

## Report of the Breeding Subprogram Review Committee

May 27, 2008

### Committee members

Brian Barber, Mike Carlson, Jill Peterson, Gerry Still, Keith Thomas, Annette van Niejenhuis, Jack Woods, Alvin Yanchuk

### Background

At its September 19, 2007 meeting, the Forest Genetics Council of BC initiated a Tree Breeding Subprogram review. Alvin Yanchuk and Jack Woods were asked to make recommendations on both terms of reference (TOR) and review committee membership to the FGC Co-Chairs. The following TOR were approved by Co-Chairs John Elmslie and Dale Draper.

#### *Terms of Reference:*

1. Process for longer-term planning and program emphasis; how do we evaluate breeding activities relative to FGC objectives and seed planning unit priorities?
2. Process for coordinating breeding programs with seed orchard activities and needs.
3. Process for setting annual breeding project budgets and priorities, including the role of the Coast and Interior Technical Advisory Committees and Species Committees in receiving and approving breeding budget plans, timing and process used for Species Committee meetings, and breeder roles.
4. Reporting on activities at 6 months and year end; are the Key Performance Indicators working? Do we need adjustments to the KPIs?
5. Process for re-directing activities and money during the year; is it working now? What amount of change requires some level of discussion or approval? Who approves?

### Process and meetings:

The review committee had two meetings (January 14 and March 4, 2008). At the first meeting, TOR were discussed, issues identified, and tasks identified. At the second meeting, tasks were reviewed, and positions formulated around the 5 TOR. Finally, this report was reviewed and approved by the Review Committee.

### Report and recommendations by TOR:

#### **TOR 1 – Planning and priority setting**

Tree breeding activities must support the broader objectives set out in FGC Strategic and Business Plans. This requires a system for setting priorities among the broad suite of seed planning units (SPU) in BC, the development of activities to address the priority SPU, and an annual budgeting and reporting process.

The current FGC process for ranking SPU utilizes the Tree Improvement Investment Priority model (TIIP) to estimate the economic value of tree improvement activities among a broad set of SPU in BC. TIIP output information is combined with other less quantitative information in a decision matrix (see Appendix 1). Ranked SPU are then categorized as follows:

1. Advanced-generation breeding program

2. First-generation breeding activities only
3. Genecology research only
4. No activities

With the addition of increased genetic conservation concerns, and with the need to initiate or expand genecology testing in light of climate change and expected species range changes, more species and zones must be included in genecology research activities. This matter will be the subject of a *Genecology and Seed Transfer Committee* set up by the FGC, and will not be further considered here. As climate change is also expected to modify the size of the existing SPU, forecasts of the level of change in size should be included in the SPU ranking process. This will increase our ability to advance FGC objectives for select-seed deployment in future decades.

This decision matrix approach to ranking SPU is considered adequate with the following changes recommended:

1. Re-run the TIIP model with updated input data
2. Add expected species range size changes to the to the SPU ranking matrix.

As the ranking system used will become out-of-date over time due to changed planting demand, new product values, and advancing breeding and orchard programs, the committee believes that the TIIP model should be updated at least every five years in conjunction with the development of a new FGC Strategic Plan, or when needed between strategic planning cycles.

The ranking system guides breeding program investments. Breeders and Research Branch Management are responsible for developing program strategies that are appropriate for the species, zone, and priority ranking using guidance from the ranking system.

**Recommendations:**

1. Update the TIIP model with new data
2. Update the SPU ranking matrix and include information on expected range expansion or contraction due to climate change.
3. Update the SPU ranking system at a minimum every 5 years.
4. Breeders and Research Branch management are responsible for developing and operating breeding programs appropriate for the priority ranking of a seed planning unit.

## **TOR 2 – Coordinating breeding programs with seed orchard activities and needs**

### **Background**

The process for setting breeding priorities described under TOR 1 is also generally used to guide seed orchard development and management priorities. Seed orchards and breeding programs are linked, and one has little value without the other. Therefore, it is imperative that planning systems coordinate these activities and that breeders and orchard managers communicate regularly. It is also important that the systems of planning, budget development and reporting used by the FGC support and encourage this coordination and communication.

