

The Kamloops Future Forest Strategy Project

OVERVIEW

Presentation for December 11, 2008
Climate Change Seminar Series

A FIA funded project

Proponent – Kamloops TSA Future Forest Team

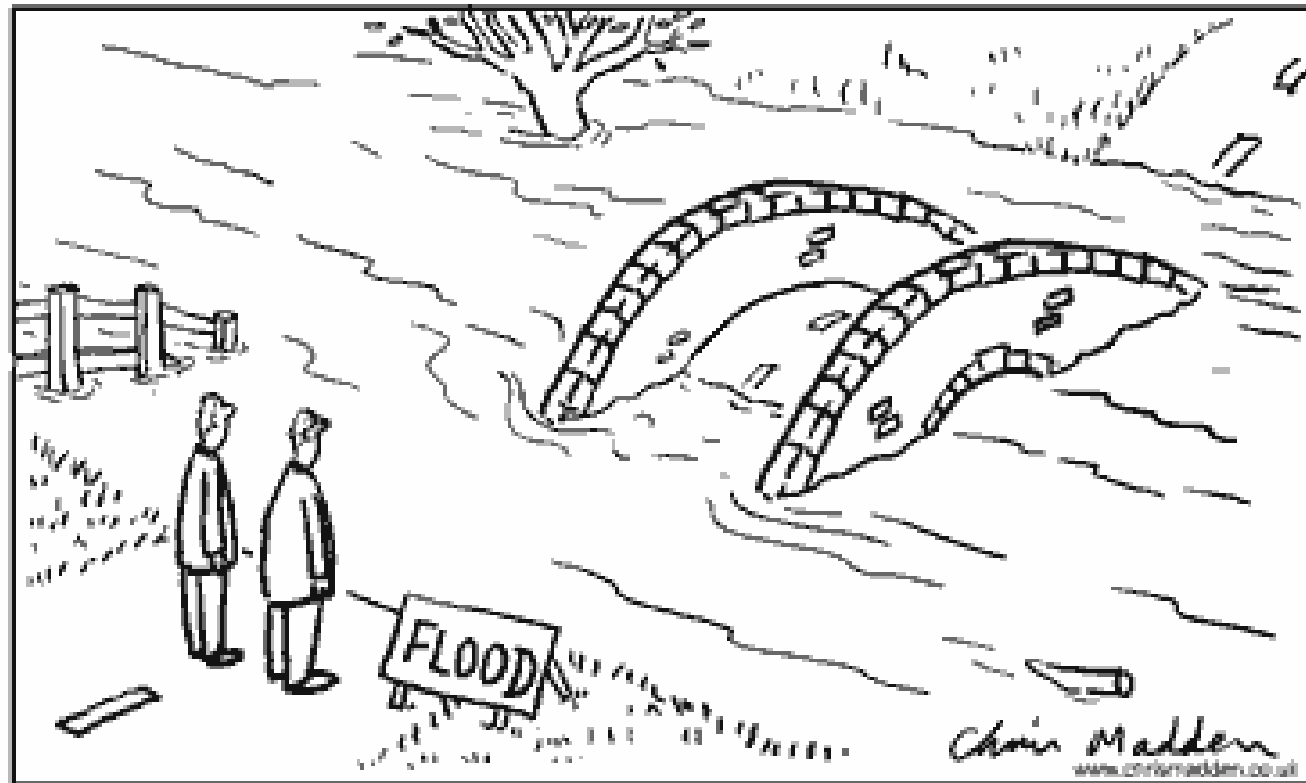
Support Team - Symmetree Consulting Group Ltd, Forsite and
Shamaya Consultants

GOAL of the KFFS...

To rationalize expectations and direction for future forest management...

...in the context of expected impacts of climate change.

And hopefully
avoid some
surprises



OBJECTIVES of the KFFS...

1. **Identify current expectations and management direction for the future forest condition**, and highlight potential overlap.
2. **Understand the range of potential impacts from climate change**, based on well-informed local climate modeling.
3. **Identify vulnerabilities for forest management expectations and direction** based on the impacts of climate change and other influences.



OBJECTIVES of the KFFS...

4. **Design options to modify management direction**, better aligned with the impacts of climate change and other influences.
5. **Articulate a robust desired future forest condition** to promote general goals for timber and other values so they are not jeopardized over the long term.
6. **Identify data gaps and uncertainties.**
7. **Provide a template** for managing multiple objectives in a changing environment.



The Kamloops Future Forest Strategy Team...

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KFFS the steps so far

Review of plans and direction for the TSA

Create climate change scenarios for the TSA

Workshops to identify ecological vulnerabilities

Field tour with the Chief Forester

Summary of workshops into Ecological Narratives by subzone

Workshops to identify management issues and options.

Next steps:

Summarize issues and options

Website: <http://www.for.gov.bc.ca/hcp/ffs/kamloopsFFS.htm>

Modeling Climate Change with ClimateBC...

Bookends - Used two different Global Climate Models with divergent Global Emission Scenarios:

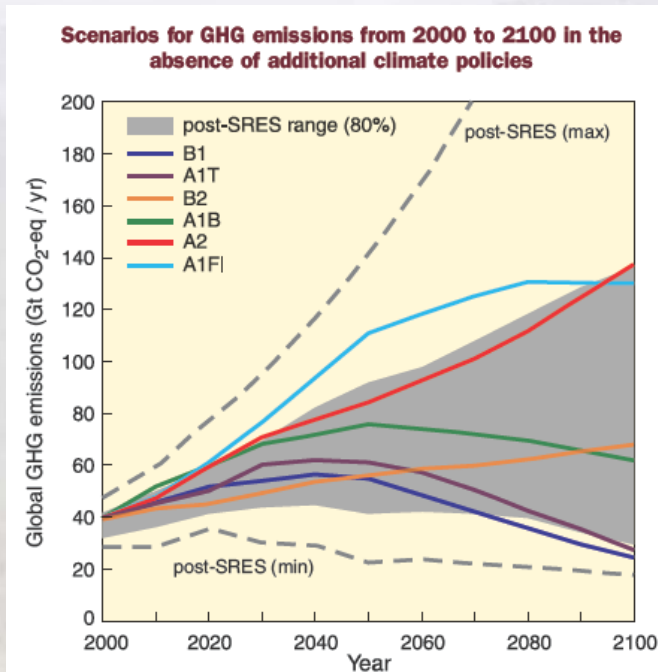


Figure 3.1. Global GHG emissions (in GtCO₂-eq per year) in the absence of additional climate policies: six illustrative SRES marker scenarios (coloured lines) and 80th percentile range of recent scenarios published since SRES (post-SRES) (gray shaded area). Dashed lines show the full range of post-SRES scenarios. The emissions include CO₂, CH₄, N₂O and F-gases. [WGIII 1.3, 3.2, Figure SPM.4]

HadCM3-A1F1 (Most Change / Worst Case Scenario)

- Hadley Centre for Climate Prediction UK.
- Pessimistic view of future emissions –current trend into the future.
- Predicts hottest driest summers.

