Climate Change Adaptation Workshops

Climate Change: Guidance for Tree Species Selection

Northern Interior

Ministry of Forests, Lands, and
Natural Resource Operations

2014

BRITISH COLUMBIA

This session's agenda

A brief history of species selection guidance

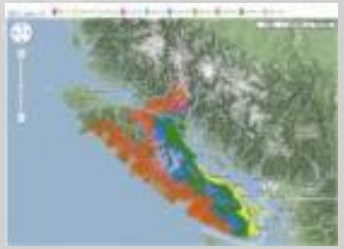
- The basics – feasibility, reliability, productivity

Climate Change – what to expect

- Ecological guidance including fire
- Seed Transfer
- FRPA tests
- Present direction and flexibility
- Questions and wrap up

Learning Objectives for the Session

1. Understand the importance of bringing climate change into the decision process for selecting species
2. Awareness of where to find ecologically based direction
3. Understand the rules surrounding seed transfer and use



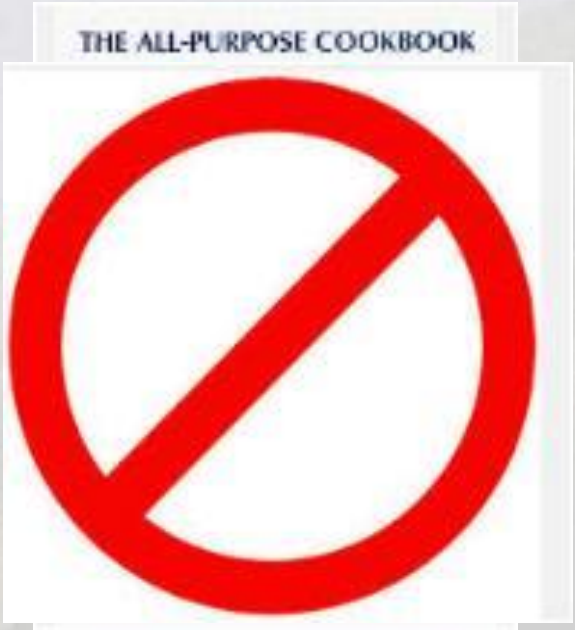
Species Selection and Climate Change 101 (lite)

- A correlated set of stocking standards were first created in 1993 – 20 years + ago to guide species use.
- They provided the following direction:

"Follow not the system as a blind man follows a wall"

Climate Change: Guidance for Tree Species Selection

Or more specifically - understand your objectives and options - through thoughtful deliberation choose species and mixes that meet the desired outcomes – there is no one cookbook answer.



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- Species guidance uses the following 3 key elements:
  - **Feasibility** – this is a critical component of all reforestation decisions and is amplified when Climate Change suggests moving some species into areas where they were not previously found
  - **Reliability** – again critical – what threats are there now and potentially in the future – this is addressed by the long term forest health test
  - **Productivity** – this is again key, the tree improvement branch is fully committed to climate based seed transfer – matching genetics to growing conditions

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Standards are to:

- Be based on ecologically appropriate species
- Be measurable
- Describe where and when it will apply
- Have clearly defined target conditions
- Maintain or improve forest health
- Maintain stand productivity or minimize the impacts to stand productivity
- Maintain or enhance the commercially valuable timber supply
- Define acceptable levels of variability

Species evaluation and categories

Primary – ecologically acceptable with a high rating for F, R, and P - managed as a major component of the stand

Secondary – ecologically acceptable but rank lower for one or more of F, R and P – managed as either a major or minor component of the stand

Tertiary – ecologically acceptable – usually only suitable as a minor component of the stand

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How to bring in climate change into the thought process?

What information is out there?

Climate Change: Guidance for Tree Species Selection

Global Circulation Models and Downscaling

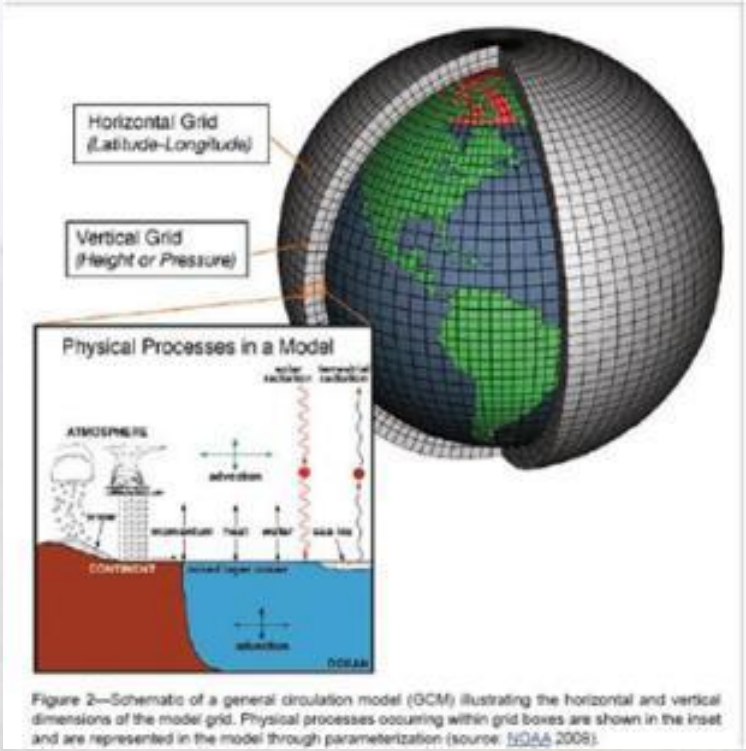
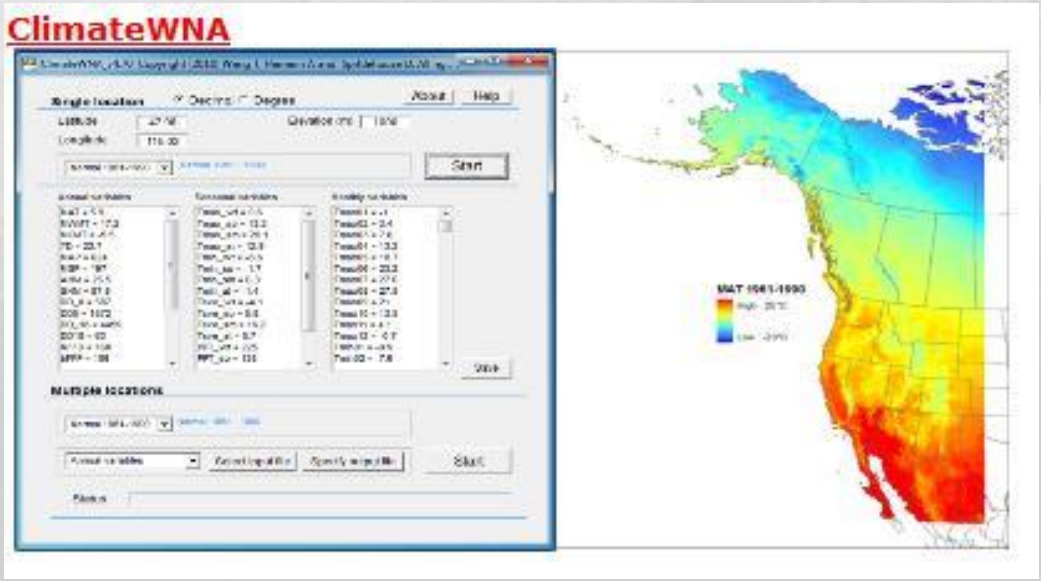


Figure 2—Schematic of a general circulation model (GCM) illustrating the horizontal and vertical dimensions of the model grid. Physical processes occurring within grid boxes are shown in the inset and are represented in the model through parameterization (source: NOAA 2008).

Mathematical representation of global climate system (the physics) – takes global climate and is downscaled for interpretation – e.g. Climate WNA



Natural Variation

Climate the bigger picture

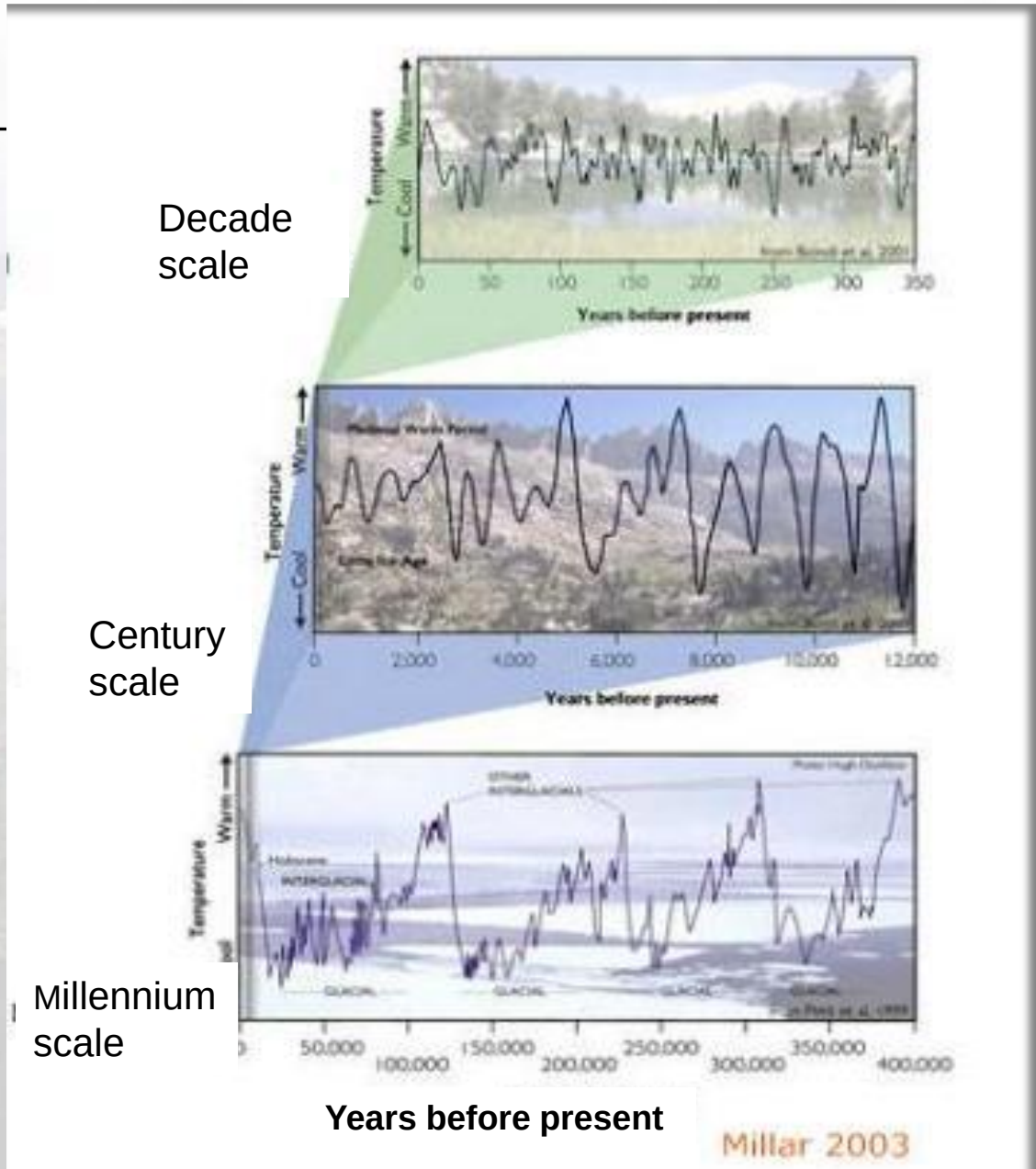
Earth's natural climate system varies over time

Climate changes over time with different patterns and modes.

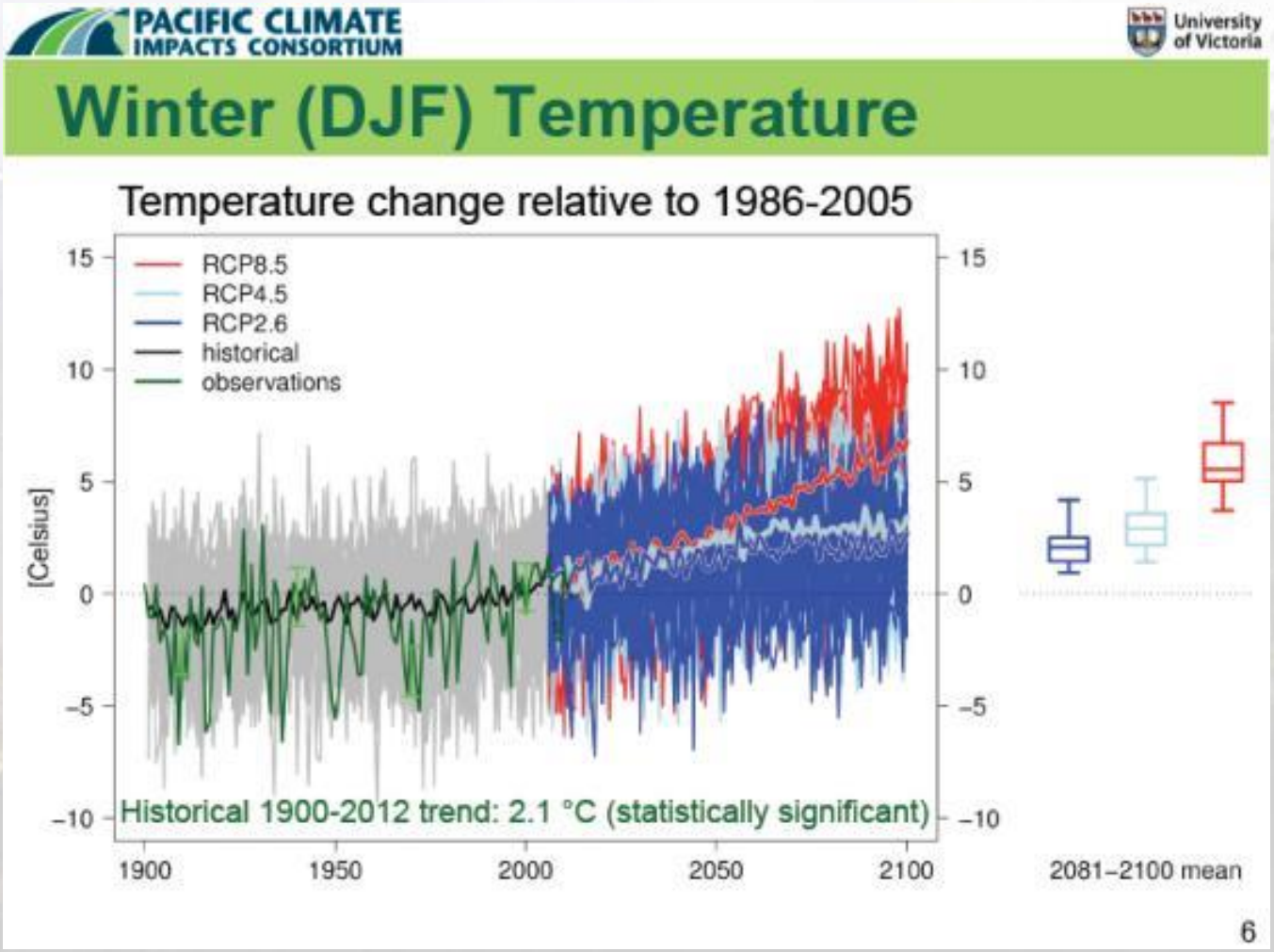
Modes are nested in annual, decadal, century and millennial scales

