



# **Forest Genetics Council of BC**

## **Business Plan 2015 / 16**

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 12, 2015**

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) 15th consecutive annual business plan. This plan is based on input from FGC's advisory committees and was approved by the FGC. The budget in this plan balances expenditures across subprograms to optimally contribute to FGC strategic objectives and was accepted by the Provincial Chief Forester to guide Land Base Investment Strategy (LBIS) spending. Resources from SelectSeed Ltd., industry, the Canadian Forest Service, and universities also contribute to this plan and to the FGC's overall goals.

The LBIS allocation to forest genetics activities in 2015/16 is \$2.5 million, unchanged from 2014/15. FGC-owned SelectSeed Ltd. contributes an additional amount of over \$240,000 to FGC program management, meetings, publications, species-plan development, consulting, and associated research. Funds from SelectSeed Ltd. will also support a Research Scientist (tree breeder) position in Tree Improvement Branch of the Ministry of Forests Lands and Natural Resource Operations (MFLNRO).

This Business Plan sets out work contributing to the FGC's new Strategic Plan for the period 2015 to 2020. It outlines a balanced-set of priorities and actions that contribute to enhancing the conservation, resilience, and value of BC's forest genetic resources. 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. These activities also support MFLNRO Service Plan performance measures for timber production.

Work outlined here will continue to support tree breeding and seed orchard work that ultimately generates the genetic gains and seed needed for BC's highly progressive and collaborative reforestation programs. Some 175 million seedlings of the 250 million planted annually will be grown from seed produced in BC seed orchards. A new climate-based seed transfer system remains a top priority; it's implementation will apply the best available science to optimize the resilience and productivity of future planted forests. The complex work done by MFLNRO and university scientists is also supported and recognized in this Plan. These projects are key for maintaining healthy and productive forests and a strong forest sector.

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

Mark Tamas, RPF  
FGC Co-chair  
Tolko Ltd.

Brian Barber, RPF  
FGC Co-chair  
Ministry of Forests Lands and Natural  
Resource Operations

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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>

## 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

## List of Tables

Table 1	Conservation subprogram budget for 2015/16. ....	6
Table 2	Breeding subprogram budget for 2015/16 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. 2015/16 forecast income and expenses by category. ....	10
Table 5	Decision Support projects and budget for 2015/16.....	11
Table 6	Cone and Seed Pest Management Subprogram projects for 2015/16. ....	12
Table 7	Genecology and Seed Transfer Subprogram projects led by non-MFLNRO proponents and approved through a call for proposals. ....	13
Table 8	MFLNRO Tree Improvement Branch Genecology and Seed Transfer Subprogram project funding and priority activities by species for 2015/16. ....	14
Table 9	2015/16 budget summary for LBIS Tree Improvement Program contributions to subprograms. ....	16
Table 10	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 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).

