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Residual trees are under water stress in variable retention stands

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Variable retention (VR) cutting leaves living trees (dispersed or in patches) in forest cutovers to improve habitat and to pass some of the biological features (legacies) of the old stand on to the regenerating stand. While this technique is widely used in Western Canada, the fate of these residual trees has not been well studied. We examined the environmental and water stress imposed upon these trees by the VR harvesting.



The microclimate at the canopy level (wind speed, temperature, relative humidity and radiation) was assessed in a boreal mixedwood stand near Drayton Valley, AB, both before and after logging, and in a nearby control stand.

The water use of white spruce, balsam poplar and paper birch trees was also measured using sapflow technology.

Findings:

1) At the canopy level, radiation doubled and wind speed increased three-fold in the VR site, but there was little difference in soil and air temperature and relative humidity between the VR and the control.

2) There was a doubling in the evaporative demand in the VR area compared to the control.

3) Soil moisture increased in the VR cut compared to the control.

4) The white spruce were able to take up water fast enough to keep up with the increased evaporative demand in the VR cut, while birch and especially balsam poplar trees were not able to keep up with the increased demand for water. Residual balsam poplar trees wilted on hot days.

Implications: The increased winds after VR cutting resulted in a stressful environment that increased the demand for water at the crown level for the residual trees. White spruce was generally able to keep up with this demand, but the hardwoods (especially the balsam poplar) were not. This is likely because of damage to



the conducting system of the wood (development of air embolism in the wood) during the periods of peak evaporation. A reduced ability to transport water from roots to leaves in the crown could be an explanation for the rapid mortality often seen for the deciduous trees left as residuals following VR cutting.

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Further Information:

Bladon, K.D., Silins, U., Landhäusser, S.M. and Lieffers, V.J. 2006. Differential transpiration by three boreal tree species in response to increased evaporative demand after variable retention harvesting. *Ag. For. Meteor.* 138: 104-119.

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