Note: Different mechanisms drive different modes

Source: Millar 2003

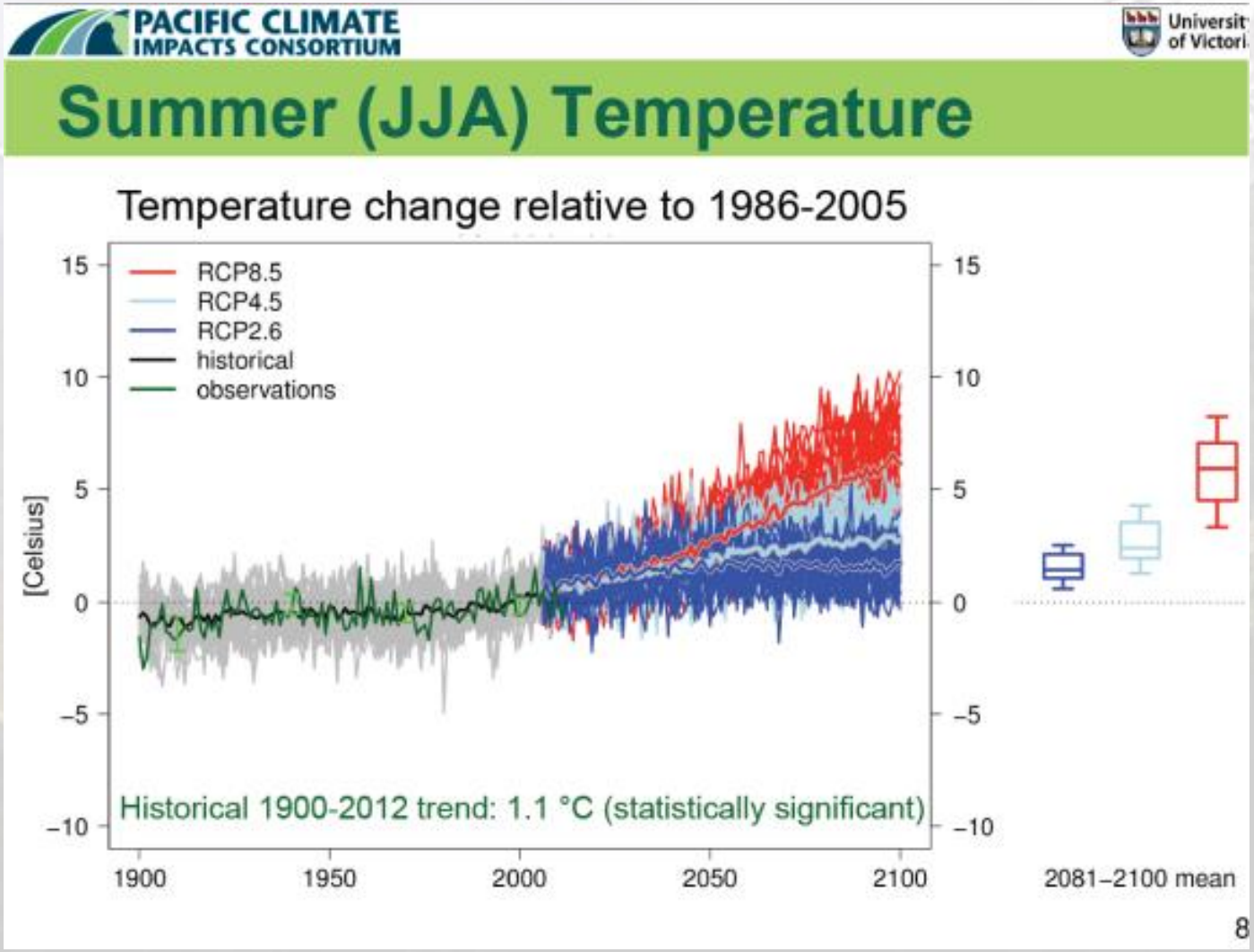


Natural Variation

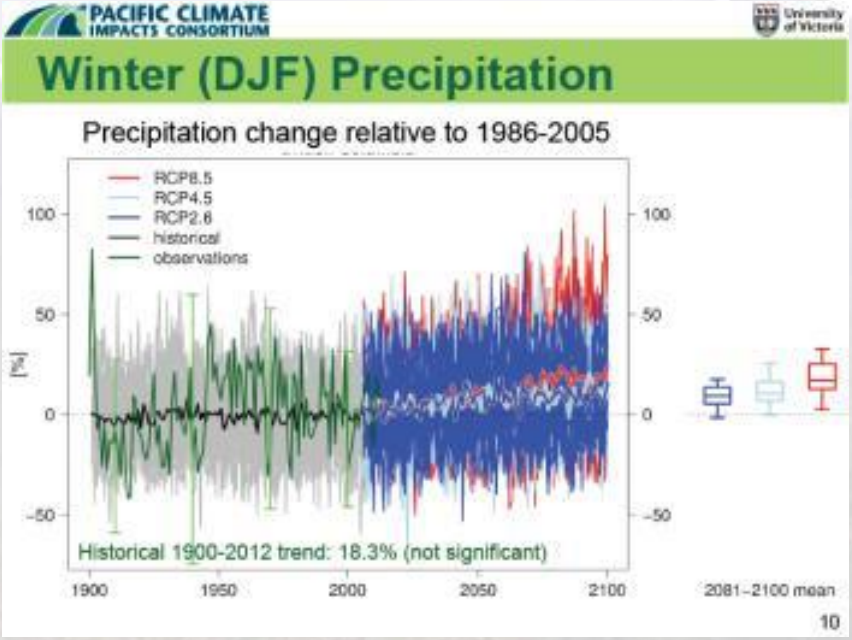


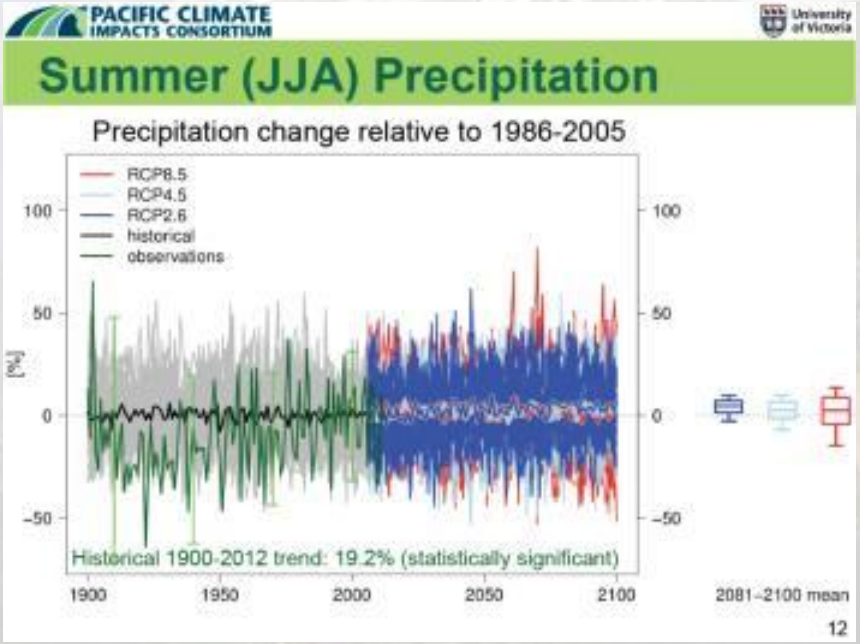
Source: http://www.climatechange2013.org/images/uploads/WGIAR5-SPM_Approved27Sep2013.pdf

Natural Variation



Natural Variation





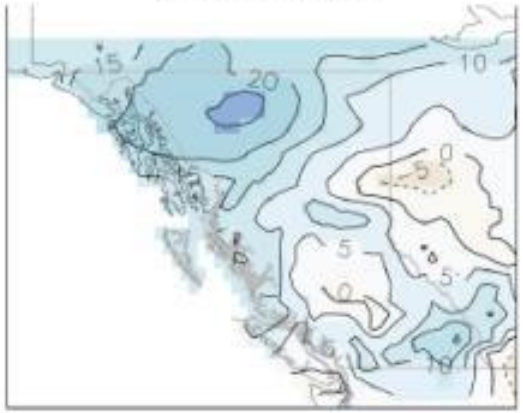
Natural Variation

PACIFIC CLIMATE IMPACTS CONSORTIUM

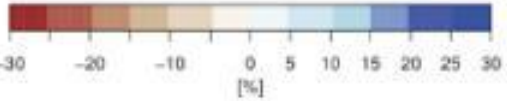
University of Victoria

Summer (JJA) precipitation trends

Observed Trend
1900-2012



Projected change
2046-2065 vs 1986-2005



Projections assume "RCP4.5"

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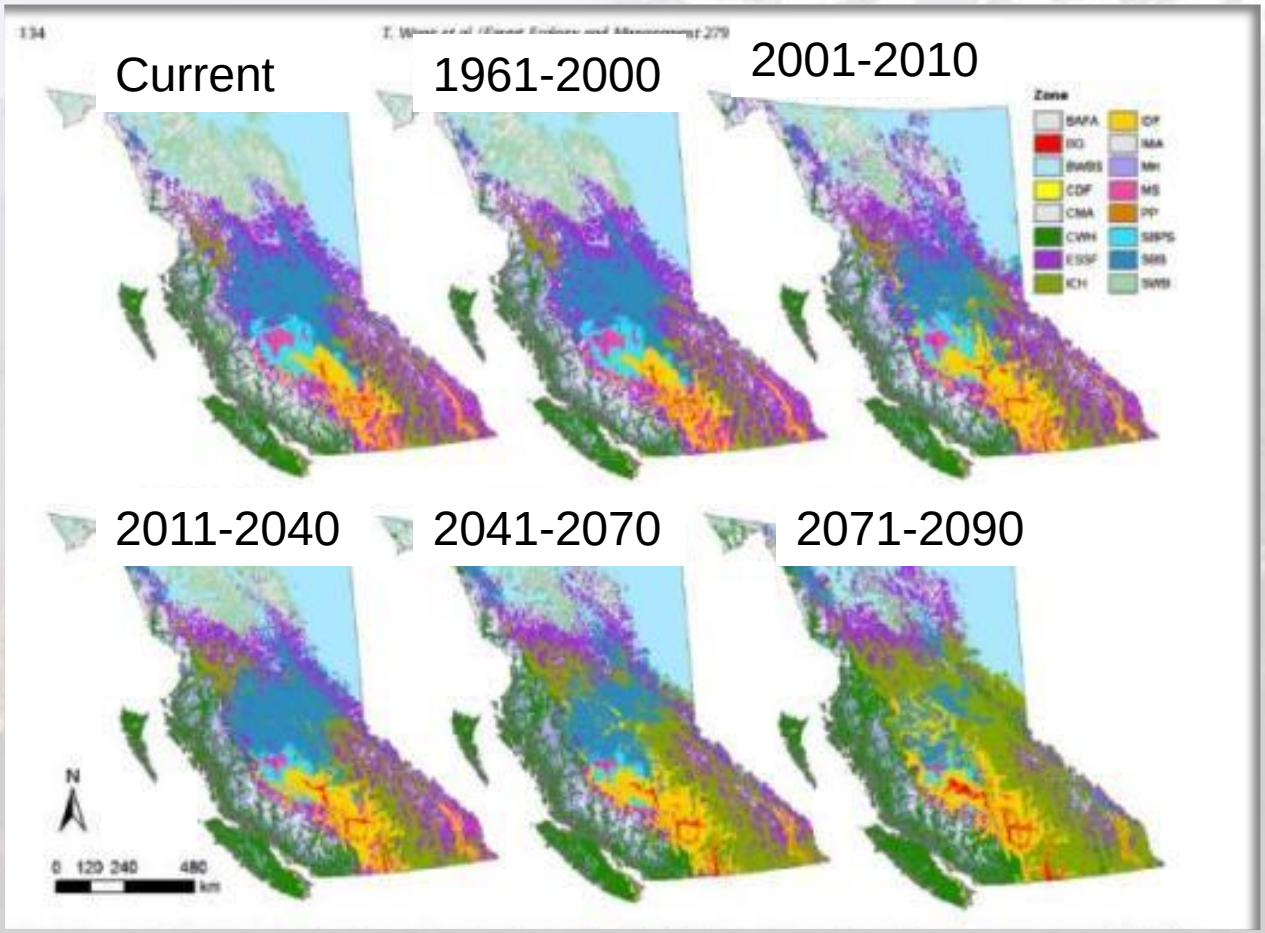
Shifts of climate envelopes – a visualization tool

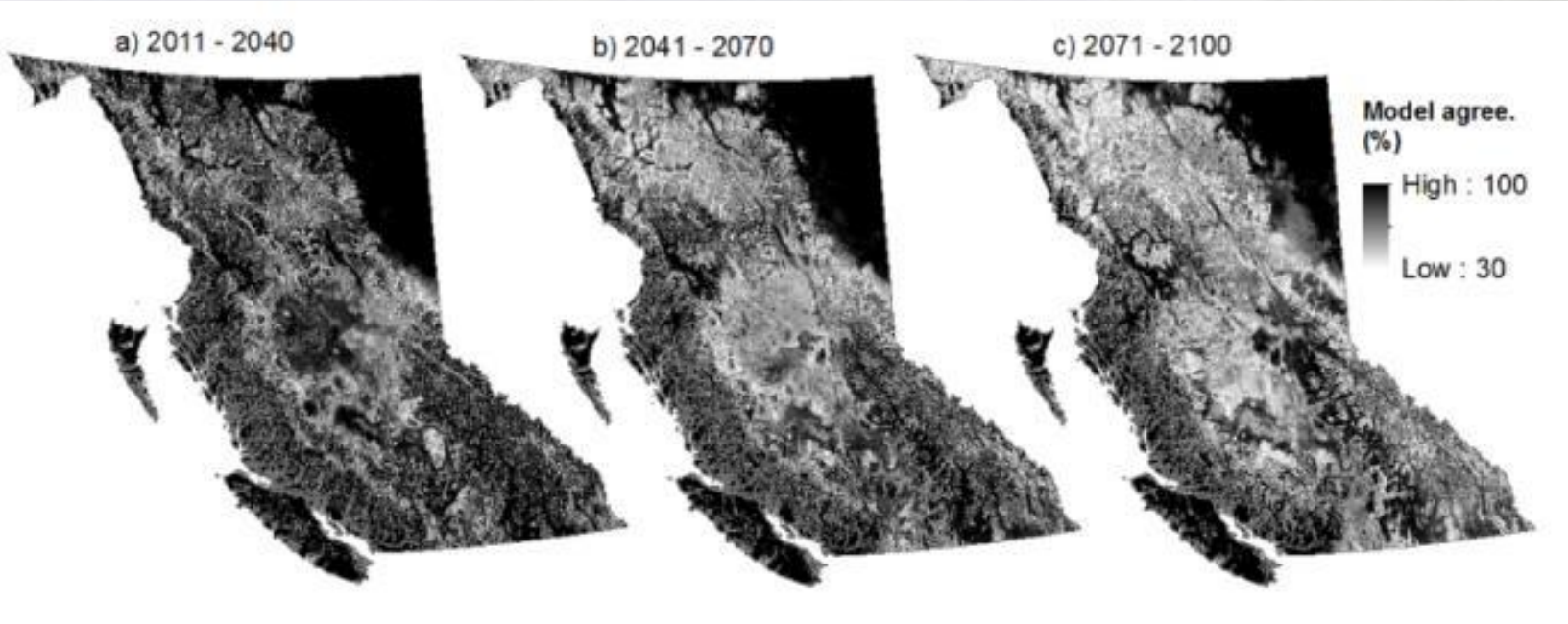
Note: This is one representation at the zonal level using BC analogues



Source: Tongli Wang et al 2012

Shifts of climate envelopes

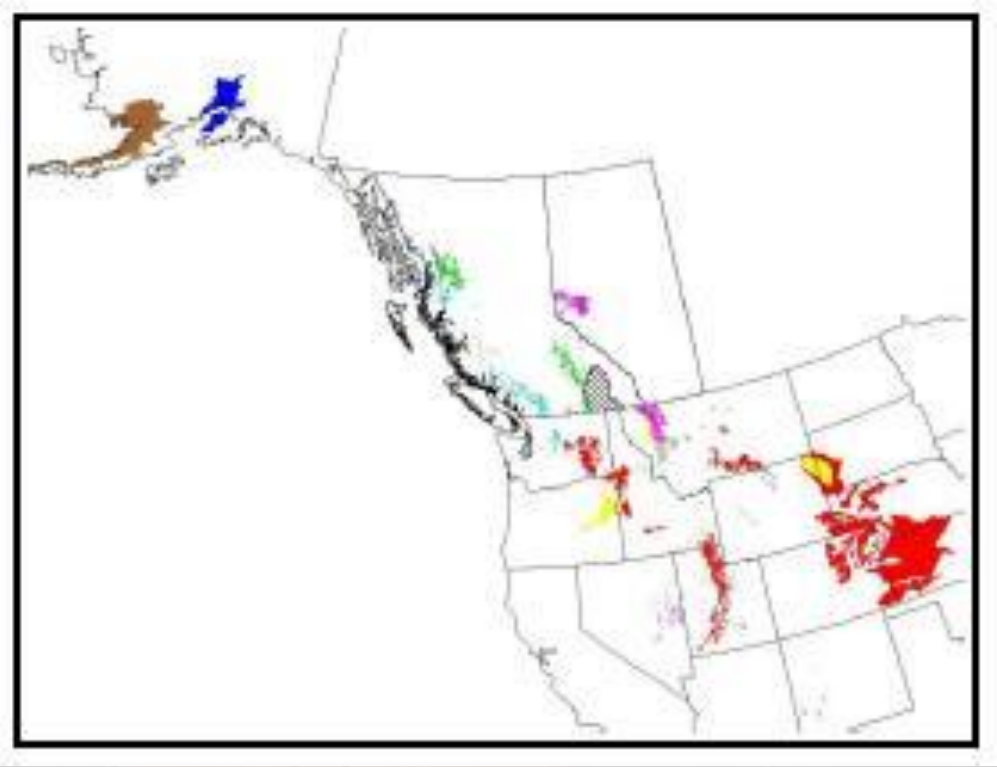
Model agreement (black) diminishes over time – (e.g., Future is more uncertain).



