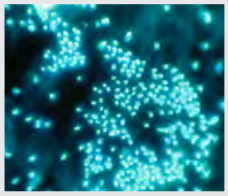
Natural Resources Canada | Ressources naturelles Canada

InBrief

from the Canadian Forest Service – Laurentian Forestry Centre

Number 31 – 2012






Hybrid Poplars and Hog Manure: A Profitable Combination

Canadian Forest Service and Université Laval research scientists are interested in the interaction between the management of fast-growing plantations and the use of hog manure in southern Quebec. They conclude that fertilization with manure significantly increases hybrid poplar growth without compromising the quality of groundwater.

In 2004, nine hybrid poplar plantations were established in the sugar maple–yellow birch bioclimatic domain near Lac-Etchemin, in Quebec, and were fertilized over a six-year period with three different amounts of liquid hog manure. Tree growth and foliage nutrient composition were measured. Lysimeters were installed to estimate the effect of fertilization on nitrate and phosphorus concentrations in soil water.

No correlation was found between the spreading of increased amounts of manure and increased tree growth, which suggests that the lowest amount was sufficient and that the trees did not benefit from greater amounts. In the majority of cases, nutrient contents in soil water were below the standards in effect in Quebec. In these circumstances, the spreading of manure does not seem to pose a risk to water quality, at least in the short term.

The results confirm that hybrid poplar plantations have the potential to store carbon and to become part of the solution for managing hog manure. When large-scale fertilization programs are considered, the researchers recommend that a monitoring program be set up to measure the long-term impact on aquatic ecosystems.

For information: Evelyne Thiffault, evelyne.thiffault@nrcan-rncan.gc.ca

Photo: NRCan

Do warmer temperatures benefit hemlock loopers?

An earlier growing season due to global warming may have an impact on the population dynamics of some insects. Canadian Forest Service researchers have studied the effect of global warming on the diapause length, hatching rates and hatching times of hemlock looper eggs. Hemlock looper is a major pest of balsam fir stands in eastern Canada. Diapause is a suspension of development and a slowing down of the basic metabolism that allows insects to avoid the harmful effects of adverse environmental conditions, such as the onset of winter. For hemlock loopers, diapause occurs in the egg stage.

Photo: J. Delisle

Researchers have demonstrated that the period during which the female lays her eggs (July-August) has an impact on the hatching rate of eggs the following spring. The earlier the female lays her eggs, the greater the hatching rate is at 15°C, while it remains unchanged at 20°C, and decreases significantly at 25°C. In addition, the higher the temperature to which the eggs are exposed, the earlier that the few eggs that survive (30%) will hatch. These eggs are fated to die because they hatch before winter. The hatching rate of eggs is therefore not only influenced by an increase in temperature, but also by the length of exposure to higher temperatures.

To avoid the negative effects of longer exposure to high temperatures, hemlock loopers may attempt to settle at higher latitudes or altitudes or delay their reproductive period by extending their larval development, a phenomenon observed in southern Quebec and United States populations.

For information: Johanne Delisle, johanne.delisle@nrcan-rncan.gc.ca

Is forest productivity slowed down by the reduction in forest fire activity?

Over the last few hundred years, forest fire activity has tended to decrease in the closed boreal forests of eastern North America. The result is an increase in the percentage of old-growth forests on unmanaged lands. This aging leads to a landscape-scale decrease in net ecosystem production. However, at the tree scale, global warming has led to improved growth conditions. Is this positive effect of global warming on growth altered by decreased fire activity? Canadian Forest Service researchers are seeking the answer to that question.

Through a combination of growth process modelling and paleoecology, they reconstituted the net production of jack pine stands in the closed boreal forest of eastern North America from the early 19th century to the late 20th century. They found that a longer growing season and a greater water supply had stimulated the absorption of carbon from the atmosphere between 1901 and 2009, and that the average age of jack pine stands had increased from 87 years in the 1920s to 131 years in 1999.

The results therefore indicate that the negative effect on productivity resulting from forest ageing is sufficient to cancel out the increase in net primary production due to climate change. Future growth projections should take into account these effects stemming from changes in the disturbance regime.

For information: Martin Girardin, martin.girardin@nrcan-rncan.gc.ca

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

Changes in mortality after boreal forest fires

Researchers at the Canadian Forest Service, the Université du Québec à Montréal and the Université du Québec en Abitibi–Témiscamingue have conducted a study in the boreal forest of northwestern Quebec to characterize, over a 10-year period, snag mortality and dynamics in a 12,557-ha area of forest near Val-Paradis that burned in June 1997.

