Impact of Commercial Thinning on Wood Density and Strength in Jack Pine (*Pinus banksiana*)

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Introduction

- Reductions in the allowable annual cuts (AAC) in Quebec might bring an increase in the intensity of it's forest management

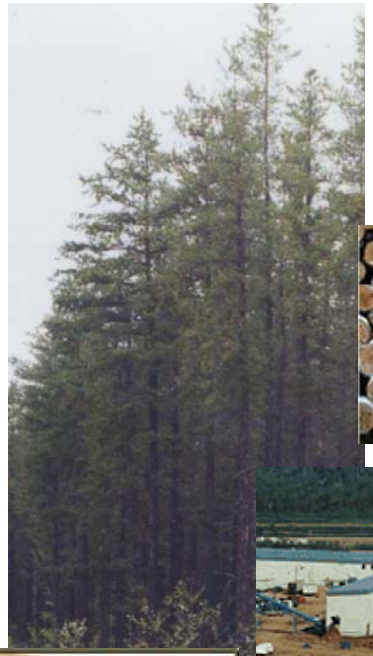
- Commercial thinning is of interest since :
  - individual stem size increases (Bella et DeFranceschi 1974, Grenier et Harvey 2001, Grenier 2004, Groot et al. 1984)
  - AAC decreases could be less drastic (MRN 2003)

Introduction

- Very limited knowledge of the impact of commercial thinning on the wood properties of jack pine:
  - slight decrease in wood density (Barbour et al. 1994)

Objectifs

- Evaluate the impact of commercial thinning on:
  - Growth and yield at tree level;
  - Growth and yield at stand level;
  - Lumber recovery and wood properties;
  - Product value.



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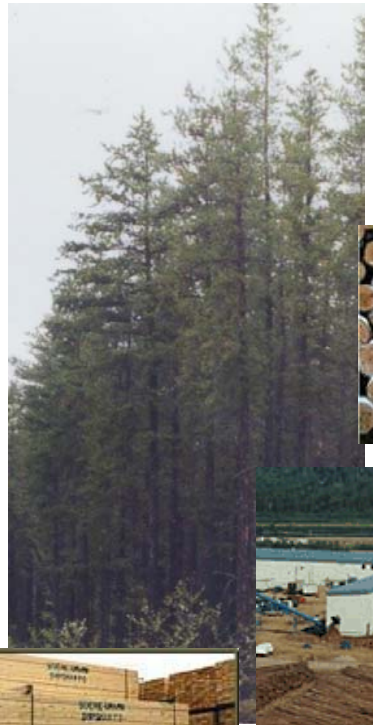

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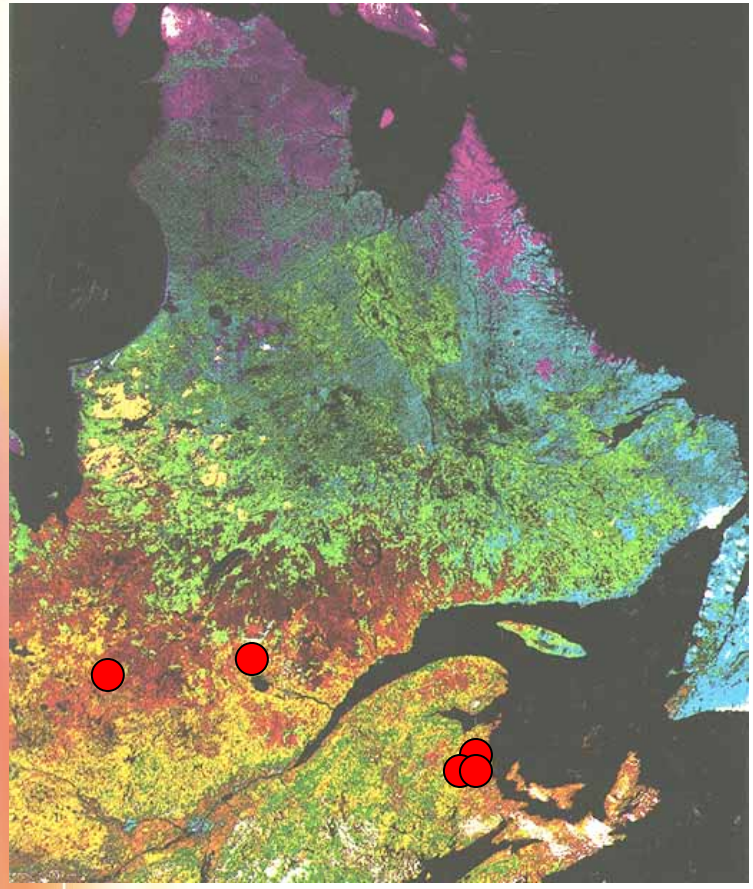
Sampled sites



