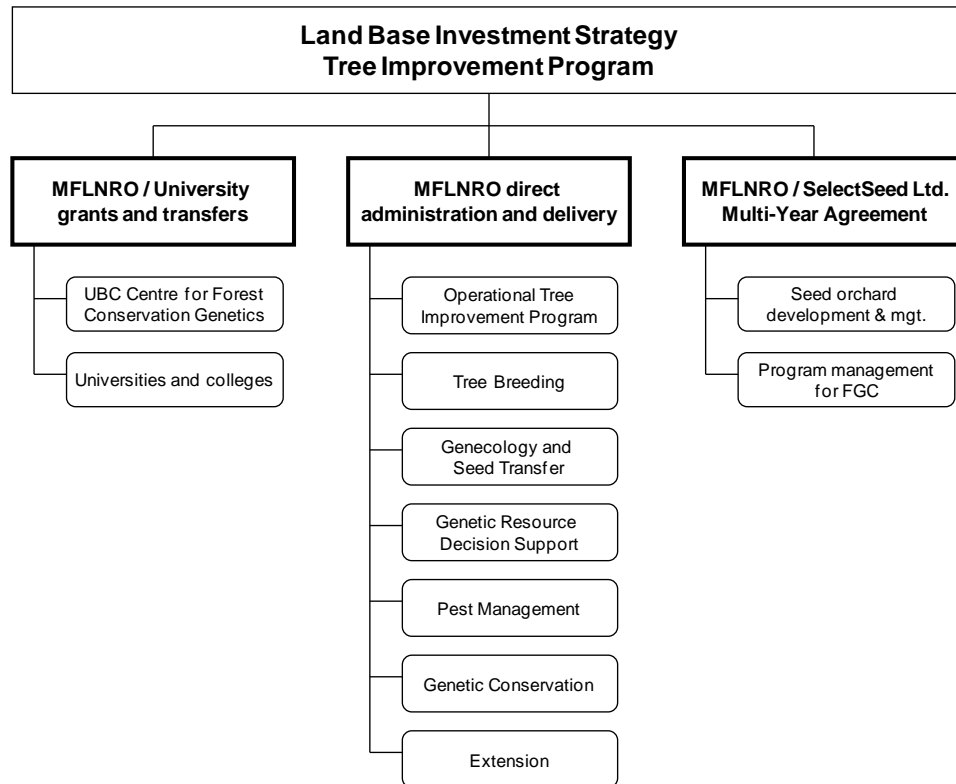


Figure 4 Administrative mechanisms for the delivery of the LBIS Tree Improvement Program funding.

## 4.2 Monitoring and Reporting

Monitoring progress is an important objective of the FGC program. All LBIS funded activities report on performance relative to criteria. In addition, progress towards long-term objectives is measured at the provincial level for all FGC activities.

### 4.2.1 Project-Level Reporting

Projects from each subprogram provide reports to be published in the annual Tree Improvement Program Projects Report for 2016/17. Work quality will be periodically audited through Review Committees and site visits. Reports will be received and reviewed by Technical Advisory Committees or project steering committees, as appropriate, as well as by the MFLNRO Program Administrator and the FGC Program Manager. Reporting to the MFLNRO Program Administrator on spending and progress is required for all OTIP projects and other contracts with the MFLNRO.

### 4.2.2 Provincial-Level Reporting

Progress towards FGC provincial objectives (see section 1.1) for increasing genetic worth of seedlots used, increasing the use of orchard seed, and climate-based seed transfer will be reported using provincial summaries of performance indicators. SelectSeed Company Ltd. will produce an annual report showing performance indicators, financial statements, and audit reports. Reporting requirements are identified in Table 9.

Table 9 List of reports, responsibilities, distribution, and preparation dates for LBIS-supported projects.

Type of report	Prepared by	Prepared for	Distribution	Dates due
Interim project status	Project leader	MFLNRO program administrators for early FY reallocations	On request	Aug 1
Project level	Project proponent	MFLNRO Program Administrator	On request	Oct 30 April 30
Annual reports and progress summary	FGC Program Manager, Program Administrator, MFLNRO; project leader contributions	FGC; MFLNRO Chief Forester; TACs; general distribution	FGC members; TACs; FIA administrators; MFLNRO; general distribution; FGC website	Aug 30

\* The Interim Project Status report is an informal report intended only to identify projects that are not progressing as planned, and for which funds may be re-allocated.

## Appendix 1: Seed Planning Units and Categories

The following table lists seed planning units (SPU) and activity categories. All provincial SPUs are grouped to one of four categories using a protocol developed by the FGC Strategic Planning Committee. The protocol evaluates SPUs based on the net present value of tree improvement investments, feasibility criteria, zone changes due to climate change, opportunities, and seed transfer information needs. Listed SPUs in categories 1 to 3 have a Species Plan in Appendix 3. Categorization for SPUs # 6, 8 and 15, are based on an expectation of increased planting with pest resistant material.