PCM-B1 (Least Change / Best Case Scenario)

- Atmospheric Research Program for Climate Modeling USA.
- Optimistic that emissions will be significantly reduced.
- Predicts moderate summers.

General Climate Trends across the TSA – Scenarios



"More decisive? How can I be more decisive?
- I live by the uncertainty principle!"

Which scenario will play out?

IPCC gives no likelihood to any of the scenarios, all have some potential, thus looking at the bookends to see the range of future possible outcomes.

General Climate Trends across the TSA – Model linkages

Start with 4 x 4 km 1960-1990 normals, Climate BC – localizes it (Wang et al 2006)

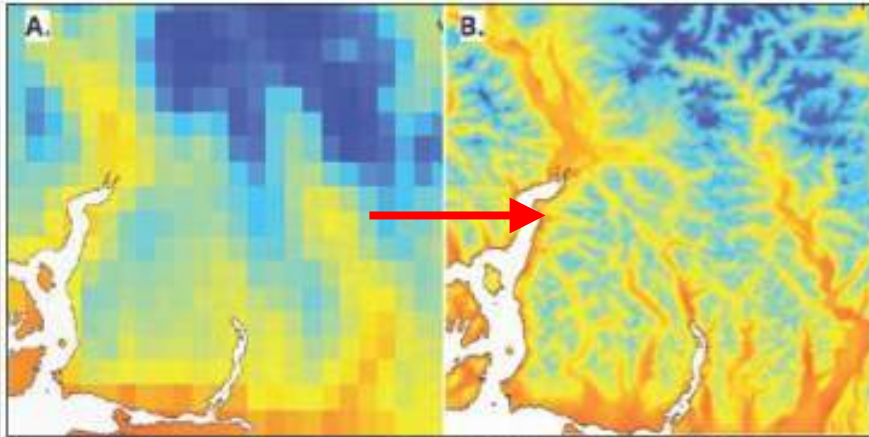
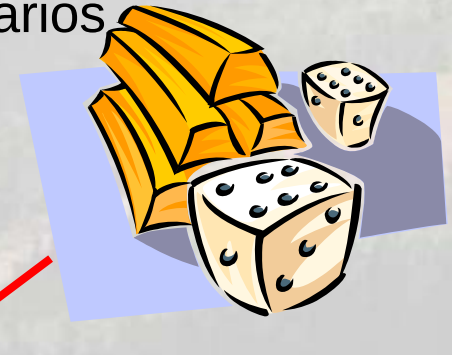
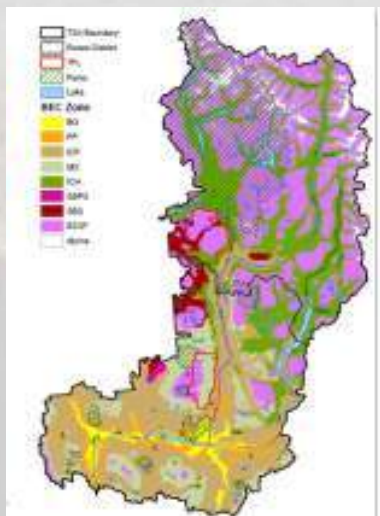


Figure 1. Maps of mean annual temperature predicted by A) PRISM, and B) ClimateBC v2.3 for the area north of Vancouver area at a resolution of 100 x 100 m. Source: Wang et al, 2006.

Run the global climate models with data from Climate BC to get future climate scenarios

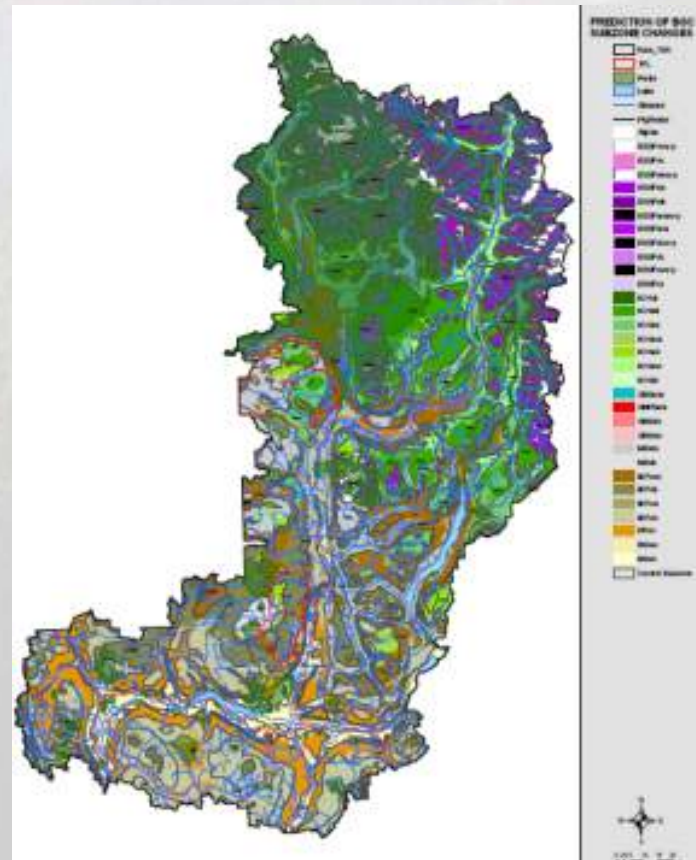


Create BEC climate envelope maps for interpretation by scenario

Modeling Climate Change with ClimateBC...

