Summary
Nadina Climate Change Vulnerability Workshop

Held April 20th, 2010, Burns Lake, BC
Summary prepared by Dave Daust, Don Morgan and Ken Zielke, April 21, 2010

Participants

• Jim Pojar	Bulkley Valley Research Centre
• Jeffery Anderson	Geomorphic Earth and Environment
• Doug Steventon	MFR-Smithers Research (ecology & wildlife)
• Rick Heinrichs	Ministry of Environment-Smithers
• Jim Burbee	Morice and Lakes IFPA
• Garth Ehalt	West Fraser-Houston
• Alison Patch	Nadina Woodlot Association
• Alex Woods	MFR-Smithers Research
• Agathe Bernard	MFR-Nadina
• Carolyn Stevens	MFR-Nadina
• Frank Varga	BCTS
• Ken Zielke	Symmetree Consulting Group
• Don Morgan	MFR-Smithers Research and BV Centre
• Dave Daust	Bulkley Valley Research Centre

Purpose

This workshop introduced a collaborate research project that aims to adapt forest management strategies to account for climate change.

Project overview

Project Title: Multi-scale trans-disciplinary vulnerability assessment

Project Team:

- Don Morgan, MFR Research
- Jim Burbee, Morice/Lakes IFPA
- Rick Budhwa, BV Research Centre
- Mark Johnson, Sask. Research Council
- Phil Burton, CFS and UNBC
- Ken Zielke, Symmetree Consulting
- Bryce Bancroft, Symmetree Consulting
- Dave Daust, Consultant
- Jeff Anderson, Geomorphic Environmental Serv.
- Agathe Bernard, MFR Nadina
- Carolyn Stevens, MFR Nadina

Project Objectives (Year 1)

1. Describe the changing climate in the Nadina ("downscaled" climate projections)
2. Identify focal management objectives/issues in Nadina (workshop).
3. Develop conceptual models of impacts of climate change on focal objectives (expert workshops).
4. Assess strengths and weaknesses of current management under a changing climate.
5. Develop management strategies that account for climate change (workshop).
6. Assess effectiveness of proposed management strategies.
7. Report describing forest management options in a changing climate.

The second and final year of the project aims to develop adaptation strategies for the communities that depend on forest resources.

Workshop objectives

- Inform managers about climate-related impacts that are relevant to forest management.
- Inform project team and researchers about key management issues/concerns.
- Identify focal management objectives (scope of project).
- Develop preliminary list of impacts/issues to address.

Workshop presentations

- Don Morgan and Ken Zielke presenting an overview of provincial and federal climate change initiatives; Ken briefly described the Kamloops project which is similar to the Nadina project.
- Don Morgan provided a brief introduction to complex systems and uncertainty.
- Agathe Bernard presented an overview of key management objectives in the Nadina.
- Jim Pojar presented an overview of the ecological impacts of climate change.

Overview of Workshop Discussion

The following numbered sections summarize discussion at the workshop. We addressed the following questions

1. What main categories of management objectives should the project focus on?
2. What are the potential impacts of climate change within each of the main categories of objectives?
3. How should the landbase be stratified to address impacts of climate change?

1) Focal objectives/values/issues

The project should address four broad classes of management values/objectives: timber, biodiversity, hydrology (aquatic ecosystems) and agriculture. Agriculture can be given less attention in the first year of the project (which focuses on forest resource management) because it will be an important component of the second year (which focuses on forest dependent communities). Agriculture was not discussed further at this workshop

Broad categories of values to address and related issues

Agriculture	**a) Timber**	**b) Hydrology**	**c) Biodiversity**
Ranching	Forest products	Aquatic ecology and fish	Connectivity
	Genetics	Water quality and quantity	Foundation species beyond trees (vertebrates, invertebrates)
	Carbon accounting	Basin characteristics (in terms of hydrology)	Focal species (foundation and other)
	Carbon storage		Test key correlates of community response (plants, vertebrates) to climate and management (see Archetype species below)
	Autecology of pests and pathogens		

Linkages among categories

The age class distribution of the forest influences timber and biodiversity.
Tree survival and distribution affects timber and biodiversity

2) Potential impacts and issues related to climate change

a) Timber

Recorded by Ken Zielke.

