CTAC Breeder's Review Meeting Minutes – March 7, 2019

Location: WFP Saanich Forestry Centre, 8067 East Saanich Road, Saanichton BC

Participants:

CTAC Members:
Annette van Niejenhuis – Chair (WFP), Sally Aitken (UBC), Charlie Cartwright (FIRM, FLNRORD), Lauchlan Glen (BCTS, FLNRORD), Michael Stoehr (FIRM, FLNRORD), Nicholas Ukrainetz (FIRM, FLNRORD), Bevin Wigmore (Mosaic), Alvin Yanchuk (FIRM, FLNRORD)

Others:
Brian Barber (FGC, SelectSeed), Kennedy Boateng (UVIC), Jon Degner (FIRM, FLNRORD), Kelsey Franklin (FIRM, FLNRORD), Chris Halldorson (FIRM, FLNRORD), Miriam Isaac-Renton (Canadian Wood Fibre Centre), Jong Leong (FIRM, FLNRORD), Sylvia L'Hirondelle (FIRM, FLNRORD), Pat Martin (FIRM, FLNRORD), Corey Mathieson (Mosaic), David Noshad (Canadian Bioact), Rafael Ribeiro (UBC), Margot Spence (FIRM, FLNRORD), Kat Spencer (FIRM, FLNRORD), Bob Johnson (Capacity), Keith Thomas (FIRM, FLNRORD), Lise van der Merwe (FIRM, FLNRORD)

Regrets:
Dave Kolotelo (FLNRORD), Jimmie Hodgson (Mosaic), Stefan Zeglan (Coast Region, FLNRORD), Stephen Joyce (FIRM, FLNRORD)

Summary of Motions:

1. The CTAC budget for 2019/20 as presented by the breeders is hereby approved and recommended to Council, with any subsequent adjustments required to meet budget targets to be based on ministry tree breeders' input of priorities and impacts. Sally/Charlie. CARRIED.
2. The budgets put forward for AMAT, CoAdapTree and CBST are hereby approved and recommended to Council. Bevin/Nick. CARRIED (1 abstention).
3. Because CBST is combining SPU 19 (Fdc SM) and SPU 31 (Fdc M High), we recommend moving to advanced generation breeding in this combined SPU. Michael/Nick. CARRIED

Summary of Action Items:

1. Bevin Wigmore to prepare the minutes of this meeting.
2. Annette van Niejenhuis (CTAC chair) to present the CTAC budget recommendations to FGC (April 2, 2019).
3. Annette to bring forward to FGC the recommendation to move to advanced generation breeding for high elevation and submaritime Fdc.

1. Proceeding

The CTAC business meeting was hosted by Western Forest Products. There being a quorum of members present, Annette van Niejenhuis called the meeting to order and welcomed members and guests at approx. 9:00 am. Bevin Wigmore volunteered to record minutes.

A minute of silence was held for our colleague and friend Dr. John Russell who sadly passed away on December 20, 2018. He was a core member of CTAC and it is our task as a group to make sure that we keep his work going forward.

2. Membership

Lauchlan Glen is stepping down as BCTS rep and will be replaced by Kona Van Diest. The amalgamation of TimberWest's and Island Timberland's management services under Mosaic was noted. No other membership changes were made.

3. Agenda

The agenda was circulated in advance (see Appendix). The Hardwoods report was switched to 11:00 am and the AMAT report switched to 1:15 pm.

4. White Pine Report and Budget

Nicholas Ukrainetz presented the coastal white pine year report. In 2018 the breeding values for blister rust resistance (DSB) were entered in SPAR and seedlot DSB values were calculated – this is a big step forward in the program. DSG value represents % survival of trees planted through to rotation. Wild seed sources are estimated to have a DSG of 30%. New orchards should be able to reach a mean DSG of around 80% resistance.