Source: Tongli Wang et al 2012

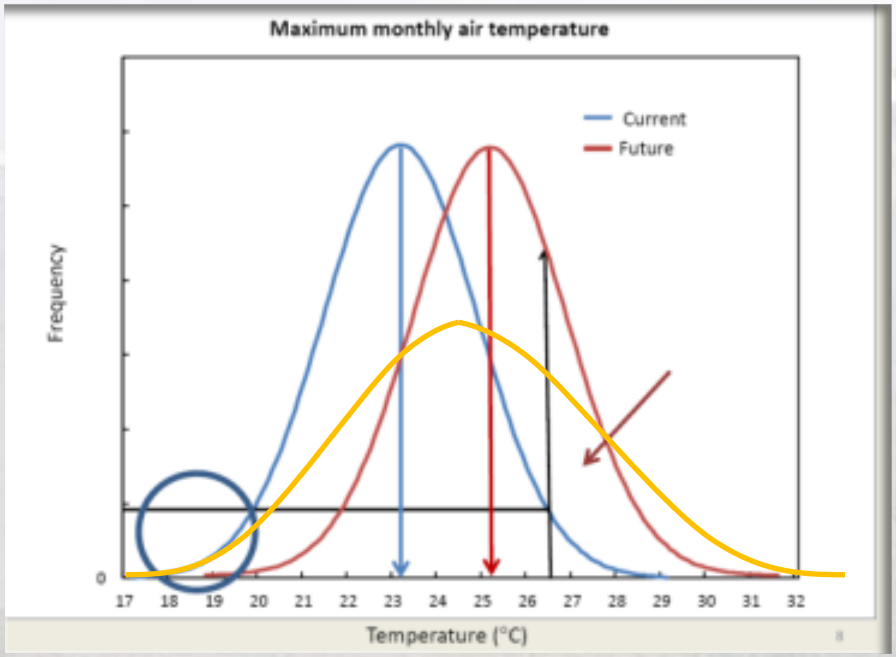
Shifts of climate envelopes

West Kootenay 2080 output - possible climate from outside BC



Source: http://www.kootenayresilience.org/Report5_BioclimateShift_Final.pdf

Regional plausible futures

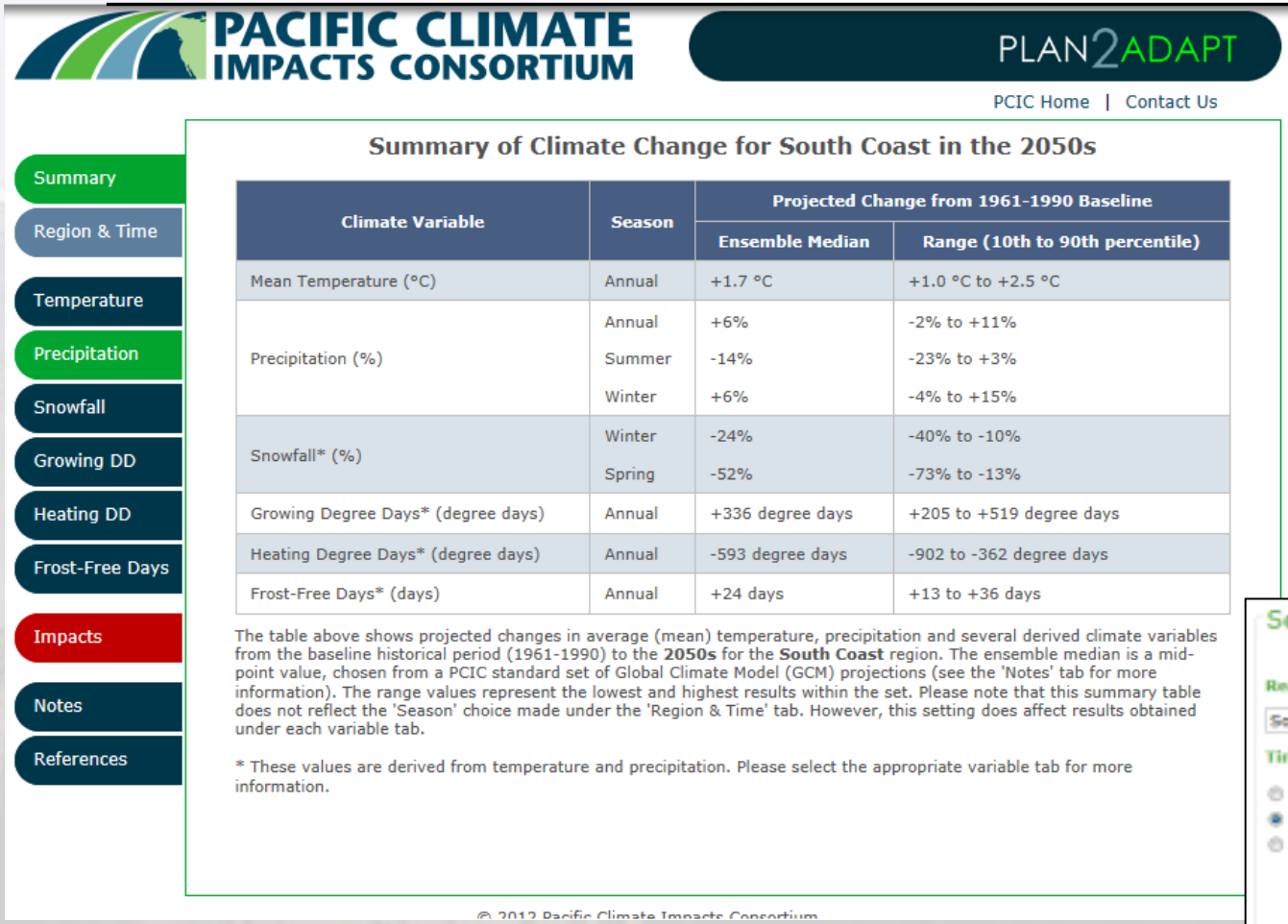


E.g., Shift of the mean and extremes

(Spittlehouse 2012)

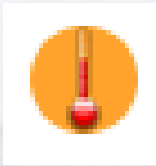
It is *virtually certain* that there will be more frequent hot and fewer cold temperature extremes over most land areas on daily and seasonal timescales as global mean temperatures increase. It is *very likely* that heat waves will occur with a higher frequency and duration. Occasional cold winter extremes will continue to occur (see Table SPM.1). {12.4} http://www.ipcc.ch/report/ar5/wg1/#.UkXFTzJrbGg

Use of Plan2Adapt



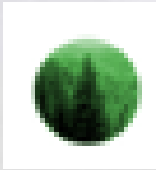
http://www.pacificclimate.org/tools-and-data/plan2adapt

Output from Plan2Adapt – list of impacts



Shorter access season where winter access requires frozen road

- Winter logging season will likely decrease
- More logs may need to be stockpiled for break-up

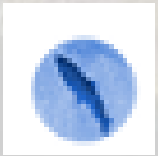


Opportunities for facilitated migration of tree species

- Increased growing season and changing frost dates
- Southerly species may be more suitable

Warmer and shorter cold season

- Increased growing season for some commodities
- Heating costs in cold season may decline



Earlier spring lake ice melt.

- Lake productivity may decline
- Inland fisheries, sport fisheries and related tourism affected
- Salmon smolt migration timing may be affected

A General Perspective on Risk

Big risks may be a sufficiently compelling to apply treatments in spite of the uncertainties.

Appropriately weigh these risks and uncertainties:

- Treatments and timing
- Direction from higher level planning
  - realistic description of the current condition and direction
- Realistic expectation of treatment effect over time.
- Phase in
  - Learn by starting small, ramp up to have an effect

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Severe
Almost certain	M	H	H	E	E
Likely	M	M	H	H	E
Possible	L	M	M	H	E
Unlikely	L	M	M	M	H
Rare	L	L	M	M	H

Adapted from : Development of an Incremental Silviculture Investment Plan for the Tolko IFPA Area - FIA Project SOTSA29 9093 006 – Note there is no weblink at this time.

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Managing Risk – information sources

Ministry of **Forests, Lands and Natural Resource Operations**

Tools

This page provides links to tools useful for:

- understanding changes underway in your area and
- adapting forest management so that BC forests remain resilient to climate change, variability and other stressors.

Credit for each of the tools belongs with each developer noted on the linked web pages.

- New link! (June 2013) **Stand Establishment Decision Aids (SEDAs)**: These SEDAS show *current* forest health risk and point to silvicultural tools and practices to deal with environmentally limiting factors within the context of BEC.
- New link! (June 2013) **Forest health change detection risk (hazard/severity) maps** in two formats:
  - **Mapped incidence of pests by TSA and cutblock from the RESULTS database** and,
  - **Regional maps of pest distribution** using the SEDA information.
- February 2013. FORREX Checklist for adapting BC's landscapes to a changing environment. This checklist summarizes the key considerations for buffering your managed forests against the impact of climate change during planning, harvesting, and reforestation. (3 pages).

This website is constantly being updated – note New! links

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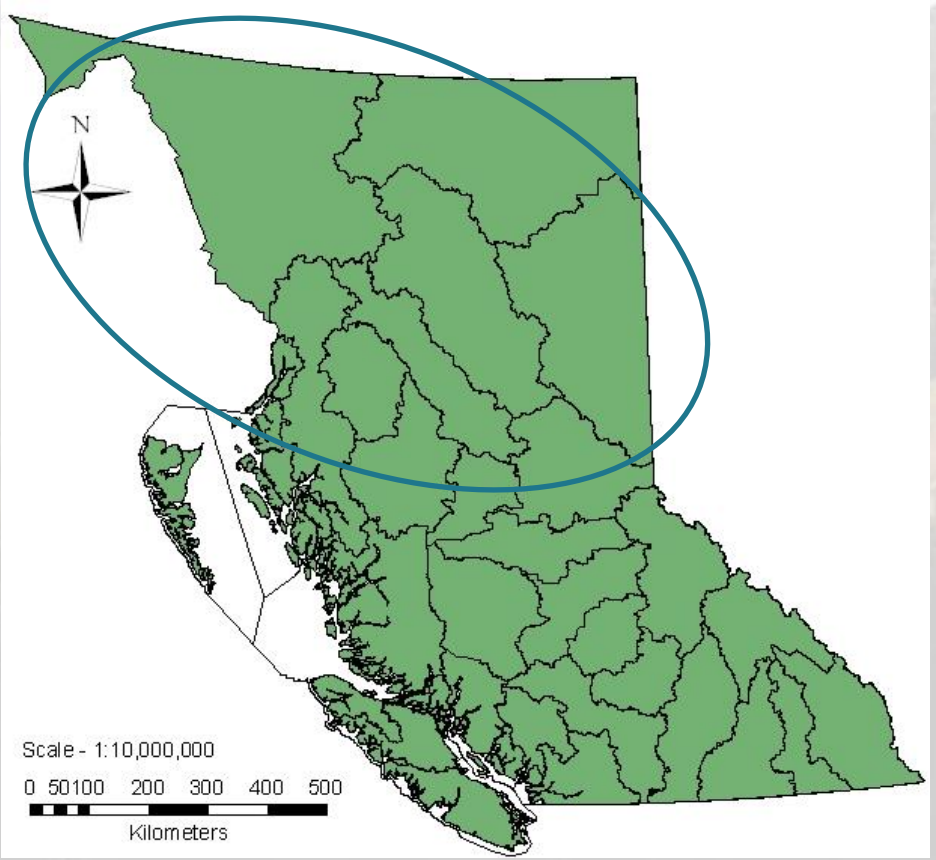
Ecological guidance

Northern Interior – Background and Recommended Guidance

Credit to:

Bruce Rogers

Regional Ecologist



Regional Guidance for Species Use Based on Climate Change (project draft)

Biogeoclimatic Ecosystem Classification (BEC) and other tools used in the climate change based guidance

Bruce Rogers
FLNRO
Regional BEC Ecologist
Omineca/North East
BECWeb: http://www.for.gov.bc.ca/hre/becweb/

BEC ecologists used some climate change based tools in The Regional Guidance for Species Use Based on Climate Change project\

Tools can be found at Tree Species Selection Project website
http://www.for.gov.bc.ca/hfp/silviculture/TSS/tss.htm

Also, can contact FLNRO North Area Regional Climatologist Vanessa Foord

My approach is purely based on projected ***site*** level changes
This provides a site level foundation to start with but you still need to consider other factors some of which may prove to be limiting or warrant additional cautionary footnotes, e.g.,

Genetics (SPU's - periodicity, phenology)
Forest health
Growth and yield (mixed spp versus single planting)
Soils (Geology/Parent Materials)
Cold Air/Frost Ponding potential, aspect
Extreme smr's

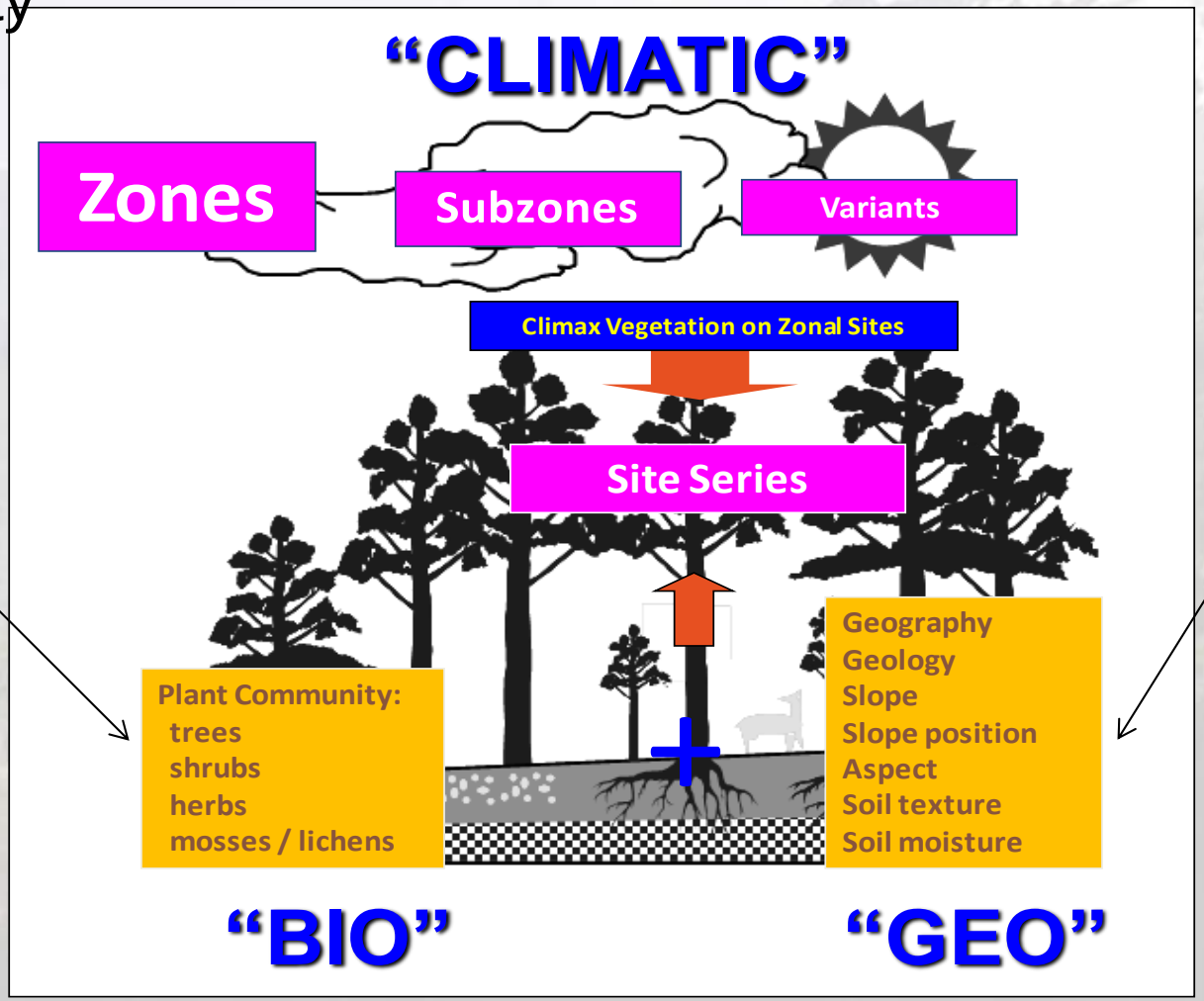
BGC Classification			Regeneration Guide									Free Growing Guide			
			Species						Stocking(i)			Regen	Assessment		Min. Height(ii)	
Zone/SZ	Series	Standards ID	Primary	Preferred (p)	Secondary	Acceptable (a)	Tertiary	Broadleaf	Target (well-spaced/ha)	MIN pa	MIN p	Delay (Max yrs)	Earliest (yrs)	Latest (yrs)	Species	Ht (m)
SBSdk	01	85193	Pl Sx	Pl Sx	Fd[9,18]	Fd[9,18]		At[3] Ep[3]	1200	700	600	7	12	15	Pl	2.00
															Fd	1.40
															Others	1.00

- 1990 - BEC classification incorporated into the Correlated Guidelines for Free Growing Stocking Standards for Ecosystems of BC

- The current Chief foresters Reference Guide Stocking Standards uses BEC site series as the foundation for preferred and acceptable and/or 1°,2°,3° tree species selection

- BEC site series classification: site level units or ecosystems defined at the plant association level that reflect site capacity

Strong climate level to site level relationship makes BEC site series an ideal unit of measure and platform for predicting future bio-climate conditions and species suitability



Plant Association

Drivers

In 2012 Resource Practice's Branch (RPB) (Winter and Astridge, 2012) initiated a climate change based species guidance project

BEC Ecologists asked to participate in Phase 1 of the project using available tools to develop Reference Guide promotion/demotion rankings for species at the site series level (only the zonal 01 site series was used to start with).

