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Assisted migration: uncertainty, risk and opportunity

by Andrew Park[1,2] and Carolyn Talbot[1]

ABSTRACT

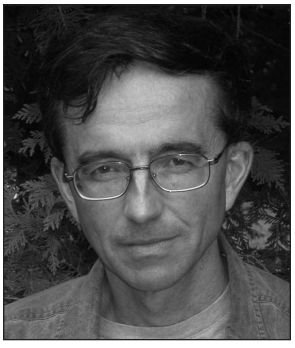
The recent *Forestry Chronicle* special section on the subject of Assisted Migration (AM) did a great service to the Canadian forestry community by summarizing the risks, opportunities and ecological aspects of this forest management strategy. In this paper, we expand on some aspects of AM that were discussed in the special section, as well as discussing additional dimensions of AM that should be considered and debated. We expand on the theme of scientific uncertainties around future warming, emphasizing the full extent of uncertainty in estimates of climate sensitivity. We also expand upon and summarize a number of recent ecophysiological results that have implications for the adaptation and acclimation of trees to climate change. We also discuss opportunities for innovative forest management, the influence of economic trends on the future of the Canadian forest industry, and limitations on public knowledge of climate change, all of which are factors that will influence the feasibility of AM schemes in the future.

Key words: assisted migration, managed relocation, climate change scenarios, uncertainty, ecophysiology, epigenetics

RÉSUMÉ

La section spéciale publiée dernièrement dans le *Forestry Chronicle* portant sur le sujet de la migration assistée (MA) a rendu un fier service à la communauté forestière canadienne en résumant les risques, les opportunités et les questions écologiques liés à cette stratégie d'aménagement forestier. Nous approfondissons dans cet article certains aspects de la MA qui ont été abordés dans la section spéciale et nous discutons également des dimensions additionnelles de la MA qui devraient être considérées et débattues. Nous nous attardons sur le thème portant sur les incertitudes scientifiques entourant le réchauffement climatique, mettant en évidence la portée complète de l'incertitude touchant les estimés de la sensitivité climatique. Nous résumons et nous discutons également de certains résultats écophysiologiques récents qui ont des répercussions sur l'adaptation et l'acclimatation des arbres face aux changements climatiques. Nous discutons aussi des opportunités d'innovation en matière d'aménagement forestier, de l'influence des tendances économiques sur l'avenir de l'industrie forestière canadienne et des limites des connaissances du public sur les changements climatiques, tous constituant des facteurs qui influenceront la faisabilité des schémas de MA dans le futur.

Mots clés : migration assistée, relocalisation planifiée, scénarios de changements climatiques, incertitude, écophysiologie, épigénétique



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Introduction

Assisted migration (also called managed relocation or assisted colonization Ste-Marie *et al.* 2011) refers to the intentional movement of organisms (be they trees, animals or crops) to areas outside their historic range. A restricted form of assisted migration (AM) is made possible by the seed transfer guidelines that are used in several provinces (O'Neill *et al.* 2008) to optimize the matching of seed sources to sites in forestry. More extensive AM of provenances and species is being contemplated as an adaptive response to anthropogenic global warming (AGW). Assisted migration was originally contemplated as a conservation measure to address the possibility that existing tree populations may become maladapted to their local conditions as the climate shifts around them. More recently, it has been argued that AM could be used to pre-emptively adapt forests to the effects of AGW. Either goal

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