Site preparation and seedling growth during fill-planting of *Picea glauca* in the boreal mixedwoods

Daniel Chalifour[1], Nelson Thiffault[1-2] et Louis Bélanger[1] : [1] Centre d'étude de la forêt, Université Laval (daniel.chalifour.1@ulaval.ca); [2] Ministère des Ressources naturelles et de la Faune





Introduction – Hypotheses

Black-spruce (*Picea mariana*) dominated sites in boreal Quebec are often characterized by a thick humus layer (25-30 cm). Scarification is thus required to improve regeneration establishment on those sites following harvesting (Thiffault and Jobidon 2006). Conversely, scarification has no effect on seedling growth in southern Quebec, where most forest sites have a thin humus layer (< 8 cm) (Thiffault et al. 2003). In the boreal mixedwoods, where an intermediate thickness of humus is found, scarification effects on seedling establishment aren't clear. Moreover, white spruce (*Picea glauca*) regeneration is problematic in the boreal mixedwoods; the species does not regenerate properly due to a lack of adequate microsites following harvesting. Our objectives are thus to determine the microsite characteristics that influence white spruce seedling survival and growth in the context of fill-planting in the boreal mixedwoods, and to test if moderate scarification increases plantation success. Our hypotheses are as follow:

- Site preparation with manual brushcutter equipment generates better growing conditions than direct planting for the seedlings, as it increases water retention and nutrient mineralization in the rooting zone.

- Planting in the mineral soil, without humus removal, provides better growth conditions than forest-floor planting. The mineral soil has better water retention capacity than humus (Alcazar et al. 2002), which limits the seedling water stress.

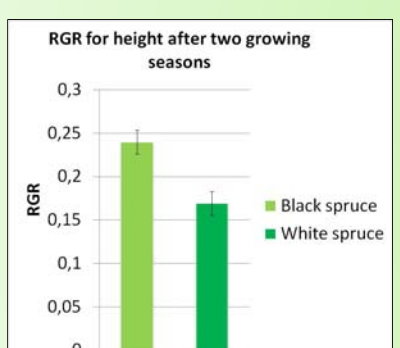
Materials and method

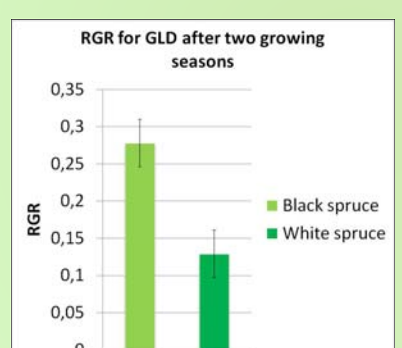
We established a field trial composed of 12 replicated blocks, laid out as a complete block split-plot. Each block was divided in 2 main plots, to which was randomly assigned one of two planted species (white or black spruce). Each of the main plots was divided into three subplots. Within each subplot, we randomly applied a "microsite type" treatment: i) seedlings directly planted in the humus; ii) seedlings planted in mineral soil, with minimal humus disturbance; and iii) seedlings planted in a mechanically prepared microsite. There was 1 seedling per 10 m^2 (40 per subplot), for a total of 2880 planted seedlings. Planting was completed in June 2008. We measured seedling height and ground level diameter (GLD) every fall following planting (2008 & 2009).

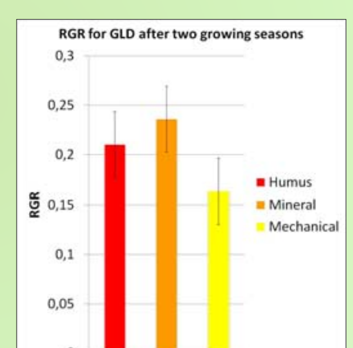
Foliar samples were collected and analyzed for nutrient concentrations. Predawn and midday water potentials, and PPFD were monitored; however, this poster focuses on seedling growth responses.

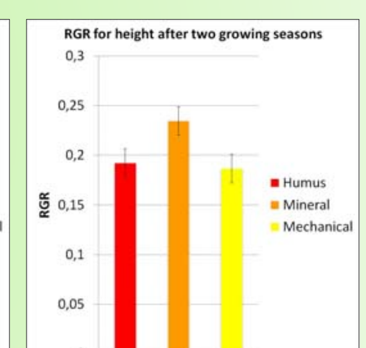
Results

After two growing seasons, black spruce had an higher relative growth rate (RGR) for GLD and height than white spruce (p < 0,001). The planting microsite also had a significant effect on RGR in GLD (p = 0,018); planting in the mineral soil resulted in better diameter growth than planting in the mechanically prepared microsite. As for height, planting in the mineral soil provided significantly higher growth than the other microsites (p < 0,001).
The compilation of measurational, nutritional, and physiological data over three complete growing seasons will provide us with a clear understanding of the best practices to promote white spruce re-establishment through fill-planting in the boreal mixedwoods.









References

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Thiffault et al. 2003. AFS. 60:645-655
Thiffault and Jobidon. 2006. CJFR. 36:2364-2376