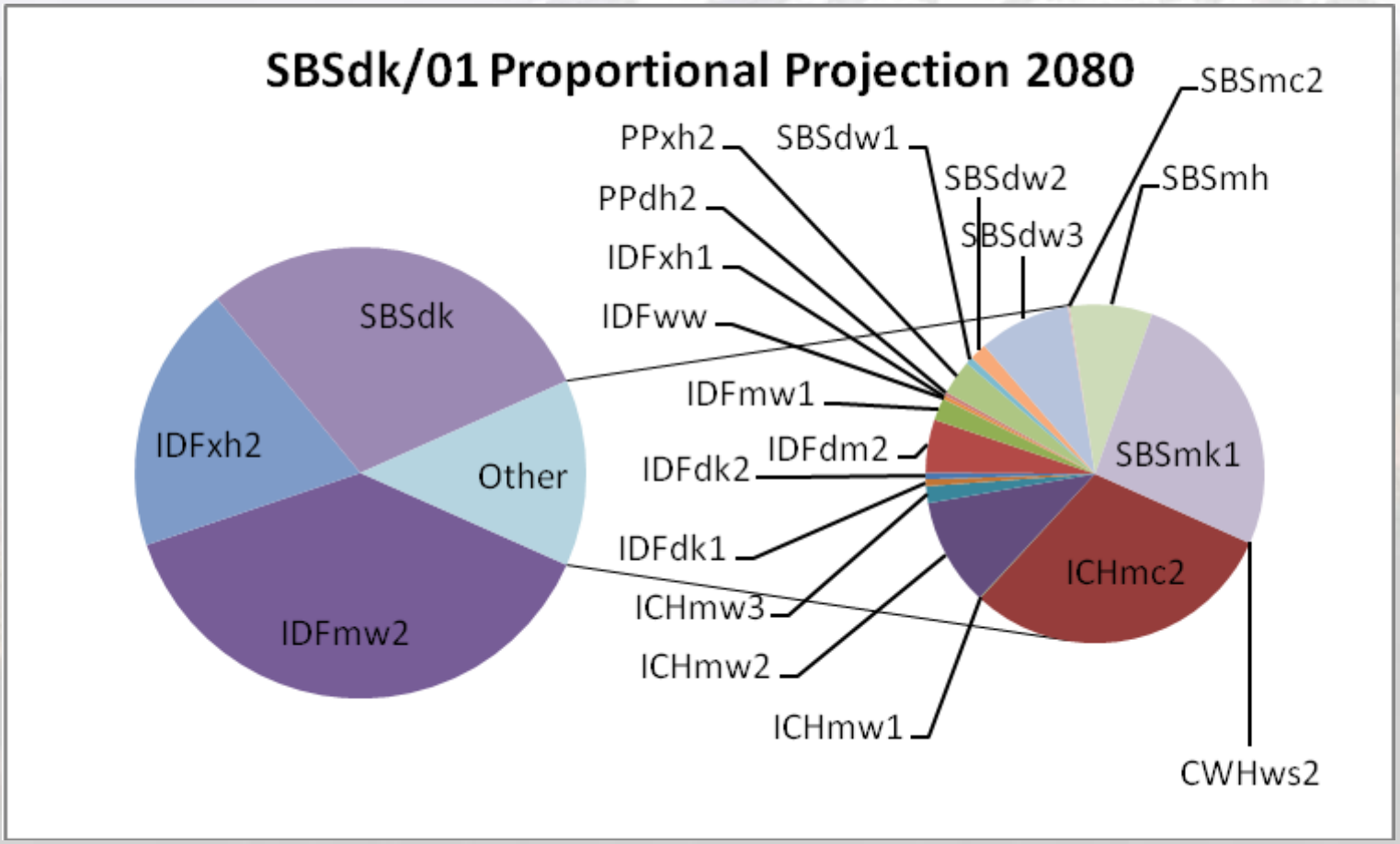
Projections for future BEC bio-climate envelope niches were produced by Wang et al. (2010 - UBC Dept of Forest Sciences) using the Climate – Western North America (WNA) model and run with 20 scenarios to generate a projection consensus map for 2020, 2050 and 2080

Some tools ecologists used in the RPB project used were:

1) BEC Database Tool (Bio-climate envelope/reference guide queries)
2) Species Drought Risk Tool (FFESC)
3) ClimateWNA Model

1) BEC Database Tool

Ecosystem/climate niches incorporated into queries in the BEC data base and linked to the tables in the Reference Guide to produce a "% area change for existing BGC climate envelopes to future ones" for 2020, 2050 and 2080 along with the corresponding new suggested species selection (Rough-cut level).



BEC Database Tool Output

Current Reference Guide species status

Zone	Site Series	Act	At	Ba	Bl	Cw	Dr	Ep	Fd	Hm	Hw	Lw	Mb	Pl	Pw	Py	Sx	Sxs
SBSdk	**01**		4					4	2					1			1	

2080 projected % area changed and new species status

2080	Site Series	Act	At	Ba	Bl	Cw	Dr	Ep	Fd	Hm	Hw	Lw	Mb	Pl	Pw	Py	Sx	Sxs	% Area Changed
IDFmw2	**01**		4			3		4	1			3		1					37.70%
IDFxh2	**01**		4						1							1			18.98%
SBSdk	**01**		4					4	2					1			1		28.92%
Other	**01**																		14.40%
																			100.00%

	Stays the same
	Was added
	Promoted
	Demoted
	Was removed
1	primary
2	secondary
3	tertiary
4	deciduous

2) Species Drought Risk Tool

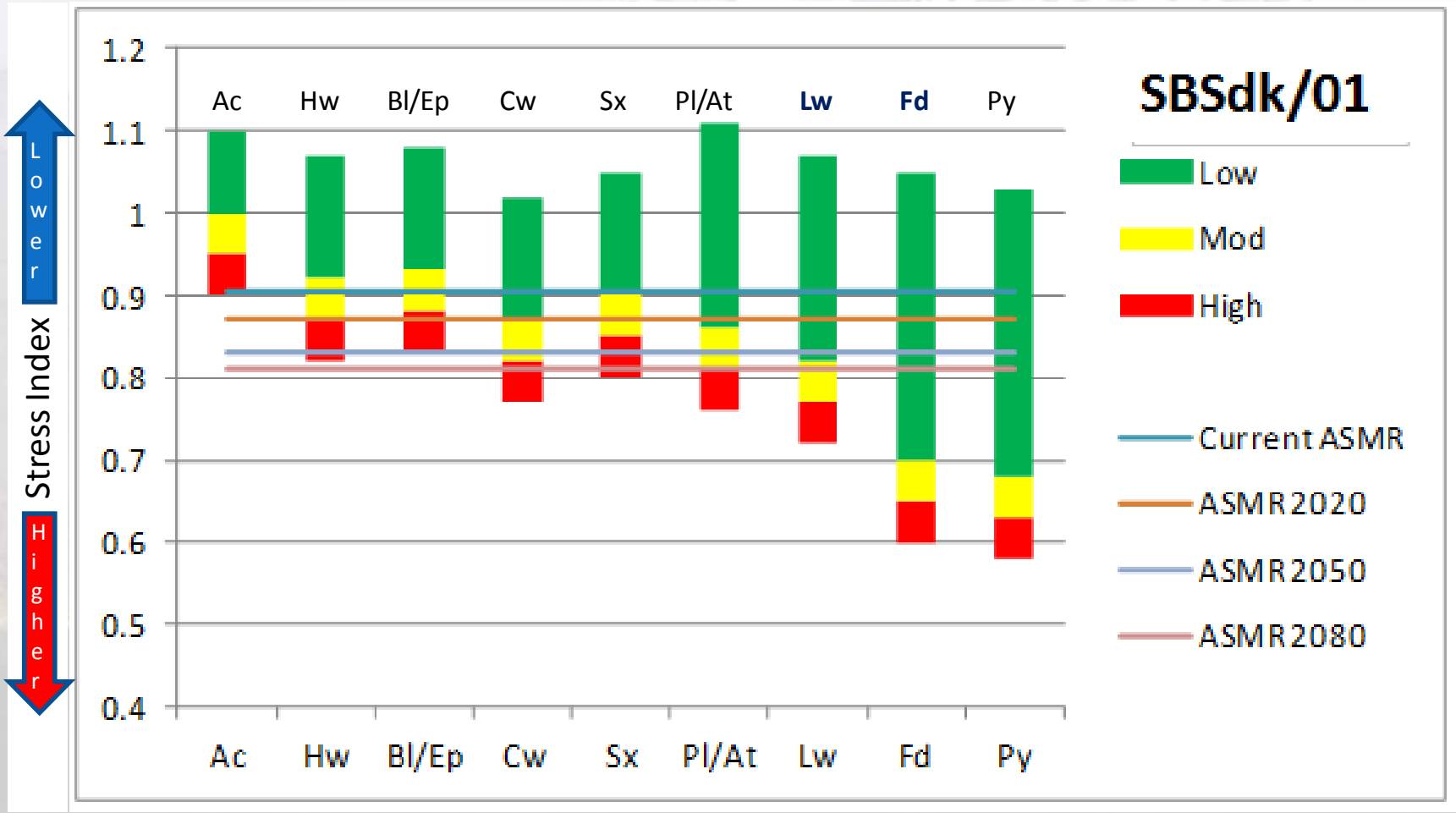
The Drought Species Risk Tool (DeLong et al. 2010-FFESC) projects future changes to actual soil moisture regime (ASMR), recently developed as part of Future Forest Ecosystems Scientific Council Project

Changes over time in ASMR for all site series are modeled based on site factor inputs and downscaled global climate scenarios using the Tree & Climate Assessment Tool (TACA Mechanistic Model-Nitschke and Innes, 2008)

Currently cold air (frost mapping) is also being completed as part of the Species Risk Tool as well

Species Drought Risk Tool Output

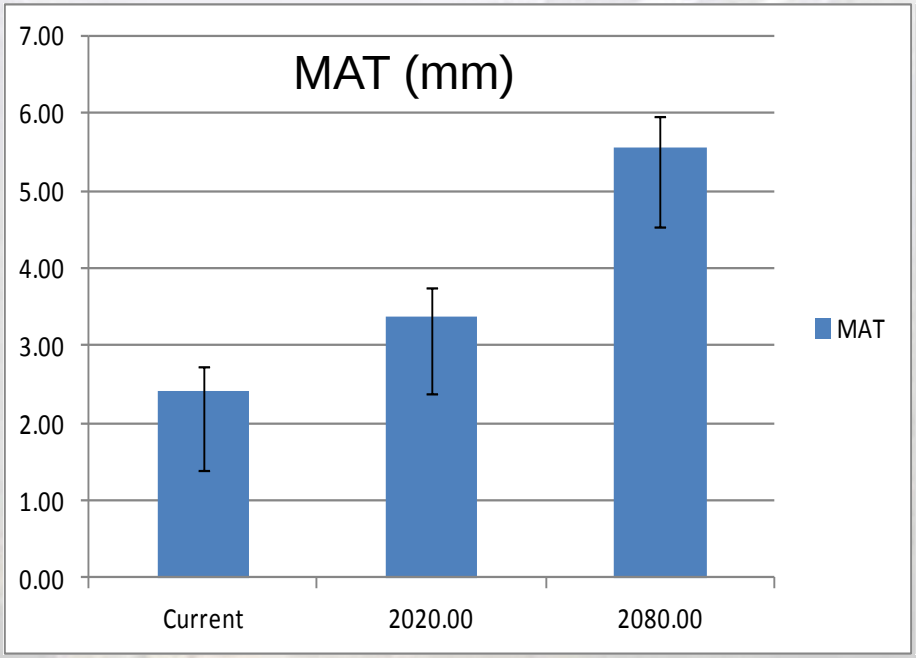
Relative species drought risk for current, 2020, 2050 and 2080 for SBSdk/01