At the present time, Forest Investment Account funds are allocated to the Tree Breeding Subprogram through planning processes developed by the FGC and described in the FGC Business Plan. The process is summarized as follows:

1. Committee structure: FGC ---> Coastal and Interior Technical Advisory Committees ---> Species Committees
2. Species Committees lead strategy development, develop program needs for each seed planning unit, and coordinate breeding and orchard activities.
3. MFR Breeders develop specific breeding strategies, activities, and budgets.
4. Budgets and activities are discussed and approved by Species Committees, the CTAC or ITAC, and finally the FGC

### **Breeder roles**

Tree breeders have responsibility for conducting breeding and research activities in specific SPUs. They have leadership roles in these SPUs due to their technical expertise and their position to make decisions regarding program timing and strategy. Therefore, breeders must (and generally do) extend this leadership role to working with seed orchard managers to help coordinate seed production systems that optimize the available quality and quantity of select material for operational planting programs.

Breeder leadership at the Species Committee level is considered key to advancing these strategic discussions and to the development of priorities within each SPU, including breeding activities, genecology needs, and seed orchard strategy. These Species Committee discussions are also key to effective delivery and priority setting for the Operational Tree Improvement Program (OTIP), as eligible funding categories must coordinate with long-term strategy and breeding program outputs.

### **Issues:**

1. Species committee leadership and strategic discussion is at times not at the level that is needed, resulting in little or no strategic discussion of breeding activities and budgets.
2. Lack of time limits strategic discussion, resulting in hasty summaries of planned activities and budgets.

### **Recommendations:**

1. Maintain existing committee structures (Species Committees – TACs – FGC), but seek efficiencies in how Species Committee meetings are held
2. The Coast TAC chair will pursue the development of meetings that will meet communication, OTIP priority, and Breeding Subprogram budget needs for coastal SPUs
3. Breeders will be encouraged to take (or continue to take) active leadership roles by chairing Species Committees and leading discussions for the SPUs for which they operate breeding programs. These discussions should consider the full activity pathway from breeding and associated research to seed production and use in reforestation programs.
4. As breeder time is limited they should be provided support for the planning, organizing, and logistics of Species Committee meetings. This support could come from their technicians, from Research Branch clerical staff, or from TIB staff.

### **TOR 3 – Annual budget process for FIA and base funds**

Forest Investment Account funds are currently allocated to the Tree Breeding Subprogram through the four-step process described under TOR 2, above.

### **Proposed system:**

No change to the four general steps outlined above is recommended. However, timing is important to allow smooth coordination of steps in budget development, and to avoid busy field seasons. The following is proposed (and largely followed at the present time):

- **Mid-October:** Breeder develops program activities and budgets for the next fiscal year based on generalized strategies accepted by Species Committees and CTAC/ITAC, and submit to the Manager of Forest Genetics, Research Branch.
- **Mid-December:** All budget requests are compiled, reviewed by Alvin, and reconciled against budget expectations for the following year. Where discrepancies appear, the Manager of Forest Genetics will work with breeders to propose budget changes to match the expected total allocation.
- **January:** Species committees meet and receive budget proposals (and reports from the previous year) from breeders. Where budget reductions from original submissions are considered unacceptable to Species Committee members, arguments can be made.
- **February:** CTAC and ITAC meet and receive species committees budget recommendations.
- **March:** Total budget allocation approved by the CTAC/ITAC is presented to the FGC for approval (along with other subprogram budgets).

**Recommendations:**

1. The budgeting process will follow the timing set out above.

## TOR 4 – Performance indicators and reporting

### Background

Tree breeding subprogram projects are currently summarized in a matrix with various work categories arrayed by seed planning unit. This is shown in Table 2 of the annual FGC Business Plan and is a useful management tool for listing projects, performance indicators, and associated funding. The performance indicators also provide the basis for a year-end-activity report that appears in the FGC Annual Report.

