Planning regeneration of the next forest in variable retention systems: it is time for silviculturists to get involved

Victor Lieffers
Department of Renewable Resources, University of Alberta
Variable Retention a Silviculture System?

• Emulation of natural disturbance
• Provides the structure and coarse woody debris necessary for biodiversity

Is Variable Retention a Silviculture System?
Spray patterns were planned in terms of distribution of residuals
Objectives

Residual Mortality - spatial distribution of residuals
Control of sprouting species
Regeneration from seed – Seedbed preparation
Genetic selection
Mortality of Residual Trees

EMEND Experiment

Compartment Size: ~10 Ha
Project Size: ~1000 Ha
Mortality of residual trees in Variable Retention – 10 years later

Solarik
J. Applied Ecol.
Aspen mortality 10 Years Post-Harvest

- 10%, 20%: 33.0%  
  - PLC < 16%  
    - TCD < 5.85m: 92.9%  
      - N = 14  
    - TCD ≥ 5.85m: 53.4%  
      - N = 73  
  - PLC ≥ 16%: 43.3%  
    - N = 106  
- 50%, 75%: 22.2%  
  - PLC < 24%: 71.4%  
    - N = 14  
  - PLC ≥ 24%: 43.6%  
    - N = 39  
- 33.0%: 50.0%  
  - PLC < 16%: 50.0%  
    - N = 120  
  - PLC ≥ 16%: 28.0%  
    - N = 25  
- 16.7%: 28.0%  
  - PLC < 24%: 43.6%  
    - N = 39  
  - PLC ≥ 24%: 16.7%  
    - N = 150  

Error: 0.789  
CV Error: 1.12  
SE: 0.0725
Aspen Residuals have greater mortality when

- Left in low densities
- Are close to machine traffic
- Have short live crowns.
Spruce mortality 10 Years Post-Harvest

16.6%
N = 428

75.0%
N = 20

13.7%
N = 408

2.8%
N = 141

10%, 20%
50%, 75%

19.5%
N = 267

11.9%
N = 194

29.7%
N = 73

PLC < 50%
PLC ≥ 50%

63.0%
N = 25

27.1%
N = 48

60%
N = 15

12.1%
N = 33

Error: 0.689
CV Error: 0.96
SE: 0.0947
Residual spruce have greater mortality when

• They are very large
• Retained at low density
• When there is root damage
• With trees of low live crown ratio
Regeneration of Aspen in Variable Retention
- a clonal species
Aspen has a large and interconnected root system
The sprouting of aspen is suppressed by living parental trees of the clone.
EMEND Experiment

Tomasz Gradowski
Clearcuts have the highest density of suckers
Substantial reduction in aspen density in 50% retention
Aspen density at year 9

Spruce Regeneration from seed

Emend Experiment

Compartment Size: ~10 Ha
Project Size: ~1000 Ha
Emend project
10 year survey
Kevin Solarik

40: 1821–1832
Stocking Trails vs. Interiors

Seed Trees ha\(^{-1}\) < 30  Seed Trees ha\(^{-1}\) ≥ 30

42.1%  n=576

Seed Trees ha\(^{-1}\) < 11  Seed Trees ha\(^{-1}\) ≥ 11

Interior  Corridor

22.7%  n=226

30.8%  n=116

54.6%  n=350

75%  10%,20%,50%

75%

35.4%  n=175

43.8%  n=126

56.1%  n=49

80.6%  n=126

Error: 0.568
CV Error: 0.633
SE: 0.0382
Masting - Seed crops (2-8 years apart)
81 aspen-dominated cutblocks

Jonathan Martin-DeMoor
Can. J. For Res. 40: 585-594;
Spruce stocking was a function of:

- Density of seed trees
- Masting
- Season of logging – soil disturbance
- Climate moisture index
- Density of grass
- Density of tall shrub/hardwoods
Feather mosses are poor seed beds
Potential to do dedicated mechanical site preparation
Use of skidders for return-trip site preparation
Shallow organic layers -best
The operator of the feller-buncher makes the decision on the genetic makeup of the next forest.
The few seed trees maintain the spruce in this site.
Seed trees on a wetland fringe
Little effort for selection of trees for genetic value
These are the seed sources of the next generation
Variable Retention/structure cuts

• Not just for biodiversity issues!
• Time for silviculturists to become involved with the use of these residual trees to influence the tree growth of the next forest
• Seed trees, selecting trees that will bear good seed for decades
• Plan site preparation
• Sometimes suppression of aspen regeneration
Intensive plantations are not the only place silviculturists should be involved.
Acknowledgments

Kevin Solarik, Jonathan Martin-Demoor, Tomasz Gradowski, Ellen Macdonald, Simon Landhausser, Gitte Grover, John Spence, Jan Volney, Andreas Hamann, Derek Sidders

- MWMA.
- DMI, CanFor
- Weyerhaeuser
- West Fraser,
- ALPAC
- NCE-SFM, NSERC