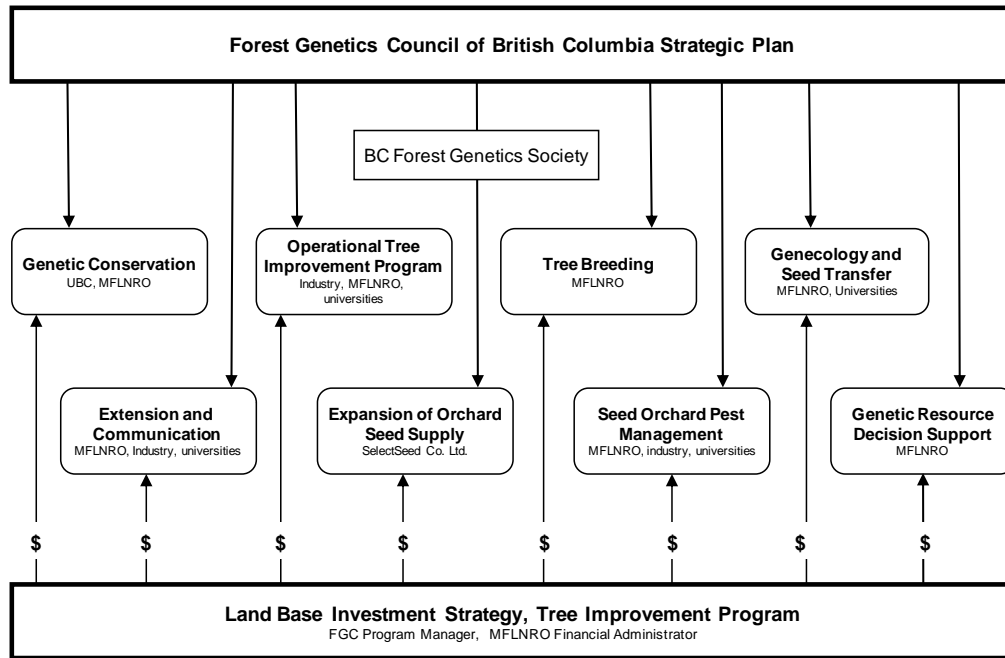


Figure 1 Relationship between the FGC Strategic Plan, Land Base Investment Strategy Tree Improvement Program, and business plan development through FGC subprograms.

## 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 the development of 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.

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.

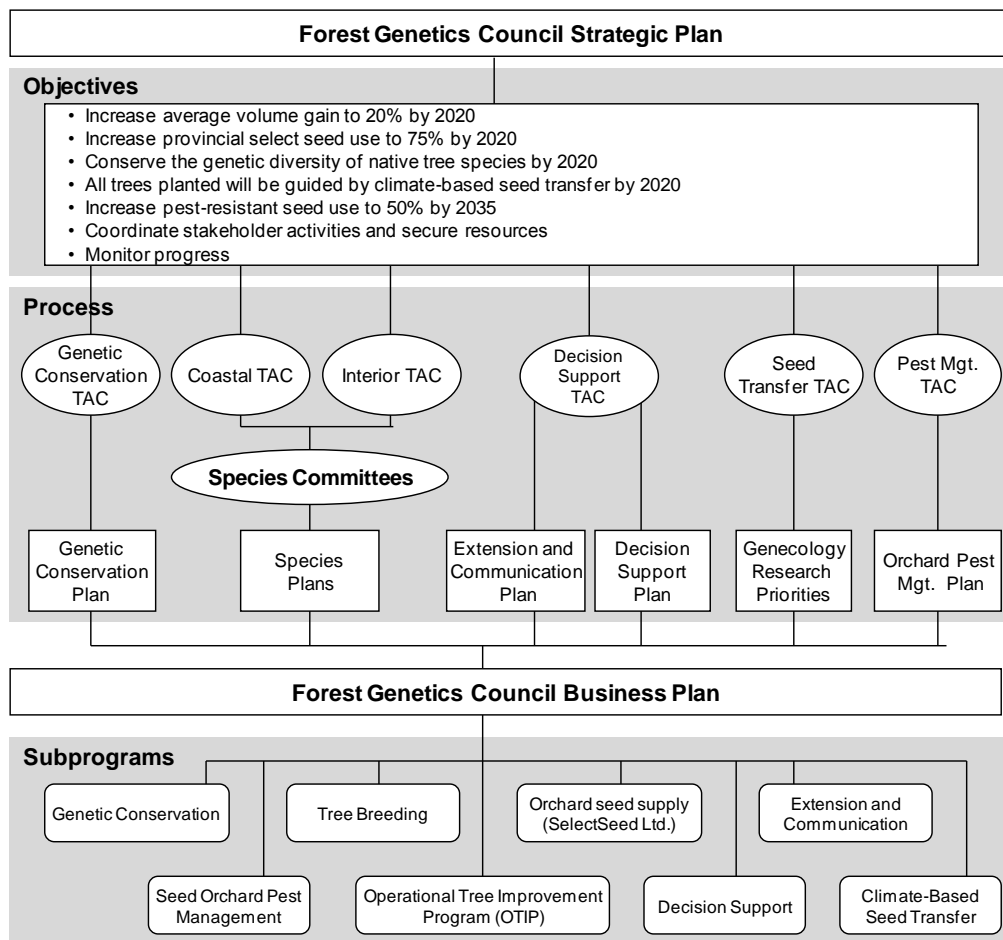


Figure 2 Link between FGC objectives, planning processes, and the subprograms of the FGC Business Plan.



