Gene Conservation Technical Advisory Committee (GCTAC)
November 17th, 2006 Meeting
UBC Centre for Advanced Wood Processing

Attending: Sally Aitken; Diane Douglas, Scott Green; Andreas Hamman; Dave Kolotelo; Roger Painter; Keith Thomas; Tongli Wang; Alex Woods; Jack Woods; Alvin Yanchuk.

Meeting Motions:

Motion: Minutes from last years meeting briefly reviewed and approved (Woods, Yanchuk) – **Passed**

Motion: That the FGC send a letter to the Chief Forester recommending that resources equivalent to one FTE be allocated to deal with items identified as Operational MOFR responsibilities as outlined in the attached matrix. (Woods, Aitken) – **Passed**

Motion: That we invite the following individuals to be members of GCTAC: Kathy Hopkins; Greg O'Neill; and Tongli Wang (Woods, Yanchuk) – **Passed**

Motion: GCTAC recommends to FGC that there be an allocation of funding to the Tree Seed Centre of $30, 000 to fund ex-situ collections for the provincial seed bank (Aitken, Woods) - **Passed**

1. Moving into Operational Gene Conservation

GCTAC has primarily been involved in providing guidance to FGC and directing the Centre for Gene Conservation (CFGC) at UBC. Their primary project of cataloguing the provinces gene conservation efforts within protected areas is reaching completion and GCTAC needs to address how to implement operational gene conservation. It is anticipated that gene conservation will include *ex-situ* seed samples and *inter-situ* reserves in clone banks, scion collections, outplantings and tests.

There was general agreement that this operational function for gene conservation is clearly a stewardship mandate of the MOFR. To clarify roles a matrix (Table 1) was put together to better define the roles of research and operations for the CFGC and the MOFR.

Discussions on how this could be done, what funding mechanism makes sense and who would do the work occurred. It was decided that OTIP was not the best place to fund operation gene conservation. It was decided that a full-time FTE within MOFR dedicated to gene conservation would allow this operational program to be developed and to become an integral part of the MOFR program.

Motion: That the FGC send a letter to the Chief Forester recommending that resources equivalent to one FTE be allocated to deal with items identified as Operational MOFR responsibilities as outlined in the matrix. (Woods, Aitken) – **Passed**

The matrix of research and operational responsibilities for the CFGC and the MOFR.

	UBC Centre for Gene Conservation	MOFR

Operations	• Cataloguing →→ 1-2 years →→
	• Extension
		→• Catalogue updates (ground-truthing, integrate new info.)
		• Gene Conservation activities
		  • Ex-situ – seed bank
		  • Inter situ –clone banks, scion collections, outplantings, tests
		  • Protected Area recommendations
		  • Limited Harvesting in "unique" stands
		  • Extension – grass roots involvement !
		• Pests – develop "Threat Index"
		• Policy development – FRPA/FREP/FFEI (issue mgmt.)
		• Quantify Climate Change and MPB impacts

Interaction with non-BC Initiatives (i.e. CONFORGEN)		
Research	• Cataloguing method development • Conservation strategies • Genetic structure of populations • Pest interaction on population structure • Climate change	• Pest Impacts on Genetic Resources • Climate Change → minor species (BEC)

2. Committee Members

We discussed the benefits of having additional individuals on the committee.

MOTION: That we invite the following individuals to be members of GCTAC: Kathy Hopkins; Greg O'Neill; and Tongli Wang (Woods, Yanchuk) – **Passed**

Action Item: Dave Kolotelo will contact prospective new members and invite them to participate.

J. Woods 12/6/06 11:07 AM
Formatted

3. Provincial Gene Conservation Measure

We discussed the need to have measurable attributes or indicators for gene conservation at the SPU and provincial levels. It was not entirely clear what these would be, but provincially, possibly something like the proportion of SPU's or Species*BEC combinations that are considered to have adequate gene conservation. This item will require further discussion and committee will be informed of any advances in this area. This will be an agenda item for the next meeting if not dealt with electronically or via conference call in the interim.

Action item: develop ideas and rationale for indicators – CFGC staff with input from other committee members.

