Research Priorities

Alberta Forest Genetic Resources Council
November 22, 2007

The Alberta Forest Genetic Resources Council advises the Alberta government and advocates research on conservation, biodiversity and productivity of forest genetic resources. This document outlines research priorities based on two years of consultation with academic, government and industry communities.

About the Council
The Alberta Forest Genetic Resources Council brings together representatives of the scientific, government and industrial communities in dialogue around how to protect biodiversity and genetic diversity in Alberta's forests, increase productivity in growth and yield, and improve wood quality and pest resistance.

Council advises the Alberta government by reviewing provincial policy and standards, monitoring activities in Alberta and nationally, and facilitating the sharing of information between interested stakeholders. The Alberta Forest Genetic Resources Council supports the development of science-based policies, standards, and practices and advocates research on conservation, biodiversity and productivity of forest genetic resources.

What research is needed?
A central challenge in developing recommendations for policies and practices in forest management is balancing risks and gains. For example, gains in forest productivity through tree improvement must be balanced against risks associated with lower genetic diversity. Similarly, strategies to adapt for climate change must balance the risk of changing proven practices and policies against benefits of adjusting to new environmental realities.

A widely used risk-avoidance strategy that can be pursued without precise scientific understanding is to emulate natural ecological and population genetic processes and maintain natural patterns of genetic diversity and biodiversity. AFGRC recommendations often follow this strategy, e.g. by restricting seed transfer, retaining natural genetic diversity in deployment populations, and conserving current patterns of genetic diversity.

AFGRC is concerned that this strategy will lose its validity under changing climate. Rather than emulating natural processes and patterns, we now need to understand the actual risks and benefits associated with seed transfer, levels of genetic diversity in deployment populations, and selection of fast growing, insect and stress resistant forest trees. Understanding tree responses to climate will help us to develop science-based guidelines for deployment of planting material in the landscape, and for conservation of forest genetic resources.

Research areas advocated by Council
Following are the research areas advocated by Council to support the development of science-based policies and practices. To be applicable, research results should enable better understanding of benefits and risks associated with existing policies and practices, and allow evaluation of possible alternatives.

1) Optimization of breeding regions, seed zones, and seed transfer guidelines

The challenge: Ensuring that planting stock is well adapted to reforestation sites through transfer rules must be balanced against the costs of maintaining multiple breeding populations or maintaining seed collections to ensure regionally well represented seed supply. Under climate change, the potential benefits of changing current guidelines in order to maintain forest health and productivity must be balanced against the risk of erroneously deploying poorly adapted genotypes.

Examples for research advocated by AFGRC:

- Investigating plant-climate relationships through experimental approaches (e.g. provenance trials)
- Climatic characterization of current seed zones and breeding regions
- Better delineation of seed zones and breeding regions based on climate and other factors
- Predicting suitable deployment areas under climate change (e.g. through bioclimate envelope modeling)

2) Long-distance transfer of provenances and use of exotics or hybrids

The challenge: The potential of increased forest health under climate change and higher forest productivity must be balanced against the risk of introducing weedy species or unintentionally introducing poorly adapted genotypes.

Examples for research advocated by AFGRC:

- Long-term field testing of exotics and hybrids
- Testing out-of-range provenances in long-term field trials
- Ecological niche modeling to assess risk of invasion
- Experimental and empirical research on gene flow from exotics and hybrids to natural populations and fitness of introduced species

3) Deployment of superior genotypes from tree improvement programs

The challenge: Gains in productivity must be recognized and balanced against the risks associated

with deploying selected genotypes (e.g. adaptive traits may have been inadvertently changed, or there may be ecological consequences of decreased genetic diversity)

Examples for research advocated by AFGRC:

- Quantify genetic gains through realized gain trials
- Develop better methods to estimate rotation-age stand volume of genetically improved planting stock
- Investigate potential impacts of climate change on realized gain
- Research indirect effects of selection on adaptive traits
- Quantify long-term consequences of deploying improved genotypes on genetic diversity at the landscape scale

The Alberta Forest Genetics Council would be pleased to endorse research programs or provide letters of support for research proposals that address these issues.

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