



ALBERTA FOREST GENETIC RESOURCES COUNCIL

*Forest genetic resources:
Conserving diversity, enhancing productivity*

Tree Improvement Coniferous Species

The Council

The Alberta Forest Genetic Resources Council advises the Alberta government, provides input on standards and policies, and helps set directions for research on conservation, biodiversity and productivity of forest genetic resources.

Members of the Council represent the scientific, government and industrial communities. This fact sheet provides an overview of why and how these sectors are engaged in coniferous tree improvement.

Who is Involved

First and foremost, the Alberta government is responsible for the public forest and for implementation of the Standards for Tree Improvement in Alberta (2003). These standards provide a process for approving how parents are selected, how breeding programs are managed, how "improved" stock is used and tracked over time. The provincial government also maintains the Alberta Tree Improvement and Seed Centre.

Several Alberta forest product companies have their own coniferous tree improvement programs, either alone or in cooperation with other companies or the Alberta government.

Coniferous Tree Improvement



Coniferous species such as lodgepole pine and white spruce are important for production of forest products in Alberta. When factors arise that cause uncertainty of supply, it becomes important to develop at least some of these trees that can go beyond the historical performance of their parents.

As one example of what can cause this uncertainty of supply, society wants to set aside more of the Crown forest landbase for uses other than timber production – for wildlife refuges, energy exploration and development, tourism sites, agriculture, infrastructure, mining and all manner of recreational activities. To do this, while maintaining Alberta jobs and communities, more fibre must be grown on a smaller landbase. Selection and breeding programs help address this need by giving us trees that grow faster and better than existing commercial forest stands.

On the weather front, predictions are that Alberta's climate will experience dramatic change in coming decades. Finding trees that show the genetic ability to survive drier, warmer weather and the insect pests that might accompany this changed climate will allow us to select and breed for traits that will maintain our social and ecological values into the future.

Trees of the same species can vary widely from one another in many traits; this variation is, in large part, due to genetic diversity within the species. We can breed and select for those genetic traits that help maximize utilization of the resource while minimizing society's overall footprint on the land.

Tree improvement is the practice of selecting individuals with desirable traits and propagating them using conventional plant breeding methods. A few examples of desired traits are health, rate of growth and wood density.

How is the work accomplished?

Tree improvement involves a sequence of activities, starting with the identification of outstanding parent trees in wild stands, and culminating in reforestation using trees with improved performance potential.

Healthy, well-formed trees with good growth are chosen in the forest. Twigs are collected from selected trees and grafted onto seedling rootstock, in much the same way that an apple orchard is propagated. The grafted trees are established in a seed orchard, where they can intermate with trees propagated from other selected parents. Seed orchards

typically contain 500 to 3,000 trees. Since genetic diversity of the future forest is very important, large numbers of parents are included in each orchard.

Seed orchards are managed for abundant flowering and seed production. Seed is collected from the orchard and grown in forest nurseries for planting in reforestation programs. Policy guidelines established by the Alberta government set standards for maintenance of high genetic diversity levels in seed orchard crops.



Testing and Breeding

The performance of each wild parent growing in the forest reflects both its genetic characteristics and the influence of its growing environment. However, we need to know the true genetic potential of the selected parents. At the time of parent selection, seeds are also collected from the parent trees in the forest, and seedlings grown from these seed are established in genetic tests that provide information and allow us to evaluate each parent. These tests can provide us with new parent trees for propagation into future seed orchards, and also offer assurance that progeny will thrive in specified geographical locations.

Gene Conservation

Standards require that wild stands of the species being planted must be set aside in the forest as gene pool reserves. These reserves must be sufficiently large to maintain the integrity of the local gene pool over several generations.

Results

Alberta's seed orchards of lodgepole pine, white spruce and black spruce have produced enough seedlings to replant more than 100,000 hectares. Significant gains in growth and wood volume are expected from these reforestation sites.

Where are we today?

You can find the latest summaries of tree breeding work in Alberta by checking the Council's annual report – available via our website, www.abtreegene.com

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