4. TSC Seed Bank / Seed Issues

An overview of the current status of the provincial seed bank was presented. It includes over 8000 samples with a large proportion of the collections being Sx and Pli. An initial analysis has been done by Andreas Hamman on how the seed bank samples fit into the larger provincial gene conservation picture. It was emphasized that the seed bank should be representative of the diversity on the landscape, not just sampling the diversity left over after protected areas are accounted for as they as well may be victim to climate change. Challenges include estimating viable seeds for expired seedlots and putting the data into a format that could be submitted to the CAFGRIS project (see #6 CONFORGEN).

Seed longevity was discussed, and for most conifers, storability is very good and one can expect from properly collected and processed collections that seedlot life is between 50 to 100 years. Exceptions to this are Cw and Hw which have the highest deterioration rates of BC conifers. There appears to be an issue with storability of subalpine larch that Barry Jaquish brings to our attention. He had collections that had germination capacities of between 5 and 75%, but after several years of storage the seeds were x-rayed and now appear to have collapsed, or shrivelled embryos. Experience in seed storability is very limited in the three conifer 'species' priorities for gene conservation: subalpine larch; whitebark pine, and Limber pine.

The cataloguing work from the CFGC is looking at 49 tree species with a large component being broad-leaved species. Seed storability information is generally lacking on these species and for some species they are considered recalcitrant and cannot be dried and stored at low moisture contents (i.e. Garry Oak). I will seek information from other facilities on storability of broad-leaves in the cataloguing project.

MOTION: GCTAC recommends to FGC that there be an allocation of funding to the Tree Seed Centre of $30, 000 to fund ex-situ collections for the provincial seed bank (Aitken, Woods) - **Passed**

5. Mountain Pine Beetle / Western Pine Beetle

We again discussed the significance of MPB to the genetic diversity of Pli. There is a general agreement that genetic diversity of the species is not being threatened due to incomplete stand attacks (80% usually quoted) and the presence of natural regeneration. There is a need for extension on this topic as it is an important question – No volunteers!

A similar issue with Ponderosa pine and the western pine beetle is also occurring in the Okanagan. It appears devastating, especially in urban areas, but there is natural regeneration that should maintain existing diversity.

6. CONFORGEN

The Canadian gene conservation initiative that was introduced following the 2006 CTIA meeting in Charlottetown. Jack is currently the BC representative on the interim steering committee and provided an overview of CONFORGEN objectives:

CONFORGEN objectives at this point are (they are still under development, and could change):

1. to promote conservation for forest genetic resources

2. to define national science-gased guidelines for conservation
3. to monitor and consistently report on Canada's national and international commitments on gene conservation.
4. to identify emerging issues and highlight research priorities.

One part of CONFORGEN is the online system CAFGRIS that is intended to document gene conservation across Canada and provide background information on tree species. Yanchuk, Hamman and Kolotelo are collaborators in this project.

CONFORGEN structure is being developed, and will very likely involve a technical committee. It is anticipated that individual provinces will contribute information to a national system (CAFGRIS), and that CONFORGEN will set standards and methods. BC's initiatives are ahead of the rest of the provinces, and may well serve as a model for national developments.

7. Whitebark Pine Workshop

There appears to be a need to co-ordinate or at least familiarize everyone with the various efforts underway in BC to deal with gene conservation and/or regeneration of this species. Everyone felt that this was a good idea and we agreed to organize a workshop for the spring of 2007. The format of having the workshop at a site where participants could visit whitebark pine stands was considered important. Initial scoping will occur regarding having the meeting in Whistler in May, 2007.

We agreed to try and consolidate mailing lists to those working on whitebark pine in BC and surrounding jurisdictions.

8. New business

a. There will be a need to have a conference call prior to our next meeting to review the 2007/2008 budget table from the CFGC before it goes to FGC.

b. Sally outlined how Sierra's project is probably going to evolve into a PhD thesis and that the CFGC is basically full with a healthy number of students, research associates and technicians involved in the program. Updates were provided by many of the students in the afternoon session.

c. There has been $2000 allocated to the construction of a gene conservation poster through ETAC. It is expected that this will be a multi-year project, so this is just the money to get started. Any volunteers?

9. Afternoon Presentations

The afternoon consisted of presentations from Brendan Wilson of Selkirk College and students and staff of the CFGC. Here are summaries of the presentations.