Also in 2018, the causal agent of white pine mortality in several orchards was determined to be a water mold, most likely *Phytophthora cryptogea*. UBC and Harry Kope are working on identification and Koch's postulates, while Geoff Bradley has developed a management strategy. And finally in 2018, 28 MGR clones (12 ramets per clone) were grafted for future pollen orchards.

Future plans include maintenance, assessment and measurement of F1 progeny trials, and making forward selections when site infection rates exceed 75%.

Budget for 2019/2020 Coastal White Pine:

Details	Activity #	Description	KPI	Funds
Series 5 Assessment	234	Assessed progeny sites	2	$ 4,500
Series 3 15-yr Assessment	233	Maintained progeny sites	3	$ 13,000
CLRS Station Support	221	Maintain arboreta		$ 12,500
Total				**$ 26,000**

5. Western Redcedar Report and Budget

Lise van der Merwe presented the Western Redcedar report. It is difficult without John – the program is still going but some items are delayed. Alvin Yanchuk is now the User Project Leader for the CeDAR GAPP project. Marie Vance has taken over the Interior Cw program.

Work planned for 2019/2020 includes

- Finish Cw breeding manual
- Complete Px series 7 16-year measurements at seven sites
- Establish second half of last set of clonal trials for CLB/Growth/Deer browse
- GAPP work – finish outstanding phenotyping of heartwood cores from clonebank parents and foliar chemistry from self lines
- Finish outstanding analysis of
    - Data from David Noshad's CLB inoculation work
    - Px series 4,5 and 6 15-year BV's
    - Data to confirm validity of Cw overrides in CBST (Degner, O'Neill)
- Final year of GAPP and UPP trial maintenance and measurements
- Present results of deer browse data analysis

Budget needs 2019/2020 Cw Maritime Low SPU#2:

Activity	Volume Growth	Forest Health
Breeding	$21,000	$21,000
Establishment (x2 fenced trials)	$21,000	$21,000
Maintain and Measurement Px series 7	$65,000	$ 5,000
Contribution to David Noshad pathology work	-	$34,000
GAPP Phenotyping	$18,000	$ 2,000
Clonebank maintenance	$ 7,000	$ 7,000
Materials and supplies	$ 5,000	-
Nursery support	$30,000	$30,000
Technician support	$25,000	-
Travel	$ 8,000	$ 2,000
Total	**$200,000**	**$122,000**

Budget needs 2019/2020 Cw Submaritime Low SPU#27:

Activity	Volume Growth	Forest Health
Maintain and Measurement Px 7 – two sites	$ 8,000	$ 8,000
Total	**$ 8,000**	**$ 8,000**

Budget needs 2019/2020 Cw Maritime High SPU#33:

Activity	Volume Growth	Forest Health
Maintain and Measurement Px 7 – one site and 1 remaining Px series 5 site	$ 8,000	$ 8,000
Total	**$ 8,000**	**$ 8,000**

Overall total for western redcedar $354,000

6. Yellow Cypress Report and Budget

Lise van der Merwe presented the yellow cypress update. In 2018 continued phasing out of the production orchard at CLRS and transferring it to Puckle Road, did clonebank maintenance, set cuttings for hedge at Skimikin and set cuttings for operational requests for 250,000 trees.

Work planned for 2019/2020 includes

- Analyze initial scoring for Skimikin and transfer the clones
- Maintain/measure 2 of the 10 Yc provenance trials, Jordan High and Jordan Low
- Graft/replacements for clonebank

Budget for 2019/2020 Yellow Cypress:

Activity	Volume Growth	Forest Health
Maintain and Measurement 2 prov. Trials	$ 25,000	-
Clonebank maintenance	$ 8,000	-
Materials and supplies	$ 1,000	-
Nursery support	$ 8,000	-
Travel	$ 2,000	-
Total	**$ 44,000**	**-**

7. Sitka spruce Report and Budget

Lise van der Merwe presented the Sitka Spruce report. With continued support from Charlie and John King, in 2018 completed the F1 series 3 measurements. All F1 trials will have 10-year data by March 2019. Measurements of augmentation trials in progress.

