Second Forum on the Conservation of Forest Genetic Resources

"Applied Forest Genetic Conservation"

29 August 2008
Quebec City

ABSTRACTS

CONFORGEN

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Forest Genetic Resources and Transboundary Conservation

F. Thomas Ledig[1], Barry Jaquish[2] and J. Jesús Vargas Hernández[3]

[1] Institute of Forest Genetics, USDA, Forest Service and
Department of Plant Science, University of California
932 Topsail Drive, Vallejo, CA 94591
E-mail: tledig@scrserv.com

[2] Ministry of Forests and Range
3401 Resorvoir Road
Vernon, BC V1B 2C7

[3] Instituto de Recursos Naturales, Colegio de Postgraduados en Ciencias Agricolas
Carretera Mexico-Texcoco km 36.5
Montecillo, Texcoco, México, C.P. 56230, MÉXICO

ABSTRACT

In the last three decades, most advocates for the conservation of forest genetic resources concluded that *in situ* conservation had significant advantages over *ex situ* conservation. The argument was partially based on cost: *in situ* conservation could piggyback on other uses of forests, such as recreation, research, environmental services, and even timber exploitation. The genetic advantage was that *in situ* populations were free to evolve in response to changing environments. However, rapid climate change has muddied the situation. In a century or less, within the span of one generation, local populations of forest trees may find themselves so maladapted that *in situ* conservation may no longer be possible. The new call is for assisted migration, the intentional movement of genetic materials to habitats projected to be suitable at some future date.

Assisted migration is not only necessary to maintain genetic resources of value to breeders, but also may be necessary merely to prevent extinction. Conservation genetics is about preventing extinction. It is concerned with the genetic conditions for survival, reproduction, and continuing evolution of species or populations. The term was coined by Otto Frankel who, himself, came from a background in conservation of genetic resources. Conservation genetics could be called the genetics of small populations because it deals with loss of diversity, inbreeding, reduction in gene flow, and accumulation of deleterious mutations, dynamics particularly critical in small, fragmented populations.

The study of rare species illustrates the problems associated with these genetic processes. Mexican spruces (*Picea* ssp.), reduced in range and population size and fragmented by warming after the last glacial period, are case examples. They are now relicts existing only in specialized habitats. Other North American spruces illustrate the effects of past climate change as well; some conifer species show genetic effects of migration following the ice ages. Climate envelope models project mass displacements of these and other species; in some cases, complete elimination from their present geographic ranges. Only assisted migration or *ex situ* conservation will preserve these resources.

In assisted migration, it may be necessary to move populations across borders, from the U.S. to Canada or from Mexico to the U.S., for example. A plan for assisted migration of Brewer spruce (*Picea breweriana*), an endemic to California and Oregon, to British Columbia is an example. While the case of Brewer spruce is relatively straightforward, there may be restrictions on movement of other species in other situations under provisions of the Convention on Biodiversity, CITES, the U.S. Endangered Species

Act, Canada's Species at Risk Act, or Mexican law. Transboundary movement could conceivably create problems by introducing potentially invasive plants or importing plant pests along with the forest species of interest. Nevertheless, we conclude that assisted migration will probably not be faced with insurmountable restrictions within North America.

Transfers may also involve movement outside North America. Presently, many North American species are planted extensively in the Austral Pacific, Asia, Africa, South America, and Europe. Documenting and managing these *ex situ* genetic resources is an important goal for the near future.

BIOGRAPHY

Dr. Ledig was a full Professor and member of the Board of Permanent Officers of Yale University for 14 years. He joined the U.S. Forest Service's Pacific Southwest Research Station in 1979 as Director of the Institute of Forest Genetics, located in Berkeley and Placerville, California. He is currently, Senior Scientist in the Pacific Southwest Research Station and adjunct professor at the University of California-Davis.

He led two binational gene conservation projects – with Mexico and Australia and served on the Policy Advisory Board of the University of California's Genetic Resources Conservation Program (1987-92). He was a member of the scientific committee of the Bull Foundation for conservation (1992-95) and of the University of California-Davis Working Group on Conservation Biology and Agriculture (1988). He was a participant in the Keystone National Policy Dialogue on Biological Diversity (1989-91) and a consultant for the National Academy of Science/National Research Council on management of forest genetic resources (1988-90) and for the Office of Technology Assessment on their report, "Preparing for an Uncertain Climate" (1992-93).

