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Wind, tree sway and crown shyness in lodgepole pine

MARK RUDNICKI, VICTOR LIEFFERS, AND ULDIS SILINS

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

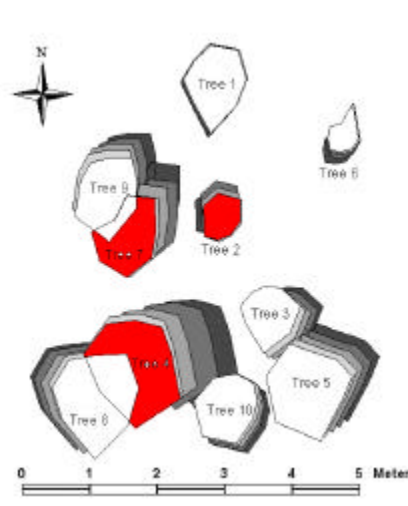


This empty space is thought to be caused by breakage of twigs and branches during collisions of crowns during wind. Twigs of conifers are very brittle in cold conditions (Lieffers et al.2001) and any collision of stems during cold periods will almost certainly break twigs and branches. This loss of leaf area and the potential to grow leaf area next year likely causes a decline in vigour of trees and productivity of stands. We suggest that crown shyness is a more severe problem in boreal and montane forests than in temperate regions. There has been little work describing how and why this empty space develops.

A study by Rudnicki, Lieffers and Silins (2001) was initiated to document the frequency and intensity of collisions of lodgepole pine crowns during wind. Electronic levels were attached to the stems of 10, adjacent, 15 m tall lodgepole pine trees in a stand near Fox Creek Alberta. The angle of the bole and direction of bending was recorded at 1/10 s intervals during wind events. The movement and collisions of crowns was determined using a GIS system using data on the flexure of the stem, direction of bending and the size of the crowns,

Crowns of an individual tree had hundreds of collisions per hour with neighbouring trees during wind events of 20 km/hr average wind speed. Individual trees swayed up to 5 m during gusts but

the trees did not sway in unison, thereby increasing the probability of collisions.



The figure shows the sway and collisions of crowns of 10, 15m tall lodgepole pine trees. Shaded areas depict the change in crown position at 1/10 s intervals. Average wind speed was 17 km/h.

Further work is needed to understand the stand conditions that influence the number of crown collisions

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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.

Lieffers, S.M, Lieffers, V.J., Silins, U. and Bach, L. 2001. Effects of cold temperature on breakage of lodgepole pine and white spruce twigs. *Can. J. For. Res.* 31:1650-1653.

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

Dept. of Renewable Resources, U. of A. Edmonton, AB T6G 2H1

Victor.Lieffers@ualberta.ca

Uldis.Silins@ualberta.ca

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