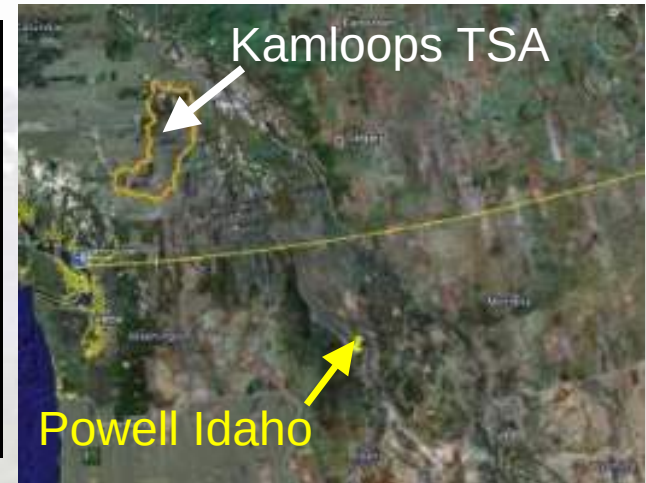
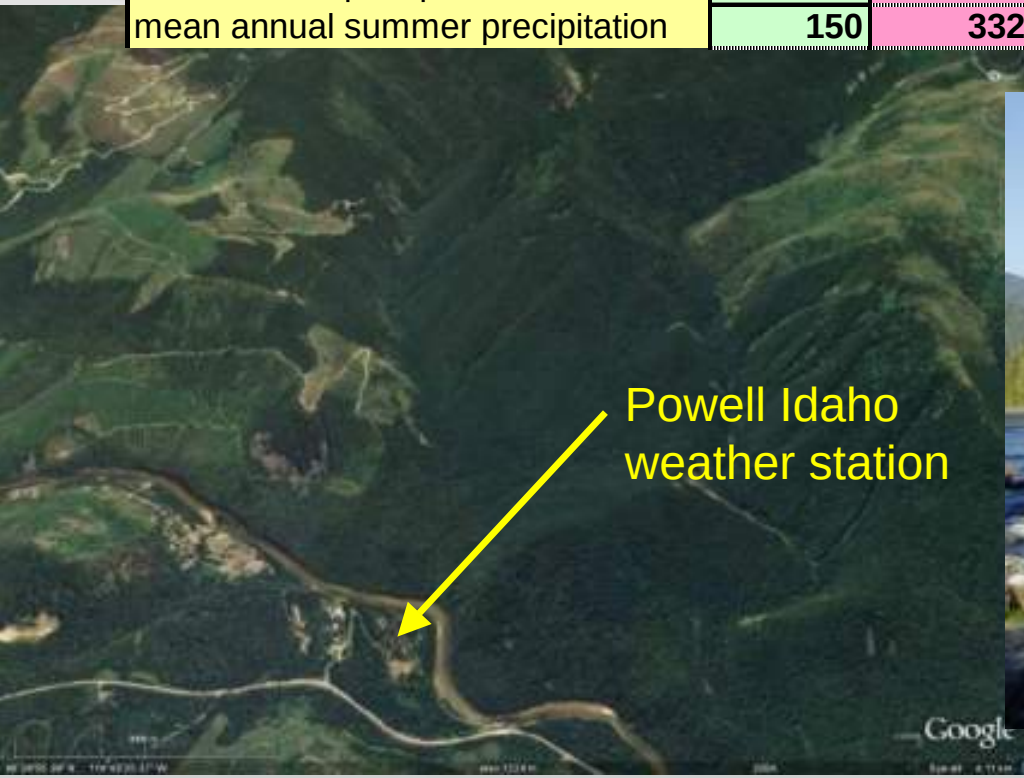
Used GIS tools used to:

- **Express changes in future climates as changes in subzone-climates.**
- Explored the reclustering of new climate variables guided by current data.
- Local ecologist occasionally had to use judgment for boundary decisions.
- Map the tool to begin the discussion not the end point.



PROBLEM - BC BEC subzone not entire adequate to describe future subzone climates

	Powell Idaho	ICHmw KTSA	ICHmw vs Powell
ANNUAL CLIMATE VARIABLES	NOW	HAD 2050	NOW
mean annual temperature	6.0	6.4	0.4
extreme minimum temperature	-35.0	-35.3	(0.3)
mean coldest month temperature	-4.5	-6.7	(2.2)
mean warmest month temperature	17.6	19.7	2.1
mean annual precipitation	988	958	-3.1%
mean annual summer precipitation	150	332	121.6%



General Climate Trends across the TSA



Temperature 2008 to 2050 (relative to 1960-90)

Warmer overall	<ul style="list-style-type: none">• Mean annual temperature - increase by 1 to over 3 degrees (consistent across subzones)
Warmest month warmer yet	<ul style="list-style-type: none">• Mean temperature of the warmest month - increase by 2 to 6 degrees (relatively consistent).
Min temps warmer	<ul style="list-style-type: none">• Extreme minimum temperature – increase by 3 to 5 degrees (relatively consistent).
Coldest month warmer	<ul style="list-style-type: none">• Mean temperature of the coldest month – increase by about 2 degrees (relatively consistent).

Temperature
→

General Climate Trends across the TSA



Precipitation 2008 to 2050 (relative to 1960-90)

Wetter



Summer drier

**Shoulder and
winters wetter**

Winter more rain

- Mean annual precipitation will increase by 3 – 4% (sometimes as low as 2% and as high as 5%)
- Summer precipitation will generally decline by 1 – 10%.
- Precipitation in the Fall, Winter and Spring will generally increase.
- More rain in winter with precipitation as snow declining by 2 to 23% (variable between subzones).

NOTE: Modellers more uncertain with precipitation trend forecasts. Increased temperatures are expected to reduce winter snowpack and increase summer drought.

General Climate Trends across the TSA



Temperature 2050 to 2080 (relative to 1960-90)

Lots warmer overall	• Mean annual temperature - increase by 3 to over 7 degrees (varies by subzones)
Warmest month warmer yet	• Mean temperature of the warmest month - increase by 2 to 10 degrees (varies by subzone).
Min temps potentially lots warmer	• Extreme minimum temperature – increase by 5 to 10 degrees (varies by subzone).
Coldest month a bit warmer	• Mean temperature of the coldest month – increase by about 3 – 3.5 degrees (slight variation by subzone).

Temperature



General Climate Trends across the TSA



Precipitation 2050 to 2080 (relative to 1960-90)

Wetter yet 	<ul style="list-style-type: none">• Mean annual precipitation will increase by 4 – 8% (varies by subzone)
Summer potentially much drier	<ul style="list-style-type: none">• Summer precipitation will generally decline by 1 – 20%.
Shoulder and winters wetter	<ul style="list-style-type: none">• Precipitation in the Fall, Winter and Spring will generally increase as for previous period.
Winter more rain	<ul style="list-style-type: none">• More rain in winter with precipitation as snow declining by 1 to 40% (variable between subzones).