Dr. Ledig is a Fellow of the American Association for the Advancement of Science (AAAS) and Secretary (1985-) of the UN/FAO/North American Forest Commission's Forest Genetic Resources Working Group. He holds memberships in the IUCN Species Survival Commission/Conifer Specialist Group, Society for Conservation Biology, International Society of Tropical Foresters, Botanical Society of America, California Botanical Society, Society of American Foresters, and American Society of Plant Taxonomists.

He has over 120 publications in genetics and physiology. His current research interests are in population genetics and evolution of Mexican and Californian conifers, the role of genic diversity in natural populations, and conservation biology.

Pan-Canadian Solutions for Genetic Resource Issues: CON**FOR**GEN's **Approach**

Judy Loo

Natural Resources Canada
Canadian Forest Service
PO Box 4000
Fredericton, NB E3B 5P7
E-mail: Judy.Loo@nrcan.gc.ca

ABSTRACT

Challenges to Canada's forest genetic resources transcend jurisdictional boundaries creating the need for a coordinated approach to planning conservation activities, and assembling and reporting information on the status of forest genetic resources. CON**FOR**GEN (a Canadian programme for CONservation of FORest GENetic resources) is an initiative of a Canada-wide network of forest tree genetics experts and it provides a framework for such a coordinated approach. CON**FOR**GEN was formally initiated at the Forum on the Conservation of Forest Genetic Resources in Charlottetown, July 2006. The steering committee consists of representatives from provincial Forest Genetics Councils, provincial governments, one territorial government, First Nations, and Natural Resources Canada. As well, a Standing Technical Committee, consisting of provincial, federal, and academic experts, has been established to oversee projects. Two subcommittees were named to work on specific tasks. CON**FOR**GEN has been recognized by the Canadian Council of Forest Ministers (CCFM) as a source of information for national reporting purposes.

CON**FOR**GEN has embarked on four areas of work. First, we are improving and re-conducting a survey to evaluate the status of native tree genetic resource conservation needs across Canada. This was done previously by CON**FOR**GEN members and we expect that each iteration will provide more detailed information. Second, we are working with CAFGRIS (Canadian Forest Genetic Resource Information System) in the compilation, summary, and presentation of Canada-wide genetic resources conservation data. CAFGRIS will be available as a platform for use by provinces, industry, universities, and others, to synthesize relevant forest genetic resources information and to assist in developing strategies to respond to climate change. Third, we plan to extend a data-based, geo-referenced gap analysis that will determine the status of native tree genetic resources and the gaps in their conservation across Canada. Finally, we have begun to develop science-based guidelines for assessing and conserving Canada's forest tree genetic resources that are impacted by threats from climate change and other stressors.

BIOGRAPHY

Judy Loo is a Research Scientist with Natural Resources Canada, Canadian Forest Service, located in Fredericton, New Brunswick. She obtained her PhD at Oklahoma State University in 1986 and worked as a Research Associate at the University of British Columbia for four years before joining CFS. Her primary interest is in conservation of forest genetic resources. Her research includes determining levels and patterns of genetic diversity of native tree species, and understanding and breeding for genetic resistance of American beech to beech bark disease. She chairs CON**FOR**GEN, a Canada-wide initiative for conservation of forest tree genetic resources.

Tracking Forest Genetic Resources: Expansion of the Knowledge Management System, CAFGRIS

Tannis Beardmore

Natural Resources Canada
Canadian Forest Service
PO Box 4000
Fredericton, NB E3B 5P7
E-mail: Tannis.Beardmore@nrcan.gc.ca