The work categories used to aid budgeting and reporting breeding activities has been a useful tool for the past 7 years. However, a number of changes are recommended to make the process easier for breeders at both the budget development and reporting stages. Appendix 2 contains a recommended replacement format for the FGC Business Plan Table 2 that summarizes breeding program performance indicators and budgets. Note that the “Provenance testing” component of the budget has been removed pending recommendations from the FGC committee reviewing genecology research needs. The table in Appendix 2 is an un-populated version of what could be used for 2009/10 budget development and appear in the 2009/10 FGC Business Plan.

**Recommendation:**

1. An updated version of the breeding budget and performance indicator matrix (Appendix 2) should be used for future breeding-program business planning.

## TOR 5 – Process for redirecting funds and activities during the fiscal year

### Background

From time to time, planned activities cannot be completed for a variety of reasons (biological, weather, etc.), activity costs are over-estimated, or cost overruns occur. As a result, the need for modifications to planned budgets and activities will occur.

### Status quo:

Re-allocations are made by the Manager of Forest Genetics as considered necessary. At the Manager's discretion, significant departures from the originally approved budget and activity matrix will be discussed with members of the Forest Genetics Council.

### Proposed system:

1. Where over- or under-runs of less than \$20,000 are identified in budget allocations, they will be moved among activities within the approved activity and budget matrix at the discretion of the Manager of Forest Genetics.
2. Where transfers or new projects (not in the approved activity matrix) exceed \$20,000, the Manager of Forest Genetics will consult with the Tree Improvement Branch Program Administrator and the FGC Program Manager, and a joint decision will be made on reallocations, or the decision will be taken to the FGC for further discussion. This process will allow consideration of other funding needs outside the Breeding Subprogram.

### Recommendations:

1. Budget over- or under-runs of less than \$20,000 (full multi-year cost if a new project) will be reallocated to approved projects at the discretion of the Research Branch, Manager of Forest Genetics.
2. For budget over- or under-runs of more than \$20,000 the Manager of Forest Genetics will consult with the Tree Improvement Branch Program Administrator and the FGC Program Manager, and a joint decision will be made on reallocations or the decision will be taken to the FGC for further discussion.

## Implementation

Implementation of recommendations found in this report will largely happen through the cooperation of all people involved in the Tree Breeding Subprogram, including breeders, CTAC and ITAC members, FGC members, the Program Administrator, and the FGC Program Manager. Having a clear articulation of timing and expectations will help, but ultimately the planning, budgeting, and coordination of breeding activities with other program areas such as seed orchards will only work as well as the people involved make it work. We believe that the Tree Breeding Subprogram is a strong program and that breeding activities are a key element in the FGC program. Further, we are confident that those involved will continue to improve planning, communications, reporting, and most importantly, the activities being undertaken on the ground.



## Appendix 1: SPU ranks and activity categories developed for the FGC 2004-2008 Strategic Plan (updated February, 2005)

### Seed Planning Unit Evaluation of Priority for Investment based on Strategic Planning Committee Criteria Scores reviewed by Species Committees fall, 2002

