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Is there a loss in growth efficiency in 'stagnant' over-stocked lodgepole pine stands?

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Overstocked lodgepole pine trees on poor sites are noted for exceptionally poor growth. It has been suggested that measures of growth efficiency are useful in determining which trees to retain when thinning. We examined the growth efficiency two different ways: 1) production of stem wood in relation to leaf area and 2) production of stem wood in relation to land surface area occupied. This was done for suppressed, co-dominant and dominant lodgepole pine trees from medium and poor sites, south of Hinton AB.



Overstocked poor site (above) and medium site (below) of approximately the same age. The poor site appears 'stagnant'.

Working south of Hinton AB, we measured the hydraulic conductivity (ability of stems to conduct water) of dominant, co-dominant and suppressed trees (~43 years old) from poor and medium site types. We also measured the growth and leaf area of these trees.

Our findings showed:

- Despite large differences in the growth rates of trees between poor and medium sites, there actually was little difference in stand leaf area between site types.
- In terms of the size-frequency distribution, poor sites had many small individuals compared to the medium site.
- Suppressed trees had higher N and P concentration in their foliage than dominant trees – a reason for survival of suppressed trees.
- Suppressed trees produced more stem wood per unit of leaf area than dominant trees, but dominants were more efficient than suppressed trees when efficiency was calculated on the basis of wood production/area of ground surface – a term foresters would be more interested in.

Implications:

In terms of production/leaf area, trees from poor sites grew nearly as efficiently as trees from medium sites, and suppressed trees were the most efficient crown class. In terms of production/land occupied, trees from medium site and dominant trees were more efficient. Growth rates of trees in poor sites are likely depressed because there simply are too many small, slow growing trees. Because trees in the poor sites thin too slowly when left unmanaged, these stands need to be artificially thinned to produce a stand of commercial value in a timely manner. Faster growing dominants and co-dominants on poor sites should be retained in any such treatment.

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Further Information:

Reid, D.E.B., Silins, U. and Lieffers, V.J. 2003. Stem sapwood permeability in relation to crown dominance and site quality in self-thinning fire-origin lodgepole pine stands. *Tree Physiol.* 23: 833-840

Reid, D.E.B., Lieffers, V.J., and Silins, U. 2004. Growth and crown efficiency of height repressed lodgepole pine: are suppressed trees more efficient? *TREES Structure and Function* in press

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