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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. The focus on climate modeling (ClimateBC and ClimateWNA) will continue in 2015/16, with collaborative funding from Genome Canada through the AdapTree project. This climate modeling work is a cornerstone for many forestry climate-change projects being undertaken in BC and in some other jurisdictions. Other projects include updating climate-change projections and species range maps for the Genetic Conservation Status Catalogue, assessing the adaptive diversity in seed orchard seed, and other ongoing projects. These projects are also leveraged through other funds and will be done by students associated with the CFCG.

In the 2015/16 fiscal year, the Centre will receive \$147,500 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 \$35,000 is allocated to the Forest Genetics section of the Tree Improvement Branch for field-testing for whitebark pine blister-rust resistance and for maintenance of a western yew *ex-situ* conservation archive at the Cowichan Lake Research Station. Funding of \$39,000 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 maintenance and testing of existing seed-bank inventory. The Southern Interior Region of the MFLNRO will receive \$17,470 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 2015/16.

<b>Project</b>	<b>2015/16 budget</b>
<b>UBC Center for Forest Conservation Genetics</b>	
Climate modelling	45,000
Adaptive diversity in seed orchard lots	18,000
Whitebark pine assisted migration	-
Gen.Cons.Catalog update (clim.chg. projections & range maps)	45,000
<b>Non-commercial species</b>	
Genecology of Garry oak	-
Population genomic diversity in Garry oak	-
Updating literature search all species	-
Seaside juniper population genetics/genecology	5,000
<b>Other projects</b>	
CFCG website update	1,000
Big Tree Registry website completion	-
<b>General CFCG expenses</b>	
Extension	2,000
Office, lab and computing	2,000
<b>Total project costs</b>	<b>\$118,000</b>
UBC overhead at 25%	<b>\$29,500</b>
<b>Total for UBC Center for Forest Conservation Genetics</b>	<b>\$147,500</b>
<b>MFLNRO Tree Improvement Branch - Forest Genetics Section</b>	
Field testing whitebark pine rust resistance	33,000
Whitebark parent tree survival, demarcation & rust hazard of accessible pop	-
Brush ex-situ reserves at Cowichan: oak and yew	2,000
<b>Total for Forest Genetics Section</b>	<b>35,000</b>
<b>MFLNRO Tree Improvement Branch - Provincial Tree Seed Centre</b>	
Ex-situ sample maintenance (moisture content determination)	\$14,000
Ex-situ seed collections for the genetic conservation seed bank	\$25,000
<b>Total for Provincial Tree Seed Center</b>	<b>\$39,000</b>
<b>MFLNRO S. Interior Region - Whitebark Pine Rust Screening</b>	
Nursery inoculations of rust on whitebark pine seedlings	<b>\$17,470</b>
<b>Total FGC approved budget</b>	<b>\$238,970</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. This Subprogram also includes realized-gain trials that quantify area-based gains in timber production, and

support research on pests and other issues that impact the achievement of genetic gains in timber supply and quality. 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 2015/16 budget for the Tree Breeding Subprogram is \$1.131 million. Table 2 summarizes budgets for breeding activities by species. Some risk management may be undertaken on the assumption that contingencies will not allow some projects to proceed as expected.

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 2015/16 by species and by coast / interior.

<b>Species</b>	<b>Budget (\$ x 1000)</b>	<b>Species</b>	<b>Budget (\$ x 1000)</b>
<b>Coast</b>		<b>Interior</b>	
Coastal D-fir	130.1	Lodgepole pine	256.2
Redcedar	205.7	White pine	44.9
Yellow cedar	29.2	Interior spruce	124.5
Western hemlock	30.0	Interior D-fir	88.3
Sitka spruce	37.0	Western larch	115.9
White pine - coast	31.1	Broadleaves	0.0
Alder	37.8		
<b>Total coast</b>	<b>\$500.9</b>		<b>\$629.8</b>
<b>Total budget - coast and interior</b>			<b>\$1,130.7</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.

Review 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 2015/16 OTIP budget is \$502,622 (Table 3). Approved projects primarily focus on activities such as protecting 2015 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. 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	48	\$477,436	\$342,406	42
Coast	21	\$185,344	\$160,216	20
<b>Total cost</b>	<b>69</b>	<b>\$662,780</b>	<b>\$502,622</b>	<b>62</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.”

