

CENTRE FOR ENHANCED FOREST MANAGEMENT



ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

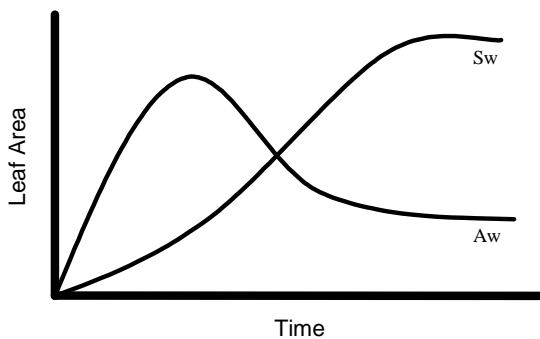
EFM RESEARCH NOTE 08/2003



Do boreal mixedwood stands have greater total yield than pure stands?

VICTOR LIEFFERS, DAN MACPHERSON, PETER BLENIS AND RONGZHOU MAN

Leaf area is the driver of forest productivity. In mixedwood stands the leaf area of the aspen quickly recovers after disturbance, while the leaf area of the spruce gradually increases as they grow up through the understory, eventually dominating the stand. Therefore, over a 100 year period a mixedwood stand maintains high leaf area for most of the period compared to a pure spruce stand. This should lead to greater total yield over a 100 year period.



Leaf area development of aspen (Aw) and spruce (Sw) stands.

Furthermore, during early and mid succession when white spruce grows in the understory, we also expect greater productivity in mixed stands compared to pure aspen stands for several reasons: 1) The understory spruce can capture the light that passes through the aspen canopy; 2) Spruce can photosynthesize in the spring and fall when the aspen is leafless; and 3) There are likely nutrient cycling benefits of growing both species in mixture.

To test this hypothesis, 29 maturing aspen stands in the Lac La Biche area of Alberta were selected and the productivity of pure aspen stands was compared to adjacent aspen stands of similar density with an understory of white spruce.

The mixed plots had 10% more total volume than the pure aspen plots. Mixed plots also had overall 12.5% more volume increment in the last 5 years than the pure aspen plots. The results indicate that more than 100 t/ha

of understory spruce (~1500 stems/ha) could be added to the aspen stand without apparent decline in the amount of aspen.



Conclusions:

- 1) Aspen stands with a spruce understory exhibited at least 10% higher overall productivity compared to pure aspen stands.
- 2) With the relay of leaf area development, from aspen domination to spruce domination, there are continuous high levels of productivity over time. If the aspen can be harvested at an optimum time (60 years or less) and the spruce are protected to allow further growth, there is a potential for large increases in total yield.

Funding was provided by Alberta-Pacific Forest Industries Inc., Weyerhaeuser Company, Weldwood of Canada Ltd., and NSERC.

Further Information:

Lieffers, V.J., Pinno, B.D. and Stadt, K.J. 2002. Light dynamics and free-to-grow standards in aspen-dominated mixedwood forests. *For. Chron.* 78: 137-145.

MacPherson, D., Lieffers, V.J. and Blenis, P. 2001. Productivity of aspen stands with and without a spruce understory in Alberta's boreal mixedwood forests. *For. Chron.* 77:351-356.

Man, R. and Lieffers, V.J. 1999. Are mixtures of aspen and white spruce more productive than single species stands? *For. Chron.* 75: 505-513.

<http://www.r2.ualberta.ca/research/EFM/>

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

Victor.Lieffers@ualberta.ca

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