



ALBERTA FOREST GENETIC RESOURCES COUNCIL



2009 ANNUAL REPORT



MESSAGE FROM THE CHAIR

Ten years have passed since the inaugural meeting of the Alberta Forest Genetic Resources Council. Many of its accomplishments have extended beyond the primary mandate of providing advisory services to the Minister of Sustainable Resource Development (SRD). These include:

- The provision of an effective platform for advancement of forest genetics through a strong working relationship between scientists, practitioners and policymakers from academia, government and industry.
- A research gap analysis, identifying priorities in forest genetics research.
- Extension services in forest genetic resource management, offering communication tools such as fact sheets and an interactive web site.
- The publication of annual reports that have earned high praise from council's constituency.
- Support for, and involvement in, the development of Alberta's gene conservation plan for native trees and Alberta's leading-edge standards for forest genetic resource management.

- Development of a web-based toolkit for practitioners, to improve understanding and encourage the application of genetics in forest growth, diversity and conservation.

One initiative that stands out above the rest was co-sponsorship of a major conference in 2006 on post-harvest stand development, with Foothills Research Institute and the Foothills Growth and Yield Association. The Post-Harvest Stand Development Conference was an impressive first step in the integration of genetics and growth and yield. More recently, SRD has sponsored a study exploring the estimation of genetic gain for three of Alberta's Tree Improvement programs. This work is indeed encouraging, though much more remains to be done.

Particularly in these challenging times, industry requires assurance that it will reap the rewards of its genetics efforts and investments through enhanced annual allowable cuts and other business

benefits. This will require a committed and collaborative effort involving industry, government and the scientific community. Policy that adequately incorporates tree improvement gains into allowable cut determination and forest management planning is critical for the survival of tree improvement programs in Alberta. Council considers this issue to be of paramount priority, and is prepared to commit time and resources towards its satisfactory resolution.



Cliff Smith, *Chair*
Alberta Forest Genetic Resources Council

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COMMUNICATION & OUTREACH

A focus of Council's communication and outreach work in 2009 was creation of the Genetics Toolkit, a learning resource for professionals launched on our website, www.abtreegene.com.

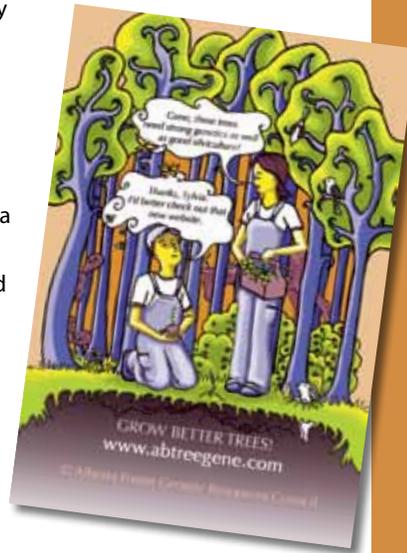
This \$70,000 project was funded by the Forest Resource Improvement Association of Alberta's Open Funds Initiative (\$50,000), and by significant contributions from our partners (see box).

Council's aim in creating the Genetics Toolkit was to provide some tools to help forest practitioners understand and apply some principles of tree genetics in their day-to-day operational and regulatory work. This was accomplished with a comprehensive web-based portal to overviews of science and practice, as well as to a range of resources and links. Respected scientists provided us with science and practice reports that head up each of the four main topic areas: Diversity, Adaptation, Gain and Conservation.

While the main work of structuring the new pages has been done, we anticipate that further additions and improvements will continue into the future.

A second part of this project was to conduct an assessment, through Inside Education, of needs and gaps in the grade school curriculum that we could address with some tree genetics resources and materials. A very informative report to help guide this next initiative was submitted for our consideration, and can be seen under "Resources" within the Genetics Toolkit.

Other communication activities included delivery of Council's 2008 Annual Report and finalization of an AFGRC poster that can be downloaded and printed for use at conferences, seminars, tradeshows and other events. Text and slides for a presentation outlining the mandate and contributions of Council was also completed.