Discount rate 4%      Adjacency percentage used 0.50%

<b>Program categories:</b>	1. Proceed with advanced generation breeding and orchards 2. First generation program only; complete 1st gen testing and orchard development 3. Geneecology work only. No progeny testing or seed orchards. 4. No genetics work	<b>Weighted Mean Tree Improvement Score for the SP</b> The weighted mean tree improvement score for the SPU is the mean score weighted by the following for each criteria.
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<b>Criteria for program categorization (10 = very high; 1 = very low):</b> A. NPV      Increment. NPV from TIIP model; scores = 10 x (SPU NPV) <sup>0.5</sup> / (NPV for highest SPU) <sup>0.5</sup> ; neg. NPV receive B. Technical feasibility for breeding      Biological feasibility and propability of success of a breeding program based on other programs, etc. C. Delivery feasibility      Feasibility of success for operational delivery of gains (i.e. orchard or cutting program success) D. TSR value to mgt. units      Value of timber supply gains in the mgt. units based on existing timber supply analyses, adjacency limits, E. Uncertainty and risk      Uncertainty of the long-term demand for select material (i.e. long-term seedling demand) F. Opportunities      Specific opportunities for higher gains (i.e. clonal testing and delivery through cuttings, SE; use of exotics, G. Seed transfer info. needs      Need for seed transfer or other geneecology information within the SPU	<table border="1"> <tr> <th>Criteria</th> <th>Weighting</th> <th>NOTE:</th> </tr> <tr> <td>A</td> <td>0.8</td> <td>- Weightings set by CTAC (Nov. 02)</td> </tr> <tr> <td>B</td> <td>0.1</td> <td>- Criteria D, E, and F are secondary; use subjective adjustment to Program Category</td> </tr> <tr> <td>C</td> <td>0.1</td> <td>- Criteria G relates to Geneecology need, and is not an economic ranking</td> </tr> <tr> <td>D</td> <td>0</td> <td></td> </tr> <tr> <td>E</td> <td>0</td> <td></td> </tr> <tr> <td>F</td> <td>0</td> <td></td> </tr> <tr> <td>G</td> <td>0</td> <td></td> </tr> <tr> <td colspan="2">total</td> <td>1</td> </tr> </table>	Criteria	Weighting	NOTE:	A	0.8	- Weightings set by CTAC (Nov. 02)	B	0.1	- Criteria D, E, and F are secondary; use subjective adjustment to Program Category	C	0.1	- Criteria G relates to Geneecology need, and is not an economic ranking	D	0		E	0		F	0		G	0		total		1
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G	0																											
total		1																										