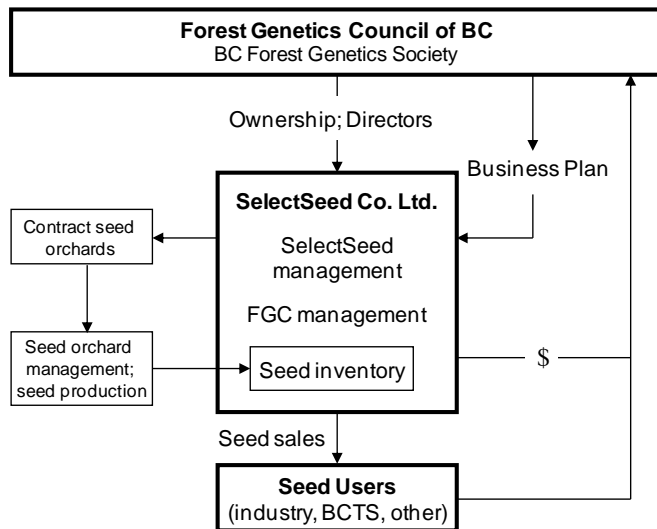


Figure 3 Organizational relationships among SelectSeed, Land Base Investment Strategy, Forest Genetics Council, and the B.C. Forest Genetics Society

#### 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 12, 2015.

#### 3.4.3 Activities and Budget

In 2015/16, 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 2015 is forecast at 43 kilograms of lodgepole pine, 72 kilograms of Douglas-fir, and 22 kilograms of spruce. Expected gross revenue from seed sales are forecast at \$580,000.

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 first year of a three year commitment to support this position within the MFLNRO.

Forecast spending for 2015/16 is \$870,800 (table 4), including \$242,600 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. 2015/16 forecast income and expenses by category.

Category description	Total	Q1	Q2	Q3	Q4
<b>SelectSeed costs</b>					
Orchard mgt contracts and capital investments	290,000	29,000	116,000	29,000	116,000
Propagation, holding, and orchard support	15,000	-	-	9,000	6,000
Crop management, seed extraction, sales	150,000	-	7,500	127,500	15,000
Management and administration	153,200	38,300	38,300	38,300	38,300
Orchard pest research trial	20,000	-	6,000	10,000	4,000
<b>Total SelectSeed costs</b>	<b>\$ 628,200</b>	<b>\$ 67,300</b>	<b>\$ 167,800</b>	<b>\$ 213,800</b>	<b>\$ 179,300</b>
<b>FGC management and support</b>					
Management, legal, communication	142,600	35,650	35,650	35,650	35,650
MYA fees (Int. breeder support - FLNRO)	100,000	100,000	-	-	-
<b>Total FGC costs</b>	<b>\$ 242,600</b>	<b>\$ 135,650</b>	<b>\$ 35,650</b>	<b>\$ 35,650</b>	<b>\$ 35,650</b>
<b>Total expenditures</b>	<b>\$ 870,800</b>	<b>\$ 202,950</b>	<b>\$ 203,450</b>	<b>\$ 249,450</b>	<b>\$ 214,950</b>
Seed sales	580,000	-	-	116,000	464,000
Interest on investments	12,000	3,000	3,000	3,000	3,000
Payment for pest research trial	20,000	-	-	-	20,000
<b>Total income</b>	<b>\$ 612,000</b>	<b>\$ 3,000</b>	<b>\$ 3,000</b>	<b>\$ 119,000</b>	<b>\$ 487,000</b>
<b>Net revenue without FGC costs</b>	<b>\$ (16,200)</b>	<b>\$ (64,300)</b>	<b>\$ (164,800)</b>	<b>\$ (94,800)</b>	<b>\$ 307,700</b>
<b>Net revenue with FGC costs</b>	<b>\$ (258,800)</b>	<b>\$ (199,950)</b>	<b>\$ (200,450)</b>	<b>\$ (130,450)</b>	<b>\$ 272,050</b>
Cash from (to) reserve	\$ 258,800				
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 2015/16 fiscal year, no specific budget was allocated to extension work. However, extension projects normally carried out by 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 a Technical Advisory Committee (TAC) 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 2015/16 fiscal year are to continue to develop decision support systems and data to support the evolution of climate-based seed transfer science and policy. Geographic Information Systems (GIS) support is provided to Tree Improvement Branch for various projects that support FGC goals and objectives. In addition, the Climate-Based Seed Transfer project will continue to receive support for management and facilitation. A total of \$60,000 is allocated to these projects (Table 5).

