

# Assessment of prescribed burning effects in paludified black spruce forests in Ontario's Clay Belt region

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NAFEW 2009 Logan, Utah

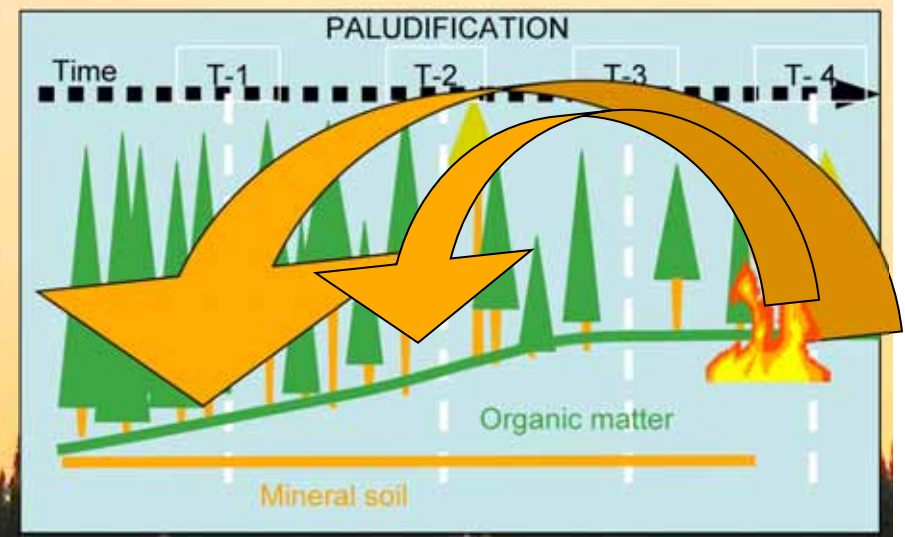






# Context of study: paludification, fire and forest management

- Paludification (Lavoie *et al*, 2005) (Fenton *et al*, 2006)
  - Accumulation of organic matter (O.M.) along the forest succession
  - Waterlogged soil conditions
  - Reduced site productivity in the absence of severe wildfires (Simard *et al*, 2009)
- Effects of fire on the paludification process
  - Removal of O.M. by combustion
  - Physical and chemical effects on soil (Zackrisson *et al*. 1996)
  - Restarts forest succession (Lecomte *et al*. 2005)
  - High and low severity fires

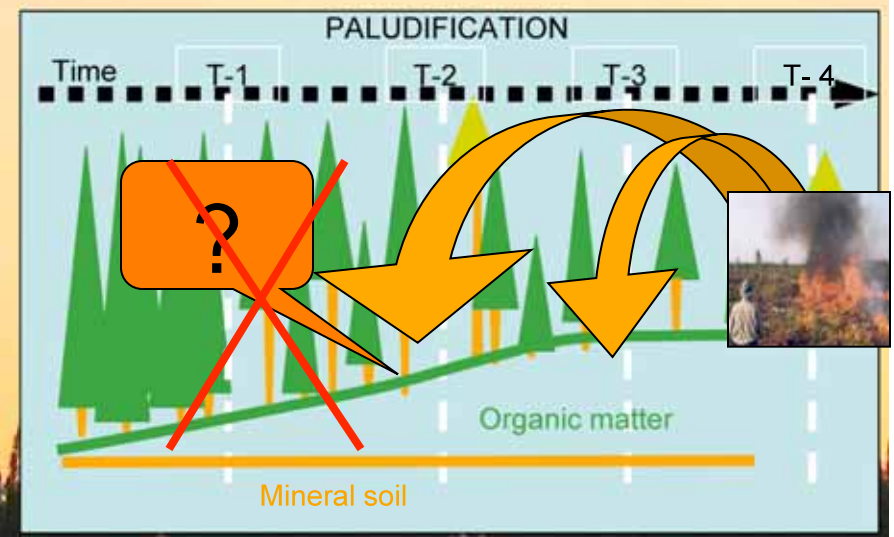


# Context of study: paludification, fire and forest management

- Low impact harvesting effects
  - « Mimics » low severity fires
  - Could increase paludification
    - > loss of forest potential

(Fenton *et al.* 2005)

- Prescribed burning
  - Site preparation to control paludification in a managed landscape?



