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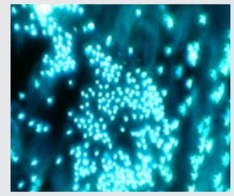
InBrief






from the Canadian Forest Service – Laurentian Forestry Centre

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Future changes in ecosystem management?

The European colonization of North America has significantly changed forest landscapes. Timber harvesting, urban development, agriculture, and increased human-caused fires have altered natural disturbance regimes. In recent years, the aim of ecosystem-based management practices has been to restore or approximate pre-colonial conditions. However, forest landscapes are also undergoing changes to due to climate change and will be different from what they were 200 years ago.

With that in mind, researchers from the Université du Québec à Rimouski, the Ministère des Forêts, de la Faune et des Parcs du Québec (MFFP) and the Canadian Forest Service assessed the impacts of climate change on the use of ecosystem-based management to reduce the gap between current and pre-colonial forest landscapes. Their study focused on the boreal-temperate forest ecotone of southeastern Canada. This region is expected to undergo significant changes in forest composition by the late 21st century.

Their work has shown that climate change will compromise the ability of ecosystem-based management in the study area to reduce the gap between today's forest composition and that of the pre-colonial era. However, according to researchers, this is still a valid management option despite the ongoing effects of climate change.

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https://scf.rncan.gc.ca/publications?id=39523

Promoting a strong root system for successful planting

During the first few years following planting, reforestation seedlings may experience growth issues, most often due to water availability. The extent of this "planting shock" varies depending on the seedlings' root system and the site's conditions. Although black spruce has the ability to develop adventitious roots for better growth, methods used in forest nurseries don't usually promote their development.

Researchers from the Université du Québec en Abitibi-Témiscamingue and the Canadian Forest Service have shown that root system characteristics are important to the survival of planted black spruce seedlings. They compared two-year-old seedlings grown bare root or in containers at two planting depths on three types of fertilized or unfertilized microsites (i.e., mineral soil, ericaceous humus, and sphagnum-ericaceous layer) in the moss – spruce bioclimatic domain of northwestern Quebec.

The planted seedlings grew best in mineral soil. Results show that containerized seedlings, including those deeply planted with pre-established adventitious roots, had greater diameter increase and experienced a lesser water stress than bare-root seedlings. Deeply planted containerized seedlings with pre-established adventitious roots experienced better nutrient uptake than other stock types The study suggests that producing seedlings with pre-established adventitious roots or planting them at a depth that stimulates the production of such roots could limit planting shock. This practice could provide a long-term advantage on nutrient-poor sites.

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Genetic selection: a tool for increasing forest resilience to drought

Increasing severity and frequency of drought periods due to climate change will negatively affect the growth of boreal forests. These changes will affect the availability of water—an important component for tree growth. Given the rapid speed of climate change and the slow evolution of trees, there is an urgent need to establish trees' ability to adapt to future climate change.

Photo: NRCan

Researchers from the Université Laval and the Canadian Forest Service determined how drought influences the radial growth of trees. They studied 1,481 sets of annual growth ring measurements from 43 white spruce populations established in a single experimental plantation in Mastigouche.

They found that genetic variation in drought response between populations plays an important role in tree resilience. Trees from drier regions grew better during drought events than trees from wetter environments. These observations show that it is possible to genetically select drought-resilient trees, which is useful information for reforestation managers.

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This publication is part of a series that presents popularized summaries of scientific articles written in whole or in part by Laurentian Forestry Centre researchers.

Canada

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Does fire change the mechanical properties of black spruce?

Photo: NRCan

Fires influence the composition, age and structure of forest stands, among other things. New conditions on burned sites can affect regeneration growth and indirectly the mechanical characteristics of wood, including stiffness.

For the forest industry, the modulus of elasticity is an important measure of the stiffness of wood products. Researchers from Laval University, the University of Arizona, FPInnovations, the Ministère des Forêts, de la Faune et des Parcs du Québec (MFFP) and the Canadian Forest Service studied the relationship between the time since the last fire and wood stiffness in black spruce. They also attempted to identify ecological factors that could explain this relationship.

The results of the study show that the time since the last fire does influence wood stiffness and that the primary cohorts, i.e., the first ones regenerated after fire from seeds, have the best mechanical stiffness characteristics. Subsequent cohorts, mainly produced by layering, would have lower stiffness values.

Forest planning could take the recurrence of fires into account to target the harvesting of stands from the first post-fire cohort. This wood will provide products with better mechanical properties.

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Urban forests: assessing the research needs of Canadian municipalities

In Canada, over 80% of the population lives in an urban environment. The urban forest—which includes trees and green spaces in or adjacent to municipalities—provides many advantages such as sequestering pollutants and filtering air particles, conserving energy, and reducing runoff. However, urban trees grow in a challenging environment and factors such as contaminated or compacted soils, de-icing salts and motor vehicle activity affect their development. All of these aspects are critical to ensuring a healthy environment for urban forests and are potential topics for research.

In this study, researchers from the Université Laval, Tree Canada, and the Canadian Forest Service identified the urban forestry research needs of Canadian municipalities with populations of at least 5,000 people, based on a Canada-wide survey. They also tested whether the region, the size of the municipalities and the percentage of canopy coverage had an effect on these needs.

Photo: NRCan

The wide range of research needs identified by the municipalities indicates that there is still a strong demand for new studies in this field. Municipalities want to know, among other things, which tree species are adapted to urban environments and what effects trees have on rainwater runoff and on human health.

Researchers also showed that research needs were significantly influenced by the size of municipalities and the surrounding region, but not by canopy coverage. This study will enable researchers to better define their research projects according to the needs identified by municipalities.

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Harvesting without damaging biodiversity

Photo: NRCan

Forests are increasingly affected by large-scale natural disturbances. Salvage logging on these sites is a way to recover timber volumes, but it affects their biodiversity. There is an ongoing debate about how much of the area of forests severely disturbed by wildfire, windthrow and pests should be excluded from salvage logging in order to preserve biodiversity.

To answer this question, researchers from 29 organizations around the world, including the Canadian Forest Service, used a mixed statistical approach that combines extrapolation and rarefaction methods to predict species richness in boreal and temperate forests. The approach used 17 taxonomic groups of insects, birds, plants, lichens and fungi to predict changes in the proportion of species present when naturally disturbed forests were salvaged or not.

Researchers found that limiting the harvest of disturbed forest area to 25% maintained 90% of the taxon richness. When the harvested area reached 50%, species diversity was reduced to an average of 73%. The type of natural disturbance and the taxonomic groups in place had an impact on results. However, the time between harvesting and disturbance did not.

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