Brendan Wilson, PhD, RPBio. A Rocky Road: Whitebark Pine Restoration Activities On The Continental Divide.

Over the past 15 years, managers have come to acknowledge that whitebark pine in the Canadian Rocky Mountain National Parks face several significant conservation problems. These include white pine blister rust, mountain pine beetle, fire suppression, and climate change. In response to these issues, Parks Canada commissioned a plan to provide background information on the conservation problem (Wilson and Stuart-Smith 2002). This plan outlined a number of options for developing a broader, more effective approach to the conservation of the whitebark pine ecosystem within the Canadian Rockies. From this initiative, we have embarked on a number restoration activities aimed at improving the chances of maintaining whitebark ecosystems in National Park landscapes.

We initiated a prescribed burn and monitoring program to aid in providing more high elevation early serial habitat for recruitment of new pine seedlings. However, actually getting fire on the landscape is a slow process, given the bureaucracy associated with fire management within the Parks system. To aid with identifying the best places to burn from a restoration standpoint, a student of mine, and I, developed a draft spatial model that classifies the landscape into regions of low, medium, and high priority. This model is based on identifying adjacent older climax whitebark seed source communities, stand age, and significant landscape level predictors of subalpine whitebark pine (from a field data regression model). In the areas of highest blister rust infection and mortality we have established cone collecting sites for seed from plus trees that appeared resistant to blister rust infection. We have harvested some cones from a small number of these trees and are looking for partners to help with propagation of seedlings for restoration work. Also, Adrian Leslie (student at TRU) is working on a seed maturity project focused primarily at differences between seeds from cones harvested before they have matured on the tree, and comparing them to seeds from caged, tree ripened cones. The goal of this study will be to determine if immature cones, harvested prior to the late summer squirrel and bird caching activities, can be matured successfully in the lab. Finally, we hope to have a draft species at risk assessment of whitebark pine submitted to COSEWIC this year.

Wilson, B. C. and Stuart-Smith, G. J. 2002. Whitebark pine conservation for the Canadian Rocky Mountain National Parks. **KNP01-01**. Cordilleran Ecological Research. Winlaw, BC, Canada.

Christine Chourmouzis Update on gene conservation cataloguing summarization

Christine Chourmouzis gave a detailed presentation on the methodologies and format for the technical report she is preparing on the status of gene conservation for BC's 50 tree species. This work will integrate the previously published work of Andreas Hamann on *in situ* conservation status with *ex situ* collections at the Tree Seed Centre, *inter situ* materials in the BC Ministry of Forests breeding programs, and predictions of species potential for range or density expansions or contractions based on bioclimatic envelop models (Hamann and Wang 'flying BEC zone' models). The analysis relies on many sources of information that will be provided as on line appendices to the printed report. Chapter 1 of this report, well underway, will summarize levels of protection of all species by BEC zone, while chapter 2 will focus on SPU-based conservation for the commercially important conifers. The details for incorporation of ex situ and inter situ information are still being worked out.

Tongli Wang Update on Climate Change project

Tongli Wang first provided a *ClimateBC update*: A web version of ClimateBC v2.3 has been developed and put on CFGC website. Positive feedbacks were received. ClimateBC v3.1 beta including historical (1901 – 2002) monthly climate data and 1971-2000 normal data has been ready for download. Results of a preliminary test show that the reliability of the historical data produced by ClimateBC v3.1 is about as good as for 1961-1990 normal data produced by ClimateBC v2.3. Secondly, he discussed '*Selection of populations of lodgepole pine for future climates'. R*esults of this study suggest 1) the importance of using reliable climate model in genecology to avoid misleading conclusions and using anchor points and multivariate functions to improve the growth response functions; 2) populations from south are not necessarily a good choice for future climates; 3) populations with broad adaptation were identified; 4) the potential of using optimized seed source to mitigate climate change is substantial. Thirdly, he discussed '*Improvement of modeling and predicting ecosystems (BEC) and SPU'. A* maximum probability approach was used to avoid scattering of modeled and predicted BECs and SPUs. This improvement would make the predictions more useful in practice. Finally, he presented information about '*Spatial analysis of genetic variation in quantitative traits of lodgepole pine'*. Through spatial analysis and modeling of migration history of this species, evolutionary forces were analyzed and discussed. A spatial hot spot was identified, which was in agreement with the study mentioned above (the first).