Table 5 Decision Support projects and budget for 2015/16.

Project	Budget (\$)
Geographic information system support for climate-based seed transfer development	45,000
Climate-Based Seed Transfer project management and facilitation	15,000
<b>Total</b>	<b>\$60,000</b>

## 3.7 Cone and Seed Pest Management Subprogram

The Pest Management subprogram supports FGC objectives 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 were developed by the MFLNRO cone and seed pest management specialists. These were subsequently reviewed by Pest Management TAC members, and recommendations made for project modifications. 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 2015/16 is \$71,072. In-kind, staff time and other contributions by affiliated companies and agencies are incremental to this amount. Projects and budgets are summarized in Table 6.

Table 6 Cone and Seed Pest Management Subprogram projects for 2015/16.

Project	Species impacted	Budget (\$)	Products
Adult host selection preference of spruce budworm for Douglas-fir – MFLNRO Tree Imp. Branch	Fdc, Fdi	1,890	Project report
Matador and Delegate Area-Wide Trials – 2014 – SelectSeed Ltd.	Pli	20,564	Final report
Cone and Seed Pest Management – Operations Budget for the Ministry Cone and Seed Pest Biologist	All species	24,300	Reports; ongoing operations support; extension bulletins
Determine if combining Matador applications and Harvest Timing Profile crop collection strategies will result in increased seed yields in an Interior Pli orchard – MFLNRO Tree Imp. Branch	Pli	6,216	Project report
Cone and Seed Pest Research Lab – MFLNRO Tree Imp. Branch	All species	5,250	Reports; ongoing operations support
Area-wide trials of Delegate against Dioryctia in Spruce – MFLNRO Tree Imp. Branch	Sx, Ss	12,852	Progress report
<b>Total budget</b>		<b>\$ 71,072</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 review committee on behalf of the STTAC. In addition, a call for proposals was released by the TIB on behalf of the STTAC and proposals were screened by a review committee 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.

#### 3.8.3 Activities and budget

The total budget allocated to the Genecology and Seed Transfer Subprogram for 2015/16 is \$361,052. This amount falls into two primary categories:

1. Successful proposals from a proposal call open only to proponents outside the MFLNRO - \$73,827 (Table 7).
2. Projects led by scientists from the MFLNRO TIB, including the Assisted Migration Adaptation Trial - \$287,225 (Table 8). This budget may be extended through risk management, at the discretion of the Tree Improvement Branch.

Table 7 Genecology and Seed Transfer Subprogram projects led by non-MFLNRO proponents and approved through a call for proposals.

Species	Project title	Budget (\$)	Performance indicator
Sx, Pli	Assessing the adaptive portfolio or reforestation stocks for future climates. The project is leveraged with funding through the Genome Canada funded AdaptTree genomics project (UBC - Aitken).	\$ 53,750	Project report; scientific publications
Cw	Identifying cedar blight resistance to develop durable and resistant western redcedar populations for future climates (UVic - Hawkins)	\$ 20,077	Progress report
<b>Total budget</b>		<b>\$ 73,827</b>	

Table 8 MFLNRO Tree Improvement Branch Genecology and Seed Transfer Subprogram project funding and priority activities by species for 2015/16.