Site	Year of CT	Age at time of CT	SI	Nb. of measures
Lac St-Jean, Qc.	1984	41	16,0	1
Abitibi, Qc.	1980	41	19,0	1
Salmon Brook, N.-B.	1975	27	19,0	14
N. Tracadie, N.-B.	1975	39	16,5	15
Grand Lakes, N.-B.	1976	25	18,5	10

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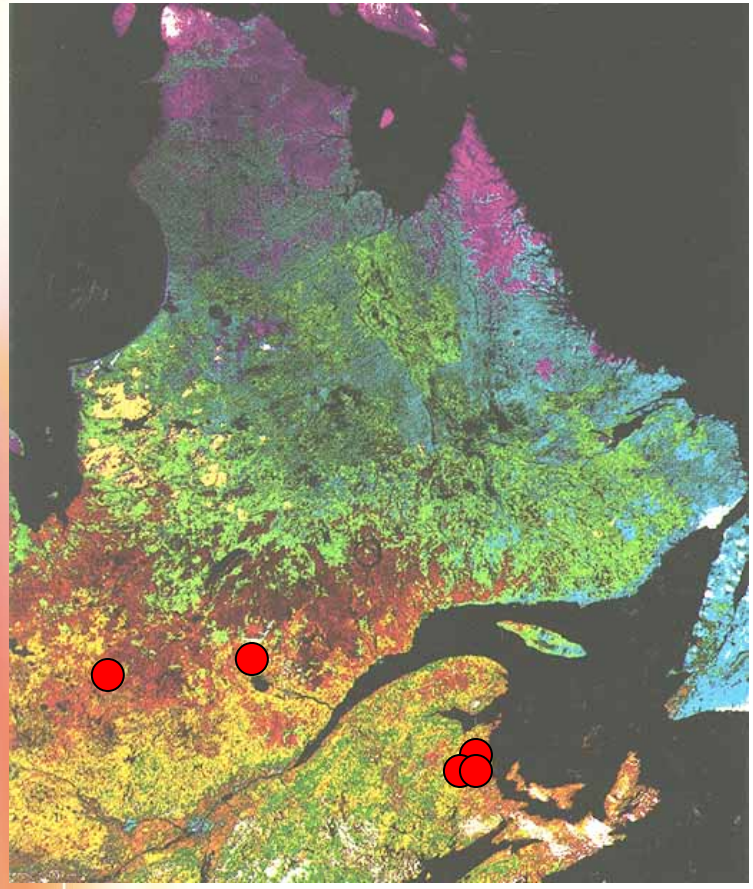

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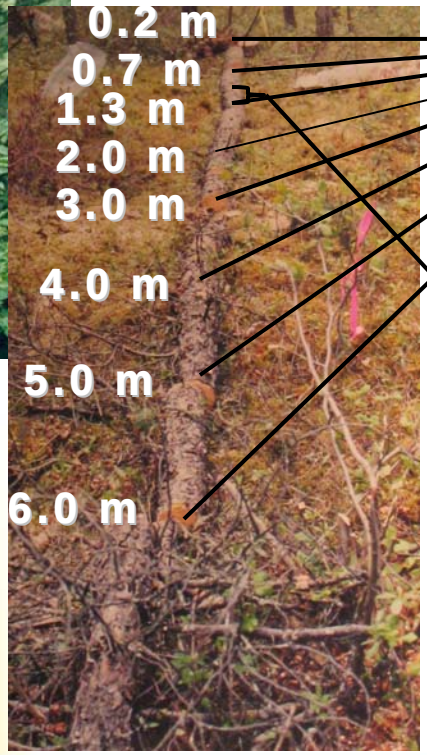
Methodology