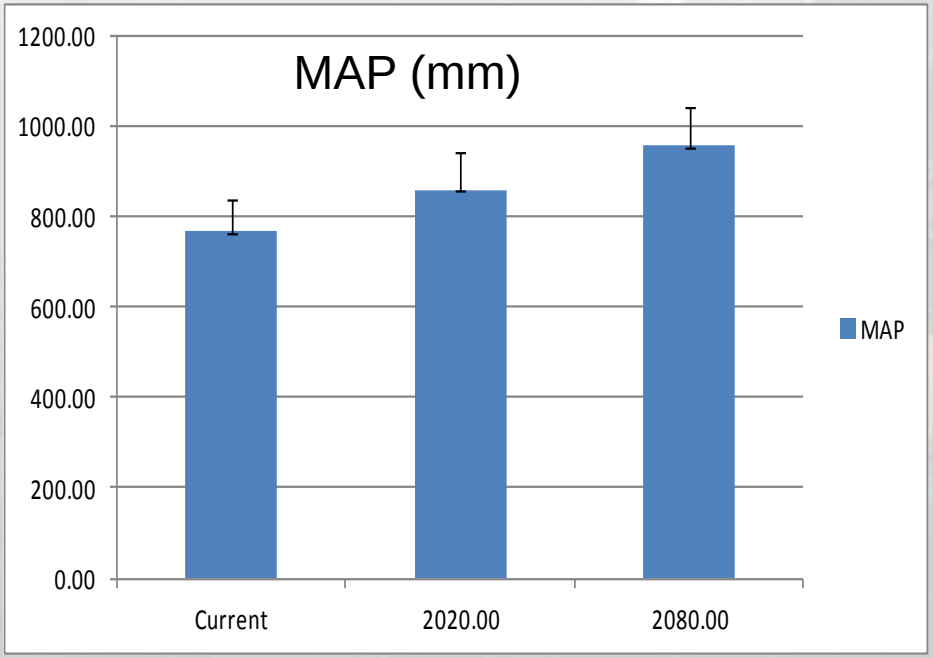


ClimtaeWNA Model

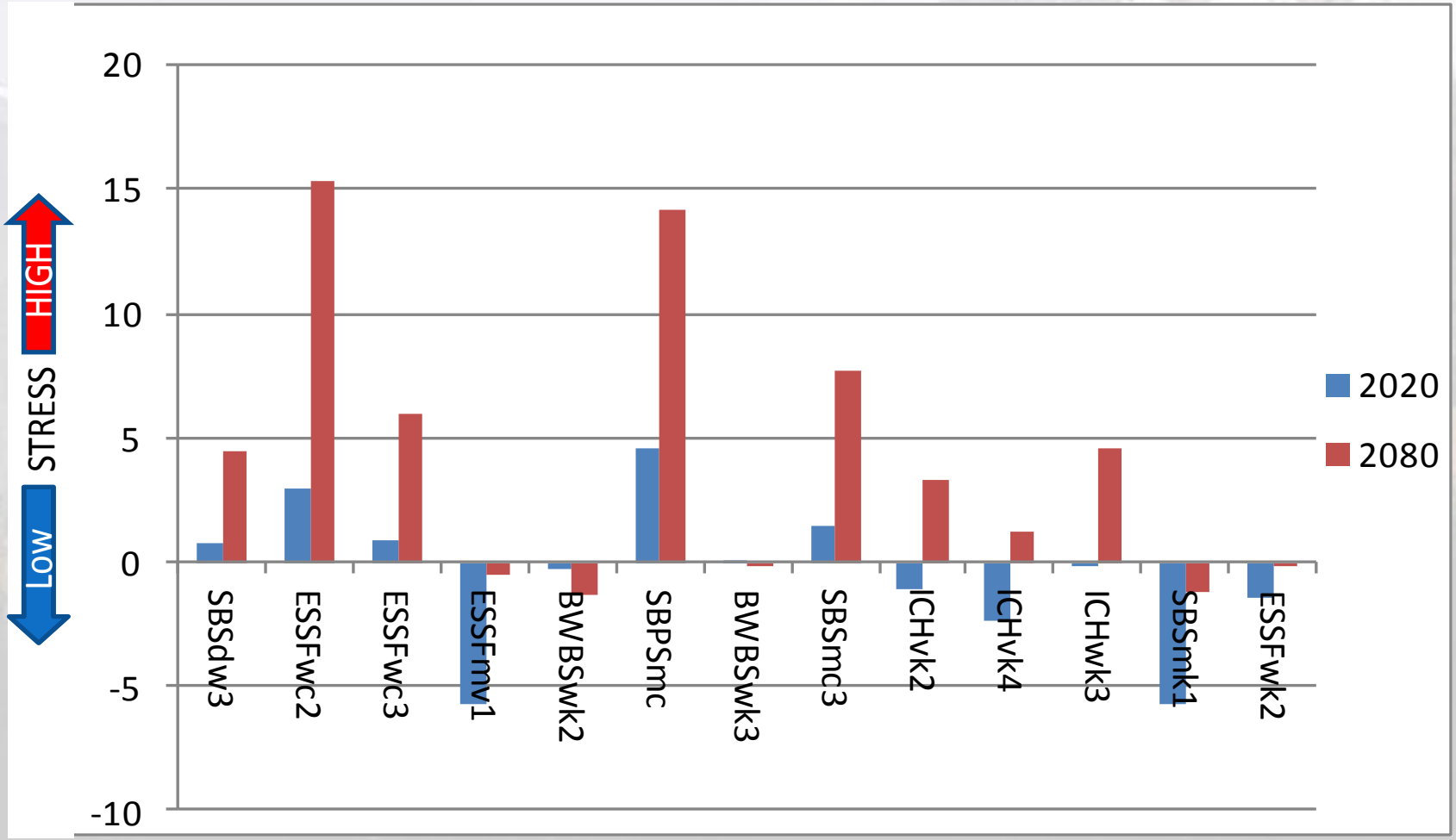
Mean Annual Temperature (MAT),Precipitation (MAP) and Summer Moisture:Heat Index (SM:HI) generated for 2020 and 2080

(averaged here for 13 Omineca BGCs)





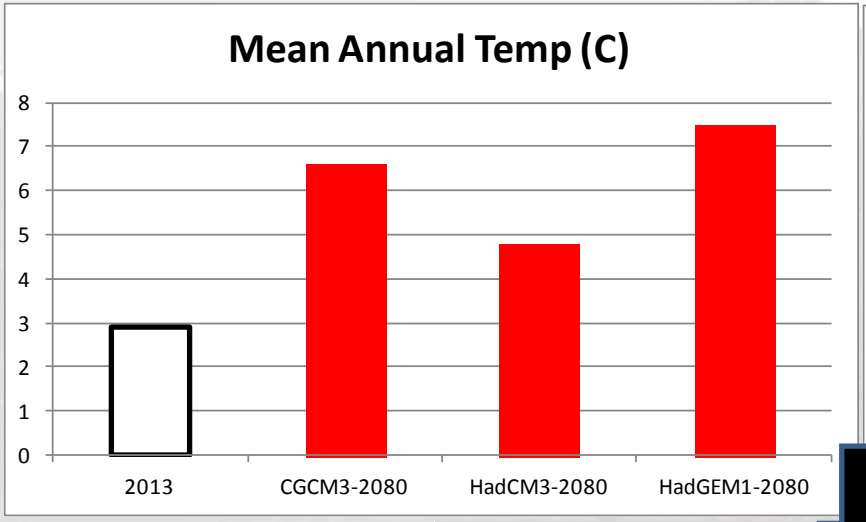
Relationship between MAT and MAP drives SM:HI (a proxy for conductance and available water to plants)

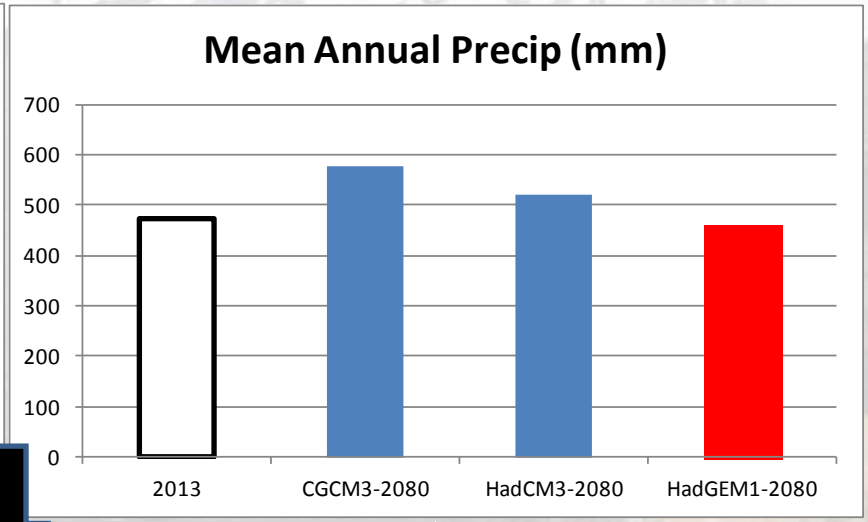


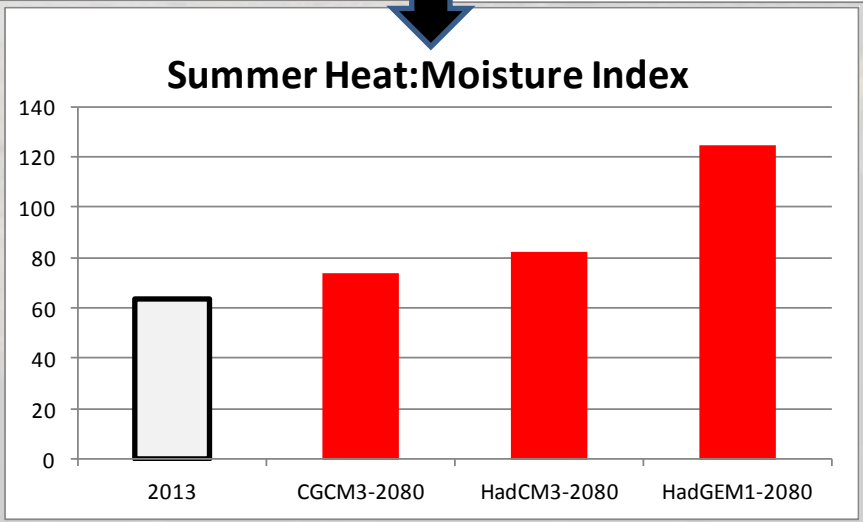
UNCERTAINTY - Consider a range of outcomes (similar trends-different mag.)

Species diversity may buffer against uncertainty (all eggs not in one basket)

