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In Brief

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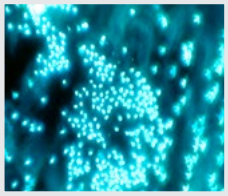


Does hybridization in poplar increase biodiversity?

Photo: NRCan

Many research projects have shown that an overlap and hybridization between different plant species can change the microfauna (e.g., insects or bacteria) that is present in the area.

This study, carried out in Alberta, led by researchers from Northern Arizona University, Agriculture and Agri-Food Canada and the Canadian Forest Service, focused on the impact of the presence of hybrids between three species of poplar (*Populus balsamifera, P. angustifolia and P. deltoides*) at the stand level and also at the level of the arthropod community (invertebrate animals such as insects, spiders, etc.), the latter being highly specific to their host tree. Genetic markers were used to categorize the trees sampled according to their degree of hybridization.

By studying the arthropod community, the researchers were able to show that the more poplar species hybridize, the more they share arthropod species; thus, the diversity of arthropod species increased with the prevalence of hybrids in the stand. Furthermore, a specific species of arthropod was found exclusively in hybrid trees, thereby proving that hybrids can be a source of biodiversity.

The results of this study highlight the significant potential for diversity in zones where these three species of poplar hybridize.

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Predicting the quantity of biomass produced in short-rotation intensive farming

Short-rotation intensive farming is a plant production system characterized by plantations of species selected for their rapid growth, such as certain willow and hybrid poplar species. These plantations are often very dense (10,000 to 20,000 plants per hectare). They are used for various purposes, including the production of biomass for bioenergy.

This collaborative project was conducted by researchers from the Université du Québec en Abitibi-Témiscamingue, the Plant Biology Research Institute, the University of Guelph, the University of Alberta, Biopterre, the *Centre technologique des résidus industriels,* FPInnovations, Martin Riopel Consultant Inc. and the Canadian Forest Service. They assessed sampling methods and developed equations in order to predict the quantity of biomass present in young willow and hybrid poplar plantations using the least amount of measurements in the field possible to obtain a specific precision level. These equations use the height and diameter measurements of a certain number of stems, following a procedure that varies according to the species.

These equations make it easier to determine the quantity of biomass contained in willow or hybrid poplar plantations that can be used to produce bioenergy. This information is useful for short-rotation intensive farming, especially in terms of estimating its costs and advantages. These results were also used in the development of the CALBIOEN application, which helps take measurements in the field and calculate biomass quantities. CALBIOEN and its user guide can be downloaded from the following site: http://www.rlq.uqam.ca/cartable/CALBIOEN/calbioen_en.php.

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Scleroderris canker in red pine: when is it time to reforest?

Scleroderris canker mainly attacks red pine and is very prevalent in natural forests, plantations and nurseries. Two strains of this pathogen are present in eastern North America: the American strain and the European strain, the latter being more virulent. The European strain, which was first reported in 1975 in New York State, causes trunk cankers and shoot blight. It can cause the death of young pines less than 6 m high within a few years.

Photo: NRCan

In a study conducted in eastern Canada, researchers from the Canadian Forest Service recommend waiting two seasons before proceeding with pine reforestation in a site where the presence of the European strain of scleroderris canker has been detected. This period makes it possible to ensure the disease is no longer present on the site and thus prevent it from spreading to young trees. However, this delay is not necessary when reforesting with white pine instead of red pine, jack pine or Scots pine, since white pine is not sensitive to the disease.

This research contributes to lowering the impact of this disease on wood supply for certain forest industries, such as those related to the production of posts and poles.

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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

In Brief
from the Canadian Forest Service – Laurentian Forestry Centre

Positive impacts of prescribed burning on paludification


Photo: NRCan

Paludification is a natural process by which the layer of organic matter on the ground continuously thickens. It occurs naturally in some black spruce stands in the boreal forest, where it causes a decrease in productivity. Among other things, it increases soil moisture and decreases the decomposition rate of organic matter. It also reduces the presence of nutrients while increasing that of sphagnum and heaths.

In this study, researchers from the Université du Québec en Abitibi-Témiscamingue, the Université du Québec à Montréal and the Canadian Forest Service showed the positive effect of prescribed burning on the soil organic layer of black spruce stands located in the Clay Belt region of Abitibi-Témiscamingue. Prescribed burning seems to result in increased spruce growth.

In order to study this phenomenon, the researchers compared the effect of prescribed burning following cutting with those of two other forest management techniques: clearcutting and cutting with protection of regeneration and soils (CPRS). They studied the effects of the above-mentioned treatments on soil conditions, sphagnum and heath reduction, as well as black spruce growth increase.

Compared with CPRS, prescribed burning increases both organic layer decomposition and the soil's pH levels. It also decreases the presence of sphagnum, but not that of heaths. In comparing prescribed burning with clearcutting, the researchers found that the former led to greater black spruce growth. Although the effect of prescribed burning is not similar to that of a very severe fire, the two have similar results (e.g. increasing the soil's pH levels). This technique could be very useful following harvesting in black spruce stands where sphagnum is thick and heaths are abundant.

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The balsam twig aphid: little-known natural enemies

The balsam twig aphid is one of the main pests affecting balsam firs grown in Christmas tree plantations in eastern North America. It causes damage to needles and twigs, and can lead to significant financial losses in those plantations.

A number of research projects on biological control strategies for balsam twig aphid populations have been carried out using different species of ladybug, both in natural environments and in plantations. However, very few of those studies involved syrphid flies (Diptera order), another group of predatory insects of aphids.

Researchers from the Université Laval and the Canadian Forest Service identified four little-known species of syrphid flies that attack the balsam twig aphid. They described the biology of the two most common species and studied their synchronization with the balsam twig aphid. The researchers noted that the density of syrphid larvae on balsam fir shoots increases rapidly early in the season (May-June) and nearly matches the density of balsam twig aphids.

Syrphids are well synchronized with aphids and could therefore play a role in their control. Further research is needed to understand this role and the impact of these predators on aphid population dynamics.

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What are the effects of climate change on black spruce?

In this study, researchers from McMaster University, the University of Toronto, the University of Alberta, Nanjing University and the Canadian Forest Service examined the effects of different climate change scenarios and forest management on black spruce stands in the boreal forest. They investigated the impact of variability in climate, seasonal temperatures, disturbances, and of the CO_2 fertilization effect on carbon dynamics in an eastern Canadian boreal forest landscape over a period of 80 years, i.e. from 1928 to 2008.

Simulation results indicate that prior to 1963, the area studied could be considered a small carbon sink since it absorbed more CO_2 from the atmosphere than it released. In 1963, as a result of cutting and insect outbreaks, the forest became an important carbon source. Since then, the forest can mainly be considered a carbon sink due to an increase in its biomass.

Researchers also indicated that rising summer temperatures would negatively affect growth in undisturbed forests by increasing dry spells. This change would counteract the effect of a longer growing season resulting from milder spring temperatures.

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