CENTRE FOR ENHANCED FOREST MANAGEMENT

ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

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Crown collisions absorb the energy of the wind preventing blowdown in dense stands

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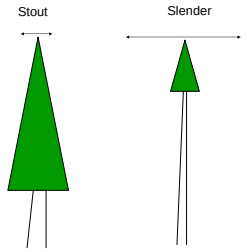
Collisions of tree crowns is known to abrade and shape the crowns of trees and cause a decline in leaf areas of stands in the 2nd half of the rotation of forests. Crown collisions, however, may also play a beneficial role in stand development in that the collision of crowns in winds may act to dissipate the energy of wind gusts, thereby decreasing the amount of blowdown. In stands with high stem density boles are slender and can sway widely in wind. In stands of low stem density, the trees have stout boles that are thought to be self-supporting in wind.

We hypothesize that stout trees will have a short period of oscillation but they will have little movement in the wind. Slender trees will have longer 'natural' period of oscillation without collisions but at higher wind speeds when crowns start to collide, their period of oscillation will be reduced because of the damping-effect of crown collisions.



A self-supporting stout tree vs. a slender tree that needs neighbours to absorb its sway energy during gusts.

Methods: Biaxial clino-meters were installed on 10 trees in a stand with stout trees and in high-density stand with slender trees. The sway of the trees was modelled. The frequency of oscillation of the trees was assessed at various wind speeds – at low wind speeds without crown collision and at higher winds speeds with collisions in the dense stand.

Results: Trees from the dense stand had a long 'natural' period of oscillation but this period of oscillation was shorter at higher wind speeds when collisions were occurring. As there were differences in diameter and height of trees, not all trees swayed in unison – therefore collisions were inevitable.

The stout and self-supporting trees from the stand with low stem density had little change in their period of oscillation – even at very high wind speeds.

Implications: Slender trees need neighbours to dampen sway energy of wind gusts. Thinning neighbours will increase risk of blowdown as there may be no neighbouring tree to absorb the sway momentum caused by the gust. An improved knowledge of sway and collision dynamics may lead to early strategic thinning to reduce windthrow.

Models for predicting blowdown must take into account the collisions with neighbours to determine risk of blowdown.

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Further Information:

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