



LAY SUMMARY

The SMarTForests project was successful in advancing Canada's position as a world leader in fundamental and applied forestry genomics. The project focused on genomics of conifers, and specifically on genomics of spruce species. Spruces are the most widely planted trees across Canada, and they are the focus of major investments in advanced tree programs in Canada. The project targeted the economically and ecologically important key traits of 1) enhanced insect resistance and 2) improved wood quality and growth of spruces with the objective to maximize value recovery and yields from planted spruce forests. The overall goal is to increase forest sustainability under conditions of present and future climates and changing economic markets. The project's genomics and integrated GE³LS research delivered fundamental new knowledge, innovative tools and practical applications in direct partnership with end users in Canada. The outcomes, achievement and implications from the research, translation and technology transfer of the SMarTForests project include:

- The first **genome sequence of white spruce**, representing one of the first sequenced conifer genomes. The project produced the genome sequences of two white spruce trees from advanced breeding programs in eastern and western Canada.
- Novel **bioinformatics tools** to assemble some of the largest genomes sequenced to date.
- Development of **genomic selection** for applications in **advanced spruce breeding programs**. Proof of concept was demonstrated for white spruce and black spruce.
- A highly improved **genetic map** of white spruce.
- **Genetic markers and biomarkers** for use in tree selection and breeding, based on advanced genomic and functional understanding of key traits of spruce trees.
- Some of the most comprehensive **conifer genomics resources** accessible in public domain databases.
- Development and implementation of **decision support tools** and **economic models** to support integration of conifer genomics into policy and decision-making.
- **Stakeholder surveys** to assess challenges and opportunities for implementation of genomics based applications in Canada.

The anticipated **socio-economic benefits for Canada** arising from these outcomes of the SMarTForests project include substantial increases on the net present value of forest production. To fully realize the projected benefits, the SMarTForests project together with end users and stakeholders developed a realistic strategy for **research translation** and **technology transfer** with a primary goal of implementing genomics tools in advanced tree breeding program in Canada.



GenomeCanada



GenomeBritishColumbia



GenomeQuébec