Assessing trees' adaptive capacity to environmental constraints: from genomic approaches to the development of innovative phenotyping tools

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Abstract: Understanding climate change impacts at various scales, from trees to landscapes, and providing suitable responses are critical priorities for forest managers and policymakers. Predicting tree responses to changes in their local environment is a key to decision-making in tree breeding, forest resource management, carbon accounting models, and biodiversity conservation practices. However, making genotype-phenotype-environment connection is central to these predictions.

Over the last decade, extensive genomic resources have been developed by Genome Canada's projects and major achievements have been made. For instance, the white spruce genome has been sequenced, and genomic selection for wood properties is being transferred to end-users. However, the prediction of tree responses to future climate remains challenging. The possibility of identifying putative causal genes responsible for adaptation to climate requires the evaluation of quantitative traits that precisely reflect how and when climate exerts selective constraints on trees. The list of traits reflecting tree adaptation to climate that could be efficiently assessed is limited and their evaluation is labor-intensive. Indeed, the evaluation of classical traits usually consists in taking punctual measurements that only represent a snapshot of a tree's life. This presentation will summarize different approaches we initiated to establish connections between adaptive traits (e.g. timing of budburst, tree ring-derived traits) and genotypes, and the results we have obtained so far in spruce and pine. Future research directions will be discussed.

Bio: Nathalie received her B.Sc. in Forestry from Université Laval in 1988. She completed her Ph.D. in Forest Sciences in 1995 at the same university. She has been a research scientist with Natural Resources Canada (Canadian Forest Service, Québec region) since 1996. She is Adjunct Professor of the Canada Research Chair in Forest Genomics at Université Laval. Her research revolves around the development of knowledge and genomics tools to better understand forest tree adaptation to climate. Over the last decade, she has been involved in successive Genome Canada projects mainly focusing on spruce species. She is also interested in translational research to foster forest certification and social acceptance of forest management practices.

Further information: http://www.genomiqueforestiere.chaire.ulaval.ca