ABSTRACT

In 2005, the geospatial-based knowledge management system CAFGRIS (Canadian Forest Genetic Resource Information System, https://cfsnet.nfis.org/cafgris/index.html) was developed to integrate and synthesize relevant geospatial data for assessing, reporting, and making decisions on the status and management of native tree species. In particular, the resilience of native tree species to the cumulative impacts by which they are currently threatened, the identification of conservation requirements, the success of conservation efforts for these species requiring attention, and tools for predicting future conservation needs under changing climate scenarios will be addressed. In 2006, funding was received for expanding CAFGRIS and further development is on-going, with a completion date of 2009. Specifically, this expansion phase will develop the application necessary for accessing sources of information over the Internet, that pertain to: 1) assessment of the current status of native tree species by ecozones, 2) predict what the future status may be under a variety of climate change scenarios (using the climate change model Seedwhere), 3) assessment of the current conservation status of these species (including *ex*, *in*, and inter *situ* conservation efforts), and 4) predict the future conservation requirements. In addition, the project will identify: 1) data deficiencies and uncertainties in the species' status and threats to the species, 2) stimulate cooperative research efforts to obtain the information necessary to evaluate species status and threats, and 3) foster voluntary efforts to conserve the species before official species listing is warranted. CAFGRIS is a collaborative effort including members from the provinces, universities, NGOs, and CON**FOR**GEN.

BIOGRAPHY

Tannis Beardmore is a Research Scientist with the Canadian Forest Service, in Fredericton, NB. Her area of expertise includes seed science and molecular biology. She obtained her MSc and PhD at the University of Guelph in 1988 and 1991, respectively. She did a Post-Doc with the CFS in Petawawa, Ontario following which she was hired by the CFS and has been working there for 12 years. Her current research interests are in gene identification and gene conservation, in particular in developing methodologies for the *ex situ* conservation of hard-to-store or recalcitrant seeds.

National and International Drivers for Gene Conservation

Ole Hendrickson

Environment Canada
Biodiversity Convention Office
Gatineau, QC K1A 0H3
E-mail: ole.hendrickson@ec.gc.ca

ABSTRACT

Numerous government agencies (federal, provincial), academic institutions, private companies, and non-government organizations within Canada are involved in forest gene conservation activities. At the international level, two organizations have a particularly strong influence on current policy developments: the UN Food and Agriculture Organization (FAO) and the UN Convention on Biological Diversity (CBD). Considerable technical expertise resides in other organizations such as IUFRO and Biodiversity International.

The Millennium Ecosystem Assessment has identified five major direct drivers of biodiversity loss: land use change, climate change, invasive alien species, overexploitation, and pollution. All five drivers affect genetic diversity and should be considered in developing applied forest gene conservation programs.

The FAO Panel of Experts on Forest Gene Resources was established in 1968 with a mandate to "help plan and coordinate FAO's efforts to explore, utilize and conserve the gene resources of forest trees and, in particular, help prepare detailed short- and long-term programmes of action, and to provide information to Member Governments". The Panel reviews work in the field of forest genetic resources worldwide and discusses priorities for action at national to global levels based on information received from member countries. It has developed a powerful database to recommend proper seed sources for reforestation and tree planting and has strong support from member countries.

In its most recent report the Panel highlighted several forest gene conservation "drivers", notably:

- coping with the challenge of mitigating and adapting to global change;
- addressing world-wide deforestation; and
- addressing potential great losses of diversity from invasive pests.

The Panel recommended that top priority be given by FAO to preparing the first country-driven *Report on the State of the World's Forest Genetic Resources*. It agreed that this Report should include all forest species of socio-economic importance - both major planted species and species with important values for local communities.

The Panel also expressed concern that while forest genetic resources are under great pressure globally, and national programmes and local communities need technical advice and support, FAO's forest genetic resources program has been repeatedly downsized in recent years and lacks sufficient resources to act in an effective and timely manner.

The FAO's Commission on Genetic Resources for Food and Agriculture recently formulated a multi-year program for its future work. It recognized that its work on plant and animal genetic resources is now well established, and that its future work should deal, in a planned and staged approach, with biodiversity for food and agriculture in its broadest sense, including crop, forest, animal, fish, and micro-organism

genetic resources for food and agriculture.

However, the reality is that forest tree species of commercial importance are grown mainly for timber, not for food and agriculture. While the proposed *Report on the State of the World's Forest Genetic Resources* should be a significant milestone, FAO will likely always give less attention to forests than agriculture or fisheries, given global food supply concerns.