Statistical approach

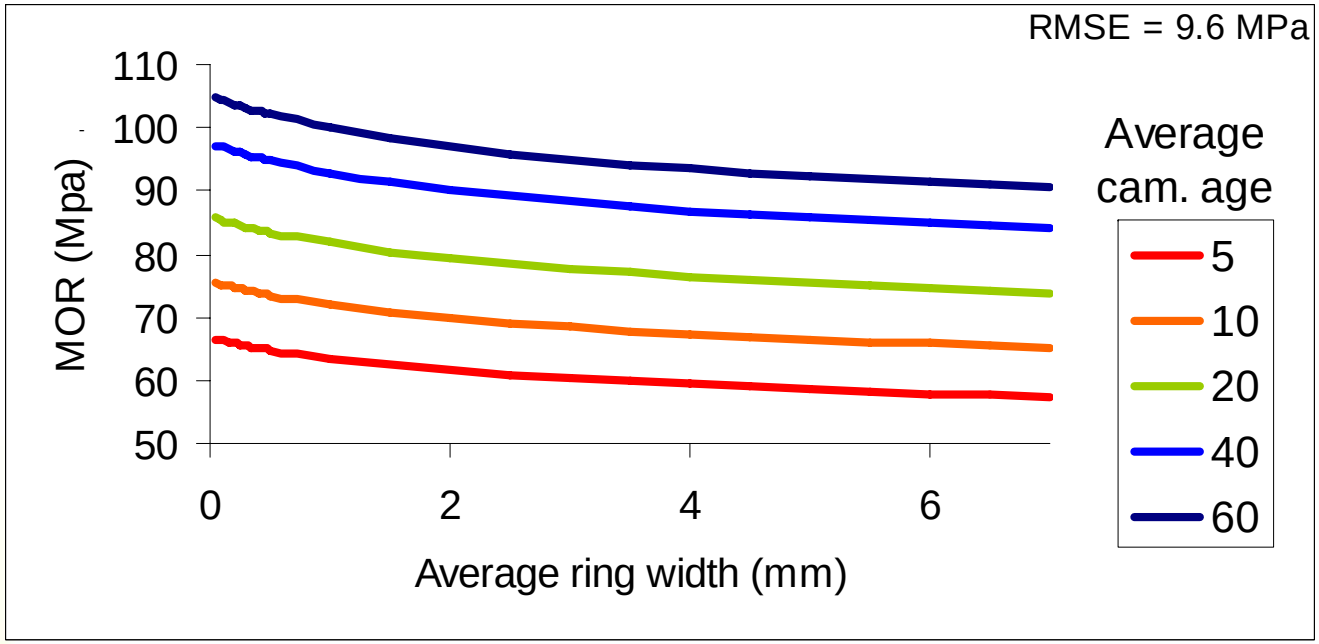
Non linear mixed model to explain:

- Bending properties (MOR/MOE)
- Average ring density (AR(1))
- Early and late wood ring density (AR(1))
- Percent late wood (AR(1))

