Partial cuts in paludified boreal forests : effects of harvesting and site conditions on regeneration success

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Context and objectives of study

Problem :

cold, wet climate
+
poorly drained soil
+
Sphagnum cover
=
paludified forests
=
wet, cold, nutrient-poor conditions

Partial cuts - proposed as alternative in the boreal forest to "careful harvesting", a type of total cut

Does site conditions (like presence of ***Sphagnum***) or harvest operation (partial cut or careful harvesting) influence tree regeneration?

Hypothesis :

Partial cuts have sufficient regeneration after harvesting, however some site conditions (such as level of paludification) will affect negatively the health of spruce trees

Methodology

Figure 1 : a careful harvest, or "CPRS" : all mature trees are removed (MRNF, 2004)

What we did:

- Fieldwork was conducted 10 years after cut (summer 2014). The two treatments are a few kilometers from each other in all 3 sites

- Black spruce (***Picea mariana***) seedlings (0-15 cm) and regenerating trees (15cm-2m) evaluated for growth and recruitment (number of trees) in 430 round plots of 4m2, half in skid trails and the other half in protection strips

- Competition, type of substrate, basal area of mature trees and degree of paludification (organic matter depth) were the variables studied

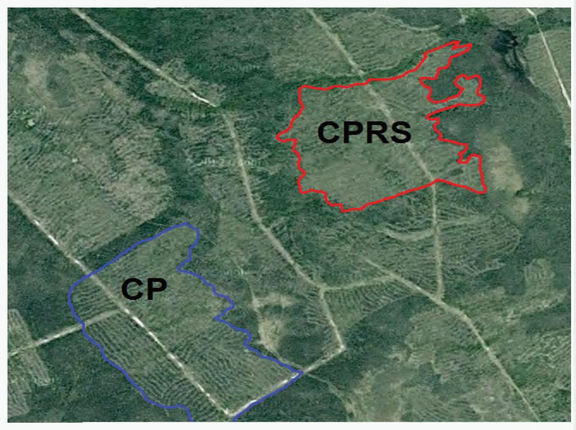

Figure 2 : two different harvesting methods in one of the 3 sites. CP = Partial cut, CPRS = Careful harvesting. Both cuts were done in the winter of 2003-2004. The partial cut is non-selective and varies from 11-75% mature tree removal

Results and conclusions

Growth

Recruitment

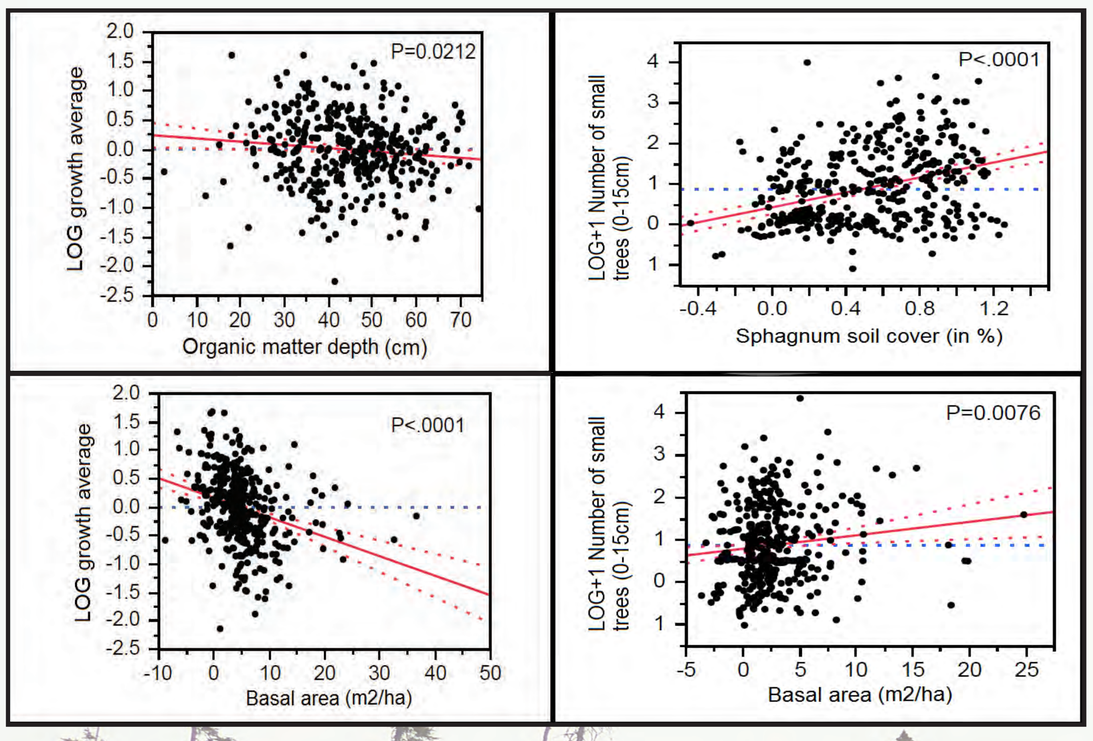

Figure 3 : Average growth and recruitment (quantity per plot) of ***P. mariana*** trees (smaller than 2m) by organic matter depth (a measure of paludification), ***sphagnum*** soil cover and basal area (a measure of the density of remaining mature, seeding trees and a reverse measure of light availability). A Hellinger transformation was done on the competition and substrate variables to reduce the bias caused by the high amounts of zeroes.

Growth is less in deep organic soils because of paludified conditions, and is lower in denser areas because of lower light availability. However, the type of treatment itself does not influence growth.

Recruitment is higher with a good substrate (such as a ***Sphagnum*** soil cover) and a high density of mature, seeding trees. Harvest treatment influences recruitment, with more trees in protection strips because machinery destroys all pre-established seedlings in skid trails.

In conclusion, it is a mix of both site condition and harvest operation that determines regeneration success. In almost all plots, **the quantity of regeneration was sufficient to insure a good, long-term stocking of spruce trees.**

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