NOTE: Modellers more uncertain with precipitation trend forecasts.

It is expected that a significant proportion of precipitation may occur as severe weather events.

General Climate Trends across the TSA - Tree growth



Extended Growing Season – could be at both ends.

✓ Wetter subzones (?)



However, in drier subzones the growing season will likely be influenced significantly by drought and the summer heat:moisture index.

Ecological Vulnerability Assessment

**Specialist Discussions and Literature Reviews
to ID key vulnerabilities and opportunities**



Stand or tree
vigor?



Other Plants?



Insects and
Disease
Impacts?



Abiotic disturbance

Output - Ecological Narratives e.g., ICHdw

ECOLOGICAL SUMMARY AND NARRATIVE for the Kamloops Future Forest Strategy

ICHdw

Short-term Vulnerability = HIGH
Long-term Vulnerability = HIGH

Ecological Narrative for the ICHdw through to 2080:

2008 to 2050

The influence of climate change

This subzone will go through a very dynamic transition up to 2050, whereby most mature and maturing tree species that currently exist will be increasingly vulnerable to disease, drought and insects. This process has already begun and is evident in this subzone with Douglas-fir, birch, and lodgepole pine, already reducing the merchantability of the mixedwood stand types that dominate the subzone. From now till 2050 increased warmth with good inputs of moisture in the spring and fall may improve vitality of *Armillaria* root disease, which is ubiquitous in this subzone. This will likely boost a mortality rate already increasing in older Douglas-fir when combined with an expected small increase in summer drought and a higher risk from bark beetles. While redcedar is more tolerant to *Armillaria* in these stands, vigour in redcedar will likely continue to decline and top dieback will increase due to summer drought, especially on warmer slopes.

A slightly prolonged summer drought period with increased fuels will provide a small to moderate increase in fire risk across the subzone, which will fluctuate periodically up to 2050. This shifting local risk will emerge in pulses as concentrations of dead trees pass through high risk phases that may coincide with dry summers. The further expansion of broadleaf trees and shrubs, which are already common in this subzone, into newly created gaps may help lower fire risk over time. Nevertheless, there is a moderate risk of several large wildfires in this subzone over the next 40 years, particularly beyond 2020 when warm cycles may coincide.

Estimated future forest condition of stands currently mature

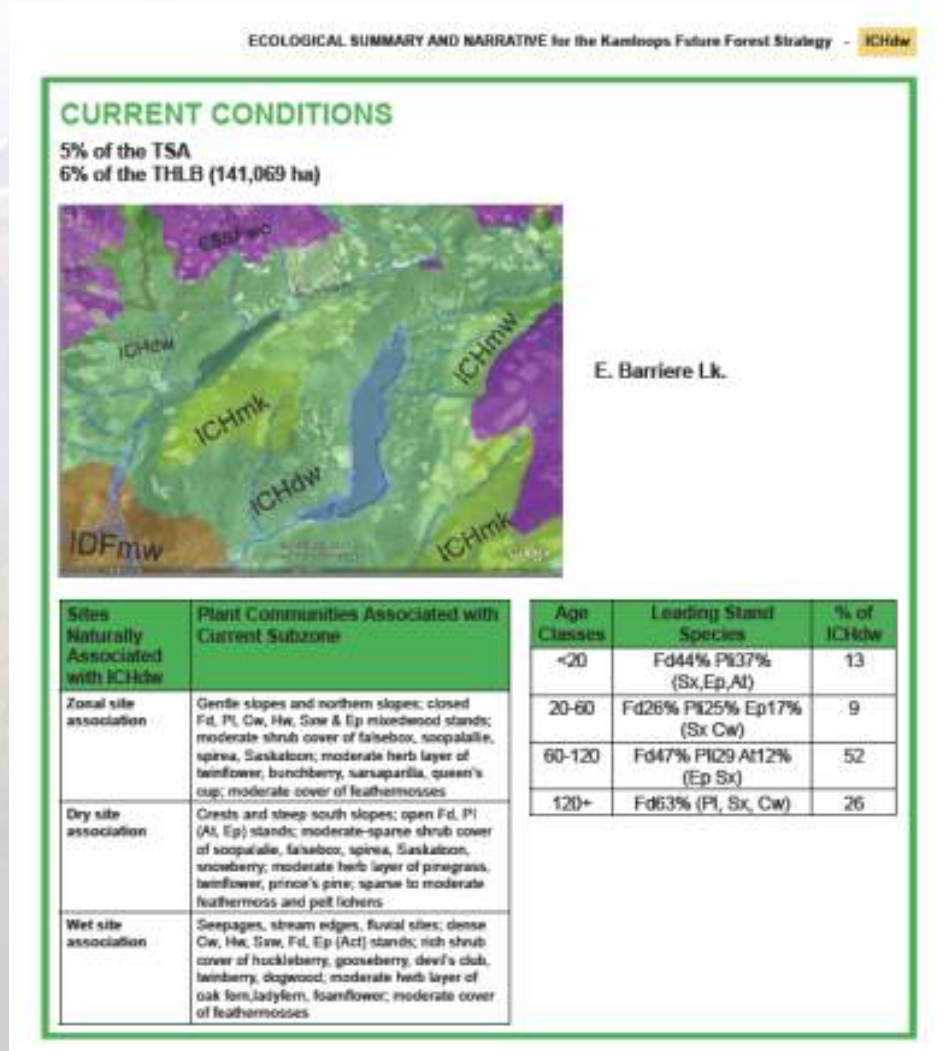
The result will be that birch and redcedar will likely disappear from warmer southern and western slopes. The presence of mature Douglas-fir in the common mixedwood types will be reduced to scattered pockets. Many older stands will therefore be dominated by low vigour non-merchantable species such as aspen, birch, redcedar, and shrub species such as maple. Harvestable older forest types with concentrations of merchantable species and sizes will become fragmented and more isolated. South slopes will see more aspen and dry-complex shrubs with much less birch.

For each subzone an Ecological Narrative or story is created.

This sets the stage for the management issues and options stage of the project.