- Using data from:
  - 125 trees from 3 sites with a thinning intensity gradient

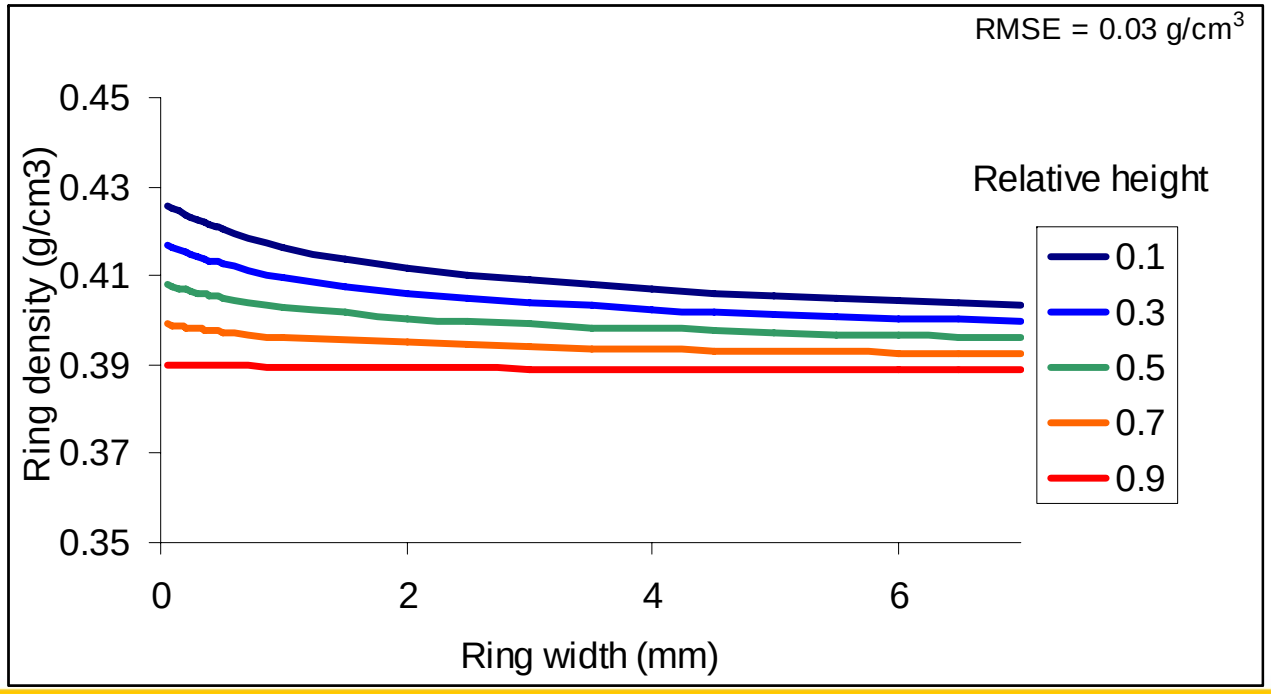
Results
MOE versus ring width

$$MOR = \frac{b_1 \cdot age_{cam}^{b_2}}{(1+rw)^{b_3}}$$



Results
Ring density versus ring width (age=10)

$$rd = b_0 + \frac{\left(b_{11} + b_{10} \cdot \frac{h}{H_{tot}}\right) \cdot \left(1 - \exp\left(b_2 \cdot age_{cam}\right)\right)^{b_3}}{\left(1 + rw\right)^{b_4}}$$



