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Treenomix I: Mechanisms of Wood Formation and Pest Resistance in Forest Trees Using Poplar, Spruce and Arabidopsis

Status	Past
Competition	I
Sector	Forestry
Genome Centre	Genome British Columbia
Project Leader	Jorg Bohlman, Carl Douglas, Brian Ellis and Kermit Ritland

Project Description

Canada's forests are the backbone of an \$81.8-billion forest industry. Yet Canada's forests are continually challenged by outbreaks of insect pests, fungal pathogens, exotic insects and invasive species. When this project began in 2002, nearly one million hectares were harvested in Canada for industrial roundwood, but 18.2 million hectares were defoliated by insects or killed by beetles.

The main objective of this project was to contribute to the long term economic benefit and sustainability of Canada's forests by developing genomics and proteomics resources for two groups of forest tree species: spruce and poplar. Benefits are already being realized through ongoing collaborations with tree breeders in the BC Ministry of Forests (BC MoF), the project's major long-term non-academic partner and leader of BC's premier forest stewardship organization.

The project focused on two areas critical to the future of the Canadian forestry industry: forest health (pest and disease resistance) and wood formation and quality. The team identified candidate genes with potential or newly-identified functions in pest resistance in certain tree species and for wood development.

The project has provided important new information on the genomics of spruce pest interaction and conifer marker genomics relevant for spruce breeding programs in the BC MoF. Research on spruce-weevil interactions has helped to identify defence and resistance traits of Sitka spruce against white pine weevil, knowledge that will be used for developing recommendations for the deployment of resistant materials for Sitka spruce planting.

The project's successful collaboration with the BC MoF built the foundation for the newly-funded Conifer Forest Health Genomics project, co-funded by long-time project collaborator, Sweden's Umea Plant Sciences Centre (UPSC), the Max Planck Institute for Chemical Ecology (Jena, Germany), UC Davis, and the UK Forestry Commission.

Fast Facts

Highlighted outcome: first and largest forestry genomics platform in Canada; the first project to establish spruce as a model system for conifer genomics; together with international partners, developed first draft genome sequence and annotation of the poplar genome; established Canada as a major international contributor to forestry genomics

Number of research personnel employed by the project: 29

Number of peer reviewed publications published: 26

Resources generated: knowledge on genomics of forest health (disease and pest resistance) and wood formation is being used to support breeding programs in the British Columbia Ministry of Forestry and inform forestry programs across Canada and internationally. Large clone collections and sequence databases of ESTs and full length cDNA libraries, various types of genetic markers, new genomics and proteomics tools for spruce and poplar functional and comparative genomics