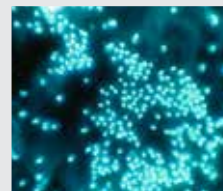




# InBrief

from the Canadian Forest Service – Laurentian Forestry Centre



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## Impact of planting density on stem shape in jack pine

A tree's stem curvature is an important factor in determining its quality, and it also has an impact on its value. Researchers from the Canadian Forest Service and Université Laval studied the effect of planting density on stem curvature in white spruce and jack pine plantations in New Brunswick.

In this study, two methods for measuring curvature were compared. The first was based on the measurement of maximum stem deformation (standard method) and the second used a detailed measurement of all deformations. The outer shape of the trees was digitized using a laser scanner, and deformations were calculated using these two methods.

The results show that with the standard method, planting density does not have a significant impact on deformation in either of these two species. However, using the more detailed and therefore more precise method, a significant impact was noted in jack pine. When density is lower than 1,600 stems per hectare, more trunk deformations are observed in jack pine. No difference was noted in white spruce, regardless of the method used. The outer shape of jack pine stems is therefore more strongly affected by stand density than that of white spruce.

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## The role of gravity in the development of white spruce

Plant development is influenced by various internal and external factors that can vary or remain stable over time. The effect of gravity is one of the rare factors that do not vary during the life of a plant and which greatly influences plant development. But what happens in the absence of gravity? This is what researchers from the Canadian Forest Service and Université Laval set out to discover through an experiment conducted aboard the International Space Station.

In 2010, white spruce seedlings were sent on board the Space Station, where they remained for 30 days. Their growth rate was compared with that of similar seedlings that remained on Earth. White spruce was chosen because it is an important species in the forest industry and its genetics are well known.



Photo: Canadian Space Agency

The researchers noted a similar growth rate in both cases (on Earth and in space), but they found differences in the expression of certain genes, namely in the number of molecules these genes produced. In essence, the absence of gravity affects the functioning and development of cells, which could have an impact on wood formation. Gravity is therefore an important element in white spruce development.

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## Taking heath and moss into account in the management of black spruce stands

Heath and moss can invade harvested sites and compromise the success of regeneration in Canada's eastern boreal forests. In order to better understand the negative effect of these plants on productivity and regeneration, researchers from the Canadian Forest Service, the ministère des Ressources naturelles du Québec, the Université du Québec en Abitibi-Témiscamingue, Université Laval, Université de Sherbrooke and the Centre d'enseignement et de recherche en foresterie de Sainte-Foy produced a synthesis of various research projects on the effects of understory vegetation on the productivity of black spruce stands, focusing primarily on heath and moss.

The researchers present a synthesis of knowledge on the relationships between understory vegetation and the development of black spruce stands. This information will be useful to forest managers, as they will be able to better understand and predict how their silvicultural treatments will affect understory vegetation at different levels (tree, stand, landscape, region and biome) and thus maintain the productivity of black spruce forests.

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## Field performance of seedlings produced from somatic embryogenesis

Nearly 4% of white spruce seedlings used for reforestation in Quebec are produced at the Saint-Modeste tree nursery through somatic embryogenesis, a plant cloning process that takes place in the laboratory using seeds harvested from trees with desired characteristics, such as strong growth. Researchers from the Canadian Forest Service, Université Laval, the ministère des Ressources naturelles du Québec and Morocco's Taounate University studied the extent to which these inherited growth characteristics were influenced by the environment and if this influence was stable over time. To do so, they monitored the growth (height and diameter) of the seedlings produced from somatic embryogenesis over 6 years: 2 years in containers in the nursery and 4 years thereafter once they were planted in the field.



Photo: NRCan

The researchers found little environmental impact in the nursery, but for the seedlings in the field, impacts increased over time. Transplantation shock may be one of the factors responsible for the changes observed between young seedlings in the nursery and in the field. However, age/height genetic correlations for height were high, indicating that clone rankings remained the same over time. This means that a given clone that was among the most highly ranked at the start remained so over the years.

In order to reduce the number of clones to be tested to obtain greater growth in height, it would be possible to eliminate some of them at a young age due to the high number of correlations observed for this characteristic over time.

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## The effect of hot summers on the whitespotted sawyer in burned forests

The whitespotted sawyer is a native insect that attacks trees in burned forests. It tunnels into the wood, sometimes to the heart of the tree. The presence of holes in processed wood products lowers their value for the forest industry. Moreover, timber harvesting in these forests is a painstaking operation.



Photo: NRCan

In order to predict wood damage caused by the whitespotted sawyer, researchers from the Canadian Forest Service, Université Laval and the Institut national de la recherche scientifique exposed burned wood logs infested with the whitespotted sawyer to different temperatures. The 3D images obtained by digitizing the wood logs made it possible to correlate the depth of the tunnels burrowed by the whitespotted sawyer with these different temperatures. The equations developed are valid for both jack pine and black spruce.

Results of analyses show that the hotter summer temperatures are, the quicker whitespotted sawyers cause severe damage to the trees. If the summer after a fire is hot, significant damage can occur as early as in the fall.

This research will contribute to developing a national model to assess the extent of damage caused by the whitespotted sawyer in burned forests based on summer temperatures, and could facilitate better planning for salvage logging of burned timber.

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## Improving identification of poplar leaf rust for better control

Fungal species belonging to the genus *Melampsora* are responsible for several diseases, including poplar leaf rust, the most significant poplar disease in the world. Several *Melampsora* species need to alternate between the host plant (e.g. poplar) and an alternate plant (e.g. larch) to complete their life cycle and cause the disease. Identifying the alternate plant is one factor that can help to identify *Melampsora* species, coupled with certain morphological characteristics. Despite this, classifying the different species of the genus *Melampsora* remains problematic and controversial.

In order to facilitate better identification of the different species of *Melampsora*, researchers from the Canadian Forest Service, Université Laval, France's National Institute for Agricultural Research and Université de Lorraine compared the genetic fingerprints of different species. These efforts will contribute to obtaining better taxonomic descriptions of these species, making their identification and management of the diseases they cause much easier.

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