Elements of timber management related to our objectives and impacted by climate change:

- Size of the productive landbase
- Productive capacity
- Growing stock
- Economics

Size of productive landbase

Impact	Rationale	Other Comments
Reduction	Drier areas, marginal for THLB now will become non-productive and likely increase area of grasslands.	Natural disturbances, especially fire could speed this dramatically.
Reduction	Valley bottom lands if sufficiently supplied with precipitation will become more productive, attractive to agriculture – removed from THLB.	May not be viewed regionally as an "impact" when balanced with other regional objectives. It would be useful to separate out the ecosystems that are winners and losers in this regard and come up with a preliminary estimate of how much area this is.
Reduction	May be selling forest land to folks migrating into the area for amenities (initially) – later for survival.	Not clear how big this would be – may be focused on areas withdrawn anyway – see above.
Reduction	Areas will likely be lost that are winter logging ground (only) because of the narrowing of the winter window for harvesting and early breakup.	Need an estimate of how much this might be.

Productive Capacity

Impact	Rationale	Other Comments
Reduction / Improvement (Net impact is not clear?)	Drier, warmer sites may lose productivity with hot/dry summers, while cooler, wetter sites may gain.	Need to examine this ecologically – how many sites may see reductions vs. how many sites are likely to see increases?

Growing Stock

Impact	Rationale	Other Comments
Opportunity to improve	With assisted migration of Fd and Lw on well-selected sites	Risky – needs to be carefully thought through.
Opportunity to improve	By making good effective use of the genetic diversity we have with populations of Pl and Sx.	Consider that most Class A seed is more diverse than local seed as it is combined in seed orchards from numerous places. We need to build on existing knowledge – Greg O'Neil of the Kalamalka Research Station should be a key contact (he is carefully considering.)
Reduction	Maladaptation of tree species	
Reduction	Related to the full range of natural disturbances – fire, insects, disease, hydraulic, wind, ice and snow damage, freeze/thaw events, summer droughts. Significant impacts on age class distributions with lots of early seral maintained due to disturbance other than harvesting. Significant impacts on natural species (trees) distributions. Many more species for example may be more heavily affected by foliar diseases (including aspen) – combinations of drought, insects, disease and other impacts will tip trees over the edge into mortality	Will impact the OAF 1 (currently set at 20%) - likely substantially increased at least over the landscape. May flip some ecosystems from treed to non-treed or only semi-treed parkland- not so much a reduction in THLB because of low productivity, but just because these sites are occupied by uneconomic species (perhaps invasives). Hits from insects and disease could be major and will occur in pulses.

Economics

Impact	Rationale	Other Comments
Opportunity to improve	Different products may emerge – carbon credits	May be able to bundle conservations benefits (protected areas) with carbon credits in a package that is quite attractive to green investors.

Impact	Rationale	Other Comments
Opportunity to improve	To convert land use to agriculture – see productive landbase.	
Opportunity to improve	May get significant economic benefits by selling land to folks migrating into the area for amenities (initially) – later for survival.	This is a double edged sword – may draw down timber harvest. When the motive turns to survival these people may have few funds to buy expensive lands.
		Other issues to consider: Policies and legislative barriers – free growing, appraisals, see transfer etc.

b) Hydrology and Aquatic Biology

Recorded by Don Morgan.

Objectives from Morice and Lakes LRMP

Hydrological structural/morphological objectives:

- Stream channel function and structure
- Floodplain structural integrity
- Riparian integrity maintenance
- Lake shore
- Alluvial and colluvial fans

Water objectives:

- Maintain water quality for First Nations, industry, recreation, etc
- Water temperature maintenance
- Water withdrawal - industry, agriculture, communities, hydro-electric
- Watershed integrity
- Minimize negative industrial use

Fish specific objectives:

- Rehabilitate high value fish habitat
- Fish access (culverts)
- Bull trout management - staging areas, fishing, temperature

Influence of climate on ecology and resource values

Climate Change	Ecological Change	Resource Value Change
precip & temp ↑	• ↑ winter flow • ↑ supply • ↑ rain on snow • ↓ summer flow (if not ↑ in summer precip) • ↑ and earlier peak flow • ↓ water table (especially if ↓ summer precip)	• ↓ quality (↑ silt and nutrient) • water temperature more even • ↑ structural change - stream channel, etc. • ↑ ground saturation • ↑ surface flow • ↓ ground water recharge
↓ summer precip & ↑ summer temp	• ↑ water temperature • ↓ flow • ↓ glacier • ↓ water table	• water quality - ↑ algae • ↓ habitat • change in fish assemblage • ↓ Bull trout • fish behaviour change (↑ wait time, struggle, ↑disease, ↓O2, etc) • ↓riparian - ↓water table, eg. loss of cottonwoods • ↓water for extraction
↑temp and precip annual and decadal variability	• dry/wet year flipping • ↑ ice jams	• uncertain water use expectations • ↓Bull trout • ↑ stream structure changes