Where else can scientists concerned about forest gene conservation turn for policy support and policy influence?

The UN Forum on Forests has not dealt with forest gene conservation to date. Its recent "Non-legally binding instrument on all types of forests" is silent on genetic diversity. Nor have Canada and other countries addressed forest gene conservation in their pursuit of a legally-binding forest instrument.

The CBD's program of work on forest biological diversity addresses forest gene conservation in detail. It sets an objective for Parties to "Develop effective and equitable information systems and strategies and promote implementation of those strategies for *in situ* and *ex situ* conservation and sustainable use of forest genetic diversity, and support countries in their implementation and monitoring."

Eight activities are suggested to achieve this objective, including:

- assessing the diversity of forest genetic resources, taking into consideration the identification of key functional/keystone species populations, model species, and genetic variability at the DNA level;
- developing an action plan to protect genetic resources of the most threatened forest ecosystems;
- understanding patterns of genetic diversity and its conservation *in situ*, in relation to forest management, landscape-scale forest change, and climate variations;
- monitoring developments in new biotechnologies for compatibility with the objectives of the Convention on Biological Diversity with respect to forest biological diversity, and developing and enforcing regulations for controlling the use of genetically modified organisms (GMOs) when appropriate; and
- implementing activities to ensure adequate and representative *in situ* conservation of genetic diversity of endangered, over exploited, and narrow endemic forest species; and complementing this with adequate *ex situ* conservation.

The CBD work program also identifies a need for increased understanding of the effects of pollution on forest genetic diversity. It calls upon Parties to develop legislation, administrative or policy measures on access and benefit-sharing (ABS) for forest genetic resources, taking into account the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization. CBD Parties are currently in the midst of negotiating an international ABS regime. It will likely have legally-binding elements and will supplement the voluntary Bonn Guidelines.

Another objective in the CBD forest work program - "Promote the fair and equitable sharing of benefits resulting from the utilization of forest genetic resources and associated traditional knowledge" - is relevant in this context. It encompasses three activities:

- to establish mechanisms to facilitate the sharing of benefits at local, national, regional, and global levels;
- to strengthen capacity of indigenous and local communities to negotiate benefit-sharing arrangements; and
- to promote dissemination of information about benefit-sharing experiences through the clearing-house mechanism and appropriate means at the local level.

Given Canada's large Aboriginal forest-dwelling populations, a focus on benefit-sharing arrangements with Aboriginal communities should be a priority. A 2008 CBD technical report, *Access and Benefit-Sharing in Practice: Trends in Partnerships across Sectors*, contains a series of relevant case studies (although none are from Canada). One study describes Aboriginal involvement in sandalwood harvesting and processing in Australia, in partnership with Aveda Corporation, a US-based personal care products company. Aveda and an Australian industry partner helped create a national Aboriginal corporation based on the philosophy "that by active participation in supporting and facilitating equitable commercial partnerships between the Indigenous and business communities, based on the sustainable use of natural resources and Indigenous cultural knowledge, positive change will occur." Natura, a Brazilian personal care products company, has done similar work on sustainable, community-based sourcing of raw materials for its products. It regards Forest Stewardship Council certified raw products as an important element of its "EKOS" product line.

Negotiating benefit-sharing arrangements can be difficult. The San people of South Africa obtained a community benefit-sharing agreement related to the hunger-suppressing plant, *Hoodia,* only after commercialization of their knowledge of its use was well advanced. The CBD report cautions that the San now face a major challenge in channelling their new flow of income in a fair and equitable way. It cites other cases illustrating "the potentially divisive impact that natural product trade can have in indigenous communities."

Researchers in academia and industry have also voiced concern about the negative impact ABS is having on basic science and on traditions of trust and collaboration among scientists. While scientific and technological developments have improved our ability to study and use genetic resources, ABS laws and regulations are being implemented in a fashion that decreases the availability of organisms to researchers, including in countries with extremely threatened ecosystems where the future of these organisms is uncertain. Some researchers warn that countries are isolating themselves and setting back their own capacity and development. Craig Venter remarked at a recent public lecture, "If Darwin were alive today, he would not have been able to have done his research."