Sincere thanks to our communication and outreach sponsors in 2009:

- Alberta-Pacific Forest Industries Inc.
- Alberta Sustainable Resource Development
- Shell Canada Energy
- Canadian Forest Service
- College of Alberta Professional Foresters
- Forest Resource Improvement Association of Alberta
- GreenLink Forestry Ltd.
- Millar Western Forest Products Ltd.
- Manning Diversified Forest Products Ltd.
- Northland Forest Products Ltd.
- Poplar Council of Canada
- Sundance Forest Industries Ltd.
- Tolko Industries Ltd.
- Vanderwell Contractors (1971) Ltd.
- Weyerhaeuser Company



FOREST GENETICS PROGRAMS IN ALBERTA

The dual challenges of changing climate and economic constraints continue to influence forest genetics programs in Alberta. Conservation of genetic diversity and maintenance of adaptability to natural environments remain among the primary objectives of all programs.

Programs for public land deployment involve two deciduous and six coniferous species native to Alberta. All programs are based on traditional methods of selection and breeding, with no genetic modification (GM). Most programs involve cooperative arrangements among various agencies, including Alberta Sustainable Resource Development and forest companies.

A broad genetic base has been accumulated, and thousands of wild genotypes have been preserved by grafting in *ex situ* reserves. In conjunction with the Alberta Genetic Resources Conservation Plan, a system of *in situ* reserves is also being initiated for all species involved in breeding programs.

Coniferous program development started in 1976, and there are now 22 programs. Increased wood production through faster growth is the main objective; other traits of interest include wood quality and disease resistance. Some programs are designed primarily to alleviate seed shortages. Orchards of lodgepole pine, white spruce, black spruce, jack pine, Douglas-fir, and western larch have been established. More than 1,850 kg of seed have been produced, and almost 30,000 ha have been

reforested using orchard seed. Progeny tests are yielding fast-growing healthy individuals for inclusion in the next generation's breeding and orchard populations. Coniferous programs are summarized below.

Programs in aspen and aspen hybrids, balsam poplar, and hybrid poplars are under development by forest products companies. Priorities for hardwood programs include adaptation, growth rate, disease resistance, and wood quality traits.

The first aspen cooperative program was initiated in 1992 by a group of companies. More than 2,000 aspen genotypes have been propagated, and more than 90 tests have been established on 26 test sites. The first cycle of aspen breeding and test establishment has been completed for two programs. More than 700 balsam poplar selections have been made

province-wide for industry-driven programs, and six clonal trials have been installed. Deployment of hybrid poplars on private land began in 2000; public land deployment of native hardwoods for reclamation is now underway. Provincial genetics policy for forest trees in Alberta was enacted in 2003. A major revision was completed in May, 2009, and the document was renamed *Alberta Forest Genetic Resource Management and Conservation Standards*, to better reflect content and applicability. These standards provide a framework for program development and accrual of benefits, while ensuring that genetic diversity, adaptation, and conservation objectives are met.



species	# of programs	parents in programs	parents under test	genotypes in orchards	trees in orchards	total seed produced (kg)*	hectares planted
Douglas-fir	1	45	0	39	131	0.07	0
Western larch	1	27	0	18	84	1.9	0
Jack pine	1	71	68	58	550	0.3	0
Lodgepole pine	7	1,943	1,633	646	11,313	302	17,903
Black spruce	3	269	179	221	4,675	2.7	0
White spruce	9	1,276	932	842	8,755	1,556	12,085
Grand Total	22	3,631	2,812	1,824	25,508	1,863	29,987

*to end of 2008

PROVINCIAL GENETIC RESOURCE STANDARDS

The Standards for Tree Improvement in Alberta, first implemented in 2003, were revised in 2009 and renamed the Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS).

The standards represent science-based policy developed to ensure the genetic integrity, health and productivity of Alberta's wild and managed forests are maintained. The standards achieve this by guiding the management of forest genetic resources in reforestation and tree improvement activities on public forest lands.

The revised standards reflect a desire to improve the clarity, consistency, grammar and formatting of the manual. Reporting forms were also updated to allow electronic completion.

A major addition was new Seed Testing Standards posted as a separate manual at <http://www.srd.alberta.ca/ManagingPrograms/ForestManagement/documents/AlbertaSeedTestingStandards-June2009.pdf>.

Changes to standards directing the use of wild seed and vegetative propagules (Stream 1) in reforestation activities include modifications to seed transfer rules to encourage movement of populations in a direction compatible with anticipated climate change.



The majority of revision effort was directed at improving standards dealing with Stream 2 Controlled Parentage Programs (CPPs) and tree improvement activities for seed and vegetative propagules. A major technical improvement was the development of digitized CPP region boundaries for approved CPP projects.

Changes were also made to field testing requirements for CPPs. Genetic research trials remain restricted in size for individual sites but a cumulative size limit was added to allow for establishment of replicated trial series.

