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Can site preparation help lodgepole pine and white spruce deal with climate change?

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Introduction: Global warming is expected to increase tree growth in northern forests due to warmer temperatures and a longer growing season. However, increases in average temperature may also result in increased drought and competition from other species.

Methods: This study examined the effects of climate on growth of lodgepole pine and white spruce following site preparation treatments in northern British Columbia. Data collected during 20 years following establishment of five experiments in the boreal and sub-boreal forests of British Columbia to compare various site preparation techniques were used for this study. Climate data were generated for each site using ClimateBC. The impact of climate change on future growth was then explored using estimates of future climate scenarios from climate models.

Results: Results show that as much as 45% of the variation in spruce growth and 37% of the variation in pine growth over the past 25 years can be explained by climatic variables. Models developed based on relationships between past growth and climate were used to estimate impacts of climate change on growth of pine and spruce in 2020. Height growth of young lodgepole pine plantations in the Sub-Boreal Spruce zone could increase by up to 12% over the next 2 decades due to the longer growing season (Fig. 1). In contrast, young white spruce plantations in the Boreal White and Black Spruce zone may suffer height growth decreases of up-to 10% over the next 20 years due to increased drought-stress. Vegetation control and mechanical site preparation treatments appear to mitigate effects of climate change on white spruce.

Implications: Results indicate that lodgepole pine will benefit more from climate change on sites that did not receive mechanical preparation or vegetation management treatments. This occurs because treatments are already providing improved soil temperature. In contrast, results indicate that white spruce growth may decline with climate change and that mechanical site preparation and vegetation management treatments may reduce impacts of climate change.

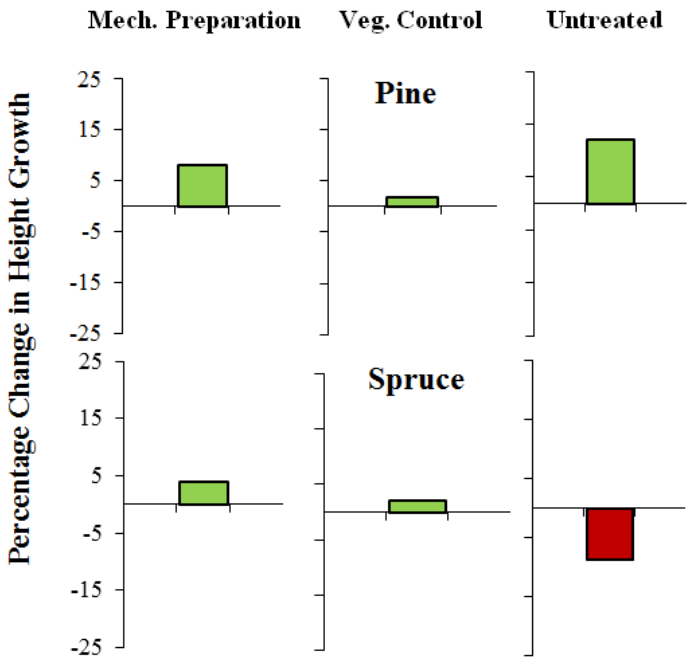

Fig. 1. Projected percent change of height growth for the 2020s future period (2005-2035) according to scenario A2 compared to the averages of past growth (1986-2006).

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Further Information:

Cortini, F., Comeau, P.G., Boateng, J.O., Bedford, L., McClarnon, J., and Powelson, A. 2011. Effects of climate on growth of lodgepole pine and white spruce following site preparation and its implications in a changing climate. Can. J. For. Res. 41: 180-194.

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