Ecological Narrative e.g., ICHdw

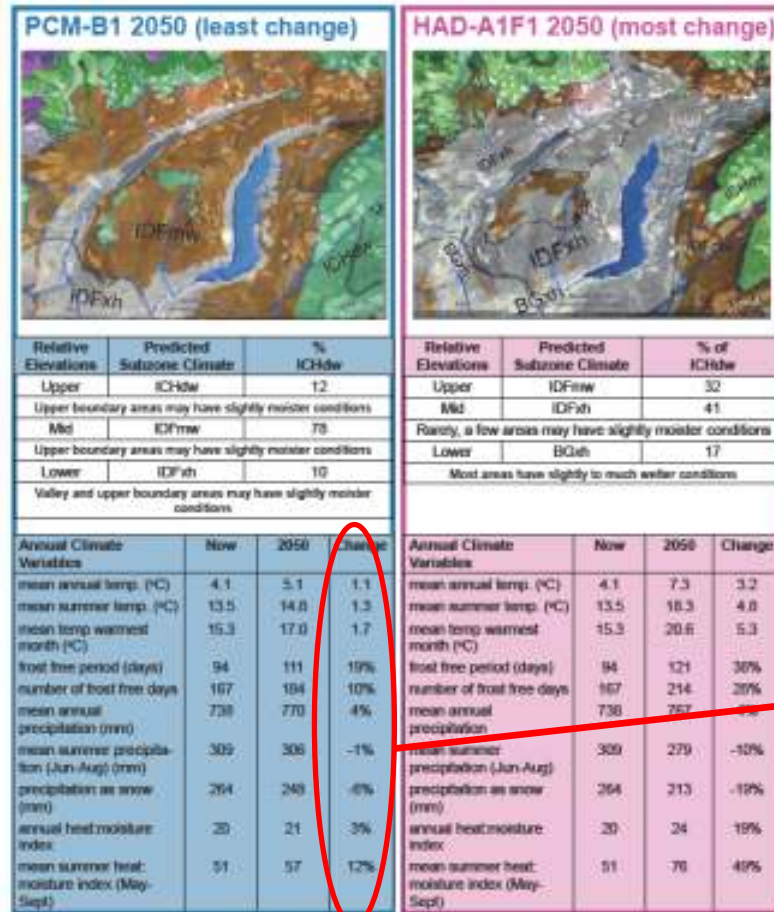
Current conditions and age class distributions are provided for context.



Ecological Narrative e.g., ICHdw

ICHdw - ECOLOGICAL SUMMARY AND NARRATIVE for the Kootenai Future Forest Strategy

Climate Scenarios



Normal summer heat:moisture index comparisons:
ICHdw - 28; ICHmw - 42; IDFdh - 90; BQdh - 139

Maps are a useful start, but it is instructive to look too at climate trends

Annual Climate Variables	Now	2050	Change
mean annual temp. (°C)	4.1	5.1	1.1
mean summer temp. (°C)	13.5	14.8	1.3
mean temp warmest month (°C)	15.3	17.0	1.7
frost free period (days)	94	111	19%
number of frost free days	167	184	10%
mean annual precipitation (mm)	738	770	4%
mean summer precipitation (Jun-Aug) (mm)	309	306	-1%
precipitation as snow (mm)	264	248	-6%
annual heat:moisture index	20	21	3%
mean summer heat:moisture index (May-Sept)	51	57	12%

Management Vulnerability/Opportunity Assessment

Specialist Discussions and Literature Reviews to ID key vulnerabilities and opportunities



Conservation of Biodiversity?



Species at risk



Timber



First Nations Interests



Recreation / Visuals



Water

Management Vulnerability / Opportunity Assessment

Workshops focused on:

- Timber
- Biodiversity, Habitat and First Nations Cultural Plants
- Hydrology, Fish and Visuals



KFFS - Management Vulnerability Workshop

ICHdw

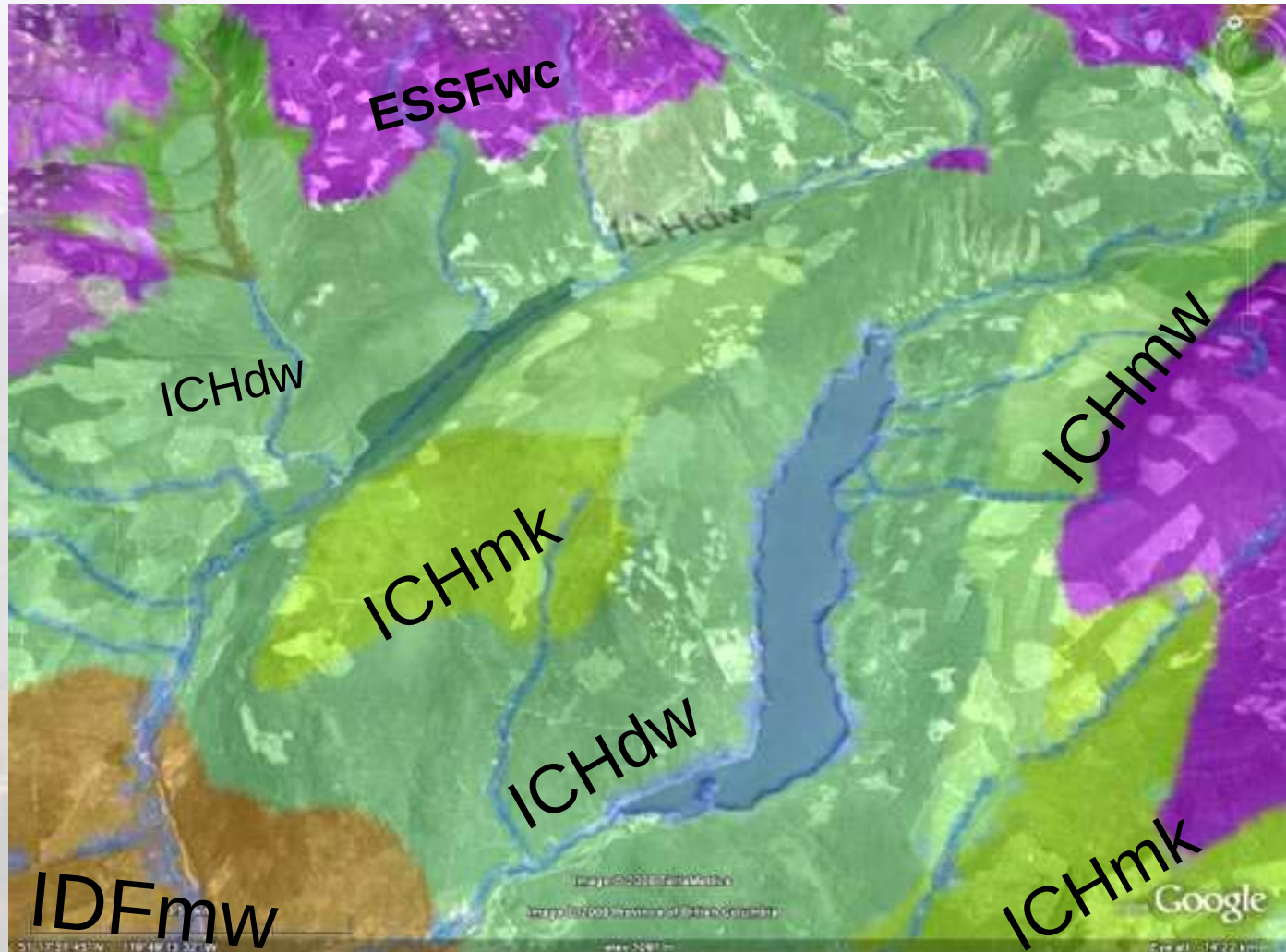
(5% of TSA)