# Objectives

- To assess retrospectively the effects of prescribed burning after clear cut on:
  - Level of soil paludification
  - Forest floor composition
  - Black spruce growth and regeneration



# Methodology

- Study area
  - Clay Belt of Eastern Canada:  
prone to paludification
  - Black spruce feather moss forest
- Treatments
  - CLAAG: Careful Logging Around Advanced Growth
  - CC: Summer Clear Cut
  - PB: Winter Clear Cut followed by Prescribed Burning
- Site selection: 24 sites
  - FEC classification
  - PB records
  - Harvest records

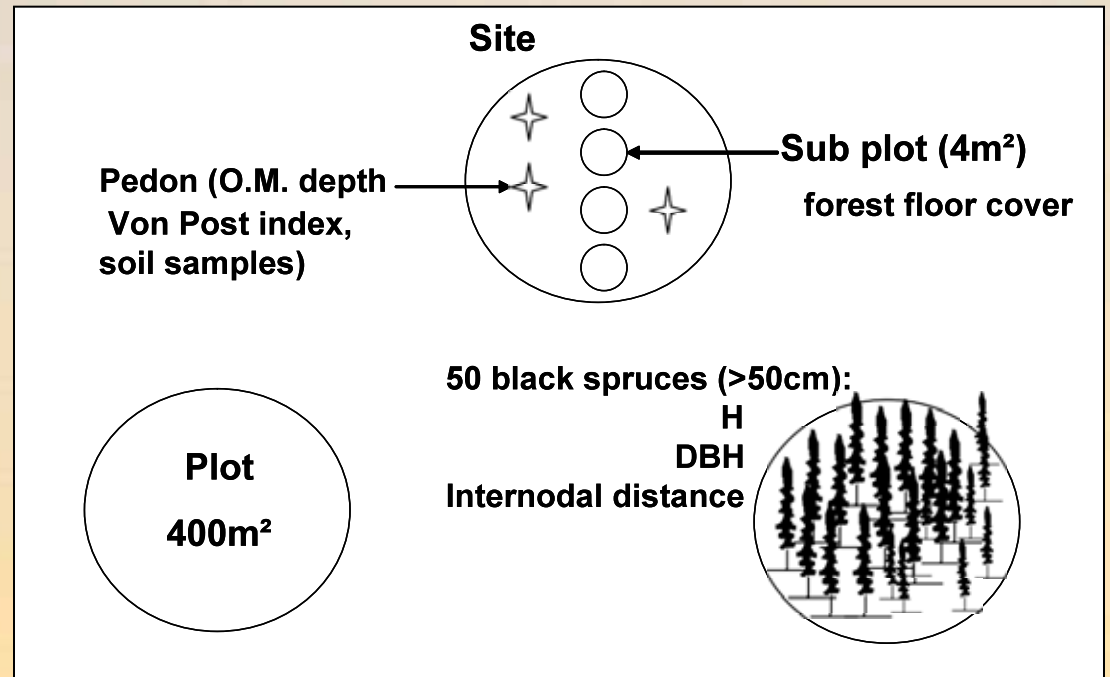


Treatment	Impact	Site age
CLAAG	Low impact	13-31 (23.6)
CC	Mechanical impact	20-42 (27.6)
PB	Physical and chemical impact	14-27 (19.16)



# Methodology

- Data collection
  - Soil survey
  - Forest floor cover
  - Black spruce growth and regeneration
- Statistical analysis
  - General linear mixed models (random effect: site and plot)