Work planned for 2019/2020 includes calculating BV's for weevil resistance and growth, and clonebank maintenance.

Budget for 2019/2020 Sitka Spruce Maritime Low:

Activity	Volume Growth	Forest Health
Analysis of F1 series of trials	$ 8,000	-
Clonebank maintenance	$ 8,000	-
Materials and supplies	$ 1,000	-
Nursery support	$ 8,000	-
Total	**$ 25,000**	**-**

8. Hardwoods Report and Budget

Alvin Yanchuk presented the hardwoods report. Phase III Red alder trials have been planted out in 2 test series; Series 1 are provenance trials for genecology information and series 2 are family trials to

develop a new breeding population. Age 3 measurements have been done, still working on data. Future plans are to:

- wait for the 6-7 year data (~2021)
- Adjust CBST rules for red alder in 2022.
- Make initial backward and forward selections on series 2 (~2022)
- New seed orchard and clonebank (~2023)
- See what's eating the Phase II trees at Bowser.

Budget for 2019/2020 Red Alder:

Activity		
Maintenance	8 sites	$ 40,000
Travel/materials	Visit 4 sties	$ 4,000
CLRS station support		$ 13,000
Total		**$ 57,000**

All 3 Bigleaf maple sites were measured this winter (age 11), and scion was collected at Powell River site. For 2019/20, full spatial analysis will be completed and 80-90 selections made, sites will be brushed and scion collected from the other two sites with grafting to be done at CLRS.

Budget for 2019/2020 Bigleaf Maple:

Activity		
Maintenance	Fence removal 3 sites	$ 18,000
Travel/materials	Travel for scion collection	$ 4,000
CLRS station support	Grafting	$ 10,000
Total		**$ 32,000**

No funds requested for Black Cottonwood.

9. CoAdapTree

Sally Aitken presented an update of the CoAdapTree genomics research project focusing on progress to date with Douglas-fir climate adaptation and Swiss Needle Cast activities. Interesting results of an activity to measure public views about reforestation strategies were also presented.

Plans for FGC-supported activities in 2019/20 FGC include:

Douglas-fir (Rafael Candido Ribeiro)

- Complete Douglas-fir raised bed common garden
- Analyze all Douglas-fir traits
- Complete sequencing of population pools and case control pools to identify candidate genes for climate adaptation and disease resistance
- Maintain and phenotype validation experiments (FS families)

Western larch (Beth Roskilly)

- Establish common gardens for cold and drought

- Sequence and analyze genomic data for population pools for patterns of local adaptation and candidate genes

CoAdapTree funding request for 2019/20:

Item	
PhD student 1 – Douglas-fir adaptation	$ 5,000
PhD student 2 – Western larch adaptation	$ 5,000
Summer student – supplement to NSERC Summer Research Award	$ 4,900
Greenhouse rental	$ 1,680
Greenhouse and lab phenotyping supplies	$ 2,000
Technician	$ 17,420
DNA lab supplies	$ 4,000
Subtotal	$ 40,000
UBC Overhead 25%	$ 10,000
Total	**$ 50,000**

10. CBST Policy and Implementation Report and Budget

Margot Spence presented the CBST Project report. The Chief Forest Standards for Seed Use were amended in 2018 to include CBST, and 58% of 2019 sowing requests were made under CBST. Other key accomplishments include impact and gap assessments and tools, SPAR functionality, considerable extension projects, CBST report distribution, and continued work on GIS analysis, SPAR help screens, and coordination with CCISS.

Key plans for 2019/20 include continued work on mitigating impacts and gaps, advance SPAR and RESULTS capacity for CBST, continue GIS analysis and tool development, establish CBST monitoring and reporting framework, finalize CBST policy report, validate and test CBST science foundation baseline data updates in SPAR and the CBST tool, update the CFSFSU again for April 2020, and complete a series of CBST information notes.

