

# CENTRE FOR ENHANCED FOREST MANAGEMENT



## ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

EFM RESEARCH NOTE 01/2009



### Elevated mortality of residual trees after variable retention cutting

BLADON, K. D., LIEFFERS, V.J., LANDHÄUSSER, S.M., SILINS U. AND BLENIS, P.

Variable Retention (structural retention) harvesting where mature trees are left in cutovers has been widely adopted across Canada to maintain biodiversity and wildlife habitat. In most cases these living trees are expected to provide a 'lifeboat' for species as the site moves from a mature forest to a well-established stand. There is recent evidence that these 'structure' trees suffer increased stress because of the very open conditions of the cutting areas. The objectives of this



work was to assess if 'structure' trees suffer from increased water stress following logging and determine if they have increased mortality in the years immediately after logging.

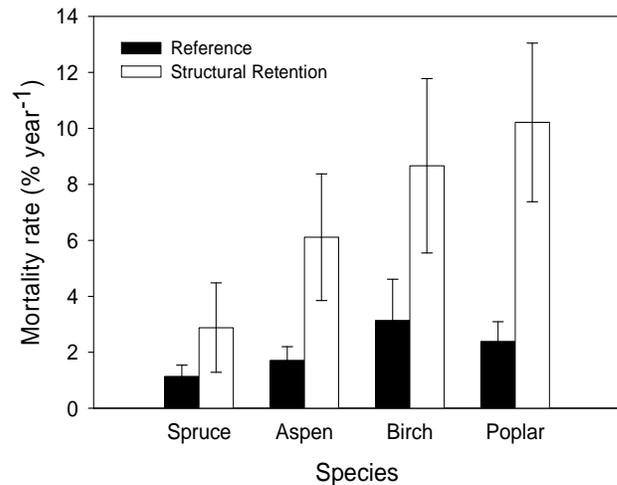
**Methods:** We assessed the water stress of isolated trees in cutovers, trees on the edge of the stand and trees in control areas in the interior of adjacent forests. Assessments were made in Drayton Valley and Lac La Biche areas of Alberta and in eastern Quebec.  $^{13}\text{C}$  analyses were used to determine the degree of stress. Secondly, in the Drayton Valley area, we marked and measure the status of residual trees immediately after logging and again five years later.

**Results:**  $^{13}\text{C}$  analysis indicated that water stress was lowest in trees in the interior followed by edge trees and most severe in the isolated residual trees. Tree growing in the wetter locations of Quebec had less water stress than the Alberta trees.

While residual spruce trees were more likely to blow down, the hardwood trees died in place leaving snags.

In spruce, damage to the bole from logging equipment was a good predictor of blowdown – particularly in dominant trees.

In hardwood species crown class was a good predictor, where co-dominant or smaller trees were more likely to die.



**Fig. 1.** Annual rates of mortality of four boreal species left as 'structure' trees in the five years after logging in boreal mixedwoods near Drayton Valley AB. Annual mortality rates of residuals in cutovers were: poplar (10.2%) > birch (8.7%) > aspen (6.1%) > spruce (2.9%). Annual mortality rates were 2.5- to 4-times greater than in the reference stands.

**Implications:** 'Structure' trees experience more stress from the open conditions and are likely to die within the first five years – especially birch and balsam poplar. Trees growing in sheltered locations, groups and along irregular edges are more likely to survive. Planners and wildlife biologists must account for the premature loss of these trees in their plans for 'lifeboating' these stands.

**Funding** was provided by the NCE – Sustainable Forest Management Network, WestFraser Mills, Weyerhaeuser Co. and the Natural Sciences and Engineering Research Council of Canada (NSERC).

#### Further Information:

Bladon, K. D., Silins, U., Landhäusser S., Messier, C. and Lieffers, V.J. 2007. Carbon isotope discrimination and water stress in trembling aspen following variable retention harvesting. *Tree Physiol.* 27:1065-1071.

Bladon, K.D., Lieffers, V.J., Silins, U., Landhäusser, S.M. and Blenis, P.V. 2008. Elevated mortality of residual trees following structural retention harvesting in boreal mixedwoods. *Forestry Chronicle.* 84:70-75.

<http://www.cefm.rr.ualberta.ca/>

Centre for Enhanced Forest Management, Dept. of Renewable Resources, U. of A., Edmonton, AB T6G 2H1

[Victor.Lieffers@ualberta.ca](mailto:Victor.Lieffers@ualberta.ca); [Simon.Landhausser@ualberta.ca](mailto:Simon.Landhausser@ualberta.ca)

**"Fundamental and applied research to enhance the productivity of Alberta's northern forests"**