Down scaled output from 3 GCMs - SBSdk



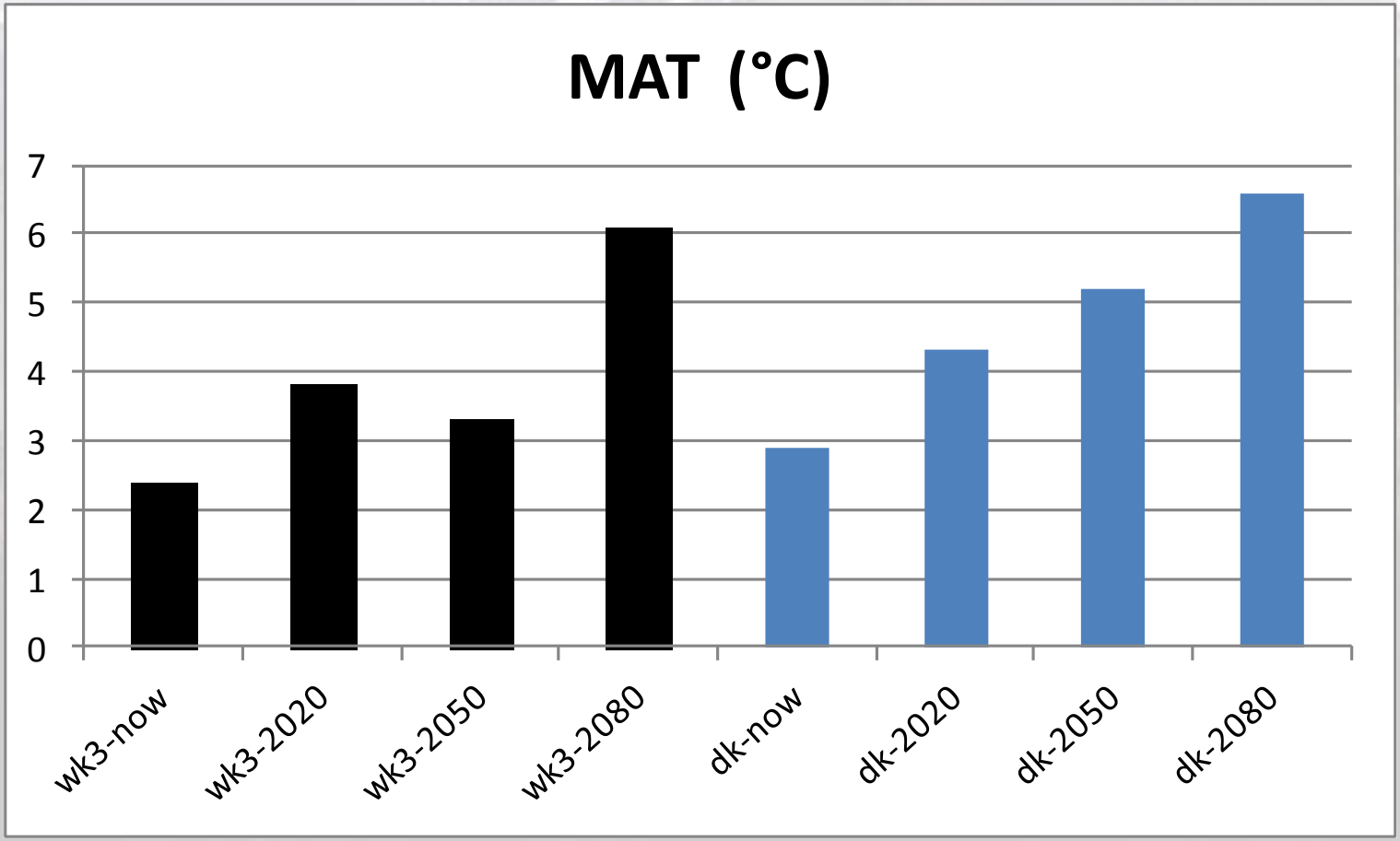


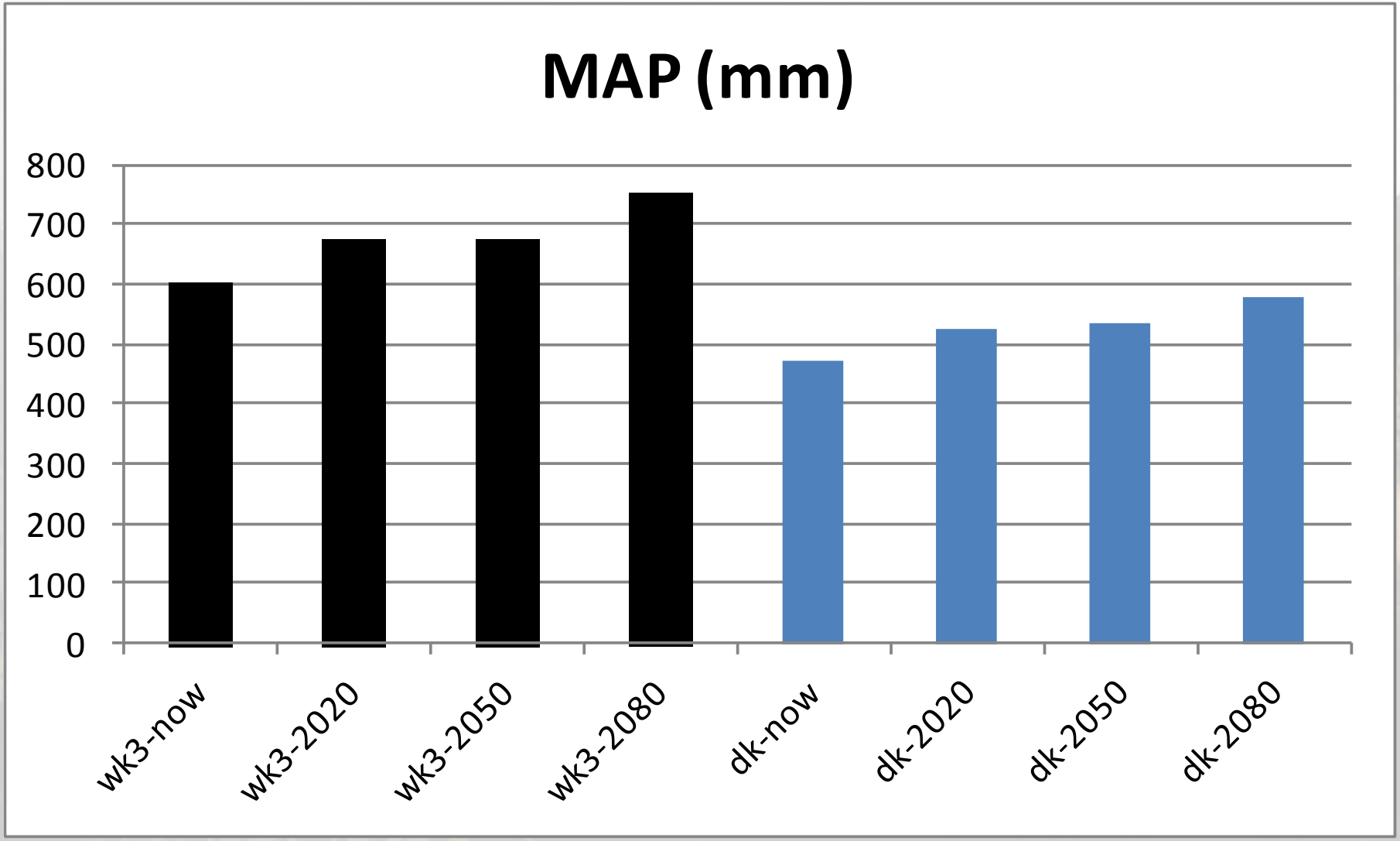


Changes in Climate and Soil Moisture for SBSwk3 and SBSdk

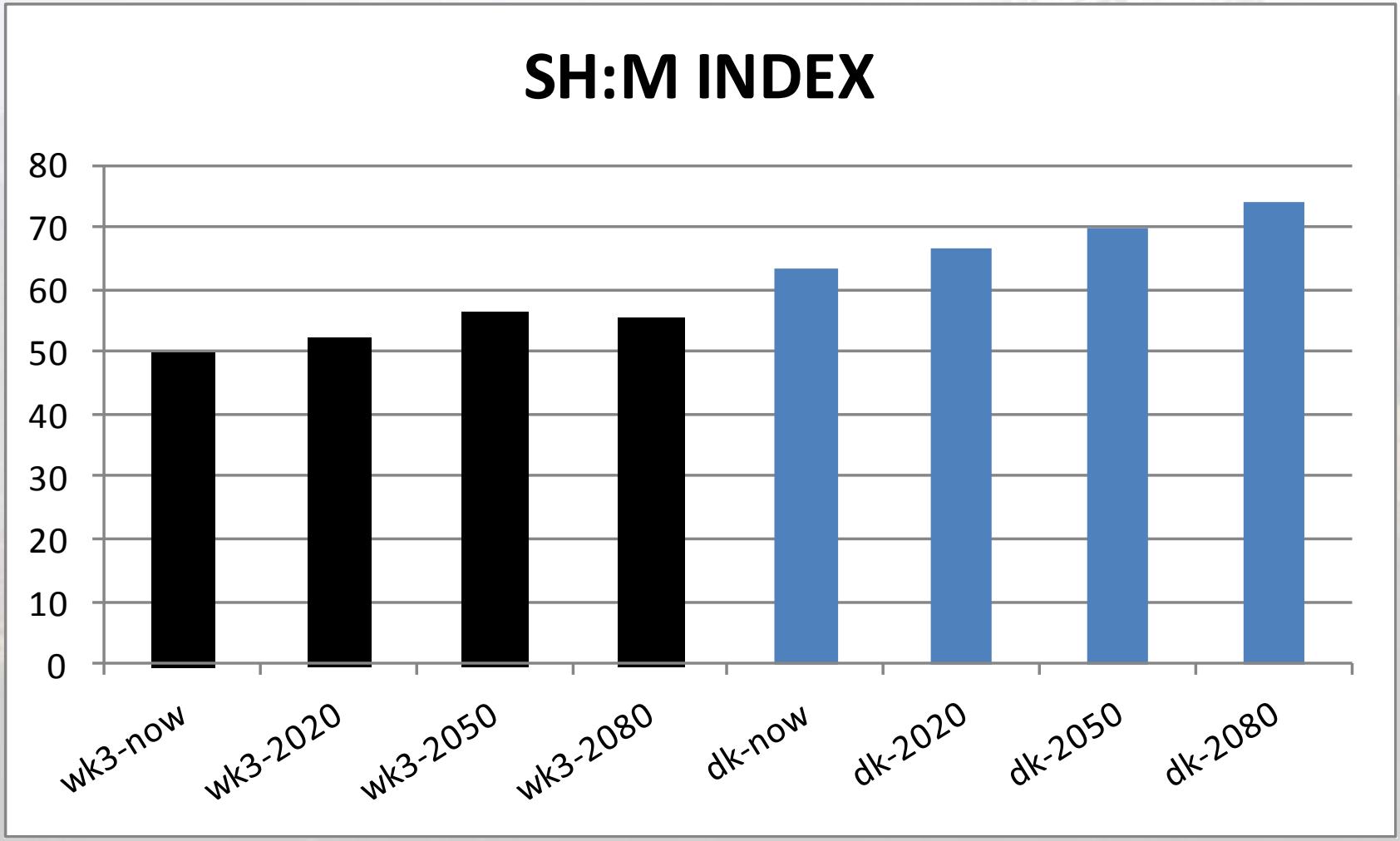
ClimateWNA - CGCM3_A2_Run4_2020s_2050_2080 (Wang et al. 2010)

Stand Level Drought Risk Assessment Tool (DeLong et al, 2010)

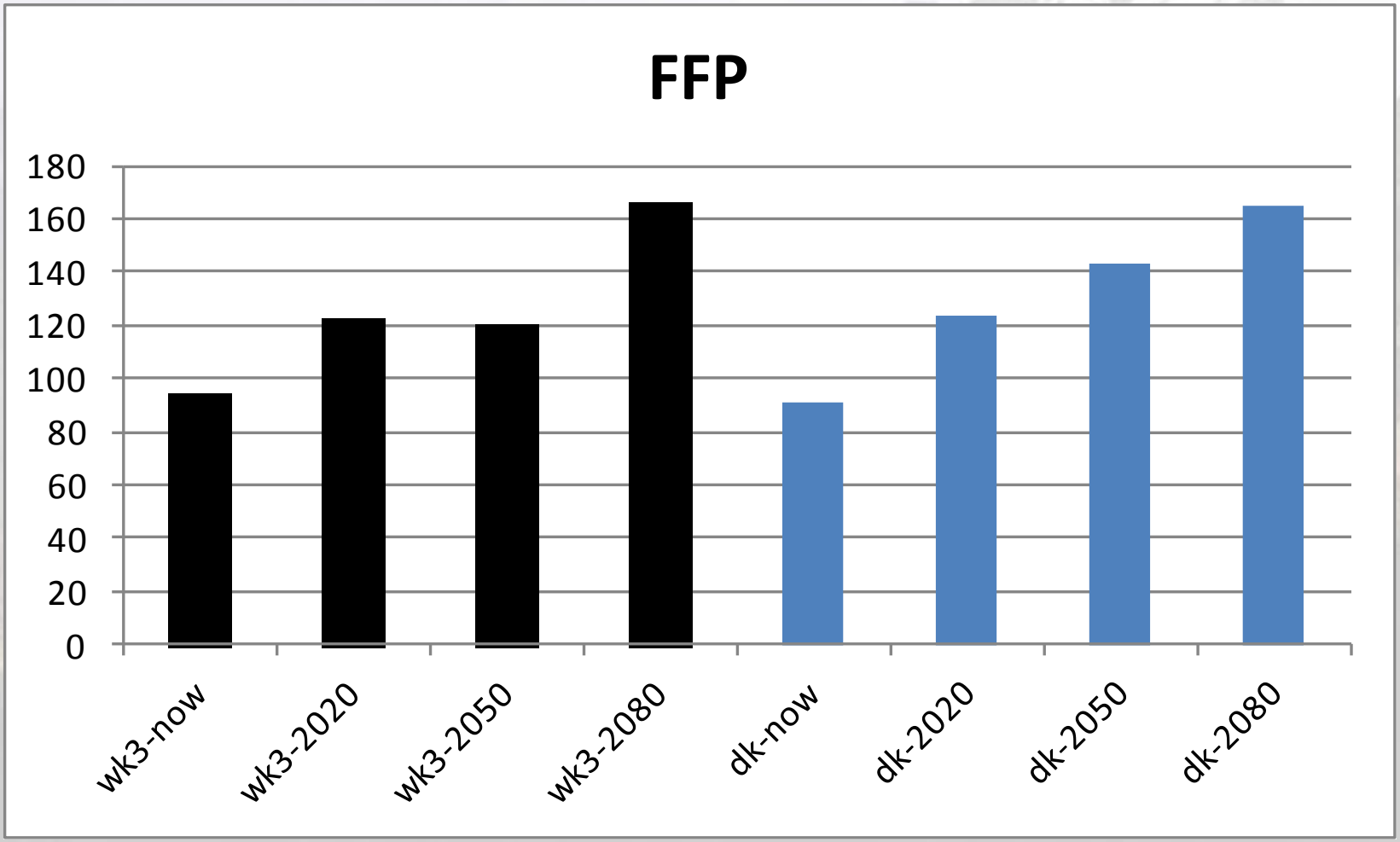



MAP (mm)
800
700
600
500
400
300
200
100
0
wk3-now
wk3-2020
wk3-2050
wk3-2080
dk-now
dk-2020
dk-2050
dk-2080

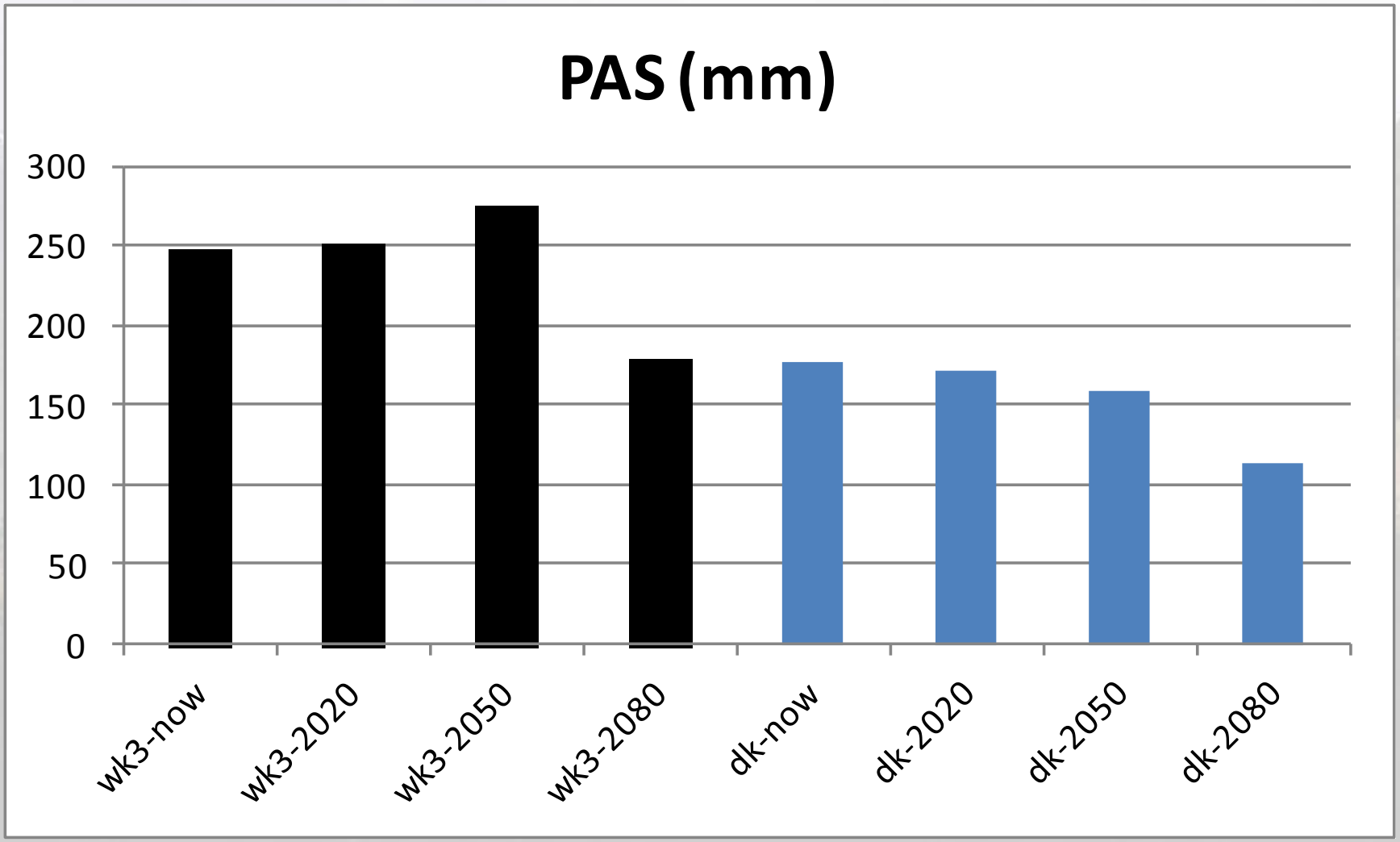
MAT and MAP – implications for changes in SM:H Index (water demand) and tree stress/maladaptation OR new suitability



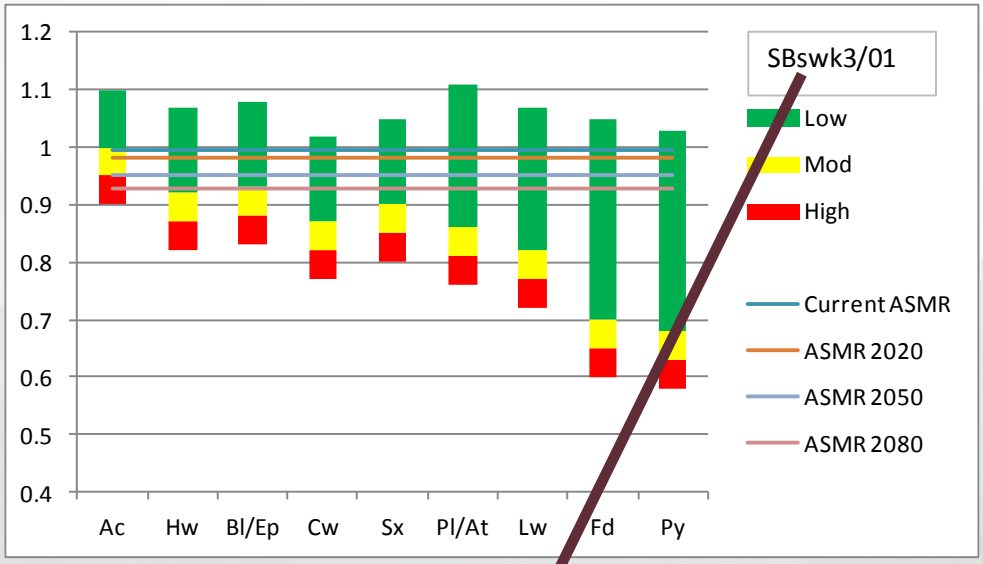
FFP – implications for changes in frost limiting conditions (growing season) Careful-footnotes still apply (max and mins???)



PAS – implications for changes snow pack-diminished spring recharge/seepage/sub-irrigation and increased tree stress (e.g. Sx) and/or diminished snow-load and decrease in damage



Climate change/Drought Related Risk to Lw and Fd and establishment – SBSwk3 example

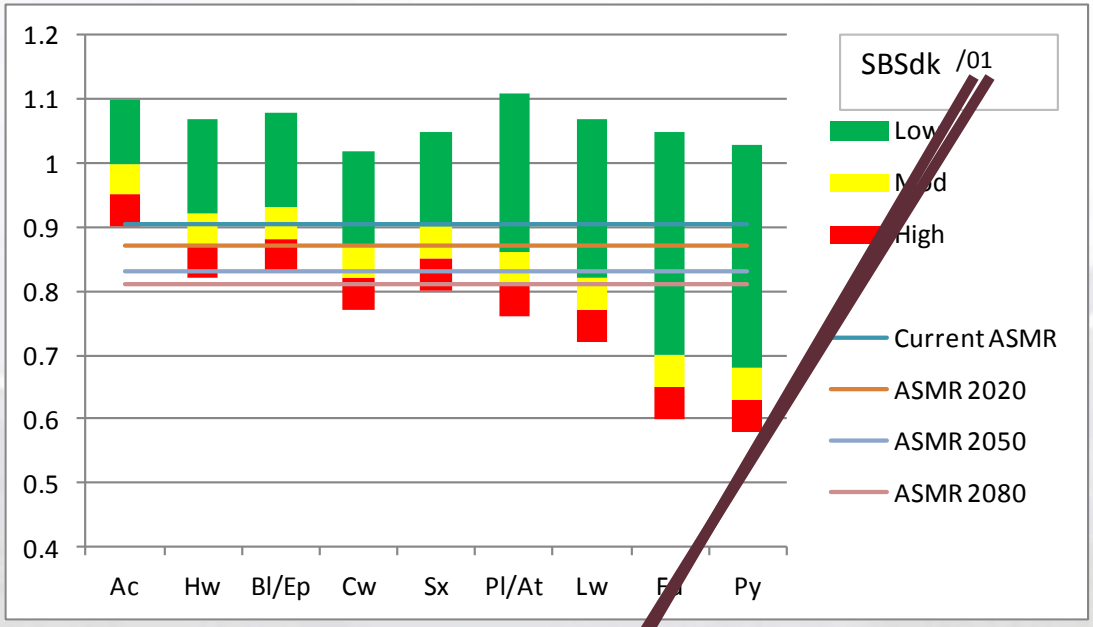


03=where Fd currently grows

SBSwk3 *= not drought risk = frost and excessive moisture and/or nutrient deficiency

SMR	Site Series	Fd - Current Establishment Drought Risk	Lw - Current Establishment Drought Risk	Fd-2080 Drought Risk	Lw-2080 Drought Risk
1	02	low	low	low	mod
2	02, 03	low	low	low	low
3	05, 04	low	low	low	low
4	05, **01**, 06	low	low	low	low
5	05, 06, 07	*high	*high	low	low
6	08	*high	*high	*mod	*mod
7					

Climate change/Drought Related Risk to Lw and Fd



04=where Fd currently grows

SBSdk *= not drought risk = frost and excessive moisture and/or nutrient deficiency

SMR	Site Series	Fd - Current Establishment Drought Risk	Lw - Current Establishment Drought Risk	Fd-2080 Drought Risk	Lw-2080 Drought Risk
1	02, 81	low	high	mod	vhigh
2	03, 04, 82	low	mod	low	high
3	05, 04, 82	low	low	low	high
4	05, **01,** 06	low	low	low	mod
5	**01**, 06, 07, 08	*high	*high	low	low
6	09, 07, 08, 10	*high	*high	mod	mod
7					

Based on output from available tools ecologists were asked to recommend promotion, demotion, addition or deletion of species in a few subzone variants (zonal sites). Then create a logic matrix:

1. Ran the VPRo database tool for zonal 01 sites and picked the dominant unit changes (13 BGC's with greatest % changed in my Regions)

2. Look at the zonal site series in the Drought Risk Tool projections to see if the logic agreed

3. Look at the ClimateWNA projected variables and see if the logic agreed

4. Formulated draft rational for promotion/demotion based on the assumptions of whether we could establish species now on site and/or whether species would be maladapted or not at rotation

In the RPB draft document "**Suggested changes to the Reference Guide for FDP stocking standards**" an example of a conservative species promotion is Fd and Lw on SBSdk/06-07 circum-mesic richer sites

Current reference guide

SBSdk		Primary	Preferred (p)	Secondary	Acceptable (a)	Tertiary
		non-forested	non-forested			
		non-forested	non-forested			
06	85198	Pl Sx	Pl Sx		Fd[9,18]	Fd[9,18]
07	85199	Sx[1,32]	Sx[1,32]	Pl[1]	Pl[1]	

Suggested promotion in draft

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	**3**	**3(2)**	**Preferred**	**Promotion**	Well drained somewhat drier soils. Avoid areas where there is potential of cold air/frost ponding.
Lw	**0**	**3(2)**	**Preferred**	**Promotion**	Southerly aspects and moist well drained soils preferred. Avoid areas where there is potential of cold air/frost ponding.