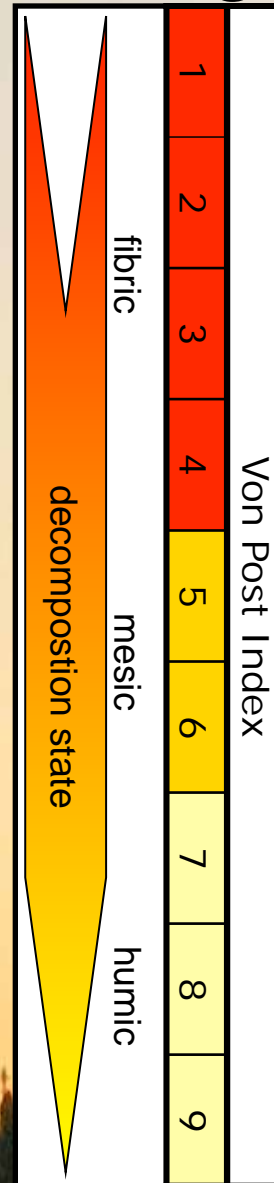
# Results

1. Soil survey
2. Forest floor cover
3. Tree growth and regeneration



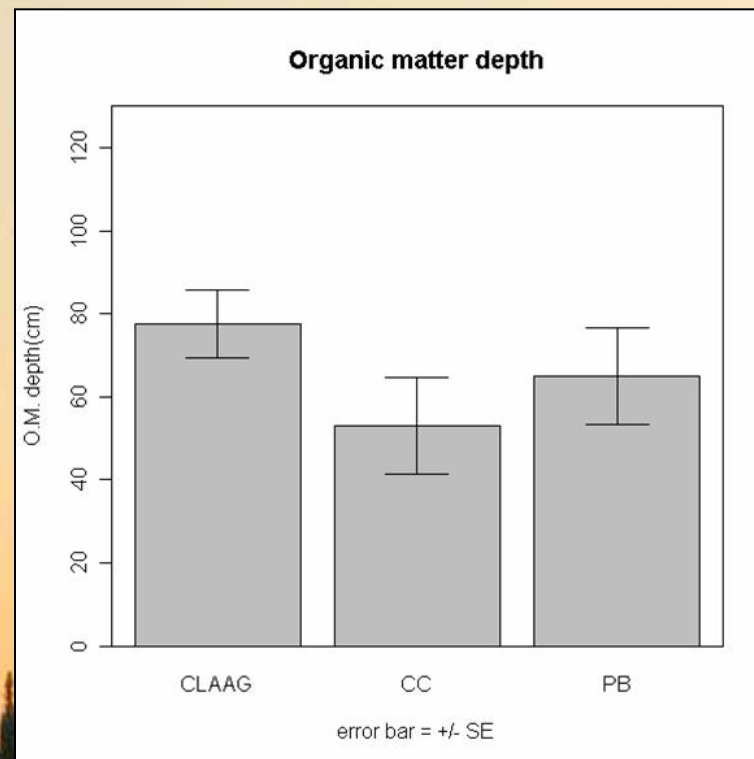
# Soil survey

A bit of organic soil pedology...



# Soil survey

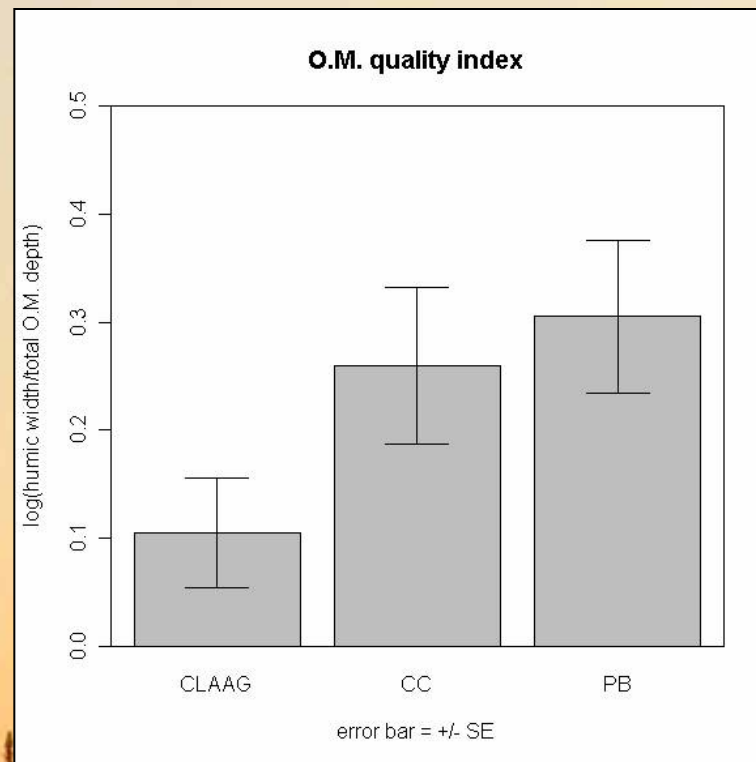
- O.M. depth
  - CC thinner O.M. soil -> compaction
  - No difference between CLAAG and PB