Budget for 2019/20 CBST Project:

Activity	
Project management (last year of contract)	$ 10,000
GIS Analysis and Tools (new contract)	$ 25,000
Completion of SPAR HELP functions and tutorials (last year of contract)	$ 10,000
Extension, Communications (added at request of ITAC)	$ 5,000
Total	**$ 50,000**

11. Discussion Paper: Managing Changes to Orchard Location, Size and Composition

Pat Martin presented the Discussion Paper (Appendix 2). The general idea is to clarify and formalize the approval and dispute resolution processes associated with changes to orchards, including size, composition and location. How would this idea be implemented, and what criteria would be applied? Various mechanisms and examples of implementation are presented in the paper. Verbal feedback was offered. Concern was expressed about fettering private orchards in their ability to adjust orchard size in response to CBST and changes in seed demand. Existing policy mechanisms, such as the Chief Foresters Standards for Seed Use, could be used to address orchard parent composition and changes under CBST.

Pat Martin is looking for additional input. Please send your thoughts, comments and ideas.

Pat.martin@gov.bc.ca
778-974-2952

12. AMAT Report and Budget

Michael Stoehr presented the AMAT report and budget on behalf of Greg O'Neill. The Sx genecology and AMAT test sites continue to inform CBST. Greg is participating in a Multiple Seedlot – Genetic Diversification study to examine opportunities for using multiple, differently-adapted seedlots as a bet-hedging strategy to buffer extreme climate events. Also ongoing is an extreme climate event study.

No budget was presented here; the budget presented at ITAC was $148,000.

13. Western Hemlock Report and Budget

Charlie Cartwright preceded the western hemlock report with a presentation on the whitebark pine genetic conservation research project.

Charlie noted that orchard GVO for low elevation hemlock can be raised by ~5% with new selections in existing orchards, to above GVO+22. Work planned for 2019/2020 includes clonebank maintenance for both low and high elevation hemlock, and brushing and measurements of low elevation sites for improved GVO and CBST information.

Budget for 2019/2020 Western hemlock SPU 3 (Maritime Low):

Activity	**Growth**	**Resilience/CBST**	**Total**
Breeding	$ 5,000	-	$ 5,000
Brushing – 3 provenance sites	$ 12,000	$ 8,000	$ 20,000
Measurements – 2 provenance sites	$ 12,000	$ 12,000	$ 24,000
Clonebank	$ 2,000	-	$ 2,000
Materials/Supplies	$ 2,000	-	$ 2,000
Technical Support			
Technician	$ 1,000	-	$ 1,000
Nursery workers	$ 5,000	-	$ 5,000
Travel	$ 3,000	$ 2,000	$ 5,000
Total	**$ 42,000**	**$ 22,000**	**$ 64,000**

Also required $2,000 for clonebank maintenance for Hw SPU 24 (Maritime High) for a total of $66,000 for Western hemlock.

14. True Firs Report and Budget

Charlie presented the report and budget for the true firs. The project plans are mostly to get data for CBST. For Amabilis fir, there are 16 test sites but only 2 or 3 will be maintained and measured. Three subalpine fir provenance sites will also be maintained and measured. There is some provenance variation with subalpine fir that can't be explained clinally, so there is an opportunity to select B+ provenances. A 20-year-old provenance trial at Cobble Hill could be rogued and used as on orchard. Also the Ritland lab is doing a systematic study to determine subspecies of subalpine fir.