(6% of THLB)

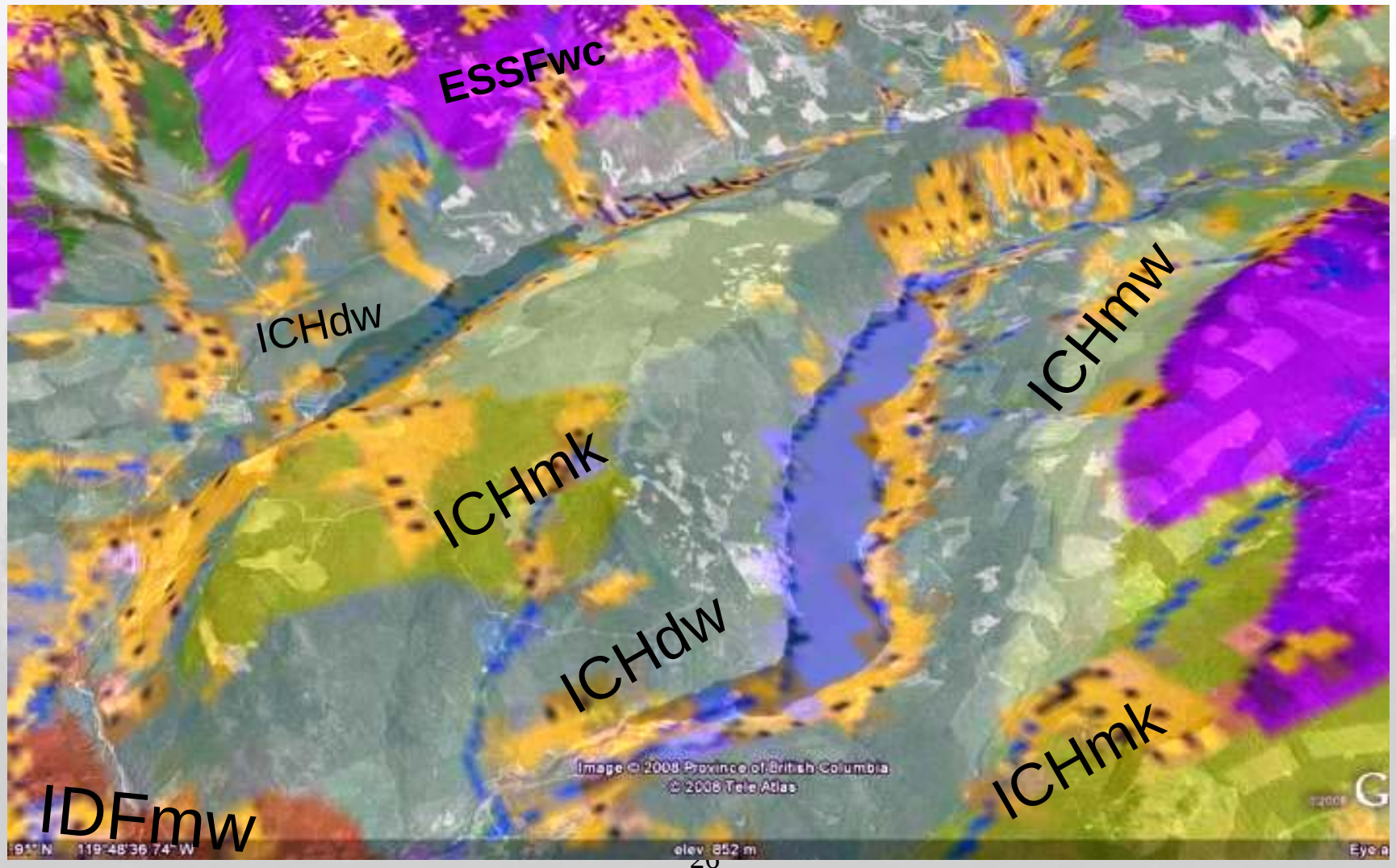
ICHdw – East Barriere Lake



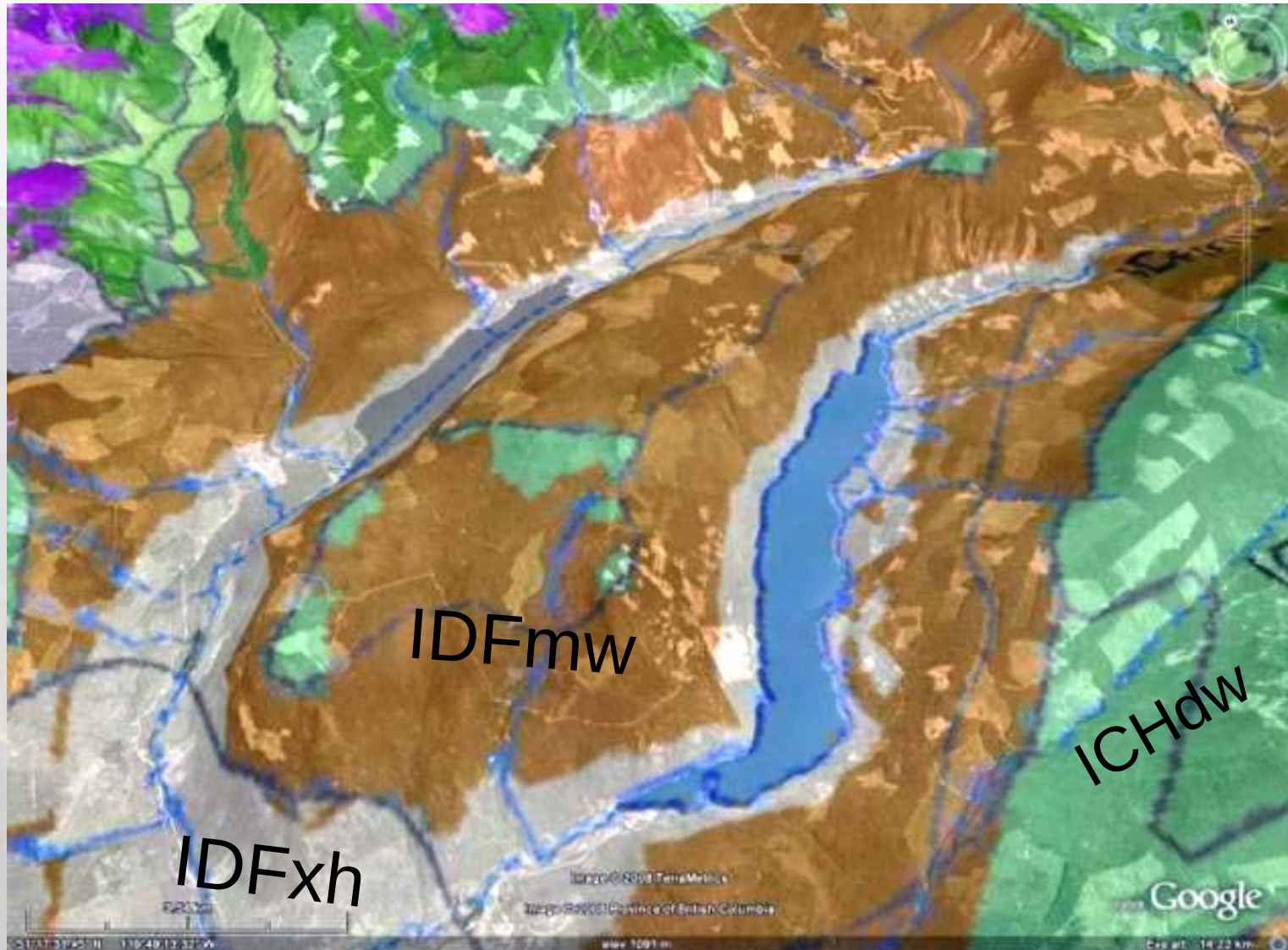
