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Tree height and bole slenderness control crown shyness in lodgepole pine

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Crown shyness is the empty space between crowns of trees in maturing, fully stocked conifer stands.



This empty space is thought to be caused by collisions of crowns during wind, especially in cold conditions and is a likely contributor to the low productivity of boreal and montane forests and the steep decline in productivity of these stands as they age.

Recent studies by Rudnicki, Lieffers and Silins (2003) examined the stand characteristics that control wind penetration, tree sway and crown collisions, and thus regulate the development of crown shyness. Ten stands ranging from 5 to 22 m in height were sampled in the foothills of Alberta. In each stand, 12 to 20 plots were established. These plots were based upon three adjacent trees of similar size forming a triangle. Within each of these triangles, the crown closure was estimated using exact measurements of crown extension using a modified moosehorn (crown scope). The tree height/diameter ratio was also determined for these three trees.



For stands less than 10 m tall, there was little evidence of crown shyness and only relative density of the trees affected crown closure. Stands above 15 m in height had significant development of crown shyness. Within these taller stands, triangle plots with stout trees (low Ht/Diam ratio) had higher levels of crown closure.



15 m tall stands (slender-left, stout- right).

Implications of this work are that crown shyness develops in the second half of the rotation and treatments such as density management, which control the stoutness of trees, could be used to limit crown shyness. Commercial thinning, if applied at the optimum times, would therefore have the potential to increase leaf area and therefore stand productivity in the second half of the rotation. This idea needs testing.

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Further Information:

Rudnicki, M., Silins, U., Lieffers, V.J. and G. Josi. 2000. Measurement of simultaneous tree sways and estimation of crown interactions among a group of trees. *Tree Structure and Function*. 15:83-90.

Rudnicki, M., Silins, U., Lieffers, V.J. 2002. Crown collisions as a mechanism for crown shyness in lodgepole pine. *Can. J. For. Res.* Submitted.

Rudnicki, M., Lieffers, V.J. and Silins, U. 2002. Relative density, tree slenderness and tree height determine the crown cover of lodgepole pine. *For. Sci.* submitted.

<http://www.rr.ualberta.ca/research/EFM.htm>

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