Seed planning unit				VALUE OUTPUTS			INFORMATION		CRITERIA FOR PROGRAM CATEGORIZATION							SCORES	
SPU #	Species	SPZ	Elev. band (m)	Increm. NPV mm\$	Total NPV rank	Total NPV mm\$	Annual planting (million)	Adjacency benefit included	A. NPV Score	B. Breeding feasibility	C. Delivery feasibility	D. TSR value	E. Uncertainty & risk	F. Opportunities	G. SPZ info needs	Wtd. Mean TI Score	Program category
1	Fdc	M low (south)	0-700	\$90.4	1	\$410.7	8.1	Y	10.0	8	8	10	10	5	2	9.6	1
12	Pli	PG low	<1200	\$57.7	4	\$129.2	20.3	N	8.0	9	7	5	9	5	4	8.0	1
6	Ss	M all (increm)	<750	\$59.0	6	\$75.8	3.0	Y	8.1	5	6	9	6	8	2	7.6	1
2	Cw	M low (all lat)	0-600	\$50.9	2	\$175.5	6.4	Y	7.5	7	7	9	8	10	2	7.4	1
7	Pli	NE low	<1400	\$34.5	8	\$69.7	4.4	Y	6.2	9	7	10	7	5	4	6.5	1
14	Sx	PG low	<1200	\$29.0	3	\$145.9	25.4	N	5.7	10	10	5	10	7	4	6.5	1
5	Sx	NE high	>1500	\$26.2	10	\$65.9	5.6	Y	5.4	10	10	9	9	7	6	6.3	1
18	Pli	CP low	<900 or <11	\$27.7	12	\$52.7	11.4	N	5.5	9	7	5	9	5	4	6.0	1
17	Pli	BV low	<1200	\$27.0	7	\$70.7	15.2	N	5.5	9	7	5	6	5	8	6.0	1
3	Hw	M (N & S)	0-600	\$24.4	5	\$101.3	2.2	Y	5.2	9	9	9	6	5	3	6.0	1
4	Sx	NE mid	1000-1500	\$19.5	9	\$67.2	5.0	Y	4.6	10	10	10	10	7	6	5.7	1
10	Pli	TO low	<1400	\$16.8	11	\$59.9	9.2	Y	4.3	9	7	8	9	5	4	5.0	1
8	Pw	Cst (all) (incr)	0-1000	\$20.6	14	\$44.8	1.5	Y	4.8	4	8	9	5	5	2	5.0	1
13	Lw	NE	<1300	\$12.7	16	\$34.1	2.9	Y	3.8	8	10	10	10	5	5	4.8	1
35	Sx	BV low	<1200	\$9.1	21	\$21.8	6.9	N	3.2	10	10	5	9	7	4	4.5	1
15	Pw	KQ (incr.)	<1400	\$15.3	19	\$24.7	2.5	Y	4.1	4	8	8	5	5	2	4.5	1
11	Yc	M	<1200	\$12.7	17	\$32.6	1.2	Y	3.8	6	8	8	7	10	4	4.4	1
21	Fdi	NE low	<1000	\$6.3	13	\$50.7	2.2	Y	2.6	8	8	10	10	5	4	3.7	1
28	Sx	TO high	1300-1850	\$3.7	23	\$18.7	3.6	Y	2.0	10	10	8	8	7	4	3.6	1
25	Sx	EK	<1700	\$2.4	20	\$22.1	1.4	Y	1.6	10	10	9	9	7	4	3.3	1
34	Lw	EK	800-1500	\$1.6	28	\$11.2	1.2	Y	1.3	8	10	9	10	5	5	2.9	1
40	Sx	PR mid	650-1200m	\$18.5	24	\$18.5	7.6	N	4.5	10	10	5	9	7	10	5.6	2
40	Sx	PR low	<650	\$9.5	30	\$9.5	4.2	N	3.2	10	10	5	8	7	10	4.6	2
24	Hw	M high	>600	\$11.2	25	\$16.9	1.0	Y	3.5	9	9	8	6	5	7	4.6	2
16	Pli	TO high	>1400	\$10.3	15	\$35.4	6.1	Y	3.4	9	7	8	7	5	4	4.3	2
42	Sx	PG high	>1200	\$4.8	38	\$4.8	2.3	N	2.3	10	10	5	9	7	4	3.9	2
33	Cw	M high	>600	\$8.5	33	\$8.5	1.0	Y	3.1	7	7	10	7	10	10	3.8	2
44	Sx	NE low	<1000	\$4.7	29	\$10.0	0.8	Y	2.3	10	10	10	10	7	6	3.8	2
19	Fdc	SM	200-1000	\$6.6	31	\$9.1	1.0	Y	2.7	8	8	8	7	5	10	3.8	2
32	Pli	EK low	<1500	\$6.2	37	\$6.2	2.2	Y	2.6	9	7	9	9	5	4	3.7	2
31	Fdc	M High	>700	\$4.4	32	\$8.7	0.7	Y	2.2	8	8	9	7	5	10	3.4	2
41	Fdi	PG	<1000	\$3.3	35	\$7.6	1.8	N	1.9	8	8	5	8	5	6	3.1	2
39	Fdi	EK	all	\$2.6	41	\$2.6	0.6	Y	1.7	8	8	9	8	5	5	3.0	2
37	Fdi	QL	<1200	\$2.2	44	\$2.0	1.0	Y	1.6	8	8	7	9	5	6	2.8	2
22	Fdi	NE high	>1000	\$2.0	18	\$31.2	2.2	Y	1.5	8	8	9	8	5	7	2.8	2
30	Sx	TO low	<1300	\$0.6	34	\$7.8	1.4	Y	0.8	10	10	8	10	7	4	2.7	2
43	Fdi	CT	<1100	\$0.7	42	\$2.3	0.5	N	0.9	8	8	5	8	5	5	2.3	2
20	Pli	NE high	>1400	\$13.3	22	\$20.3	3.0	Y	3.8	9	7	9	8	5	6	4.7	3
29	Pli	EK high	>1500	\$6.3	36	\$6.3	1.9	Y	2.6	9	7	9	7	5	6	3.7	3
26	Pli	PG high	>1200	\$6.3	27	\$11.6	3.8	N	2.6	9	7	5	8	5	4	3.7	3
9	Ba	M / SM	<1000	\$7.9	26	\$13.4	1.9	Y	2.9	4	3	7	5	5	10	3.1	3
27	Cw	SM	200-1000	\$3.0	39	\$3.0	0.8	Y	1.8	7	7	5	7	10	10	2.9	3
45	Pli	CHL/BB	all	\$0.7	46	\$0.7	8.8	N	0.9	9	7	7	6	5	10	2.3	3
23	Sx/Ss	SM/NST	all	\$1.6	45	\$1.6	1.1	Y	1.3	5	5	7	7	7	10	2.1	3
36	Bg	M low	<700	-\$2.1	54	-\$1.4	0.1	Y	0.0	4	3	5	4	5	7	0.7	3
46	Bl	NST/all int.	all	-\$1.5	55	-\$1.5	2.2	N	0.0	4	3	6	6	5	10	0.7	3
47	Bn	M	600+	-\$2.8	59	-\$2.6	0.1	Y	0.0	4	3	6	4	5	6	0.7	3
48	Aspen/Birch	Interior															3
49	Poplar/alder	Coast															3