Species	Approved budget (\$ x 1000)	Priority activities
Lodgepole pine	0	
Interior Douglas-fir	39	Field trial maintenance and measurement
Western redcedar (coast)	8	Field trial maintenance
Coastal Douglas-fir	24	Field trial establishment and maintenance
Interior spruce	43	Field trial maintenance and measurement
Western hemlock	21	Field trial measurement
Sub-alpine fir	14	Field trial maintenance and measurement
Western larch	11	Field trial maintenance and measurement
Western redcedar (interior)	13	Field trial maintenance and measurement
Pacific silver fir	11	Field trial maintenance
Western white pine	0	
Yellow cypress	11	Field trial maintenance and measurement
Sitka spruce	11	Field trial measurement and data analysis
Red alder	4	Field trial maintenance
Birch	0	
Grand fir	1	Field trial maintenance
Poplar	10	Field trial maintenance and measurement
Ponderosa pine	0	
Big-leaf maple	7	Field trial maintenance and measurement
Noble fir	1	Field trial maintenance
Assisted migration adaptation trial	60	Field trial maintenance and measurement
<b>Totals</b>	<b>287.2</b>	

\* Assisted Migration Adaptation Trial; includes multiple species.

### 3.9 Applied Tree Improvement and Biotechnology

The Applied Tree Improvement and Biotechnology research program accepts 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 received 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 proposals were received by the FGC Program Manager and reviewed by a Steering Committee reporting to the FGC. Criteria for project evaluation included the potential to contribute to FGC objectives, probability of success, proponent ability to meet project objectives, and cost. The Steering Committee considered project costs and reserved the right to suggest modifications to project activities or scope and to modify budgets, where they felt it was appropriate.

### 3.9.3 Projects and budget

Three proposals were received and reviewed under this subprogram and one proposal was approved for 2015/16 with reduced funding of \$125,550. The approved project is a continuation of a projected funded in 2014/15. Part one of this project investigates the possibility that lodgepole pine filled seed losses in north Okanagan seed orchards is being at least partially caused by a fungus. Part two of the proposal will continue an ongoing project that is assessing hormonal treatment options for Douglas-fir and lodgepole pine to increase cone production. This project is being led through the University of Victoria.

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## 1.10 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, Extension and Communication, Pest Management, and Genetic Resource Information Management,
- the administration of contracts with successful proponents through the OTIP, Genecology and Seed Transfer proposal calls, and with universities and SelectSeed Company Ltd.,
- support for the business of the FGC, including scheduling 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 2015/16 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 2015/16 fiscal year, and is summarized in Table 9. An additional approximately \$242,600 will be contributed by Council-owned SelectSeed Ltd. to cover program management, meeting costs, website, publications, and other support work.

Table 9 2015/16 budget summary for LBIS Tree Improvement Program contributions to subprograms.

<b>Subprogram</b>	<b>Allocation</b>
Genetic Conservation	238,970
Tree Breeding	1,130,734
Operational Tree Improvement Program (OTIP)	502,622
SelectSeed Company Ltd.	0
Extension and Communication	0
Cone and Seed Pest Management	71,072
Genecology and Seed Transfer	361,052
Genetic Resource Decision Support	60,000
Applied Tree Improvement and Biotechnology	125,550
Administration (Tree Improvement Branch)	10,000
<b>Total LBIS contribution</b>	<b>\$ 2,500,000</b>
<b>SelectSeed Ltd. contribution</b>	<b>\$ 242,600</b>
<b>Total FGC budget</b>	<b>\$ 2,742,600</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.