Program categories include:

1. Advanced-generation program,
2. First-generation program only,
3. Genecology research only, and
4. No genetics program (SPUs in this category are not listed here).

Seed planning unit (SPU)				Program	Seed planning unit (SPU)				Program
#	Species	SPZ	Elev. band (m)	category	#	Species	SPZ	Elev. Band (m)	category
1	Fdc	M	1-900	1	28	Sx	TO	1300-2100	2
2	Cw	M	1-700	1	29	Pli	EK	1500-2000	2
3	Hw	M	1-600	2	30	Sx	TO	700-1500	1
4	Sx	NE	1000-1700	1	31	Fdc	M	900-1200	2
5	Sx	NE	1700-2100	2	32	Pli	EK	800-1500	2
6	Ss	M	1-500	2	33	Cw	M	700-1500	2
7	Pli	NE	700-1600	1	34	Lw	EK	800-1700	1
8	Pw	M/SM	1-1000	1	35	Sx	BV	500-1400	2
9	Ba	M	1-1000	3	36	Bg	M	1-700	3
10	Pli	TO	700-1400	1	37	Fdi	QL	700-1400	2
11	Yc	M	1-1100	2	38	Hw	M north	1-600 (part of SPU 3)	2
12	Pli	PG	700-1400	1	39	Fdi	EK	700-1400	2
13	Lw	NE	450-1600	1	40L	Sx	PR low	250-650	2
14	Sx	PG	600-1400	1	40M	Sx	PR mid	650-1200	2
15	Pw	KQ	500-1400	1	41	Fdi	PG	700-1200	2
16	Pli	TO	1400-1600	2	42	Sx	PG	1200-1550	2
17	Pli	BV	700-1400	1	43	Fdi	CT	600-1400	2
18	Pli	CP	700-1300	1	44	Sx	NE	1-1000	1
19	Fdc	SM	200-1000	2	45	Pli	BB/CHL	All	3
20	Pli	NE	1600-2000	2	46	Bl	all int.	all	3
21	Fdi	NE	400-1200	1	47	Bn	M	all	3
22	Fdi	NE	1000-1800	2	48	Broadleaves	Interior	-	3
23	Sx/Ss	SM/NST	all	3	49	Broadleaves	Coast	-	3
24	Hw	M	600-1100	2	50	Lw	NE	1200-1800	2
25	Sx	EK	750-1900	2	51	Py	S. Interior	300-1000	2
26	Pli	PG	1400-2000	3	52	Fdi	TO	600-1100	2
27	Cw	SM	200-1000	2	53	Fdi	TO	1100-1600	2
					54	Alder	M	1-700	2

Seed zones are adjusted from time to time based on new research information, or on administrative needs. For information updates on seed zones, please contact Margot Spence of the MFLNRO Tree Improvement Branch ([Margot.Spence@gov.bc.ca](mailto:Margot.Spence@gov.bc.ca))

## Appendix 2: Forest Genetics Council and Technical Advisory Committee Members

### Forest Genetics Council of BC

Name	Affiliation	Representing
Brian Barber (Co-Chair)	MFLNRO Tree Improvement. Branch	MFLNRO Co-Chair
Mark Tamas (Co-Chair)	Tolko Ltd.	Industry Co-Chair
Dr. Rob Guy	University of BC	Universities
Mark Hays	BC Timber Sales	BC Timber Sales Ltd.
Domenico Iannidinardo	TimberWest Forests Ltd.	Coast industry orchard owners
Stephen Joyce	MFLNRO Tree Improvement. Branch	Interior Technical Advisory Committee
Scott King	Lousiana Pacific	Southern interior industry
Joe Leblanc	Interfor Ltd.	Coast industry
Gerry MacDougall	MFLNRO, Regional Rep	MFLNRO
Chris Stagg	Canfor Ltd.	Interior industry orchard owners
Dr. Michael Stoehr	MFLNRO Tree Improvement. Branch	MFLNRO
Annette van Niejenhuis	Western Forest Products Inc.	Coastal Technical Advisory Committee
Raoul Wiart	Canadian Forest Service	Canadian Forest Service
Gernot Zemanek	Roserim Forest Nursery	Woodlots and nurseries

