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Lodgepole pine water relations following thinning

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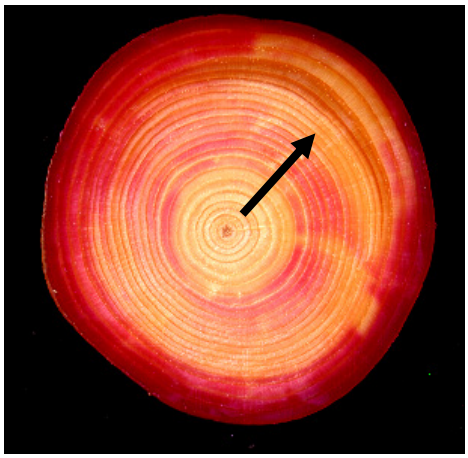
Release of trees following thinning is thought to be related to increased availability of light, nutrients and water. Of these three resources, water has received the least attention but may be very important in explaining the variability in tree response following thinning.

We examined the water uptake of juvenile lodgepole pine in a ~ 20 year-old lodgepole pine stand near Swan Hills Alberta. The stand had ~20,000 stems per hectare prior to thinning. This study built up on an earlier study of thinning juvenile pine stands. In the summer of 2002, we measured water uptake on trees in thinned plots, using sapflow sensors inserted in the stem of trees, attached to data loggers. Trees were from plots that were thinned in 2002, thinned 5 years earlier or from the adjacent unthinned control stand. We also measure soil moisture and meteorological variables.

Immediately after thinning, water uptake (scaled to leaf area) was lower compared to the control trees and trees that were thinned 5 years ago. By the end of the season, however, the recently thinned trees had greater uptake of water than the other treatments. This increased water uptake per tree might have been due to increased soil water availability and increased root growth in the thinned plots.

Despite the increased water use, there was some damage to the water conducting system by the end of the first summer after thinning relative to control trees.



Red stain indicates the xylem that can conduct water – note damage to outer xylem (arrow).

Implications: This study shows that soil water is a limiting resource in some pine stands. Following thinning there is more water available in the soil which can eventually translate into increased water uptake by the trees. Despite some damage to water transport tissues in their stems, these trees had sufficient residual capacity to transport water, and were able to release. We suspect, however, that the poor response to thinning in some thinned stands is a result of greater damage to the stem's capacity to transport water to the crown.

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Further Information:

Liu, X., Silins, U., Lieffers, V.J. and Man, R.Z. 2003. Wind, bending and thinning, affect the hydraulic conductivity of conifer stems. Can. J. For. Res. 33: 1295-1203.

Reid, D.E.B, Silins, U. and Lieffers, V.J. 2006. Sapwood hydraulic recovery following thinning in lodgepole pine. Ann. For. Sci. in Press.

http://www.rr2.ualberta.ca/research/EFM/

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