Climate change reforestation strategies:
policy barriers and opportunities

Brian T. Barber, MA, RPF
Director
Tree Improvement Branch
BC Forest Service

November 27, 2008

1

Outline

1. Research Method
2. Climate Change Impacts and Responses.
3. CC Reforestation Strategies
4. BC's Forest Policy Framework
5. Policy Barriers and Opportunities to Implementing CC Reforestation Strategies
6. Conclusions
7. Interim changes to seed transfer standards

2

Research Method

1. Literature review
   - Climate change
   - Impacts on Forests
   - Reforestation Strategies
2. Interviews
   - BC Forest Service
   - Forest Industry
   - Legal Counsel
   - ENGO
   - First Nations
3. Policy Analysis
   - BC's forest policies and practices
4. Follow-up Interviews
5. Synthesis

3

Climate Change Impacts

More Frequent Intense Storms

More Insects and Disease

Changing Fire Conditions

More Frequent Droughts

4

CC Reforestation Strategies

1. Increasing diversity
2. Facilitating migration
3. Managing for shorter rotation spp.
4. Selecting and breeding for adaptation and environmental stresses

Stanley Park restoration - following 2006 windstorm

5

1. Increasing Diversity

a) Increase # species; and

b) genetic diversity of trees

within cutblocks and across the landscape

MoFR 2006a, Martin et al. 2005.

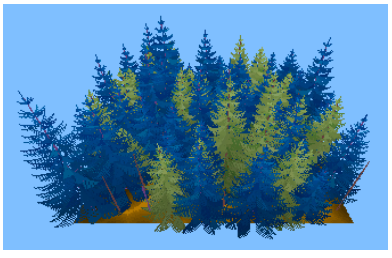


Image: Dave Simpson

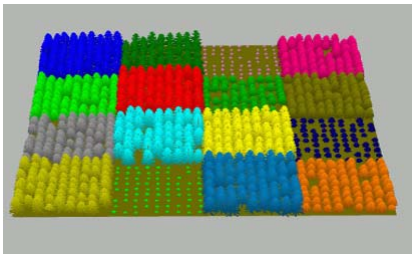


Image: Ian Cameron

6

1. Increasing Diversity (con't)

Benefits:

- Increases resilience of forest ecosystems.
- Some trees will survive to maturity and merchantable age or size.

Limitations:

- Stand vulnerability dependent on species composition, not diversity.
- May negatively impact productivity; optimum mix not known.
- Harvesting challenges in mixed species stands.
- Trade off between genetic diversity and genetic gain
- Increased seed/seedling handling costs

Tree Seed Centre - Surrey

7

2. Facilitating Migration

- Matching spp. and seed to future climate of the planting site
- Moving spp. beyond its current range
- Introducing exotics

8

2. Facilitating Migration

Benefits:

- Trees better adapted to site
- Increase or mitigate timber productivity losses
- Applicable to all species and areas

Limitations:

- Scientific information (provenance testing) not avail. for all spp.
- Trees must survive present climate (e.g. early frosts, snow press)
- Soils and other biophysical factors may not be suitable
- Managing for natural regeneration

Western Larch
Photo: B. Jaquish

9

2. Facilitating Migration (con't) Exotic species

Benefits:

- May not be susceptible to pests and disease.
- May increase forest productivity.

Limitations:

- Cost and time required to test.
- May interfere with biophysical processes (e.g. soil hydrology)
- May pose environmental and socio-economic risks if invasive.
- Public acceptability unclear.

Siberian x Japanese Larch
breeding arboretum - Quebec

10

3. Shorter Rotation Spp.

Manage fast growing spp.

- Aspen
- Birch
- Cottonwood
- Red Alder
- Big leaf maple
- Hybrid poplars

11

3. Shorter Rotation Spp. (Con't)

Benefits:

- Regenerates naturally
- Improves soils
- Harvest and replace
- Interim timber supply

Limitations:

- Harvesting Challenges
- Seed, seedling knowledge limited

Hybrid Poplar Demo - Saanich

Hybrid Poplars

+ Fast growing, <15 yr rotation
+ Carbon sink, biomass, afforestation
- Intensive management (site prep., H2O, vegetation control)
- Limited suitable area in BC (e.g. moist rich soils)

12

4. Selection and Breeding

- Select, test for adaptation to environment, pests drought etc.
- Provenance testing
- Traditional breeding
- Seed/cutting production
- Biotechnology – tissue culture, somatic embryogenesis, GMOs

13

4. Selection and Breeding (con't)

Benefits:

- Seedlings with higher chance of survival
- Increased productivity
- Broader seed deployment and flexibility in use

Kalamalka Forestry Centre - Vernon

Limitations:

- Costly and time consuming to test and produce seed (so select sources already adapted to climate)
- Pests may evolve to overcome tolerances in time to test and produce operational quantities of seed.
- Genetic diversity decreases as selection intensity increases.

