



# 2BILLION TREES

## 2 BILLION TREES SCIENCE

### Research in Support of Tree Planting

NOTE 9

## Identification of species-specific genetic determinants that increase tree flammability

#### LEAD RESEARCHER:

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#### CFS CENTRE:

Laurentian Forestry Centre

#### PROJECT LOCATION:

Chibougamau and  
Mastigouche, QC

#### Project Drivers

Chemical traits of trees can directly contribute to the flammability of forests. Terpenes are among the chemicals associated with fires. They are highly volatile and have low flash points that contribute to their flammability. Terpenes can accumulate to significant levels in boreal forests. The build-up is especially significant in conifers, where they provide protection against stress, such as challenges from pests and pathogens. Considering that stressed trees generally accumulate higher levels of terpenes, climate change could push terpene levels even higher and potentially increase flammability. This project will examine whether genes associated with terpene production are also associated with tree flammability. This project will support the 2 Billion Trees (2BT) program by contributing to the management and mitigation of wildfire risks, thus better ensuring the long term survival of planted trees and their continued GHG emission reductions.

#### Project Approach

Provenance trials are where seed sources representing the genetic range of a species are grown together in a common garden experiment. Two existing provenance trials will be used to collect samples of the range of genetic variation in white and black spruce. Provenance trials allow the sampling of existing genetic variation within a species from one or more experimental sites. This eliminates the need for researchers to travel large distances to sample the range of black and white spruce across Canada in their home environments. The project team will collect twigs from both trial locations, and analyze the different chemical and flammability profiles. The team will identify genetic determinants for the variation of chemical profiles associated with flammability. They will then compare variation in chemical and flammability traits with the fire history and climate of the origin populations to test whether variations in these traits are associated with fire. Results will indicate if the traits have evolved to increase or decrease flammability as an adaptation to local environments and climates. Data collected in this project will be used to generate models that predict tree flammability.

#### Anticipated Outputs and Impacts

This research project provides an opportunity to manage the risk of fire in our forests by identifying chemical traits and genes associated with flammability. These genes could be used as genetic markers to select flammability traits and guide the selection of planting materials in regions of

high fire risk, ultimately reducing current and future impacts of wildfire. This research will support seed and species selection decisions for the 2BT program by considering the factors associated with a changing climate and fire behavior. This project will also begin to assess whether fire risk assessment could benefit from models of tree flammability that are informed by tree genetics. Additionally, it will examine whether variations in chemical traits are adaptive for different climates, which has important implications for understanding fire ecology.