Quality control standards for height and diameter measurements in genetic field trials have been modified, with height now being required to be within 5% of check values 95% of the time across the test series, and diameter being within 10% of the check value 95% of the time.

The following issues remain to be addressed:

- acceptable deployment patterning of clonal material at both the stand and landscape level;
- development of a methodology for calculating landscape N_e for Stream 2 material once the current caps are reached;
- conservation requirements for CPP programs once the in situ conservation GAP analysis is completed; and
- specification of the required gender ratio for reforestation lots of vegetatively propagated hardwood species.

THE ROLE OF ALBERTA NURSERIES

Nurseries play an important role in the management of forests in Alberta and are sometimes overlooked with respect to implementation of key standards contained in the Alberta Forest Genetic Resource Management and Conservation Standards (2009).

A critical area of responsibility is ensuring the proper chain of custody documentation. Nurseries must track material from seed withdrawal, pre-sowing seed treatments, sowing, growing, harvest, and storage through to delivery to the client. Although, technically, seed extraction is not necessarily a nursery function, it is important to note that all approved seed processing facilities in Alberta are all operated by nurseries. In addition, nurseries are also often asked to process documentation on the client's behalf (e.g. seed withdrawal requests, variance requests).

Oilfield and reclamation clients are sometimes less aware of the requirements and standards than those working in reforestation. Consequently, nurseries are frequently required to represent the standards to their clients, particularly with

respect to the proper collection and deployment of material within existing seed zones.

Depending on the type of material, the level of engagement of the nursery may vary. For example, when vegetative material is being propagated from cuttings taken from the bush in the winter prior to rooting, (i.e.: non-serial production) the nursery will often handle the processing and storage of the propagation material as well as the nursery production function. When material is based on serial or repeated production of the same clonal material, the stoolbed or mass production beds where the cutting material is produced may also be a nursery service provided to the client, in addition to storage and growing the rooted cuttings.

Other areas where nursery responsibilities intersect with regulations are in the handling of excess seed, seedlings and vegetative material. Where genetically improved seed is being handled, seed-use efficiency is also an important consideration.



ALBERTA TREE IMPROVEMENT AND SEED CENTRE

"Climate Change and Alberta's Forests: an information and discussion paper of predicted implications," by Dr H.F. Cerezke, was published by Alberta Sustainable Resource Development in 2009. This report is part of ongoing work being done by the Alberta Tree Improvement and Seed Centre on a long-term forest pest breeding strategy.

A Gene Conservation Plan for Native Trees of Alberta by government staff was endorsed by the Alberta Forest Genetic Resources Council and published in May 2009. This plan deals primarily with *in situ* conservation planning for the 28 identified native trees of Alberta. Development of gap analysis procedures and an initial gap analysis for *in situ* reserves is being conducted in cooperation with the University of Alberta and Dr Andreas Hamann.

Significant effort was made to monitor and survey pine orchards, clone banks and field trials for mountain pine beetle and to carry on protection and measurement work where required. Fall 2009 surveys did not find evidence of attack in any of the field trials but beetle attacks were observed near several pine progeny test sites.

Pine conservation work continued with regional lodgepole and hybrid pine conservation seed collections and parent tree selections from wild stands. Targeted scion collections from lodgepole pine progeny tests were made for grafting and establishment in the clone bank as a conservation measure. The centre is participating in species recovery planning and conservation field work for

limber and whitebark pine, both of which have been listed as endangered in Alberta.

Field test site development for expanded progeny, clonal and climate change adaptation testing continued in four locations in western and northeastern Alberta.





WESTERN BOREAL ASPEN CORP.

Western Boreal Aspen Corp. (WBAC) experienced retrenchments in its trial establishment program in 2009 due to global fiscal realities. Nonetheless, Ainsworth Engineered Lumber and Daishowa-Marubeni International (DMI) both established trials of exotics at the Saskatoon Mountain test site and the DMI farm.

WBAC has a significant number of aspen clones waiting to be tested. The clones have been planted into WBAC's arboretum at the tree improvement facility north of Drayton Valley to ensure their survival until they can be propagated and trials can be established.

As of 2009, WBAC has successfully completed the establishment of all its progeny tests. These trials cover 29 ha and comprise over 30,000 pedigreed individuals with source identified parents and full-sib, half-sib, and clonal structure. The latitudinal range of the trials is 4.1 degrees and the elevational range covers 709 m. All trials are replicated and randomized and the treatments are grouped in alpha blocks. The power in these trials stems from the overlapping genetic structure, the standard robust experimental design, the clonal structure and the diverse range of origins and test sites.