Scientists are beginning to address these concerns and there is reason for optimism that they will be addressed in the international ABS regime (negotiations are supposed to conclude by 2010). The Consortium for the Barcode of Life is organizing a November 2008 international workshop on basic research and ABS. It will propose guidelines for DNA barcoding that will include abiding by local laws in obtaining samples, trying to increase the capacity to carry out barcoding when carrying out studies in developing countries, and protecting rather than exploiting genetic resources.

Canada, as both a user and provider country for genetic resources, is struggling to develop a national policy on ABS. The 2008 CBD report recommends that provider countries undertake national consultations to address the range of issues that touch upon ABS, including patenting of life forms, relationships with external companies, and implications of new biotechnology. The scope of Canadian consultations is yet to be determined, including the question of whether researchers will be involved. The CBD Report also recommends a regional or international clearing house for information on commercial use of biodiversity. It would include information on sectors undertaking research on genetic resources, including scientific and technological developments, demand for access, trends in benefit sharing, and new ABS agreements. It would help Parties stay abreast of the commercial activities they seek to regulate.

Engagement of the forest sector in developing Canada's ABS policy is critical. The agricultural sector will likely not play as active a role as might be expected in light of the importance of genetic resources to agriculture, as the legally binding International Treaty on Plant Genetic Resources for Food and Agriculture has already been negotiated in harmony with the CBD and has come into force. Parties to the

Treaty have established a Multilateral System, encompassing a list of genera of food and forage crops, designed both to facilitate access to relevant genetic resources and share the benefits arising from their use. If a company commercializes a product that uses these resources and restricts its access for further research and breeding, it pays a fixed percentage of the sales of the commercialized product into a trust fund established by the FAO. The Treaty foresees a funding strategy to mobilize these funds, especially to help small farmers in developing countries.

While ABS is the "hot" current policy issue related to genetic resources, an emerging policy issue that warrants more attention is ecosystem services (or "ecological goods and services"). These are defined by the Millennium Ecosystem Assessment (MA) as "the benefits people obtain from ecosystems." They include *provisioning services* such as food, water, and timber; *regulating services* that affect climate, floods, disease, wastes, and water quality; *cultural services* that provide recreational, aesthetic, and spiritual benefits; and *supporting services* such as soil formation, photosynthesis, and nutrient cycling.

The MA classifies genetic resources as provisioning services (or "ecological goods"). They are traded at a modest level (e.g., tree seeds). Unlike other ecological goods, such as food and timber, the level of trade is low and provides only a weak economic incentive for their conservation. Furthermore, the degree to which genetic diversity underpins other ecosystem services - particularly soil formation, photosynthesis, and nutrient cycling - is not well taken into account either in the MA's conceptual framework or in our current economic system:

> Most resource management decisions are most strongly influenced by ecosystem services entering markets; as a result, the non-marketed benefits are often lost or degraded. These non-marketed benefits are often high and sometimes more valuable than the marketed ones.

Growing awareness of the social and economic benefits of ecosystem services has spurred interest in a variety of incentives to address market failure. These include removal of subsidies that encourage overexploitation, carbon trading markets, certification and ecolabeling schemes, payments for ecosystem services, and biodiversity offsets. So-called "framework incentives", such as information provision, scientific capacity building, education and awareness raising, economic valuation, and local stakeholder involvement are also important.

Gene conservation should be more strongly addressed in both these emerging initiatives and in the conceptual framework for ecosystem services. If ecosystem services such as carbon sequestration receive disproportionate attention (e.g., in carbon markets), gene conservation will be short-changed and the problem of market failure will persist. Conversely, provision of genetic resources is one of many ecosystem services, and there is a risk of focusing too narrowly on their commercialization (e.g., under ABS schemes). To maximize human well-being, economic incentives should take into account the full suite of ecosystem services, and the role played by genetic diversity in providing them.

