

CENTRE FOR ENHANCED FOREST MANAGEMENT



ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

EFM RESEARCH NOTE 05/2006

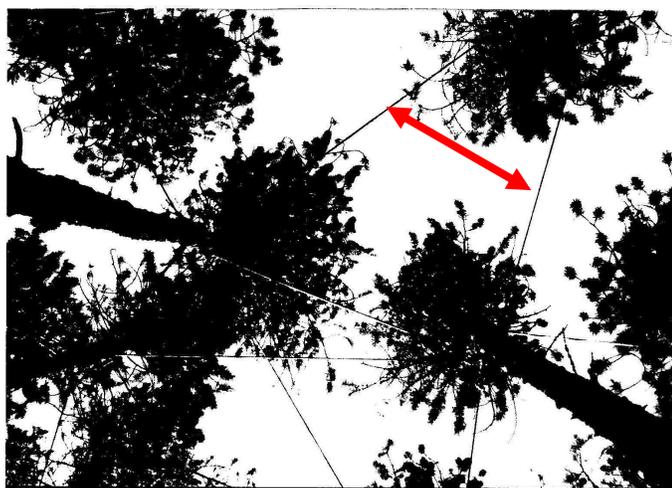


Crown collisions of trees reduce leaf area and canopy closure of maturing lodgepole pine stands

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As forest stands age, productivity peaks and then starts to decline. The time of maximum productivity coincides with a peak in leaf area. There are various theories as to why leaf area decreases as stands age, including decline in available nutrient, water supply and also the loss of branches during wind events, especially in tall trees. We tested if the collision of crowns during wind is the cause of the decline of leaf area in maturing lodgepole pine stands.

Four, 15m tall lodgepole pine stands (~50 years old) were selected from western Alberta. In each stand, we selected two plots of similar structure and established a treatment and control. The treatment consisted of 12-15 trees tied together in a web pattern at ~10m height. This allowed the crowns to move in unison but minimized crown collisions. We photographed the canopy of each plot at the time of webbing in 1998 and again in 2004 and measured crown closure. We then cut the trees down and measured leaf area and crown characteristics.



Lodgepole pine stand with crown shyness (i.e., empty space surrounding the crowns). The trees are roped together at 10m height (red arrow).



Upturned and polished branches of control trees.

Based upon before and after pictures, after 6 years, plots with webbed trees increased crown closure by 14% when compared. Controls were mostly unchanged. Trees in the webbed plots had a 22% gain in leaf area relative to controls. Branches in the control plots had evidence of crown abrasion; branches of the mid-crown had an upturned orientation, and the outer edge of branches had polished bark and twigs that were oriented inward compared to the trees from the webbed plots.

Implications: As stands grow in height, there is an increase in speed and velocity of crown collisions, resulting in breakage of branches. Managers might delay onset of crown shyness by density management to produce stouter trees or select populations of trees with more rigid stems that resist sway in wind.

Funding was provided by Canadian Forest Products, Millar Western Industries Ltd., West Fraser Mills Ltd., Weyerhaeuser Canada Ltd and the Natural Sciences and Engineering Research Council of Canada (NSERC).

Further Information:

Meng, S.X., Rudnicki, M., Lieffers, V.J., Reid, D.E.B. and Silins, U. 2006. Preventing crown collisions increases the crown cover of maturing lodgepole pine. *J. Ecol.* In Press.

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