

Branching out

from the Canadian Forest Service ■ Laurentian Forestry Centre

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Optisource: a tool for optimizing Seed Transfer

Can seedlings intended for reforestation be planted anywhere, regardless of the seed source from which they were obtained? The Optisource software was developed to help forest managers answer this question.

Seed production in Quebec

The ministère des Ressources naturelles et de la Faune du Québec (MRNF) oversees the production of tree seed and seedlings to meet the reforestation needs of public and private forests. Nearly 600 million viable seeds are required for forest regeneration every year. Tree seeds are produced in a variety of locations in Quebec. Optisource, the decision support tool used by the MRNF, was designed by Canadian Forest Service researchers using a geographic information system. This software combines data concerning ecological districts with data obtained from seed source transfer models.

When improved or local seed sources are not available to reforest a given site and a different source needs to be used, Optisource can be used to determine which seed sources are best suited to the planting site.



Photo: CFS

Estimating the risk associated with seed transfer

The researchers made several assumptions in developing Optisource. For instance, it was assumed that the greater the distance between the seed source and the planting site, the greater the risk of maladaptation. It was also assumed that local seed sources are optimally adapted to local conditions. The researchers then assessed the risk associated with seed transfer for black spruce by looking at three sites at differ-

ent latitudes where the species is naturally present.

Black spruce is the most widely used species for reforestation in Quebec. Research has shown that black spruce exhibits variability in certain characteristics, such as germination rate and juvenile growth, which makes it possible for the species to adapt to the variety of conditions encountered in its extensive geographic range. Genecology studies are carried out to assess these variations in relation to environmental characteristics.

The models were validated using data obtained from a provenance test covering the species' natural range: the greater the difference between two groups, the greater the risk. For example, if a given seed source is transferred to a region where the growing season is shorter and climatic conditions are harsher, there is a risk of maladaptation, which may be reflected in increased frost sensitivity.



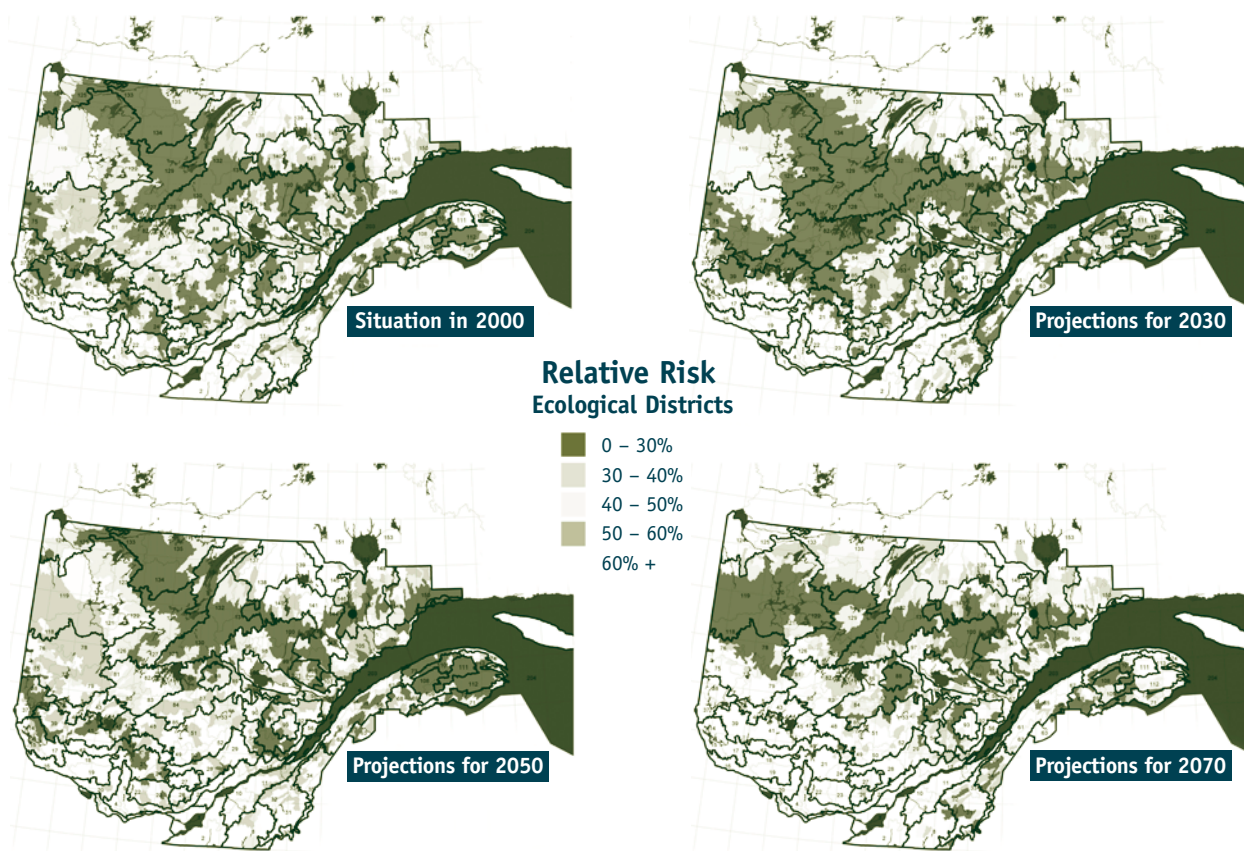
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Maps showing the risk related to the transfer of black spruce provenances from a seed orchard located in Ragouneau (black dot on the map)



Source: André Deshaies, Ministère des Ressources naturelles et de la Faune du Québec

Use of Optisource

The seed transfer models that were developed incorporate latitude, elevation, estimated precipitation, air moisture during summer and an aridity index. Although similar studies were carried out for white spruce and jack pine, the climate change projections were performed only for black spruce. To this end, the researchers incorporated predictions for the next 30 years derived from BioSIM¹, a software tool developed by the Canadian Forest Service to predict the timing of

specific events in the seasonal development of insect pests based on meteorological data.

When the risk level is higher than 40% and no other relevant data are available, the researchers advise against seed transfer. Since the model needs to be validated for northern Quebec, caution must be exercised in considering transfers above the 48th parallel. Optisource can also be used to predict black spruce adaptation for a given site under different climate change conditions.

FOR MORE INFORMATION, PLEASE CONTACT:

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¹ For more details, see Branching Out No. 3 (2003), <http://cfs.nrcan.gc.ca/news/174>.