BIOGRAPHY

Ole Hendrickson works for Environment Canada as Senior Science Advisor in the Biodiversity Convention Office, which deals with matters related to the Convention on Biological Diversity (CBD). He coordinates Canadian participation at meetings of the CBD's Subsidiary Body on Scientific, Technical and Technology Advice (SBSTTA), and acts as lead negotiator for a range of scientific issues at meetings of the SBSTTA and the CBD's Conference of the Parties. He is engaged in a broad range of science issues, including biological information management, forest ecology, invasive alien species, impacts of climate change on biodiversity, and incentive measures. He led Canadian government participation in the Millennium Ecosystem Assessment, a major international initiative to assess the consequences of ecosystem change for human well-being and the scientific basis for action on conservation and sustainable use.

Prior to his current position, Dr. Hendrickson was Science Advisor, Biodiversity, in the Science Branch of the Canadian Forest Service (Natural Resources Canada) in Ottawa (1990 to 2000). In 1993 and 1994 he was a member and then chairman of the International Tropical Timber Organization's Expert Panel for technical appraisal of project proposals. He worked as a Research Scientist at the Petawawa National Forestry Institute (Canadian Forest Service) from 1983 to 1990 and published over 25 journal articles on forest ecology and forest soil microbiology. He was a post-doctoral fellow at the University of Guelph in 1981-1982. He holds a BS in Environmental Studies (1973) from the University of Wisconsin, and a PhD in Ecology (1981) from the University of Georgia. His PhD research was on nutrient filtering by riparian forest soils in agricultural watersheds.

Climate Change Adaptation Strategies for Conservation: A Gap Analysis Approach

Andreas Hamann

University of Alberta
Department of Renewable Resources
739 General Services Building
Edmonton, AB T6G 2H1
E-mail: andreas.hamann@ualberta.ca

ABSTRACT

A central element of gene conservation planning at both the provincial and national levels is a network of *in situ* genetic reserve forests. To be effective, multiple reserves should represent locally adapted populations of species with some redundancy to ensure against simultaneous loss of all reserve forests. Minimum effective population sizes must be maintained in reserves to ensure against loss of genetic diversity through genetic drift. Both the required reserve size and the degree of redundancy can be determined with stochastic methods.

It is unclear, however, whether a static network of forest reserves is a suitable conservation strategy under changing environments in the long-term. Over the past three decades, boreal and sub-boreal forest regions in western Canada have experienced a warming trend of 0.8°C and a reduction in precipitation by 20%, resulting in disease epidemics and stress-related dieback of forest trees. This raises the question of whether populations protected in genetic reserve forests can survive and adapt under a continued warming trend that is predicted to be around 0.4ºC per decade.

A gap analysis approach is used to evaluate the vulnerability of tree populations in protected areas under various climate change scenarios. Using botanical inventory and sample data, interpolated climate data, and topo-edaphic information we derive an approximate ecological niche space for each tree species. Subsequently, this niche space is spatially projected under 20 climate change scenarios using several modeling methods. With these habitat projections we determine where and for how long species habitat is sustained in current protected areas (e.g., reserve X contains at least 250 ha of suitable habitat for species Y under 80% of the scenarios until 2050).

BIOGRAPHY

Dr. Hamann graduated from the State University of New York, Syracuse, with a MSc degree in Forest Resource Management in 1995, and obtained his PhD degree in 2001 from the University of British Columbia in Forest Science. He served as Assistant Director at the Center for Forest Gene Conservation at UBC before taking up a faculty position at the University of Alberta in 2005. His research program focuses on ecological genetics and climate change impacts and adaptation strategies.

Gene Conservation Pressures in Ontario and the Need for Gene Conservation Guidelines

Kathleen Brosemer

Forest Genetics Ontario
510 Queen Street East, Suite 24
Sault Ste. Marie, ON P6A 2A1
E-mail: kbrosemer@fgo.ca

ABSTRACT

Forest Genetics Ontario (FGO) is the provincial association mandated to be the lead organization coordinating forest genetic resource management work in Ontario. We have three regional association members: Superior-Woods Tree Improvement Association, Northeast Seed Management Association, and Forest Gene Conservation Association.

In the two northern regions, current pressures on forest genetic diversity are largely due to harvesting and can be controlled through good forest management practices set by the Crown. Past harvesting practices have left a legacy of lost diversity among some species, and climate change threatens the adaptation of local genetic material to future conditions.