### Coastal Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Annette van Niejenhuis (Chair)	Western Forest Products Inc.	Dr. John Russell	MFLNRO Tree Imp. Branch
Dr. Sally Aitken	University of BC	Margot Spence	MFLNRO Tree Imp. Branch
Charlie Cartwright	MFLNRO Tree Imp. Branch	Dr. Michael Stoehr	MFLNRO Tree Imp. Branch
Shane Ford	MFLNRO Tree Imp. Branch	Nicholas Ukrainetz	MFLNRO Tree Imp. Branch
Jimmy Hodgson	Island Timber Ltd.	Bevin Wigmore	TimberWest Forests Ltd.
Stephen Joyce	MFLNRO Tree Imp. Branch	Dr. Chang-yi Xie	MFLNRO Tree Imp. Branch
Dave Kolotelo	MFLNRO Tree Imp. Branch	Dr. Alvin Yanchuk	MFLNRO Tree Imp. Branch
Bob Merrell	BC Timber Sales Ltd.	Stefan Zeglan	MFLNRO Coast Region
Lisa Meyer	MFLNRO Tree Imp. Branch		

### Interior Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Stephen Joyce (Chair)	MFLNRO Tree Imp. Branch	Dave Kolotelo	MFLNRO TIB / Tree Seed Center
Mike Brown	PRT Growing Services Ltd.	Dan Livingston	PRT Growing Services Ltd.
Guy Burdikin	West Fraser Timber Ltd.	Dr. Greg O'Neill	MFLNRO Tree Imp. Branch
Dr. Michael Carlson	MFLNRO Tree Imp. Branch (emeritus)	Roger Painter	SelectSeed Ltd.
Krista Copeland	Tolko Ltd.	Alan Rasmussen	MFLNR / BC Timber Sales Ltd.
Dan Gaudet	Vernon Seed Orchard Company	Jason Regnier	West Fraser Timber Ltd.
Gary Giampa	MFLNRO Tree Imp. Branch	Nicholas Ukrainetz	MFLNRO Tree Imp. Branch
Hilary Graham	MFLNRO Tree Imp. Branch	Kori Vernier	Canadian Forest Products Ltd.
Barry Jaquish	MFLNRO Tree Imp. Branch		



**Genetic Conservation Technical Advisory Committee**

<b>Name</b>	<b>Affiliation</b>	<b>Name</b>	<b>Affiliation</b>
Dr. Pia Smets (Chair)	MFLNRO Tree Imp. Branch	Dr. Michael Murray	MFLNRO S. Int. Region
Dr. Sally Aitken	University of BC	Dr. Tory Stevens	Ministry of Environment
Charlie Cartwright	FLNRO Tree Imp. Branch	Alan Vyse	Independent
Dr. Andreas Hamann	University of Alberta	Dr. Tongli Wang	University of BC
Dr. Jun-Jun Liu	Canadian Forest Service	Dr. Alvin Yanchuk	MFLNRO Tree Imp. Branch
Dave Kolotelo	MFLNRO Tree Imp. Branch		

**Pest Management Technical Advisory Committee**

<b>Name</b>	<b>Affiliation</b>	<b>Name</b>	<b>Affiliation</b>
Dr. Ward Strong (Co-Chair)	MFLNRO Tree Imp. Branch	Hilary Graham	MFLNRO Tree Imp. Branch
Tia Wagner (Co-Chair)	Vernon Seed Orch. Co.	Corey Mathieson	TimberWest Forests Ltd.
Dr. Jenny Cory	Simon Fraser Univ.	Dr. Jean Turgeon	Canadian Forest Service
Gary Giampa	MFLNRO, Tree Imp. Branch		

**Decision Support Advisory Committee**

<b>Name</b>	<b>Affiliation</b>	<b>Name</b>	<b>Affiliation</b>
Jason Regnier (Chair)	West Fraser Timber Ltd.	Margot Spence	MFLNRO Tree Imp. Branch
Cathy Cook	Western Forest Products Inc.	Kori Vernier	Canadian Forest Products Ltd.
Dan Gaudet	Vernon Seed Orchard Company	Susan Zedel	MFLNRO Tree Imp. Branch

**Seed Transfer Technical Advisory Committee**

<b>Name</b>	<b>Affiliation</b>	<b>Name</b>	<b>Affiliation</b>
Margot Spence (Chair)	MFLNRO Tree Imp. Branch	Jason Regnier	West Fraser Timber Ltd.
Dr. Sally Aitken	University of BC	Nick Ukrainetz	MFLNRO Tree Imp. Branch
Guy Burdikin	West Fraser Timber Ltd.	Annette van Niejenhuis	Western Forest Products Inc.
Scott King	Louisiana Pacific Ltd.	Dr. Tongli Wang	University of BC
Dr. Greg O'Neill	MFLNRO Tree Imp. Branch		

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## Appendix 3: Species Plans

Species plans present information for seed planning units with active or planned breeding programs, seed orchards, or genecology work, including SPUs that are not supported through LBIS Tree Improvement Program funding. Information presented includes breeding strategy (where applicable), seed orchard production forecasts, gain forecasts, historic seed use, seed in storage, genetic conservation status, and genecology/seed transfer projects. The plans are organized by species.

**Species plans are available online at:**

**<http://www.fgcouncil.bc.ca/doc-04-speciesplans.html>**

and on the MFLNRO Tree Improvement Branch website.