Autecology of Lw and Fd

Primary ecological amplitudes for Lw and Fd are the same

But still need to recognize the differences (strengths/weaknesses) between the species

Figure 2 – Lw ASMR

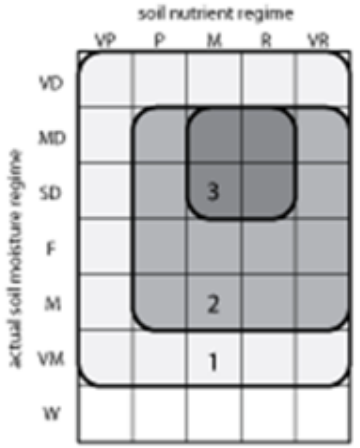
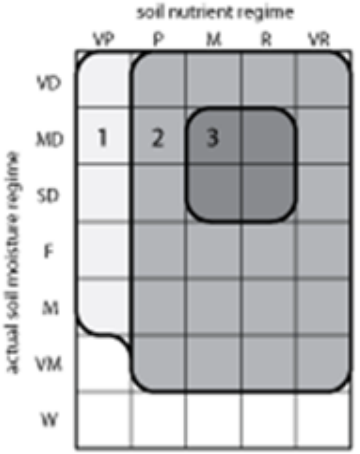


Figure 3 – Fd ASMR



Feature	Western Larch	Douglas-fir
	Tolerance Class	
northern extent	Currently south of 51 deg lat	Currently just north of 55 deg lat
Edaphic amplitudes	mod-dry to slighly-dry: medium-rich nut	mod-dry to slighly-dry: medium nut
low light	L	L - H
frost	M	L - M
heat	M	M - H
water deficit	M	M
water surplus	L	L
nutrient (mainly N) deficiency	M	M
snow	H	L - M
wind	H	H
	Risk Class	
fire	M (resist ground fire when mature)	M (resist ground fire when mature)
insects	*M (Lw case earer, sx budworm)	H (Fd beetle, bud worm, tussock moth)
fungi	L	*H (rootrot, butt rot, needle cast)
other agents	M (dwarf mistletoe)	L (browse, hair, rohdent...)
	Interperative Class	
Reproduction capacity	H	H
Seed disemintation capacity	M	H
Low light nat reg potential	L	L-H

Keep in Mind:

•Climate change is occurring and we need to use the tools we have to make educated BEST GUESSES

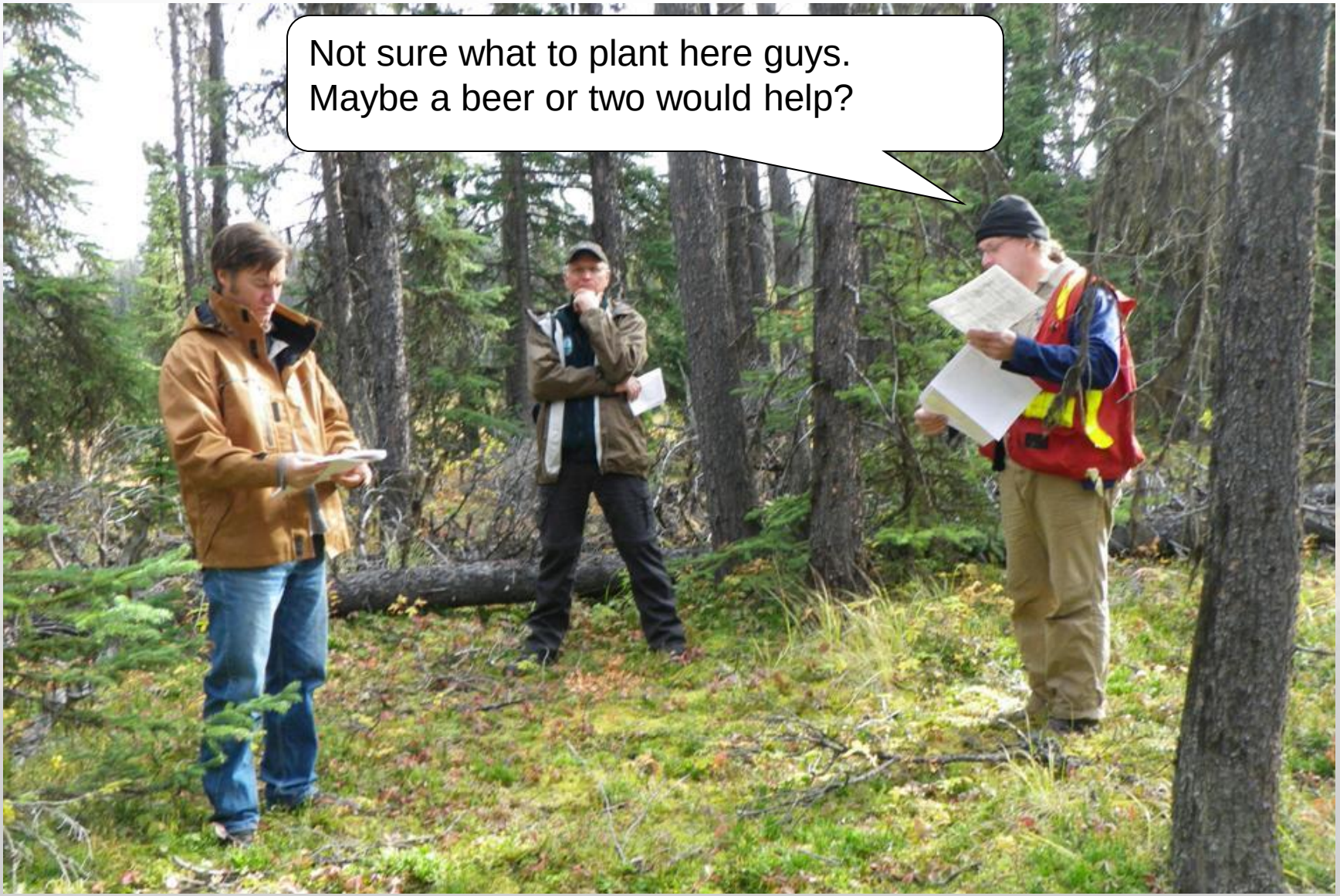
•Climate projections are based on a range of scenarios. Managing for the future should be based on a range of potential outcomes (not all eggs in one basket)

•Field data for Fd and Lw plantations, some up to 50 years old, indicate both species show excellent potential within parts of the ICHmc2, SBSdk, dw3, mc2 and CWHws1 (LePage, P and L. McCulloch 2010)

•Bioclimate models for Lw can be used in conjunction with modeled geographic patterns of genetic variation to develop and map for the contemporary climate the seed zones and seed transfer guidelines needed for reforestation (Rehfeldt G. E. And Jaquish, B.C, 2010).

•Need to be proactive <u>but be aware of</u> the assumptions of tools and models e.g:

1) strengths and weaknesses in tree species responses (mixed vs single spp planting)
2) site level changes
3) need to maintain and initiate monitoring and more long term trials to answer some of these questions


Not sure what to plant here guys.
Maybe a beer or two would help?

FIN

References and Links

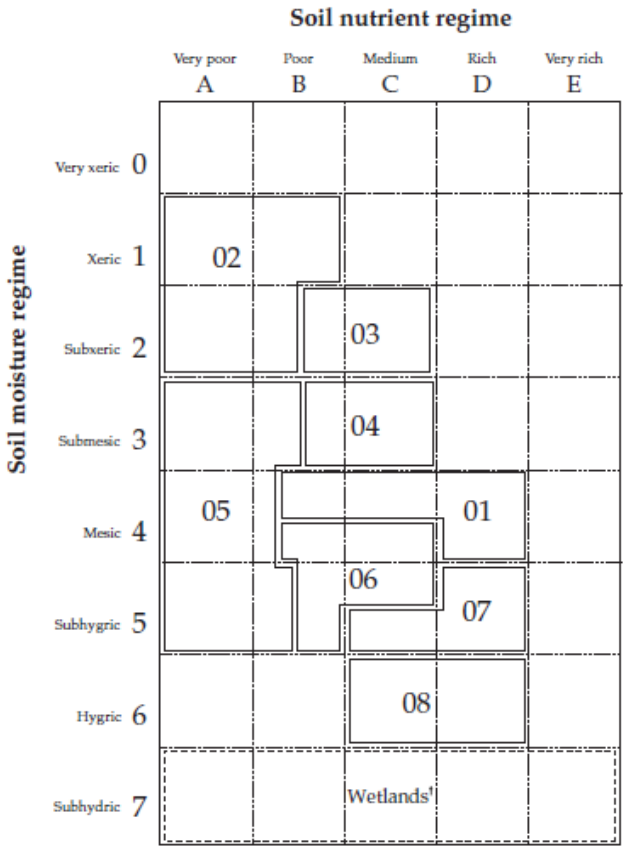
The paper entitled Stand level Tool Paper_Nov_DeLong_etal.pdf is a draft manuscript so not published yet and, no link exists and I can't circulate widely so don't use the FTP link for that one but the other less detailed report is available on the Future Forest Ecosystem Scientific Council website at http://www.for.gov.bc.ca/hfp/future_forests/council/#completed-projects entitled "Risk analysis and Decision Support Tool" which covers the central concepts behind the work so just use this one and if they have more detailed questions they can get a hold me. Also, I have changed the footnotes below so that links to publications work. I have also included links to the associated models so that folks can play with these them selves

Resource Practices Branch - Tree Species Selection Tool - http://www.for.gov.bc.ca/hfp/silviculture/TSS/tss.htm

[1] DeLong, S.C, H. Griesbauer2, and C. R. Nitschke, 2012 (accessed December 4, 2013). Risk Analysis and Decision Support Tool, Future Forest Ecosystem Scientific Council, Final Report, http://www.for.gov.bc.ca/hfp/future_forests/council/#completed-projects . (To download or run Stand Level Drought Risk Assessment tool see http://www.for.gov.bc.ca/hfp/silviculture/TSS/Drought_Risk.html on the Tree Species Selection Tool website http://www.for.gov.bc.ca/hfp/silviculture/TSS/tss.htm)

[2]Wang, T., E.M. Campbell, G.A. O'Neill, S.N. Aitken (2012). Projecting future distributions of ecosystem climate niches: Uncertainties and management applications. For. Ecol. Manage. 279:128-140. http://www.sciencedirect.com/science/article/pii/S0378112712003118 (For further information on ClimateWNA (Western North America) Prism downscaling model see http://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna/ ; to run the web version of ClimateWNA see http://climatemodels.forestry.ubc.ca/climatewna/

SBSwk3 EDATOPIC GRID

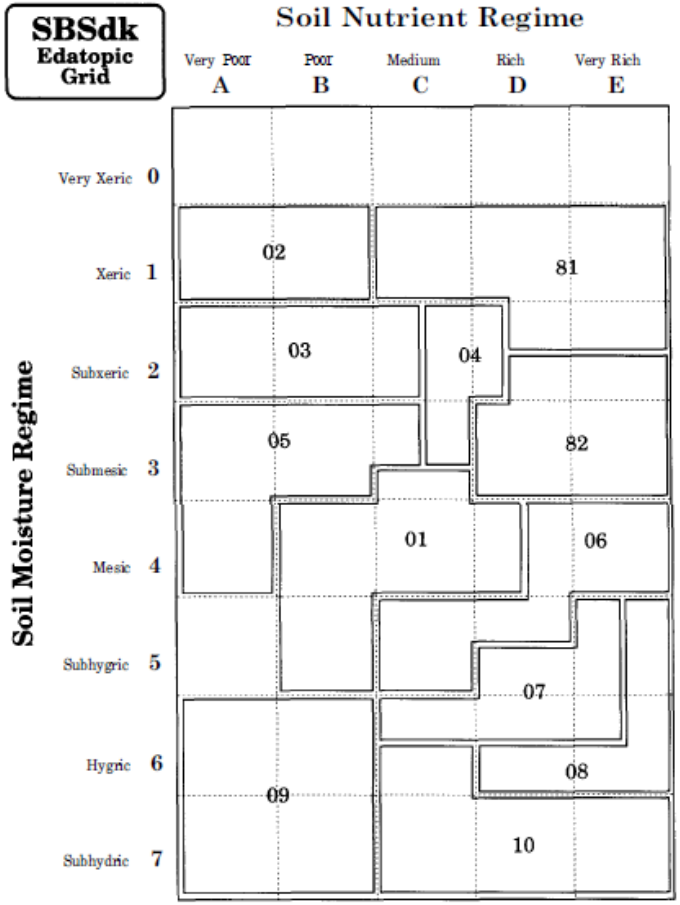


01 Sxw - Oak fern
02 Pl - Huckleberry - Cladina
03 SxwFd - Purple peavine
04 Sxw - Huckleberry - Highbush-cranberry
05 Sb - Labrador tea
06 Sxw - Twinberry - Coltsfoot
07 Sxw - Devil's club
08 Sxw - Horsetail

[1] *See MacKenzie and Moran (2004) for classifying wetlands occuring in the area*

FIGURE 9.1 *Edatopic grid displaying site units of the SBSwk3 variant.*

SBSdk Edatopic Grid



01 Sxw - Spirea - Purple peavine
02 Pl - Juniper - Ricegrass
81 Saskatoon - Slender wheatgrass (scrub/steppe)
03 Pl - Feathermoss - Cladina
04 Fd - Soopolallie - Feathermoss
82 Bluegrass - Slender wheatgrass (grasslands)
05 Sxw - Spirea - Feathermoss
06 Sxw - Twinberry - Coltsfoot
07 Sxw - Horsetail
08 Act - Dogwood - Prickly rose
09 Sb - Creeping snowberry - Sphagnum (forested bogs)
10 Sb - Soft-leaved sedge - Sphagnum (forested swamps)

FIGURE 9. Edatopic grid displaying site units in the SBSdk subzone.

What about climate effects on species use?

What is being done?

Type 4 Silviculture Strategies have species direction at the Subzone level as desired trends and or targets, e.g., for SBSdw in the Quesnel TSA

SBSdw

Pl			Sx			Fd		
Current	Trend	Target	Current	Trend	Target	Current	Trend	Target
68 / 80	◇	20 - 30	25 / 11	◇	15 - 20	5 / 5	⇧	30 - 40

Promote Fd where possible; maintain reduced dependence on Pl, increased use of Sx over harvest.

- Current – proportions planted / logged
- Trend – whether it is desired to
  - increase ⇧
  - decrease or ⇩
  - maintain the proportion planted / logged ◇
- Target – a biological target for the unit to trend towards where feasible

What about climate and wildfire – our options?

Fire Management Stocking Standards

Ed Korpela
Fire Management Specialist
Wildfire Management Branch

www.environmentdebate.wordpress.com

What about climate and wildfire – our options?

Fire Management Stocking Standards

- Ability to provide win/win scenarios
  - Ecosystem restoration
  - Hardwood production
  - Fire hazard reduction
- Consistent with Chief Forester Guidance on:
  - Incorporating mixedwood and broadleaves
  - Tree species composition at stand and landscape scales
  - Maintaining/recruiting habitat
  - Use of western larch
  - Immediate and long-term forest health issues

What about climate and wildfire – our options?

Fire Management Stocking Standards - Key Questions

- Why – Protection of life and property and enhancement of the delivery of ecosystem goods and services from forests within BC
- Where – where should fire management stocking standards apply?
- When – at what point(s) in the life of a stand should stocking standards apply?

What about climate and wildfire – our options?