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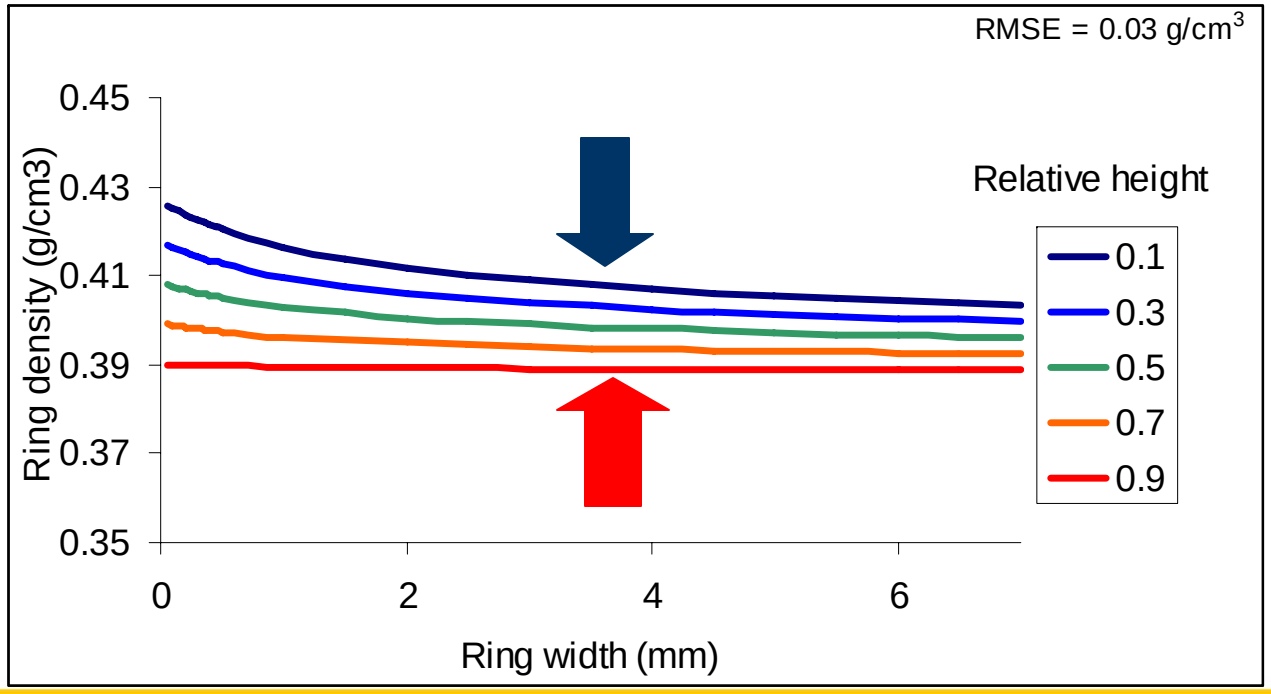
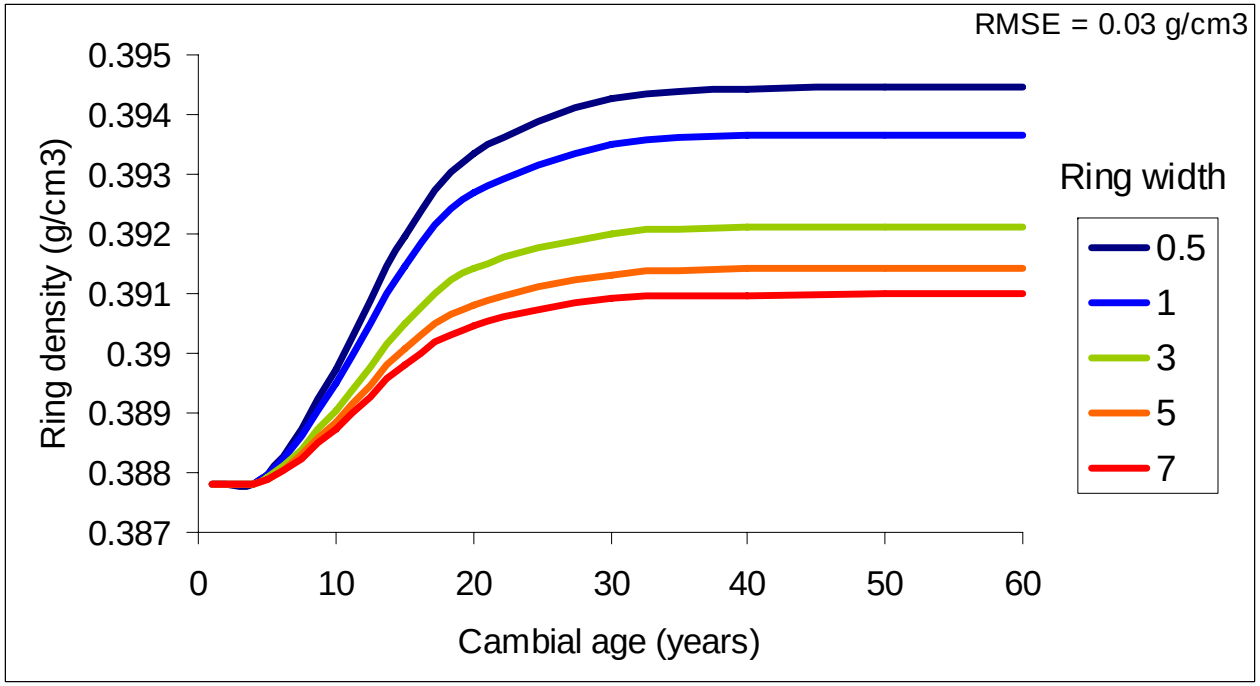