14

4. Selection and Breeding (con't) Biotechnology

Dr. So-Young Park – UBC

Benefits:

- Cloning eliminates loss of desired traits due to sexual recombination.
- Reduces time associated with breeding and seed orchard production.
- Produce large #s of trees with desired traits.

Limitations:

- Cost and time to develop methodology and "stable" plants
- Not advanced for operational use of BC's conifers
- Genetic diversity decreases as selection intensity increases.
- Public acceptability of clonal forestry?

15

Forest Policy

"The course or principles of action adopted by government to guide the management and use of forest resources and the development and operation of the forest sector."

(ABCFP 2006a).

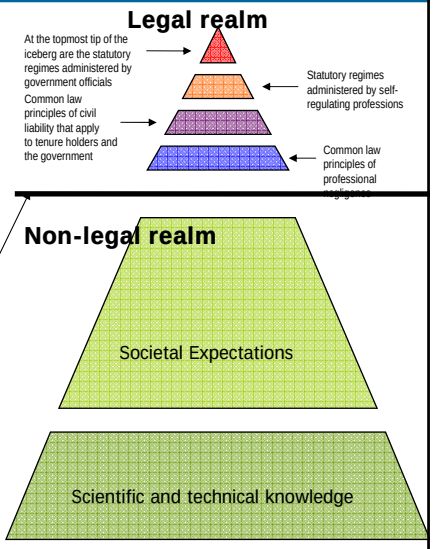
16

BC's Forest Policy Framework

ACTS

- *Forest Act*
  - AAC Determinations and Forest Tenures
- *Forest and Range Practices Act*
  - Government sets objectives for 11 values
  - Licensees and professionals establish results and strategies to meet objectives
  - Some default standards – e.g. soil, tree seed
- Acts establishing self-governing Professional Associations
  - Foresters, engineers and geoscientists

REGULATIONS
CIVIL and COMMON LAW



R. Reader, 2006

17

FRPA Values & Objectives

- 11 Values – e.g. soils, water…
- Timber objectives
  - Maintain and enhance
  - Competitive wood delivery costs
  - Licensees activities do not constrain rights of another

18

Forest Stewardship Plans

- Prepared by licensees and BCTS managers
- Submitted to District Manager for approval
- Results and Strategies must be
  - Consistent with govt objectives
  - Higher level plans
  - Prescribed requirements
  - Measureable & verifiable
- DM cannot reject if consistent
- Licensees and BCTS managers must use professionals to prepare, but can reject advice
- Reforestation strategies not set in stone by policy (e.g. silviculture system, species selection, stocking)

19

Policies Governing Reforestation

- Free growing stand must be established after harvest.
- Stocking standards – must maintain timber supply etc.
- If planting, use tree seed in accordance with *Chief Forester's Standards for Seed Use* (registration, storage, selection and transfer)
- Trees planted become property of government

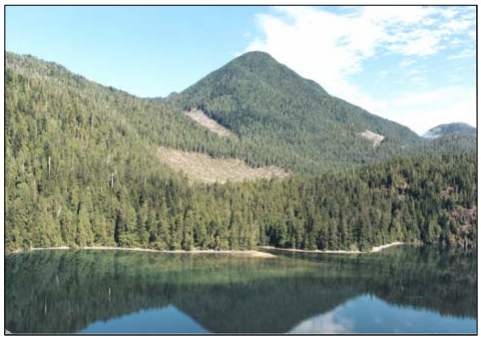
20

General Policy Barriers and Opportunities

- No reference to climate change in FRPA, *but…*
- Must maintain timber supply and consider long-term forest health, *but...*
- Lack of certainty & information re CC, *but…*
- New information can be used in developing FSP strategies if from a credible source, *but…*
- *Catch 22* if strategies different from timber supply assumptions, *but...*
- Chief Forester can take CC into account in AAC determinations prompting licensees to develop CC reforestation strategies.