Sierra Curtis-McLane Bioclimatic Envelope Model Evaluation

The bioclimatic envelope model (BEM) created by Hamann and Wang (2005) forecasts dramatic changes in the latitudinal and elevational distributions of the climatic envelopes of forest trees throughout British Columbia over the next eight decades. While BEMs provide tremendously valuable information regarding potential future range distributions, field studies are needed to determine the actual biological responses of forests to changes in climate. Sierra Curtis-McLane's research will evaluate predictions from British Columbia BEMs compared to germination, survival and fitness of conifers planted outside of their native climatic ranges. Current research examines how climate patterns affect annual growth in populations of lodgepole pine (*Pinus contorta*). While baseline growth differential data have confirmed strong genotype by environment interactions, our research addresses the question of how annual ring widths vary among populations within a site and among sites for a given population. Wood cores were sampled in sixteen lodgepole pine common gardens that were established in 1974. Annual growth trends will be analyzed in conjunction with weather data, thereby shedding light on fitness responses of varying genotypes to current climate trends. Future field and growth chamber research will examine the germination and growth potential of different conifer genotypes relative to climate conditions at the margin of the species ranges. This information will be used to assess the extent to which adaptation by selection is taking place, and compared to seedling plantation data for seed transfer and conservation purposes.

Pia Smets NSERC-BIOCAP project

Pia Smets reported on the final results of an NSERC-BIOCAP project "short term testing of provenances and genotypes to predict response to climate change and adapt seed transfer policy". The relative response of populations to temperature in climate chambers corresponded well with the response curves established based on field data, with the notable exception of Prince George. Proposed improvements for the extension of this project, which is funded by FGC, include more extreme (more realistic) daily temperature variation, the inclusion of drought treatments, and the addition of interior spruce. Candidate seed orchard and wild stand seed lots for the extended study were presented.

Karolyn Keir Update on Pacific Dogwood project

Karolyn Keir presented an updated proposal and work completed thus far for her Masters project entitled "Population Genetics of Pacific Dogwood (*Cornus nuttallii*)". In the past, population genetic studies of Pacific Northwest tree species have focused primarily on conifers. Unlike these species, Pacific dogwood is a low density broadleaf, is insect pollinated and has it seeds dispersed by animals thus providing an opportunity to observe how genetic parameters such as population genetic diversity, structure and mating system vary among Pacific Northwest tree species. For her Masters project she plans to estimate these genetic parameters using microsatellite and chloroplast markers, and to investigate the post-glacial migration strategy of Pacific dogwood using results from chloroplast DNA study. All sampling has been completed for this project. In the spring, fresh foliage was sampled from 20 populations encompassing the entire species range. Included in these 20 populations are a southern disjunct population found in the San Bernadino Mountains in southern California, an eastern disjunct population occurring in northern Idaho and 6 populations in British Columbia making up the northern periphery of the species range. This leaf material will be geneotyped to obtain estimates of population genetic diversity and structure. In the fall, seed was collected from 11 of these populations to collect seeds for a common garden experiment. Thirty families from two of these populations will be used to estimate mating system for this species. These two populations occur at different parts of the species range. One is found in the central part of the species range, along the Umpqua River in central Oregon, while the other occurs in the northern periphery of the species range, south of Pemberton B.C. Applications of this research include development of a species-specific gene conservation strategy, predicting genetic consequences of climate change and possible aid in the restoration of Idaho population of *C. nuttalllii*, which has been heavily impacted by an introduced fungus.

Colin Huebert Update on Garry Oak Project

Colin Huebert gave a short presentation on his proposed Garry oak (Quercus nuttallii) Masters research, and his progress to date. He will be studying the ecological genetics of Garry oak by establishing common garden experiment with 3,500 acorns collected this fall from across the species range. The acorns are now germinating in a greenhouse at UBC. They will be outplanted at Totem Field on the UBC Campus, and possibly at the Agriculture Canada research facility near Sidney on the Saanich Penninsula in cooperation with Parks Canada. He plans to collect data on growth, phenology, cold hardiness and possibly drought hardiness, and use information on genetic clines for these traits to develop recommendations for seed transfer for restoration purposes. He will also evaluate the data in terms of climate change.