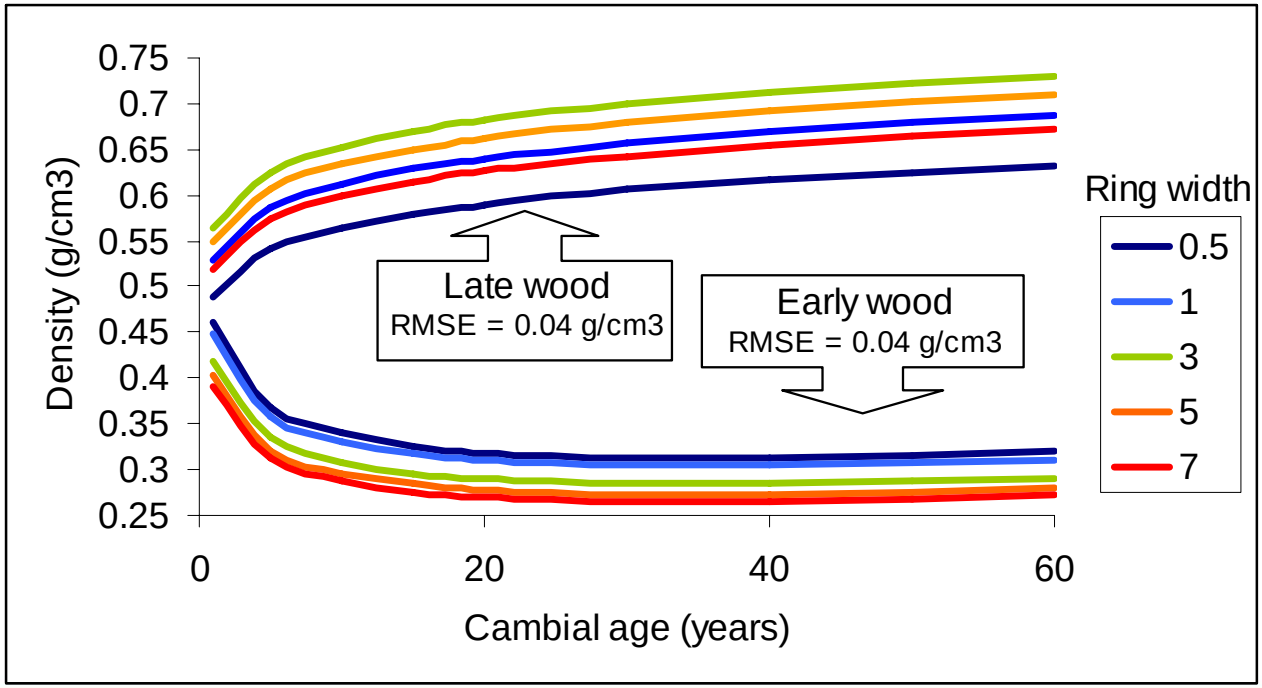
Results
Ring density versus cambial age (rel. h.=0.9)

$$rd = b_0 + \frac{\left(b_{11} + b_{10} \cdot \frac{h}{H_{tot}}\right) \cdot \left(1 - \exp\left(b_2 \cdot age_{cam}\right)\right)^{b_3}}{\left(1 + rw\right)^{b_4}}$$



Results
EW and LW density versus cambial age (rel. h.=0.9)

$$ewrd = \left(b_{10} + b_{11} \cdot \frac{h}{h_{tot}}\right) \cdot b_2^{age_{cam}} \cdot age_{cam}^{b_{30}+b_{31}\cdot\frac{h}{h_{tot}}} \cdot (1+rw)^{b_4} \quad / \quad lwrd = \left(b_{10} + b_{11} \cdot \frac{h}{h_{tot}}\right) \cdot b_2^{rw} \cdot rw^{b_{30}+b_{31}\cdot\frac{h}{h_{tot}}} \cdot (1+age_{cam})^{b_4}$$



Discussion

- Commercial thinning:
  - Effect hardly noticeable in the bending properties since the relationship MOR versus average ring width is almost ‘flat’
  - increases ring width which decreases density (no direct effect)
  - effect on CT on ring width more important in younger stands than older, it is of short duration

Conclusion

- Very little effect of commercial thinning on wood density and bending properties

- In light of these results, commercial thinning may be beneficial by increasing the proportion of mature wood in plantations without adversely affecting its properties

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