# Soil survey

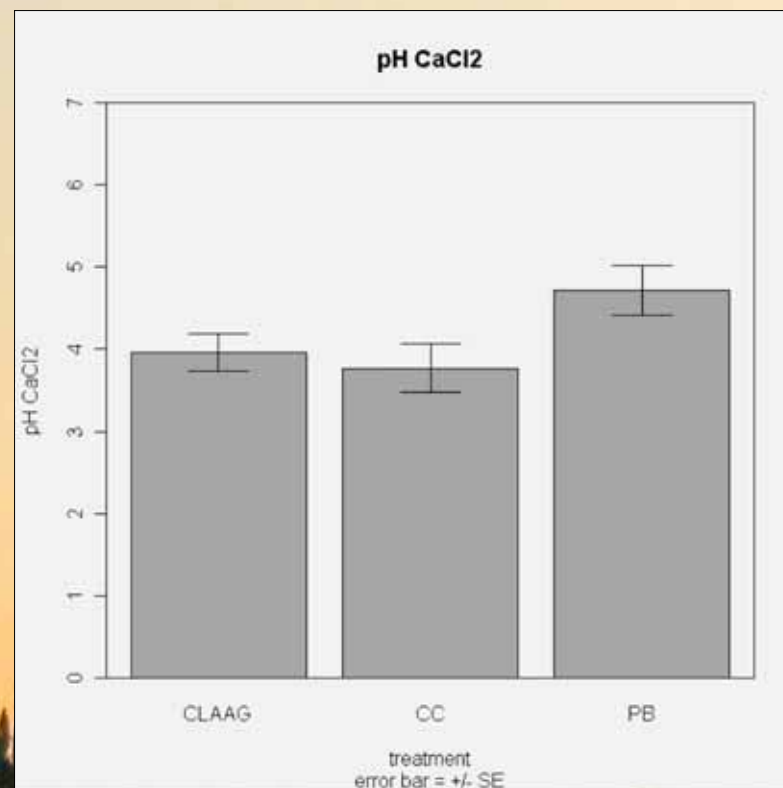
- Soil quality index  
Humic OM / total OM





# Soil survey

- Chemical analysis
  - Higher pH on PB sites
  - No significant difference for nutrient contents



# Soil survey



- summary
  - No difference of OM depth
  - Soil is more decomposed on PB and CC sites
  - Humus quality is higher on PB sites
  - Soil acidity is lower on PB sites



# Forest floor cover

- Sphagnum
  - Rapid growth
  - The sponge tactic
- Ericaceous shrubs
  - Chemical competition
  - Scaffolding effect

