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Conifer Forest Health Genomics

Status	Current
Competition	III
Sector	Forestry
Genome Centre	Genome British Columbia
Project Leaders	Jorg Bohlmann & Kermit Ritland

Project Description

More than two-thirds of Canada's forest land consists of conifer forests – cone-bearing and usually evergreen trees that are used for softwood. These conifers are the mainstay of Canada's massive forest industry. Canada's conifer forests are increasingly threatened by outbreaks of insect pests and the impacts of climate change. But what is the genomic and biological basis of conifer defense response to forest pests? And how do conifers adapt to abiotic stress associated with changing environments?

Dr. Jörg Bohlmann and Dr. Kermit Ritland of the University of British Columbia are project leaders of Conifer Forest Health Genomics. This project draws on Treenomix – Canada's first large-scale forestry genomics project, previously funded by Genome Canada, Genome BC and the Province of British Columbia – and applies existing and new knowledge to improve our understanding of spruce species (Picea spp.).

Spruce trees are hosts to a wide range of insect pests, such as the spruce weevil (Pissodes strobi), a native insect in British Columbia, bark beetles or budworms. In BC, the spruce weevil is destroying all but the most resistant Sitka spruce trees and is also affecting white and interior spruce. In Eastern Canada, the weevil is a serious pest in plantations of Norway spruce.

Drs. Bohlmann and Ritland will focus on the structural and functional genomics, proteomics and metabolomics of spruce trees, particularly where insect defense and resistance mechanisms are concerned, associated with spruce weevils. In addition, through international collaborations they will make genomic comparisons between spruce and loblolly pine (Pinus taeda), a common southeastern US pine and established system for conifer genomics.

This project aims to identify the underlying genetic mechanisms of resistance to biotic disturbance (for example resistance to insects and insect associated pathogens) and adaptation to abiotic stress (for example regulation of bud set and cold hardiness). The project will also seek to identify and use the natural genetic variation of forest trees in order to support breeding for resistance and adaptation in conifers to improve forest health overall.

Forestry genomics is opening up new opportunities, making it possible to select genetic traits and accelerate tree-breeding schedules. This field of research aims to make Canada's conifer forests more sustainable and the Canadian forest industry more competitive.