Budget for 2019/2020 for Amabilis fir:

Activity	Growth/Health	Resilience/CBST	Total
Maintenance – 2 provenance sites	-	$ 7,500	$ 7,500
Measurements – 2 provenance sites	-	$ 11,000	$ 11,000
Materials/Supplies	-	$ 500	$ 500
Technical Support			
Nursery workers	-	$ 2,000	$ 2,000
Travel	-	$ 1,000	$ 1,000
Total	**-**	**$ 22,000**	**$ 22,000**

Budget for 2019/2020 for Subalpine fir – Interior:

Activity	Growth/Health	Resilience/CBST	Total
Maintenance – 3 provenance sites	-	$ 8,000	$ 8,000
Measurements – 3 provenance sites	-	$ 14,500	$ 14,500
Materials/Supplies	-	$ 500	$ 500
Technical Support			
Nursery workers	-	$ 3,000	$ 3,000
Technical support – Systematics study	-	$ 22,000	$ 22,000
Total	**-**	**$ 48,000**	**$ 48,000**

Budget for 2019/2020 for Grand fir and Noble fir:

Activity	Growth/Health	Resilience/CBST	Total
Maintenance – 3 provenance sites	-	$ 2,000	$ 2,000
Clonebank	-	$ 1,000	$ 1,000
Travel	-	$ 1,000	$ 1,000
Total	**-**	**$ 4,000**	**$ 4,000**

15. Douglas-fir Report and Budget

Michael Stoehr presented the Coastal Douglas-fir report and budget. One interesting project initiated in 2018 is a drought resistance study using cores and resistograph data in cooperation with CFS and FPInnovations. If resistograph data can be correlated with cores it could be a huge cost savings in screening parents for drought resistance. Also in 2018 three progeny sites were evaluated for SNC using

needle retention, stomatal occlusion and overall vigour. GCA families at Jordan River were assigned an SNC infection score. Finally 3 new 4th generation test sites were established.

Work planned for 2019/2020 includes:

- One more 4th gen test site to be established (in the interior).
- Measure series 4, new BV's next January
- Brushing, fence removal
- SNC continue David Noshad's contract and support for Juergen Ehlting's portion of CoAdapTree
- Continue drought resistance work (half paid for by FPI)
- Wood quality work using the same cores as the drought resistance project
- Propose combining SPU 19 and 31 and crossing between them.

Budget for 2019/2020 Coastal Douglas-fir:

Activity	Volume Growth	Forest Health	Total
Breeding	$ 1,000	$ 1,000	$ 2,000
Selections	$ 1,000	$ 1,000	$ 2,000
Establishment (1)	$ 2,500	$ 2,500	$ 5,000
Maintenance			
Brushing	$ 3,000	$ 2,000	$ 5,000
Fence removal	$ 5,000	$ 5,000	$ 10,000
Measurements	$ 15,000	$ 5,000	$ 20,000
SNC			
Contract	-	$ 34,000	$ 34,000
UVIC	-	$ 10,000	$ 10,000
Drought Resistance	$ 4,000	$ 4,000	$ 8,000
Materials/Supplies	$ 4,000	-	$ 4,000
Wood Quality	$ 30,000	-	$ 30,000
Technical Support			
Technician	$ 10,000	-	$ 10,000
Nursery workers	$ 15,000	$ 5,000	$ 20,000
Travel	$ 8,000	$ 2,000	$ 10,000
Total	**$ 98,500**	**$ 71,500**	**$170,000**

Michael also presented on CBST seedlot selections for the submaritime for those who missed it at the species committee meeting.

16. Budget recommendations

The total budget roll-up was presented by Keith Thomas. A slightly different approach this year – with John Russell gone everyone is working together, more of a team budget by species.

Total breeder's budget ask is $848,000 (vs $885,000 for last year and that was the reduced ask). However province wide we are still over budget as ITAC's ask is up.