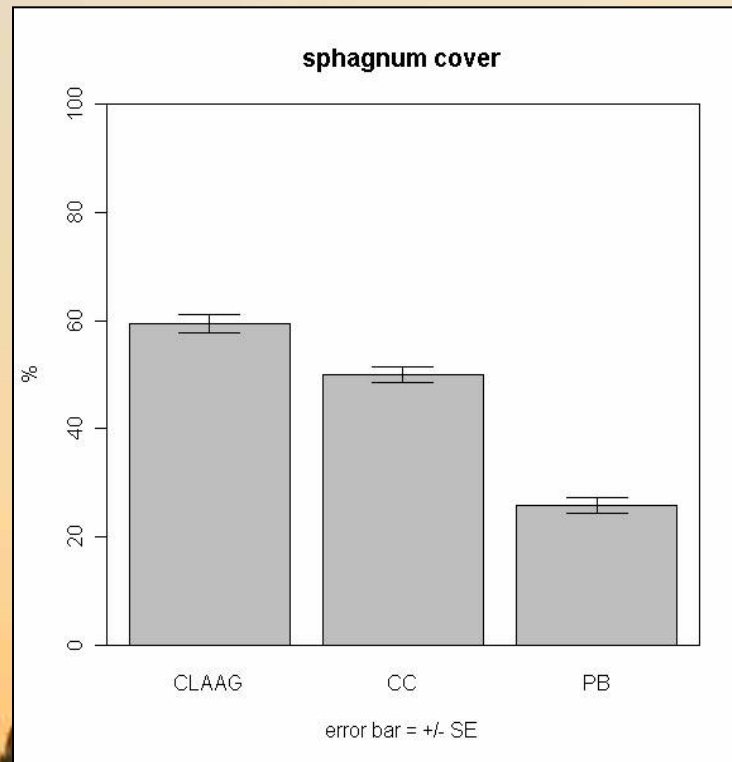




# Forest floor cover



- Sphagnum
  - Lower sphagnum cover on PB sites

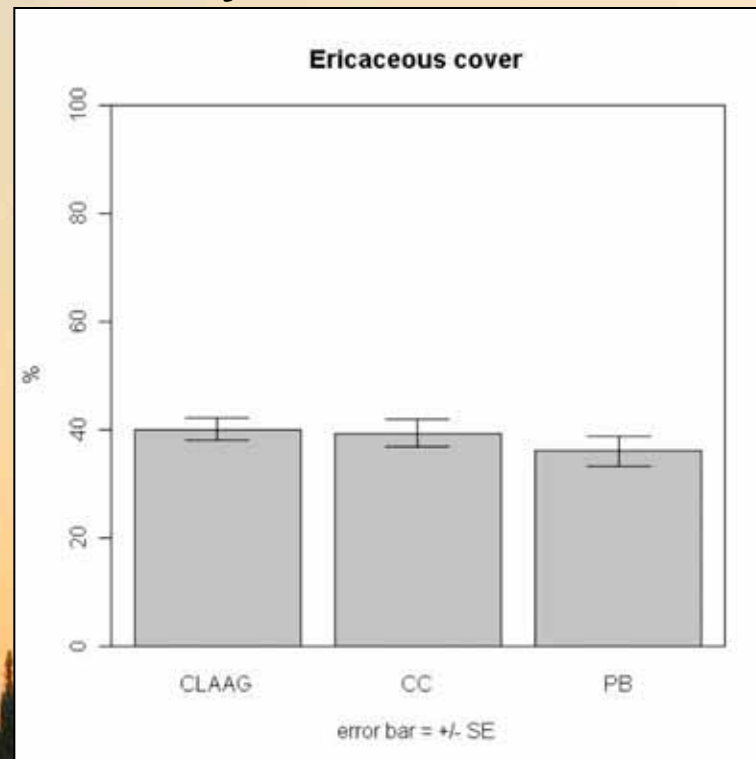




# Forest floor cover



- Ericaceous shrubs
  - No difference observed
  - Higher variability on PB sites



# Forest floor cover



- Summary:

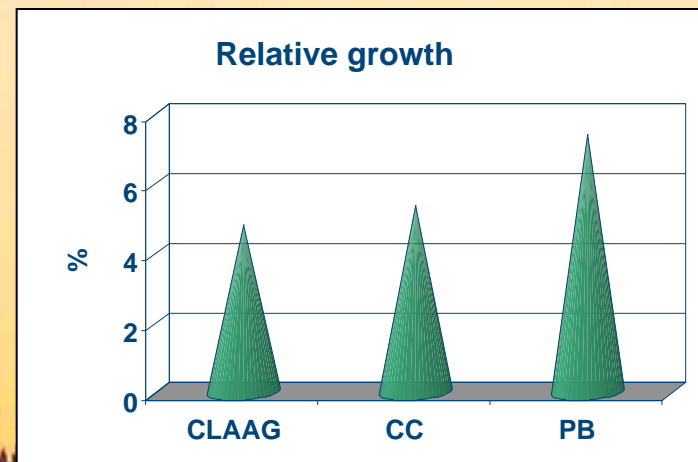
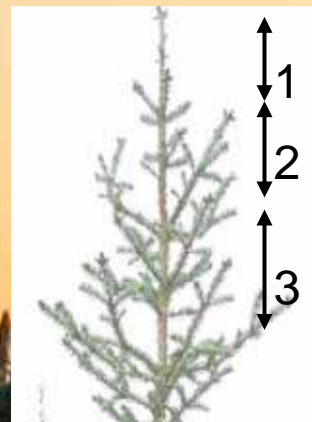
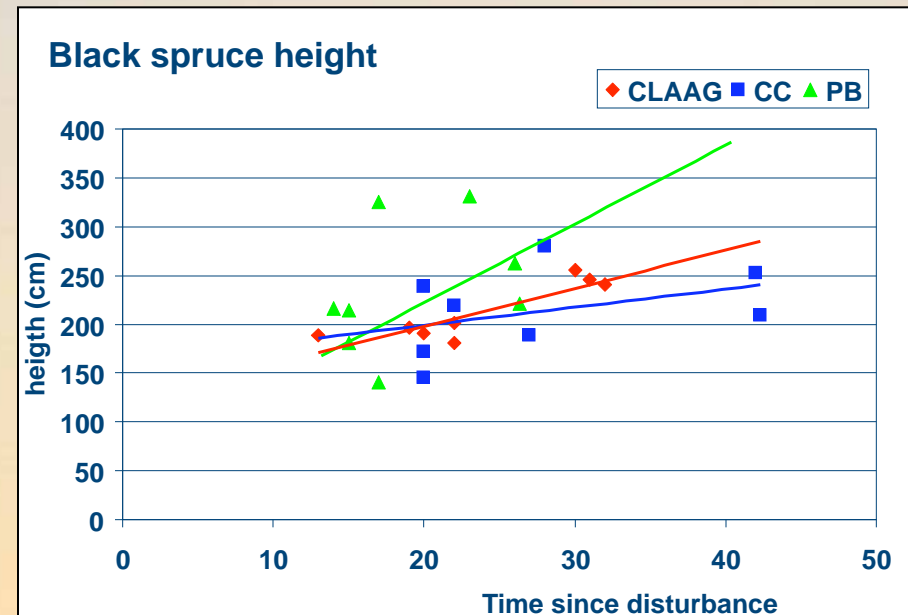
- PB diminishes sphagnum cover
- Ericaceous cover could be increased by prescribed burning (Mallik 2003)