POPLAR COUNCIL OF CANADA

Dr Barb Thomas, a member of the Alberta Forest Genetic Resources Council, was named Chair of the Poplar Council of Canada (PCC) in 2009. The PCC is a non-profit organization established in 1978 to bring together industry, universities, land owners, research institutions and governments to promote the wise use, conservation and sustainable management of Canada's private and public poplar and willow resources.

The PCC (www.poplar.ca) supports a wide range of activities nationally and internationally, including working groups that address specific issues and challenges related to all aspects of poplar and willow management. Currently there are two working groups, one focused on providing genetics and breeding information while the other concentrates on the testing and approval of various pesticides to enhance silvicultural options.

The membership represents a diverse cross-section of individuals and corporations directly involved in all aspects of poplar and/or willow management in Canada. From time to time the PCC also provides administrative services to assist with, for example, presenting conferences and managing research and project funds for associated agencies.

ALBERTA-PACIFIC FOREST INDUSTRIES INC.

Alberta-Pacific Forest Industries Inc. (Al-Pac) is pursuing an active clonal balsam poplar program for its Forest Management Agreement (FMA) lands.

Four FMA area field test sites have been selected, along with one at the Al-Pac millsite and another at the Alberta Tree Improvement and Seed Centre in Smoky Lake. These sites span the range of the proposed Controlled Parentage Program region to test for adaptability across several seed zones. Over 400 clones have been selected with 10 clones per provenance across the FMA area, adjacent to the FMA area and also from several drainage systems in British Columbia.

In the hybrid poplar program, seedlings produced through hybrid breeding continue to be planted for early nursery based screening providing a solid foundation towards our continuous improvement and selection of clones for operational deployment. Activities are under way to initiate a new round of breeding which will once again help expand the material to select from.

Since 2000, more than 7,700ha of leased farm lands from within a 200 km radius of the mill have been planted with hybrid poplars. The program continues to develop new site preparation, maintenance and deployment strategies to ensure maximum growth and survival. Site selection has been targeted more recently to ensure optimization of factors such as soil pH, texture and drainage.

FOREST GENETICS ALBERTA ASSOCIATION

Forest Genetics Alberta Association (FGAA) includes four members – Manning Diversified Forest Products Ltd., Northland Forest Products Ltd., Alberta Tree Improvement and Seed Centre (ATISC) and Tolko Industries Ltd.

The year saw the successful reservation, survey and fencing of the McKay River cooperative genetic field test site. Alberta Sustainable Resource Development surveyed the Firebag genetic test site about 100 km northeast of Ft. McMurray, intended for supportive genetic testing in the northeast region.

In the northwest FGAA region, the Controlled Parentage Program (CPP) Region J lodgepole pine orchard continues to be protected from mountain pine beetle attack with the use of anti-aggregation pheromone. The orchard was expanded with additional parents and grafts as a mountain pine beetle seed supply contingency for the J project CPP region.

Pine conservation work included the collection of scions and grafting of top performing parents from the Region J progeny tests. Grafts are being reared at ATISC for inclusion in the pine clone bank. Seed collections were also made from wild stands in the vicinity of Fontas fire tower north of the Chinchaga River.

Region J orchard expansion and redesign was completed and all new Region J selections are grafted and in stream for incorporation into the orchard in 2010-2011. The CPP Region G2 white spruce seed orchard for the northwest region has achieved full orchard capacity and the northeastern region P1 jack pine and E1 white spruce CPP region orchards are almost full. A crop of 1.57 kg was collected from the E1 seed orchard. All four orchards have produced collectable seed crops and the emphasis now is on graft maintenance and development to enhance seed production.





ALBERTA FOREST GENETIC RESOURCES COUNCIL

Please contact us if you have any questions or comments regarding this Annual Report or the work of Council.

Secretariat:

Website: www.abtreegene.com

E-mail: afgrc@shaw.ca

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MediaMatch West Communications

COUNCIL MEMBERS IN 2009:

Scientific Sector: Dr Andreas Hamann,
Dr Ted Hogg, Dr Janusz Zwiazek

Biological Sector: John Stadt

Industry Sector: J.P. Bielech, Willi Fast
Bruce Macmillan, Dr Sally John, Dr Barb Thomas

Government Sector: Leonard Barnhardt,
Dr Ken Greenway

Chair: Cliff Smith

Administrative support: Tammy De Costa