Note AMAT is now CCAR – Climate Change Adaptation Research

Budget Summary Table:

2018-19 Tree Breeding and Resilence Program budget by area and species					2018/19	Change from 2018/19 Allocation
Area and Species	Recommended by TACs				FIRM Initial Allocations (April 20 2018)	
	Tree Breeding		Resilience (CBST)	Total by Spp or Project		
	Forest Health	Value				
Coast						
Western redcedar	$ 138,000	$ 216,000		$ 354,000	$ 349,219	$ 4,781
Douglas-fir (coast)	$ 71,500	$ 98,500		$ 170,000	$ 131,179	$ 38,821
White pine (coast)	$ 26,000			$ 26,000	$ 48,749	-$ 22,749
Hemlock		$ 44,000	$ 22,000	$ 66,000	$ 58,499	$ 7,501
Yellow cedar		$ 44,000		$ 44,000	$ 38,113	$ 5,887
Sitka spruce		$ 25,000		$ 25,000	$ 48,749	-$ 23,749
Red Alder	$ 3,000	$ 54,000		$ 57,000	$ 62,044	$ 26,956
Maple, Big leaf		$ 32,000		$ 32,000		
Amabalis fir			$ 22,000	$ 22,000	$ 47,862	$ 26,138
Subalpine fir			$ 48,000	$ 48,000		
Grand and Noble fir			$ 4,000	$ 4,000		
Extension Mtg Dec						
Forest Health Assessments				$ -	$ 53,180	-$ 53,180
Coast Subtotal	$ 238,500	$ 513,500	$ 96,000	**$ 848,000**	**$ 837,593**	**$ 10,407**
Province-wide						
Climate Change Adaptation		$ -	$ 148,000	$ 148,000	$ 128,342	$ 19,658
CoAdaptree			$ 50,000	$ 50,000	$ 50,359	-$ 359
CBST Project	$ -	$ -	$ 50,000	$ 50,000	$ 80,000	-$ 30,000
Province-wide subtotal			**$ 248,000**	**$ 248,000**	**$ 258,701**	**-$ 10,701**

Motion. The CTAC budget for 2019/20 as presented by the breeders is hereby approved and recommended to Council, with any subsequent adjustments required to meet budget targets to be based on ministry tree breeders' input of priorities and impacts. Sally/Charlie. CARRIED.

Motion. The budgets put forward for CCAR, CoAdapTree and CBST are hereby approved and recommended to Council. Bevin/Nick. CARRIED (1 abstention).

17. Other Business

Motion. Because CBST is combining SPU 19 (Fdc SM) and SPU 31 (Fdc M High), we recommend moving to advanced generation breeding in this combined SPU. Michael/Nick. CARRIED

Sally Aitken announced a CoAdapTree Presentation event at UBC on May 21st and invited everyone to attend.

A motion to adjourn the meeting was made at approx. 4 pm. Michael/Sally (CARRIED)

APPENDIX 1 AGENDA

CTAC Meeting – WFP Saanich Forestry Centre, 8067 East Saanich Road

March 7, 2019
9:00 – 4:00

Breeders, will you separate your budget into Genecology, and the new GW designations, please?
Participants will learn of latest developments in identifying gain in volume and pest resistance, in seed transfer research, and in support tools development. Participants will influence investment recommendations for gain, seed transfer, and support tools.

Start Time		Lead
8:45	Coffee is on	
9:00	**Welcome – Safety – Facilities**	Annette van Niejenhuis
9:05	White Pine Report and Budget	Nick Ukrainetz
9:30	Western Redcedar Report and Budget	Lise van der Merwe
10:15	Yellow Cypress, Sitka Spruce Report and Budget	Lise van der Merwe
10:45	**BREAK**	
11:00	AMAT Report and Budget	Greg O'Neill / Michael Stoehr
11:20	CoAdaptree Report and Budget	Sally Aitken
11:45	CBST Policy and Implementation Report and Budget	Margot Spence
12:15	Discussion Paper: Managing Changes to Orchard Location, Size, and Composition	Pat Martin
12:30	**LUNCH**	
1:15	Hardwoods Report and Budget	Alvin Yanchuk
1:45	Western Hemlock, True Firs Report and Budget	Charlie Cartwright
2:30	Douglas-fir Report and Budget	Michael Stoehr
3:15	**BREAK**	
3:30	Business Meeting - Budget recommendations - Other Business	Annette van Niejenhuis
4:00	**Adjourn**	