Climate Change	Ecological Change	Resource Value Change
↑ natural disturbance	• Impact depends where in watershed event occurs • ↑ watershed snow pack • ↑ melt rate • ↓ absorption • ↓transpiration • ↑ water table in areas of accumulation • ↑ solar on ground • ↑ground water temperature	• ↓riparian habitat • ↑ temperature • ↑ structural change • ↓Bull trout • ↓water quality • ↓O2
↑logging	• ↓shade • ↓snow interception • ↑stream temperature • ↓transpiration • ↑drainage - roads • ↑peak flow • earlier melt with snow pack and exposure	• ↓water quality • ↑water temperature • ↓stream flow - summer and fall • structural change • ↓fish habitat • ↓Bull trout

c) Biodiversity—coarse filter

Recorded by Dave Daust

<u>Old seral representation</u>

As temperature increases, natural disturbance (e.g., fire, insects and disease) will increase. Old seral stages will be disturbed directly. Also disturbance of younger seral stages can reduce the amount of forest entering the old seral.

Many mature and old stands will be partially disturbed. What value will these stands have for biodiversity? How should they be counted in conservation planning?

<u>Setting Seral targets by Subzone</u>

Currently seral stage representation targets are set for each BEC Subzone. Subzone boundaries reflect regional climate. As the climate changes, subzone boundaries will change. It may be better to set representation targets for more enduring ecological features such as topographic features and parent material.

Reserved areas (OGMAs and WHAs)

Increased natural disturbance will affect areas set aside for conservation. The role of these reserved areas needs to be clarified. Are reserves intended to represent natural areas or old seral forest? More specifically, if old growth management areas (OGMAs) are heavily disturbed, should they be moved? If Wildlife Habitat Areas (WHAs) are heavily disturbed, should they be moved?

WHAs may also become unsuitable because of changes other than natural disturbance (e.g., snowpack).

Microclimate conservation

Should forests be managed to maintain specific microclimatic conditions?

Connectivity

Should forests be managed to retain corridors across the landscape (e.g., South to North and low to high elevation)? Complicating matters, connectivity is a function of species considered and connectivity may assist spread of insects and disease. Note that roads also affect connectivity.

Invasive species

As temp increases, invasive species will increase and may outcompete other species particularly on disturbed sites. Roads provide travel corridors for invasive plants.

Stand-level retention

Wildlife Tree Patches are relatively exposed and will be stressed by changes in temperature and moisture, becoming more susceptible to insects and disease. Increased wind will also cause mortality. Thus, large live trees in WTPs will probably die sooner, becoming snags and down wood, relatively sooner in the rotation. The ecological costs and benefits of this change in timing are poorly understood.

WTPs also provide connectivity at the stand scale.

Tree species composition

Lichens, invertebrate and birds are sometimes associated with specific tree species. Maintaining tree species diversity will support biodiversity. Regeneration standards including acceptable species and stocking should perhaps be re-evaluated.

Rare ecosystems

Rare ecosystems support rare plant communities. As ecosystems re-organize under climate change, new plant communities will develop and the concept of a rare ecosystem fails. It may be more appropriate to consider rare site conditions.

c) Biodiversity—specific species

Focal species identified in plans (e.g., red-listed)

In response to climate change, the expected viability of these species in a region may either increase or decrease. This project should take a coarse look at these species, using a triage approach, to determine which species should be a priority for further study.

Archetype species (niche space)

Examine impact of climate change on a range of life history strategies and habitat requirements.

Foundation species

This project should consider impact to the species that many other species depend on. Trees are the obvious example of a foundation species, but other foundation species should be identified.

Stratifying the landbase

Climate impacts will vary by ecosystem. Consider impacts on different ecosystem types:

- SBS versus ESSF (or relatively low versus relatively high elevation forest)
- High productivity versus low productivity sites
- Valley bottom versus upland sites; valley bottoms have high timber and biodiversity value; this division overlaps with the high versus low productivity division above—may not need both.
- Watershed type (e.g., presence of lakes and/or glaciers)—mainly for the purposes of hydrological impacts.
- Morice versus Lakes TSA, because Lakes TSA has relatively gentle topography and hence trees will have to move farther to find suitable climate

Use “example valleys” to aid communication

Note: downscaled maps need review by ecologists because downscaling is a mathematical process and some results may not make ecological sense.