In the southern region, pressures are enormous with 80% of its 12.6 million ha privately owned. The population of 11 million creates pressures such as:

- land use change, including more than a century of forest clearing
- poor forest management and logging practices
- introduction of non-native species – plants, diseases, insects
- pollution of air, land, and water
- climate change

The effects of some of these pressures on the genetic diversity of some of Ontario's tree species will be described, as well as actions being undertaken by the Forest Gene Conservation Association and FGO to forestall genetic diversity loss in the face of these pressures. Work on gene conservation guidelines on the national level is progressing through CON**FOR**GEN's subcommittees and participants, and there is an enormous need for such guidelines to help with Ontario's efforts.

BIOGRAPHY

Kathleen Brosemer is the provincial coordinator for Forest Genetics Ontario, the forest genetic resource management cooperative in Ontario. Her scientific background is in geology and soil science, supplemented with broad experience leading nonprofit organizations. She also holds a Commercial pilot certificate.

A Challenge Dialogue Respecting Forest Tree Genetic Resource Conservation and Management (GRM) in British Columbia

Brian Barber

Ministry of Forests and Range
Tree Improvement Branch
PO Box 9518 STN PROV GOVT
Victoria, BC V8W 9C2
E-mail: brian.barber@gov.bc.ca

ABSTRACT

British Columbia's forest genetic resources are the foundation for maintaining healthy productive forest ecosystems and a globally competitive forest industry. BC is fortunate in having a strong, multi-sectoral community of practice involved in conserving and managing its forest genetic resources. However, a number of social, economic and environmental drivers, such as the Mountain Pine Beetle epidemic and climate change, challenged us to re-examine the assumptions, objectives, activities, and desired outcomes that guide Forest Tree Genetic Resource Conservation and Management (GRM) in BC.

In 2006–08, under the sponsorship of Jim Snetsinger, Chief Forester, and Craig Sutherland, Deputy Chief Forester, representatives from Tree Improvement Branch, Research Branch, and the Forest Genetics Council of BC (FGC) undertook a Challenge Dialogue™ [1] with members of the GRM community of practice, stakeholders, and interested members of the public to develop a collective vision and strategy for guiding GRM activities over the next decade.

A Challenge Dialogue is an iterative process whereby questions and draft statements are prepared for comment, and then based on feedback, improved upon. This dialogue afforded persons the opportunity to participate, learn, share, and wrestle with ideas regarding GRM. As a result, the process of engaging persons in this Dialogue was just as, if not more, important than its final products.

A new vision, scope, sets of assumptions and guiding principles, and objectives for GRM in BC was compiled by the project champions and supporters in March 2008 based on the diverse and rich input received through various meetings, responses to two challenge papers, and a workshop. The final report can be downloaded at: http://www.for.gov.bc.ca/hti/grm/grm_dialogue.htm

This final report will serve to guide the development of business plans and the FGC's next 5-year strategic plan (2009–2014). The latter will include performance measures necessary to achieve the desired objectives for the 3 core business areas of GRM: Conservation, Resilience, and Value, and their enablers: Research, Policy, Decision Support, and Extension.

[1] Challenge Dialogue is a trademark of Innovation Expedition Inc. http://www.innovationexpedition.com/CDS.html

BIOGRAPHY

Brian T. Barber is the Acting Director, Tree Improvement Branch, Ministry of Forests and Range (MFR), in Victoria, BC. Tree Improvement Branch's mission is to conserve and manage BC's forest genetic resources through excellence in policy, planning, seed production, cone and seed services, and extension http://www.for.gov.bc.ca/hti. Brian received a Bachelor of Science in Forestry from the University of British Columbia in 1987 and a Master of Arts in Environment and Management from Royal Roads University in 2007. His master's thesis was titled "Reforestation strategies for adapting British Columbia's managed forests to climate change: policy barriers and opportunities". Brian, a registered professional forester, has worked for the MFR in various policy and planning positions over the past 16 years. In collaboration with colleagues in the MFR and the Forest Genetics Council of BC, Brian oversees the develop and implementation of many of BC's forest genetic resource management strategies, policies, operations, and decision support systems. Brian is married with 3 children and enjoys forest history, exercise, playing hockey, and travel.