Natural Resources Canada | Ressources naturelles Canada

CANADIAN FOREST SERVICE

Science HIGHLIGHTS

CLIMATE CHANGE AND SPECIES MIGRATION

How can we help Canada's forests adapt to climate change?

Expanding the range of existing species could help

If climate change proceeds as predicted, trees that are well suited to current climate conditions will be growing in sub-optimal conditions within the next 20 to 50 years. Indeed, trees in some parts of Canada may already be growing outside their optimal climates. Because trees take so long to grow, many researchers argue we need to consider what to do today to help forests withstand the effects of climate change in the future. Solutions range from maintaining and enhancing the health of forest ecosystems to using seed sources from more southern regions to establishing species outside their current ranges.

Climate models for B.C. and Ontario predict things like average minimum temperature increases of 5°C to 10°C by the end of this century, according to Dan McKenney, chief of landscape analysis and applications at the Canadian Forest Service of Natural Resources Canada's Great Lakes Forestry Centre in Sault Ste. Marie. "These changes are certain to have extensive impacts on forest ecosystems. For one thing water availability will likely change for many forest regions in Canada."

As the climate gets hotter, trees on the southern edge of their range are expected to decline as the area with conditions for which they are adapted to shrinks. But, conversely, if the soils are appropriate, conditions on the northern edge of their ranges may improve.

"We also anticipate changes in forest composition," McKenney says. He and his colleagues examined the effect of climate change on the geographic distribution of 130 North American tree species. They reported an average northward shift in suitable climate of 700 km by the end of this century. Such rapid change in potential habitat will result in major redistribution pressures for tree species across the continent.

"The concern is that the natural rate of migration for most tree species is measured in tens of metres per year. There is a real mismatch between what climate change will bring and what a species can do to adapt on its own," McKenney says.

He and his colleagues have recently written about three forest management strategies to help reduce the negative impacts of climate change on forests: modifying seed transfer guidelines, assisted migration of seed sources and assisted migration of species.

Overview

Ideas to help trees adapt to climate change range from keeping forests healthy, to changing the seed transfer rules, to moving species outside of their current natural ranges.

The natural rate of migration for most tree species is measured in tens of metres per year. Climate change may shift habitats by hundreds of kilometres by the end of the century.

Seed transfer guidelines

Almost half of Canada's harvested land is regenerated artificially, either through planting or seeding, which potentially involves moving native seeds some distance from their point of origin. Forest managers are already making important decisions about the climatic tolerance and transferability of seeds. Simply matching seeds to existing climate conditions would be an improvement over uninformed seed selection. It's important to note that transfer guidelines aren't intended to introduce new species into an area. Rather, they are designed to maximize the health and productivity of a species within its established area. Some jurisdictions have sophisticated seed transfer guidelines but not all.

Assisted migration of seed sources

Climate change will affect forest health as trees' annual growth cycles become out of synch with their environment. Being exposed to new pests and diseases may also become factors that trees are forced to deal with. Planting seeds from native trees that are already adapted to future climates—assisted migration of populations—is a proactive strategy to help trees adapt to climate change. It doesn't involve radically altering a species' range, instead it focuses on enhancing the adaptability of a species to the evolving climate and in some cases expanding the leading edge of a species' natural range.

Assisted migration of species

Few people object to moving seed sources within a species' current geographic range, based on sound seed transfer guidelines, but moving species into new areas—labelled species migration—is much more contentious. "Given the expected rapid northward shift of suitable climatic boundaries for many species, researchers and policy-makers need to advance the discussion to understand the risks and uncertainties involved in moving species," McKenney says.

McKenney insists we need to take a strategic approach to helping Canada's forests adapt to a changing climate. "There isn't one single answer. We need to discuss options and hedge our bets with a range of solutions. But undoubtedly the place to start is by ensuring that our forests are as healthy as possible today so we are in the best position to deal with the future."