

CENTRE FOR ENHANCED FOREST MANAGEMENT



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DEPARTMENT OF RENEWABLE RESOURCES

EFM RESEARCH NOTE 10/2006



Stocking levels for white spruce: How many trees do we need to establish?

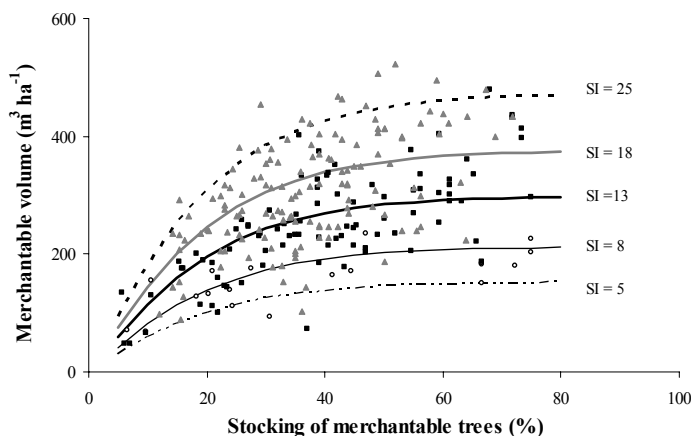
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In many parts of Canada, provincial regulations require juvenile surveys to prove that forests are re-established; in Alberta a stocking survey (using a grid of 10m² plots) must be done by year 8 and performance survey by year 14. Targets for these surveys, however, were mostly established by expert opinion. We evaluated the linkage between spatial pattern and stocking; and stocking, tree mortality and final yield of white spruce in mixedwood stands.

Data were from 709 stands, aged 7 to 150 years, including juvenile and mature permanent sample plots, and juvenile survey data.

Findings were:

- 1) The relation between stocking and density is not a straight line and is influenced by the spatial pattern of the trees, which can be easily estimated from counts of tree in regeneration survey plots.
- 2) In regenerated stands, ingress of natural spruce often overwhelmed the regular planting pattern, creating clumped distributions in many stands.



3) In mature permanent sample plots, only 30-40% stocking of spruce in 10 m² plots was needed to achieve full yields of unmanaged stands.

4) Mortality rates for planted spruce varied from 0.1-0.8% year⁻¹, between 7 and 23 years and 1.7-3.3% per year for mature stands. For rotation-length predictions, 0.7% per year is likely an average mortality loss.

5) Between 7 and 23 years, the mortality rate for the tallest "crop tree" spruce measured in each 10m² plot, was similar regardless of its size.

Implications:

1) At age 14, a well-dispersed planting pattern of 1200 stems per ha would have 85% stocking. A 0.7% per year average mortality rate until age 120, would leave 60% stocking; this is higher than the 30 to 40% stocking needed to reach full yield. However, if mortality rates were 1.5%, it would be approximately the correct level of stocking. A better grasp on mortality rates is for spruce in mixedwoods is required.

2) Since crop trees in juvenile 10m² plots had similar rates of early mortality regardless of size, a minimum height standard for trees to be acceptable can only be viewed as a performance measure, rather than an indicator of future survival.

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Further Information:

Feng, Z., Stadt, K.J. and Lieffers, V.J. 2006. Linking juvenile white spruce density, dispersion, stocking and mortality to future yield. Can. J. For. Res. In press.

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

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