21

General Policy Barriers and Opportunities (con't)



- Managing for short-term results:
  - Free growing
  - Green-up
  - Reduce time, costs, risk and liabilities
- Limited provisions for compensating licensees for plantation failure (e.g. not drought or frost)
- Conflicts with managing for other values (e.g. water) and FNs' rights and title

22

1. Increasing Diversity

Policy Barriers

- No requirement to est. all species identified in FSP stocking standards.
- Higher establishment costs - favours reduction in diversity

Opportunities:

- No restrictions on increasing species and seedlot diversity
- No restrictions on increasing genetic diversity (Ne >10)

23

2. Facilitating Migration

Western Larch plantation

Photo: B. Jaquish

Policy Barriers

- No requirement to plant trees
- No compensation for damage /loss
- Seed transfer and species selection not aligned
- Costs to modify seed transfer – orchards, seed inventories and information systems (e.g. SPAR)
- Exotics – significant land use issue

Opportunities:

- Develop credible information to guide species selection
- Transfer 5% of trees outside seed transfer limits
- CF can amend seed transfer standards – doing so now!
- Govt pay to plant trees more at risk – if not contravention of SLA.

24

3. Shorter Rotation Spp.

Policy Barriers

- Similar to *Increasing Diversity*
- Limited economic opportunities and land-base
- Social concerns with land use conversion (hybrids)

Red alder and Big leaf maple - Duncan

Opportunities:

- Similar to *Increasing Diversity*
- Increasing commercial interest in broadleaves

25

4. Selection and Breeding

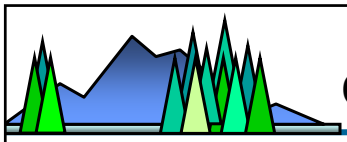
Policy Barriers

- No restrictions on breeding – except costs of restructuring programs and orchards etc.
- Feds regulate testing and release of GMOs
- Societal concerns with use of biotechnology

Opportunities:

- Lots.
- Can deploy biotech seedlings when adequately tested

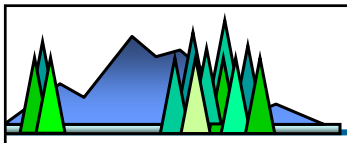
26



Conclusions

- CC reforestation strategies vary in benefits and limits
- **Facilitated migration** - greatest benefit
- Employ together – identify acceptable levels of risk at stand and landscape levels.
- **No hard policy barriers in FPRA** – but gov't could clarify expectations respecting managing for CC
- Different expectations (Caution vs "Let's go!")
- Seed transfer rules – technical and easy to change
- Tenure and reforestation responsibilities – core societal policies – harder to change
- Continue research, modelling, discussion (e.g. Future Forest Ecosystem Initiative)
- Start now with low-risk quick wins – e.g. increasing species diversity and seed transfer

27



Interim changes to seed transfer standards

- "Interim" - prior to introducing new climate-based seed transfer system in 2-3 yrs.
- Increase elevation transfer by 100 or 200 m for a number of species (wild and orchard seed sources)
- Based on climate change over past 100 yrs and projected in next 25 yrs.
- Increase transfer of Pli superior provenances
- Transfer of wild Pli seed from Thompson-Okanagan to Big Bar seed planning zones (SPZs)
- Effective April 1, 2009
- First intentional "climate change" forest management policy introduced in Canada?

28

Acknowledgements

Sponsors and Advisors

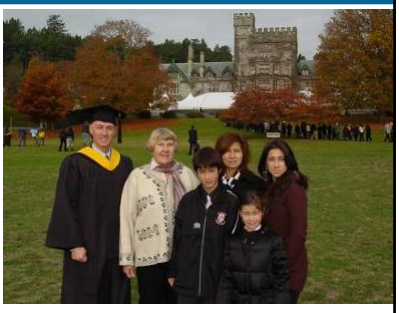
Dale Draper, PhD, Ken Baker, RPF, Henry Benskin, RPF, Vivian Wilson, PhD. My family!

Technical Advice and Support

Pat Martin, RPF, Del Meidinger, PhD, P.Ag., Mike Pelchat, RPF, Craig DeLong, R.P.Bio, Kathy Hopkins, RPF, Jenny Fraser, Christine Fletcher, RPF, Albert Nussbaum, RPF, Natialie Lavoie, PhD, Eric Meyer, Alex Woods, RPF, Alvin Yanchuk, PhD, RPF.
+Articles, books, reports, workshops, internet.

Formal Interviews

Greg O'Neill, PhD, RPF, Ian Miller, RPF, Brian Raymer, RPF, Heather Rooke, Dave Kolotelo, RPF, Jack Woods, RPF, Vincent Day, RPF, Archie MacDonald, RPF, Garry Merkel, RPF, Dwight Yochim, RPF, Jessica Clogg, LL.B., Roberta Reader, LL.B.



29

The best time to plant a tree adapted to today's climate was 20 years ago.

The best time to plant a tree adapted to the climate in 20 years is now.

- based on ancient Chinese proverb.

30