APPENDIX 2

DISCUSSION PAPER
Managing Changes to Orchard Location, Size, and Composition
February 15, 2019

Introduction

The authority to regulate seed and tree gene resources is provided in FRPA s. 158, 169, and 118. The chief forester has established standards (Chief Forester's Standards For Seed Use, CFSFSU) and Material Transfer Agreements. Under the current CFSFSU, the characteristics of seedlots from orchards are regulated, but fundamental characteristics of the orchards themselves (such as their size, location and composition) are not regulated.

Background

Approximately 70% of the tree seed used to reforest Crown land is sourced from tree seed orchards. There are 97 seed orchards in BC, owned and operated by a mix of public- and private-sector organisations. The existing orchards were developed to supply seed to fixed seed use zones. The boundaries of the seed zones had not changed much in recent years, contributing to a relatively stable environment with only occasional interest by orchard managers in establishing new orchards, expanding existing orchards, or undertaking major changes to orchard composition. In this environment a soft policy approach to regulating orchards has been adequate. A letter from the Chief Forester has provided non-binding guidance, and through the Forest Genetics Council BC's set of tree seed orchards has been somewhat self-regulating.

In 2018, the introduction of climate based seed transfer (CBST) changed the seed use zones creating a radically different operating landscape. As a result of CBST, the development of improved orchard parent trees, and other driving factors, orchard managers have begun to assess their orchards and consider significant modifications to orchard size, location and composition. Under the current framework, the tools to adequately manage this situation are lacking.

Gaps in the Current Regulatory Framework

The current regulatory framework is focussed on the characteristics of the collected seed lots. This approach has provided good protection for seedlot quality. However, by not addressing the characteristics of the orchards themselves, the current framework is inadequate when orchard managers want to:

- move orchards to new locations
- expand orchard size
- modify orchard composition to account for new seed transfer rules
- establish new orchards

When well-executed the above actions can be beneficial to seed supply in BC. However, when poorly managed these actions can:

- reduce the genetic quality of the seed used to reforest Crown lands,
- exacerbate risks associated with the dominance of single seed suppliers, and

- reduce the financial viability of existing seed suppliers.

Benefits can be promoted and negative impacts mitigated by introducing a mechanism to provide some control over changes to orchard location, size, and composition.

Possible Mechanisms

Various approaches can be pursued to regulate orchard location, size, and composition, including:

- licensing orchards,
- requiring orchard management plans,
- signing a new type of agreement, and
- additions to the CFSFSU that require orchards to conform to approved specifications.

An Example Implementation

One option is outlined here. Within section **5.2.2 Lots collected from parent trees within British Columbia**, a new section 5.2.2.7 could be added:

> ***5.2.2.7*** *In order to be registered as a lot collected from parent trees within British Columbia, the seed orchard in which the parent trees are located must conform to the Approved Orchard Specifications set out in Appendix 8.*

A new Appendix (8) would be added to list orchards with their approved specifications, including orchard location, size, and composition. Initial orchard specifications could be obtained from orchard managers, SPAR, and the Forest Genetics Council (FGC) species plans. The FGC is well-positioned to serve as a clearinghouse for periodic updates to the list of approved orchard specifications.

An alternative approach may be to simply require that orchards conform to specifications established by the Chief Forester. That is, within section **5.2.2 Lots collected from parent trees within British Columbia**, a new section 5.2.2.7 could be added:

> ***5.2.2.7*** *In order to be registered as a lot collected from parent trees within British Columbia, the seed orchard in which the parent trees are located must conform to the Approved Orchard Specifications set out by the chief forester.*

The Forest Genetics Council could develop the critical specifications for each orchard in BC and provide these as a recommendation to the Chief Forester.

Meeting minutes by Bevin Wigmore and Brian Barber – approved April 8, 2020