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Is water stress an issue following thinning in lodgepole pine?

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In many circumstances, there is slow release of trees following thinning in juvenile lodgepole pine stands. There are various theories why this may happen, including strong allocation of photosynthates to roots, root grafting and water stress as a result of the open-windy conditions of the thinned stand. In this study we assessed the water use of trees in the first and fifth year after thinning of 20 year-old lodgepole pine stands.

Near Swan Hills, AB fire-origin stands were thinned from ~15,000 stems/ha to 1500 stems/ha. At the start of the 5th growing season, a new plot was added and thinned adjacent to the existing plots. Trees were instrumented with sapflow sensors (pictures) to measure the rate of water use, and these trees were monitored over the growing season.



Findings:

- 1) The ability of stem sapwood to conduct water declined immediately after thinning.
- 2) Dynamic testing of water uptake during the summer showed; however, that trees in the stand that had been thinned in the previous spring, and other trees that had been thinned 5 years earlier were eventually able to deliver more water to their foliage (on a leaf area basis) than trees in the un-thinned control.



Implications: There apparently was damage to the conducting ability of the stems (likely air embolisms in the sapwood) following thinning. Because the trees were able to eventually deliver a good supply of water to the foliage; however, the decrease competition for water at the root level (coupled with increased root growth) may have countered the negative effects of xylem damage. Further, it is likely that the stems have excess capacity to deliver water which allows them to tolerate periodic water stress events related to drought or other disturbances. We expect, however, that in some thinning events, stress may exceed the extra capacity of the xylem and result in prolonged delays in release.

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Further Information:

Reid, D.E.B, Silins, U. and Lieffers, V.J. 2006. Sapwood hydraulic recovery following thinning in lodgepole pine. *Ann. For. Sci.* 63: 329-338.

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