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Living without herbicides in Québec (Canada): historical context, current strategy, research and challenges in forest vegetation management

Nelson Thiffault · Vincent Roy

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Abstract Vegetation management is crucial to meeting the objectives of forest plantations. Following public hearing processes, chemical herbicides were banned on Crown forest lands in Québec (Canada) in 2001. Release now mainly relies on mechanical treatments. Our objectives are to review the historical context and the research conducted over the past 15 years that has led to the province's current vegetation management strategy and to identify the major challenges of vegetation management being faced in Québec in the context of intensive silviculture and ecosystem-based management. Research has led to an integrated management model without herbicides, adapted to the ecological characteristics of reforestation sites. The Québec experience illustrates how, on most sites, vegetation management that is based on early reforestation, the use of tall planting stock and intensive mechanical release

brings crop trees to the free-to-grow stage without the use of herbicides and without resulting in major effects on vegetation diversity. This vegetation management strategy is an asset in the implementation of ecosystem-based management. However, research demonstrates that mechanical release alone does not promote optimal crop-tree growth, due to rapid resprouting or suckering of competitors and competition from herbaceous species. Therefore, the current strategy poses important challenges in the management of plantations where the objective is to maximise wood production.

Keywords Plantation · Integrated forest vegetation management · Soil preparation · Early planting · Stock type · Mechanical release · Herbicides

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N. Thiffault · V. Roy
Direction de la recherche forestière, Ministère des Ressources naturelles et de la Faune du Québec, 2700 rue Einstein, Québec, QC G1P 3W8, Canada

N. Thiffault (✉)
Ministère des Ressources naturelles et de la Faune du Québec and Centre d'Étude de la Forêt, Québec, QC, Canada
e-mail: nelson.thiffault@mrrnf.gouv.qc.ca

Present Address:

V. Roy
Laurentian Forestry Centre, Canadian Forest Service,
1055 rue du P.E.P.S., Québec, QC G1V 4C7, Canada

Introduction

The establishment of well-planned and well-managed plantations can be used to meet a large variety of objectives within the context of sustainable forest management (Paquette and Messier 2009). The protection of natural forests through enhanced productivity of intensively managed plantations (Messier et al. 2003; Wagner et al. 2004), carbon sequestration (Ouimet et al. 2007) and forest ecosystem restoration (Paquette and Messier 2009) are examples of the benefits that can be derived from plantations. In most contexts, vegetation management is crucial in meeting plantation objectives (Newton 2006). For example, in cases in which commodity-grade wood for pulp and construction is the primary objective, Wagner et al. (2006) reported wood volume yield increases of up to 477% for planted black spruce (*Picea mariana* (Mill.)