ICHdw – East Barriere Lake – CURRENT BEC



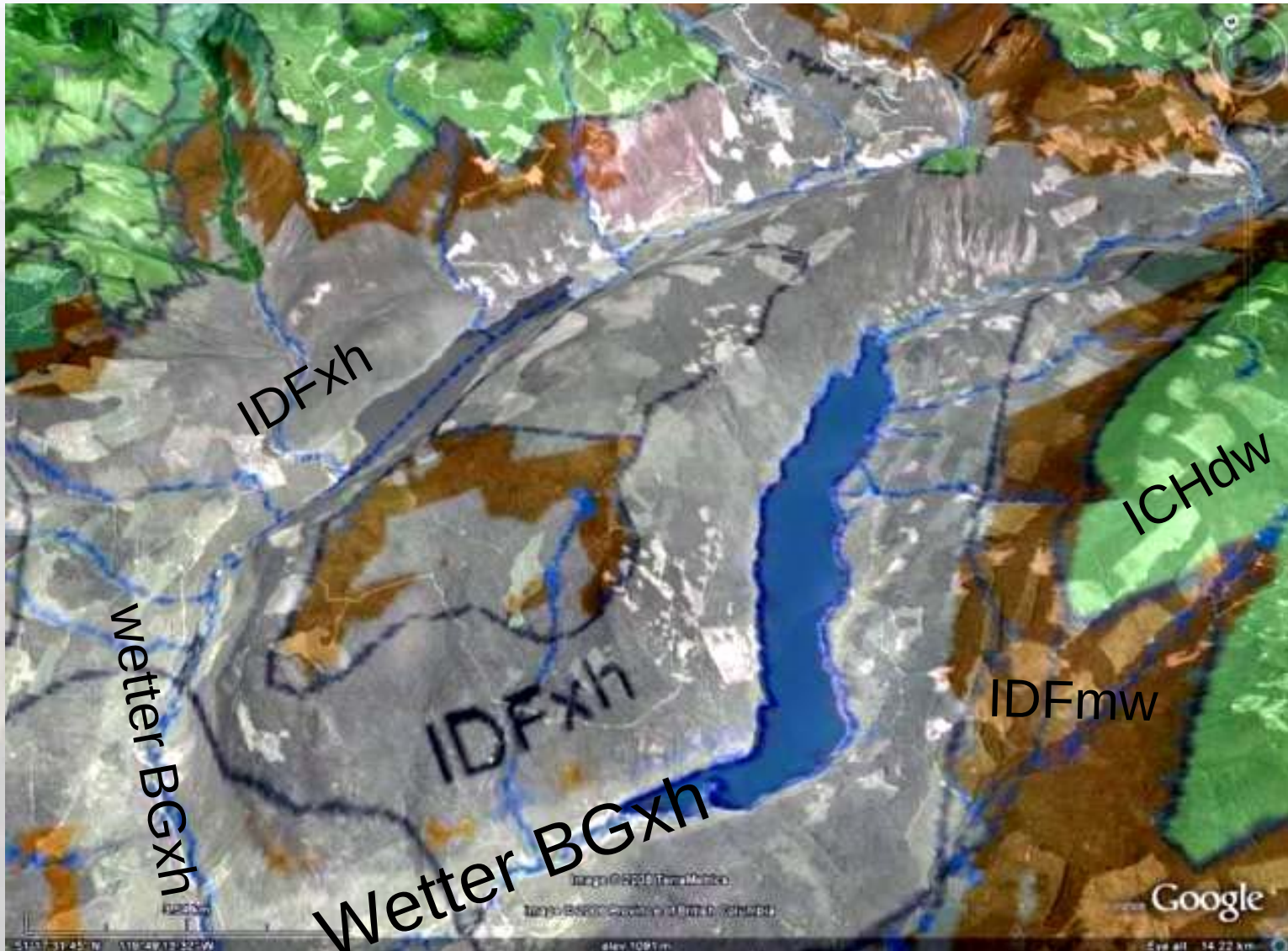
ICHdw – East Barriere Lake – CURRENT BEC