The data obtained from permanent plots established immediately after the fire were analyzed to determine the composition, species, diameters, fire severity, basal area, and the presence of salvage logging. The researchers found that most of the trees had died in the first two years following the fire, and tree mortality continued during the 10 years of the study. They estimated that trees that were still alive after 10 years would live for several more years. Snag persistence and the factors affecting it vary according to species. Jack pine snags were the most persistent, followed by trembling aspen and black spruce snags. In addition, the more severe the fire was, the more persistent the snags were.

Photo: V.-A. Angers

Another interesting find was that the classic transition pattern whereby a standing tree dies, becomes a snag, and is top-lopped several times before finally falling to the ground only accounted for 10% of cases. Many of the trees that were still alive had been uprooted or were broken at the base.

Gaining a better understanding of these dynamics, which have a major impact on post-fire biodiversity, will make it possible to influence the development of timber salvaging strategies.

For information: Sylvie Gauthier, sylvie.gauthier@nrcan-rncan.gc.ca

Is forest biomass a panacea?

Canadian Forest Service researchers have assessed the potential for using forest biomass as an energy source in Canada. The term "forest biomass" refers to any biological feedstock that comes from trees, and logging waste is the most abundant, readily available source of forest biomass for energy production. However, because of ecological, operational and economic limitations, the amount of forest biomass available is significantly less than what is theoretically available.

Bioenergy accounts for about 5% of Canadian primary energy consumption. Even if the total amount of harvested timber and logging waste was used as an energy source, Canadian forests would still provide for only 18% of the country's total energy consumption. The use of biomass produced by natural disturbances along with increased forest productivity—resulting, for example, from more intensive management—could help to increase this percentage in the future.

The efficient conversion of forest biomass into a usable type of energy depends on the technology used. The same is true for the potential to reduce greenhouse gas (GHG) emissions through the use of biomass. The biggest reduction will undoubtedly be obtained through the use of forest biomass to produce heat (direct combustion) or through cogeneration in community projects implemented in proximity to sources of supply. Estimates of these reductions also depend on the period for which calculations are made.

Forest biomass has a worthwhile potential that is mostly undeveloped; this potential can be harnessed to meet a portion of energy requirements as well as reduce GHG emissions. Although Canada has vast forests, they can only be used to meet a small fraction of current energy requirements. Therefore, it is vitally important that this resource be used as efficiently as possible and in accordance with its impact on the carbon cycle.

For information: David Paré, david.pare@nrcan-rncan.gc.ca

From mouse-ear cress to spruce in a single step

Mouse-ear cress (*Arabidopsis thaliana*) is an annual plant of European origin that grows to a height of 20 to 25 cm. Its full seed-to-flower cycle is six weeks. Because it is the first plant whose genome was sequenced, making it the model organism in plant genetics, this species is studied extensively in order to understand a particular biological phenomenon, based on the assumption that the findings will be applicable to other organisms, as is the case with studies conducted on lab mice.

Canadian Forest Service researchers worked in collaboration with Norwegian Forest and Landscape Institute researchers to determine whether the results of research work on mouse-ear cress could be applied to white spruce.

The researchers identified and isolated two genes associated with the defence mechanism of white spruce. They introduced them into the mouse-ear cress genome and reintroduced them into spruce trees, adding a marker gene. They then exposed the modified mouse-ear cress and white spruce trees to pests, including a fungus and a bacterium, in order to observe their reactions.

The results show that mouse-ear cress and spruce reacted in a similar manner, which indicates that researchers can use mouse-ear cress in their research activities and transpose the results they obtain to white spruce and potentially to other conifer species. This demonstration will help to reduce the cost of analyses as well as speed up research work by using mouse-ear cress as a forecasting tool.

For information: Armand Séguin, armand.seguin@nrcan-rncan.gc.ca

For more information about the series:

Natural Resources Canada
Canadian Forest Service
Laurentian Forestry Centre
1055 du P.E.P.S.
P.O. Box 10380 Stn. Sainte-Foy
Quebec (Quebec) G1V 4C7
418 648-5789

cfs.nrcan.gc.ca/publications/series/read/2

Partenariat innovation forêt
FPInnovations
Canada

© Her Majesty the Queen in Right of Canada 2012 • ISSN 1925-5756