**Appendix 2: Revised breeding subprogram budget and reporting table**

**Research Branch Breeding Program Business Plan -- KPI's and budget**

Seed Planning Unit				220 Selection and Breeding								230 Progeny testing						240 Technical Support				Total \$ ,000								
				211		221		222		223		224		231		232		233		234			240-1		240-2		240-3		240-4	
				# genotypes selected	# genotypes establ. in arboreta / archives	# gntyps. maint. in breeding arboreta	# pollen collections (genotypes)	# crosses made (# diallel cells)	test sites sown (# sites)	progeny sites establ. / prepped (# sites)	progeny sites maintained (# sites)	progeny sites assessed (# sites)	Projects																	
#	Spp.	SPZ	Elev (m)	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	KPI	\$	
1	Fdc	M	1-700																										0	
2	Cw	M	1-600																										0	
3	Hw	M-S	1-600																										0	
4	Sx	NE	1000-1500																										0	
5	Sx	NE	1500-1900																										0	
6	Ss	M	1-500																										0	
7	Pli	NE	700-1400																										0	
8	Pw	M/SM	1-1400																										0	
9	Ba	M	1-1000																										0	
10	Pli	TO	700-1400																										0	
11	Yc	M	1-1100																										0	
12	Pli	PG	700-1200																										0	
13	Lw	NE	700-1400																										0	
14	Sx	PG	600-1200																										0	
15	Pw	KQ	500-1400																										0	
16	Pli	TO	1400-1600																										0	
17	Pli	BV	700-1200																										0	
18	Pli	CP	700-1100																										0	
19	Fdc	SM	400-1200																										0	
20	Pli	NE	1400-2000																										0	
21	Fdi	NE	400-1000																										0	
22	Fdi	NE	1000-1600																										0	
23	Sx/Ss	SM/NST	all																										0	
24	Hw	M	600-1100																										0	
25	Sx	EK	750-1700																										0	
26	Pli	PG	1200-2000																										0	
27	Cwr	SM	200-1000																										0	
28	Sx	TO	1300-1900																										0	
29	Pli	EK	1500-2000																										0	
30	Sx	TO	700-1300																										0	
31	Fdc	M	700-1200																										0	
32	Pli	EK	800-1500																										0	
33	Cwr	SM	600-1500																										0	
34	Lw	EK	800-1500																										0	
35	Sx	BV	500-1200																										0	
36	Bg	M	1-700																										0	
37	Fdi	QL	700-1200																										0	
39	Fdi	EK	700-1400																										0	
40	Sx	PR	650-1200																										0	
41	Fdi	PG	700-1000																										0	
42	Sx	PG	1200-1550																										0	
43	Fdi	CT	600-1200																										0	
44	Sx	NE	1-1000																										0	
45	Pli	BB/CHL	all																										0	
46	Bl	all int.	all																										0	
47	Bn	M	all																										0	
48	At/Ep/Ct	interior	all																										0	
49	Dr/Ct/Mb	Coast	all																										0	
50	Lw	NE	1200-1800																										0	
51	Yp	S. Int.	300-1200																										0	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0