# Black spruce growth and regeneration



- Mean height
  - higher trees on PB sites when controlling for time since disturbance
- Relative growth
  - Higher relative growth on PB sites

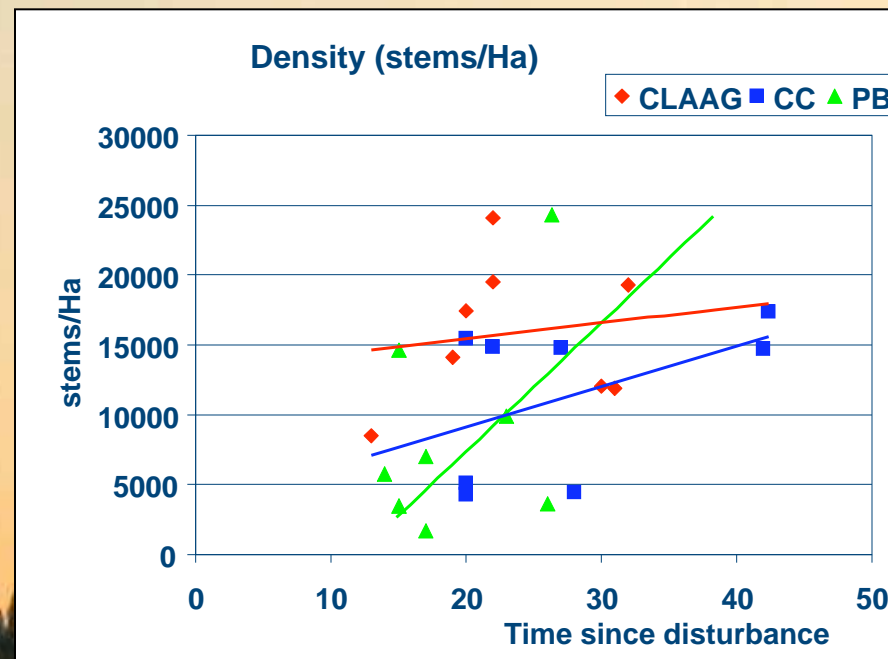




# Black spruce growth and regeneration



- Tree density
  - Lower density in PB sites
  - Difference diminishes with time





# Black spruce growth and regeneration

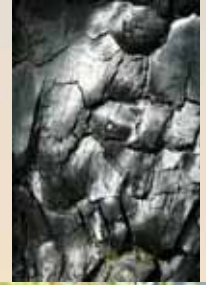


- Summary:
  - Better growth on PB sites
  - Stand density is reduced temporarily after a PB



# Conclusions

- Compared to CLAAG and CC, Prescribed Burning seems to have an effect on:
  - Humus decomposition properties
  - Forest floor cover
  - Black spruce growth



# Implications

- Natural disturbance based management applications:
  - Prescribed burning could be used to control paludification processes in potentially productive stands.
  - Prescribed burning is able to emulate some of the effects of wild fires.





# Acknowledgments



Nicole Fenton and Sylvie Gauthier for their support and advice

Ariane Béchard, Valentine Lafond, David Lemieux for the fieldwork

Jeffrey thomas and Wade Lake Park Rangers for accommodations and all the laughs!