ICHdw – East Barriere Lake – PCM-B1 2050



ICHdw – East Barriere Lake – HAD-A1F1 2050



2008-50 ICHdw Ecol. Narrative – HIGH Sensitivity :

General climate influences :

- Temperature regime between the IDFmw and IDFxh.
- Precipitation is between the IDF and ICH
- Drought stress, vigorous Armillaria and beetle – significant mortality (Evident already with Doug-fir, PI and birch).
- Cw will also have problems with drought – marginal in the subzone to begin with.
- Fire hazard moderate over time due to increased fuels



2008-50 ICHdw Ecol. Narrative – HIGH Sensitivity :

Future forest conditions – current mature stands :

- Mature Doug-fir will become much more patchy and fragmented in the mixedwood stands common here.
- Harvestable older types will be harder to find.
- S slopes will have less birch and more aspen and dry shrubs.



2008-50 ICHdw Ecol. Narrative – HIGH Sensitivity :

Future forest conditions – young stands :

- Doug-fir will do well where established in plantations post-stumping.
- Pli will see increased problems with rusts, root collar weevil and other pests – significant mortality in pure plantations.
- Doug-fir, larch and ponderosa pine mixed in will provide diversity.



PEEK FURTHER INTO THE FUTURE

ICHdw East Barriere Lake – PCM-B1 2080



PEEK FURTHER INTO THE FUTURE

ICHdw East Barriere Lake – **HAD-A1F1 2080**



2050-80 ICHdw Ecol. Narrative – HIGH Sensitivity :

General climate influences :

- Much hotter and drier summers – close to IDFxh / BGxh temp
 - Precipitation closer to IDFmw
- Armillaria problems may decline as ecosystems get drier
- Stumping in the past will pay off – relatively good stands of Doug-fir
 - May get some mortality to thin out stands and growth will likely decline somewhat.



2050-80 ICHdw Ecol. Narrative – HIGH Sensitivity :

Future forest conditions – mature stands :

- Less problems in scattered Doug-fir stands, but vigor decline somewhat.
- In older stands - birch and Cw will gradually disappear except on moist sites.
- Aspen may expand – especially on moister aspects.
- More drought tolerant shrubs and herbs on dry south slopes.



Management Vulnerability / Opportunity Assessment

Considered key questions for climate change.



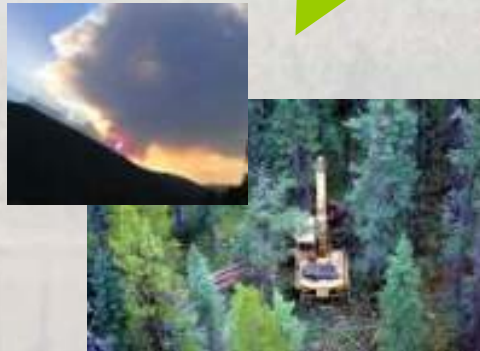
Performance of existing stands?



Biodiversity?



Tree Seed Supply?



Natural Disturbance and Salvage



Role of Broadleaf and other species?



Timber Supply Sensitivities?

Management Vulnerability / Opportunity Assessment

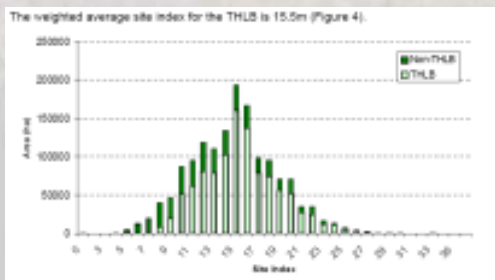
Information to consider by subzone and specific management areas:



Ecological Vulnerabilities



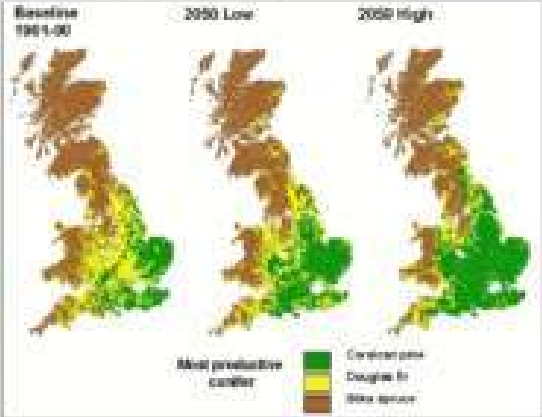
Other Pertinent Information



Existing Management Expectations and Direction

[illegible]

Numerous FFEI projects working on this.



<http://www.forestresearch.gov.uk/website/forestresearch.nsf/ByUnique/INFD-5ZXFSD?OpenDocument&Click=>

Options for Integrated Management Direction



Integrated Management Direction

- Actions or practices in broad stand types or ecosystems.
- Rationalize expectations and management in the context of:
 - Projected vulnerabilities/issue and opportunities.
 - All pertinent resource values.
- Consider adaptive capacity

Challenges

Policy issues on species use – what is the best route forward?

Strategic planning direction – LRMP from 1995, present direction is limited – guidance is general and may be out of date.

Limitations of the SFMP – needs more interdisciplinary input to address climate change direction.

Biodiversity planning – done to minimize impact on the cut, not to maximize biodiversity – problematic with shifting climate: what were the original objectives for the areas retained, do they remain valid?



Challenges

Tactical planning – no concerted multistakeholder planning to address issues and plot a course ahead.

For example: Multi licensees on the same landbase without coordination, issues with small scale salvage and possibly biofuel tenures harvesting areas left by others for biodiversity.

Economic climate – cost of participation in planning is an obstacle.

Lack of incentives to do things differently – e.g., harvesting stands at risk.

Incorporating new information as it becomes available, where does it fit?



A photograph of two people in a forest setting. They are wearing orange safety vests and are sitting on a large, weathered tree stump. The person on the right is wearing a green cap and is writing in a notebook. The person on the left is wearing a blue jacket. The background is filled with green coniferous trees and some bare branches.

REMEMBER – Climate change poses a challenge, but one worth tackling. As a pilot much is being learned on how to address issues as they emerge, as more information becomes available ...

It must be revised, refined and adjusted – keep in touch,

Thanks

www.symmetree.ca