

# CENTRE FOR ENHANCED FOREST MANAGEMENT



## ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

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### Crown shyness in lodgepole pine stands in the upper foothills

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Crown shyness is the empty space surrounding canopies of individual trees that is not attributable to gaps formed by mortality of dominant trees. Our objectives were to determine the stand characteristics that might affect crown shyness.

We sampled 100 pure lodgepole pine stands in the Upper Foothills near Hinton AB. These stands ranged in height from 6 to 21 m and all of the stands had no obvious canopy gaps related to tree mortality based upon the inter-tree spacing expected at crown closure (estimated from density management diagrams). In



each stand we measured crown closure (the inverse of crown shyness) along line transects using a vertical periscope (see left).

**Findings:** There was steep decline in crown closure as stands increased in height; stand 20 m in height had less than 50% crown closure. Crown closure tended to increase in stands with high density and high site index. Crown width and crown length reached their maximum in stands 8-10m tall; there was no increase in crown length to compensate for increased crown shyness. There was more green litter on the ground in tall stands, suffering from crown shyness.

#### Implications:

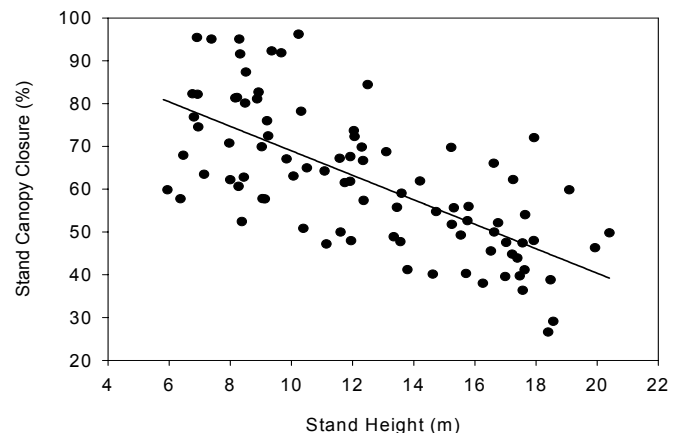
1) In tall, well-stocked, lodgepole pine stands, less than 50% of the view of the sky may be covered by crowns. The fact that crown size (crown width and length) did not increase with stand height, but litter production did, suggests that crown shyness as a result of abrasion of branches will reduce leaf area and productivity in taller-older stands.

2) The concept of crown closure in stand density management diagrams needs to be re-examined, as there were large amounts of empty space in taller stands that were well-above the line of crown closure.

3) Our study shows that crown radius and crown length reached their maximum size when stands were about 8-10 m tall. This is likely the time of onset of crown abrasion.

4) The fact that crown shyness was lower in stands with higher site index suggests that better growing conditions can partially compensate for crown abrasion.

5) Because there was not an increase in crown length to take advantage of the greater spaces between crowns in these taller stands, additional factors besides crown abrasion may also affect crown development in these high elevation sites.



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#### Further Information:

Fish, H., Lieffers, V.J., Silins, U. and Hall, R.J. 2006. Crown shyness in lodgepole pine stands of varying stand height, density and site index in the upper foothills of Alberta. *Can. J. For. Res.* In Press.

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