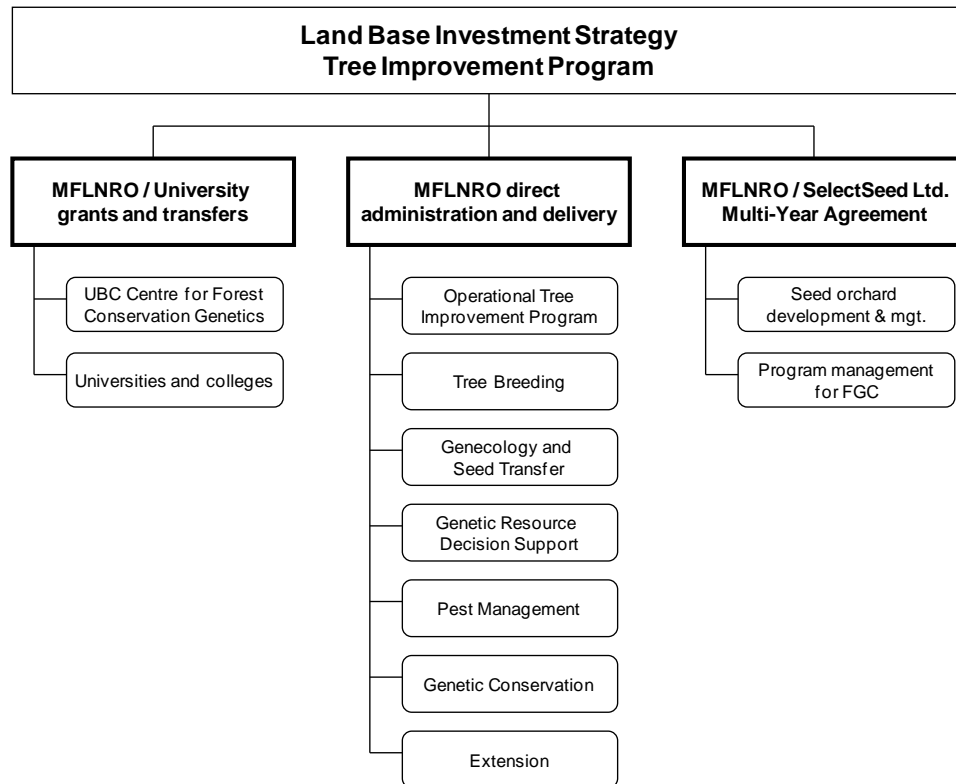


Figure 4 Administrative mechanisms for the delivery of the LBIS Tree Improvement Program funding.

## 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 2015/16. 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 10.

Table 10 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	700-1600	1	40L	Sx	PR low	450-650	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 Lee Charleson of the Ministry of Forests and Range Tree Improvement Branch ([lee.charleson@gov.bc.ca](mailto:lee.charleson@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.	Lisa Meyer	MFLNRO Tree Imp. Branch
Dr. Sally Aitken	University of BC	Dr. John Russell	MFLNRO Tree Imp. Branch
Charlie Cartwright	MFLNRO Tree Imp. Branch	Dr. Michael Stoehr	MFLNRO Tree Imp. Branch
Jimmy Hodgson	Island Timber Ltd.	Nicholas Ukrainetz	MFLNRO Tree Imp. Branch
Stephen Joyce	MFLNRO Tree Imp. Branch	Bevin Wigmore	TimberWest Forests Ltd.
Dr. John King	Independent	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.		

### Interior Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Stephen Joyce (Chair)	MFLNRO Tree Imp. Branch	Barry Jaquish	MFLNRO Tree Imp. Branch
Mike Brown	PRT Growing Services Ltd.	Dave Kolotelo	MFLNRO TIB / Tree Seed Center
Guy Burdikin	West Fraser Timber Ltd.	Dan Livingston	PRT Growing Services Ltd.
Dr. Michael Carlson	MFLNRO Tree Imp. Branch (emeritus)	Dr. Greg O'Neill	MFLNRO Tree Imp. Branch
Krista Copeland	Tolko Ltd.	Roger Painter	SelectSeed Ltd.
Vince Day	Canadian Forest Products Ltd.	Doug Perdue	Dunkley Lumber
Dan Gaudet	Vernon Seed Orchard Company	Alan Rasmussen	MFLNR / BC Timber Sales Ltd.
Gary Giampa	MFLNRO Tree Imp. Branch	Jason Regnier	West Fraser Timber Ltd.
Hilary Graham	MFLNRO Tree Imp. Branch	Nicholas Ukrainetz	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>
Stephen Joyce (Chair)	MFLNRO, Tree Imp. Branch	Corey Mathieson	TimberWest Forests Ltd.
Dr. Jenny Cory	Simon Fraser Univ.	Dr. Ward Strong	MFLNRO Tree Imp. Branch
Gary Giampa	MFLNRO, Tree Imp. Branch	Dr. Jean Turgeon	Canadian Forest Service
Hilary Graham	MFLNRO Tree Imp. Branch	Tia Wagner	Vernon Seed Orch. Co.

**Decision Support Advisory Committee**

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

**Seed Transfer Technical Advisory Committee**

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

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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://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/seed-planning-use/seed-planning-units-species-plans>**