Fire Management Stocking Standards - Where

- Relative to values negatively impacted by fire on the landbase
  - Within approx 2 km of interface
    - Provincial strategic threat analysis (PSTA) map
  - Within approx 2 km of other high value infrastructure on the landbase
    - Fire Management Plan Values Maps
    - Additional defined by Designated Decision Maker
  - Where identified by fuels management plan within the fire management plan
    - Based on landscape scale fire management objectives

What about climate and wildfire – our options?

Fire Management Stocking Standards - Where cont.

- Does not necessarily have to be applied to entire harvest blocks
  - Usually adjacent to value to be protected
  - On other appropriate standard units
  - More than one fire management standard could be developed
    - May be desirable to create a diversity of fuel types
    - Spatial arrangement of fuel types is important – locally and landscape

What about climate and wildfire – our options?

Fire Management Stocking Standards - When

- At different forest sucessional stages
  - Regeneration/ Free growing
  - Partial harvest with regeneration objectives
  - Intermediate Cut
- When identified by fuels management plan within a fire management plan
  - Based on landscape scale fire management objectives
  - May apply to any/all phases of forest production

What about climate and wildfire – our options?

Fire Management Objectives

- May be Landscape or Local
  - Landscape
    - Reduce fire size
    - Reduce fire behaviour
  - Local
    - Reduce fire behaviour
    - Reduce likelihood of crown fire
    - Reduce fire intensities
    - Reduce rate of spread
- In both cases – typically include enhanced suppression effectiveness and success as an objective

What about climate and wildfire – our options?

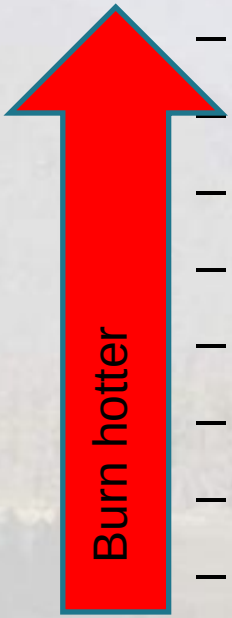
Stand Structure Considerations

- Include:
  - Species
    - Species fire characteristics
    - Species fire resistance
  - Inter-tree distance
    - Density and canopy bulk density
  - Canopy base height
  - Ecological suitability
  - Genetics
  - Tree/competition height ratios
  - Climate change considerations
  - Forest succession and in-growth including understory

What about climate and wildfire – our options?

Species Considerations

- Representative Canopy Bulk Densities (kg/cubic meter) for a single tree of the same size (approx 30cm dbh and 20 m tall) In order of decreasing bulk density – higher means hotter



  - Douglas-fir 0.00077
  - Western red-cedar 0.00075
  - Grand fir 0.00060
  - Western hemlock 0.00054
  - Lodgepole pine 0.00033
  - Western white pine 0.00026
  - Ponderosa pine 0.00022
  - Western larch 0.00017

What about climate and wildfire – our options?

Species Considerations

- Fire Resistance
  - **High** - western larch, ponderosa pine, Douglas-fir
  - **Moderate** - western white pine, lodgepole pine, western red-cedar
  - **Low** - western hemlock, grand fir, Pacific silver fir
  - Notes - Highly dependent on bark thickness (thicker is better), rooting habit (deep is better), branching habit (self pruning is better), foliage density (less is better) and associated species. Relationships and categorization vary with age and opinion.
- Flammability
  - Deciduous species are generally far less flammable than coniferous species.
  - Western red-cedar may be considered the most flammable of the coniferous species considered due to tendency to retain foliage and oil.

What about climate and wildfire – our options?

A Fire Management Stocking Standard

- Then becomes the combination of:
  - Fire management objectives
  - Stand structure considerations
  - And other compatible objectives (e.g. Timber production, ecosystem restoration, hardwood production, etc)

What about climate and wildfire – our options?

Fire Management Stocking Standard Development Approaches

- Development of new stocking standards
- Approved variance(s) on existing standards
- Planning to develop guidance for approved variances – option 2.

Managing Risk and Exploring Options

LOTS OF THOUGHT ON THIS ONE

The BC Wildland Fire Management Strategy 2010

Framework for achieving fire resilient landscapes.

Forest Sector Strategy for BC 2012

...Province will implement landscape fire management planning...

The BC Forest Stewardship Action Plan for Climate Change

...Manage risks and capture opportunities for fire resilience

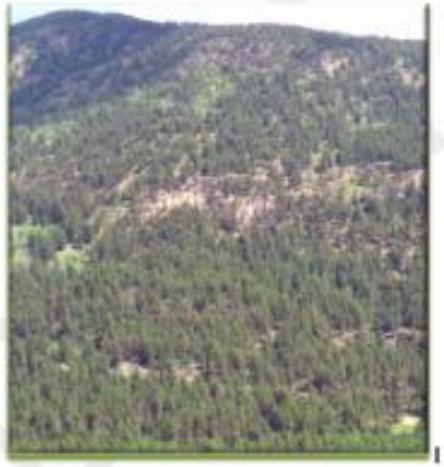
- ***Need to bring this into some thoughtful operational strategic planning***

Climate Change: Guidance for Tree Species Selection

What can be done now?

Available guidance

UPDATES TO THE REFERENCE GUIDE FOR FDP STOCKING STANDARDS (2013): CLIMATE-CHANGE RELATED STOCKING STANDARDS



Resources Practices Branch:

Ministry of Forests, Lands and Natural Resources Operations

DRAFT V 3.2

January 16, 2014

Ecological Guidance
An example

KAMLOOPS – THOMPSON OKANAGAN

ESSFwc2/01 (Kamloops)

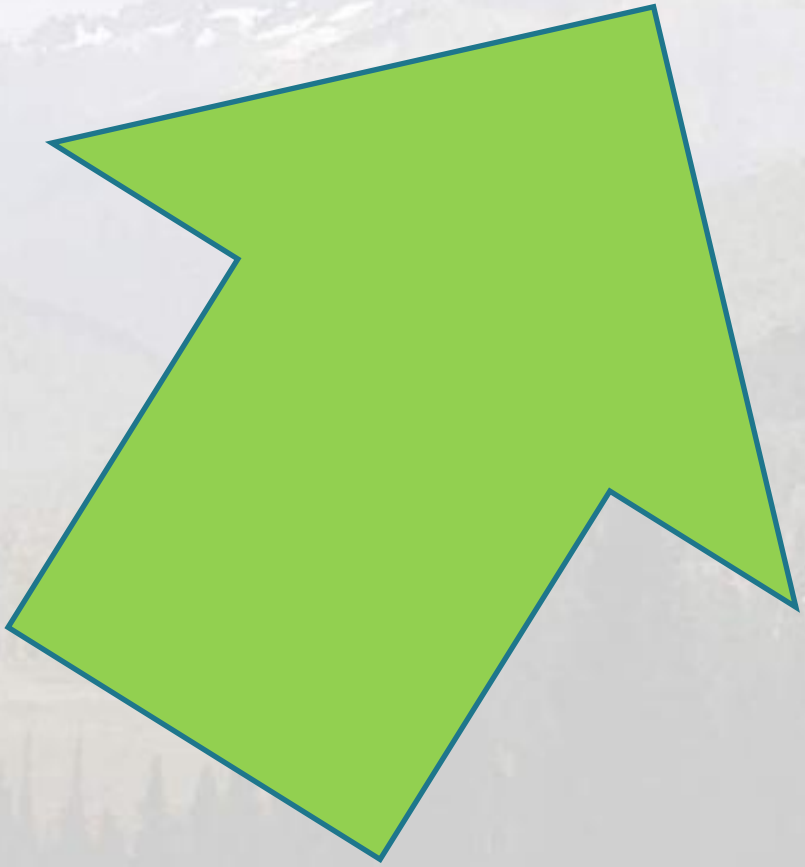
Trends and Comments

- ESSFwc2 encompasses 617,608 ha.
- About 50% of the ESSFwc2 is proposed to shift to ICH by 2020 and 75% by 2050.
- This is one of the largest changes by area for BGC units in the Thompson Okanagan Region
- Consider use of lower-elevation genetic stock of spruce (Sx)

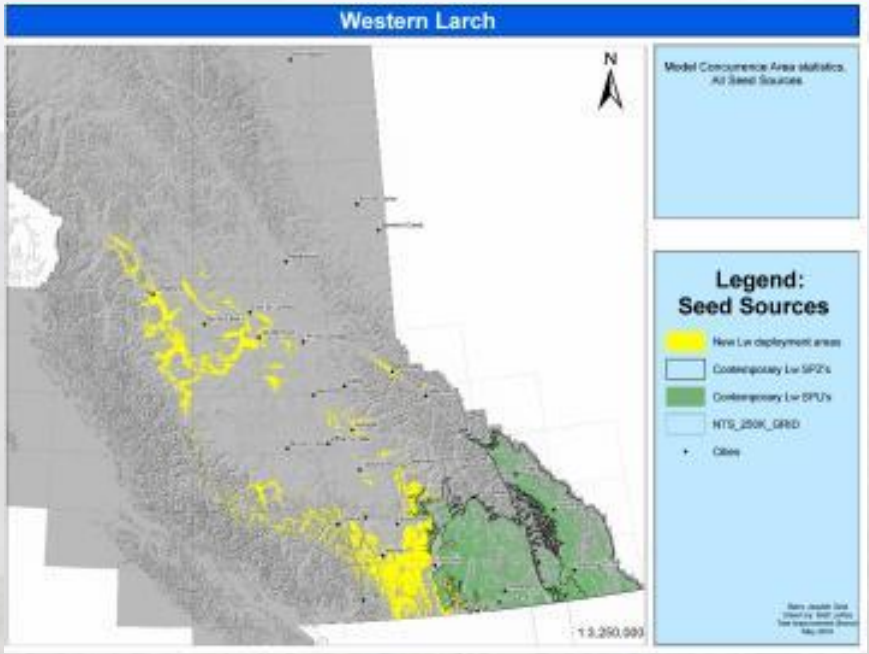
Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Bl	1	1	Preferred	No change	
Pl	3 Pl [17, 34]	0	Not suitable	Demotion	Not a suitable species.
Fd	0	3 Fd [9, 14, 32]	Acceptable	Promotion	May consider use on warm aspects at low elevations where growing-season frosts are not expected
Cw	0	3 Cw [14, 32]	Acceptable	Promotion	Consider using Cw at lowest elevations
Hw	0	3 Hw [14,32]	Acceptable	Promotion	Consider using Hw at lowest elevations
Pw	0	3 Pw [31, 9, 14]	Acceptable	Promotion	Use blister-resistant stock on warm aspects at low elevations

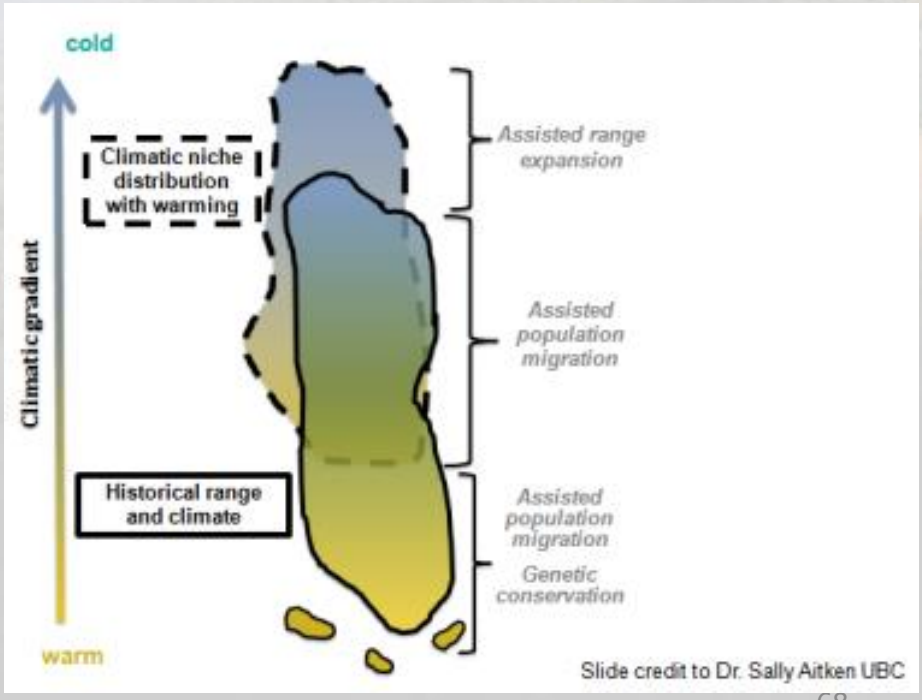
Available guidance

Link to guidance document to show specific examples – query participants



Available guidance – added range for Lw

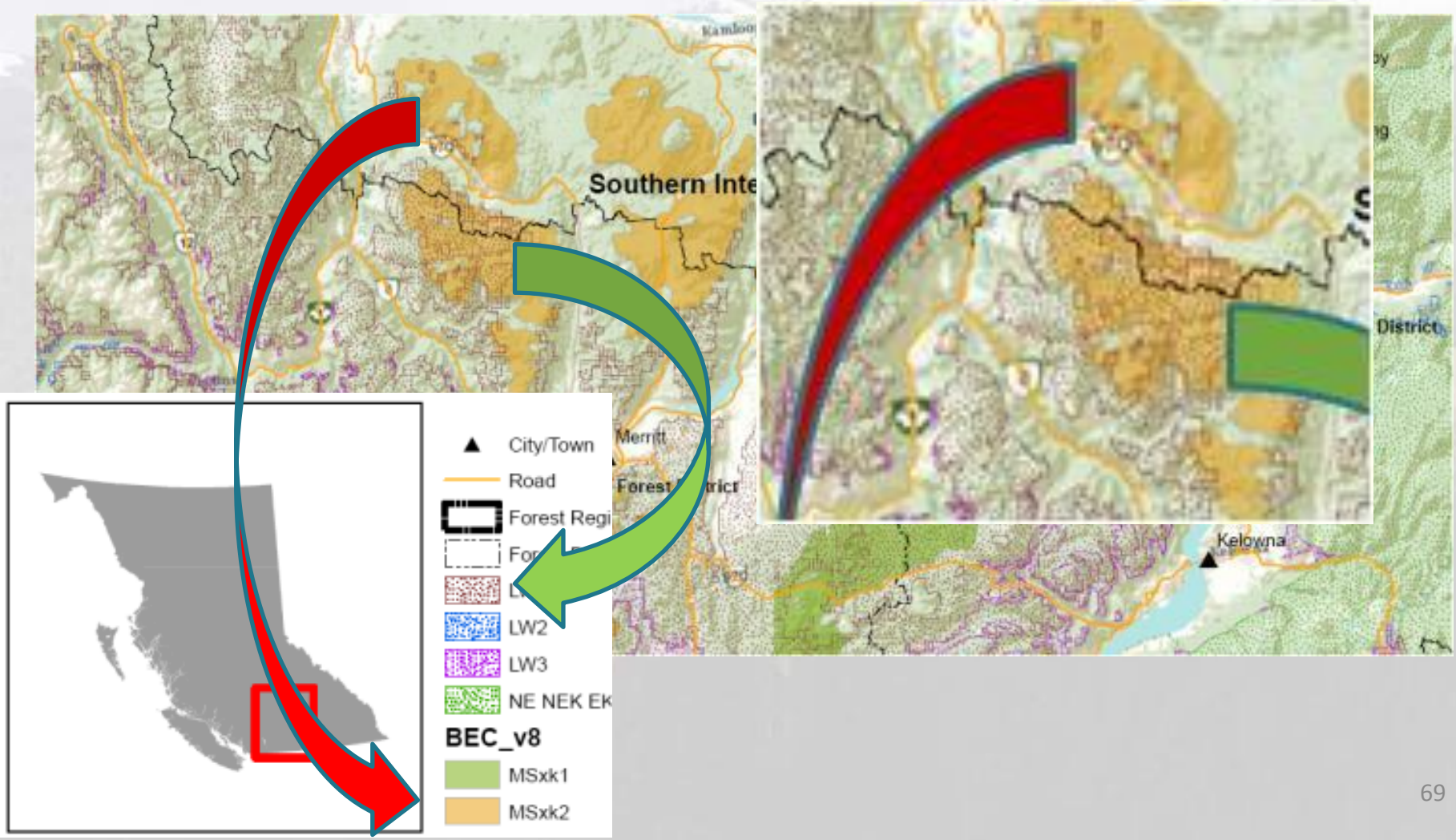




Climate Change: Guidance for Tree Species Selection

What can be done now?

Not all area is available within the present transfer rules



Climate Change: Guidance for Tree Species Selection

What can be done now?

Available guidance – you have 5% or if you desire more

What to do now if you wish to transfer outside of the defined seed zones

Call Lee – she will help guide you through the process

Lee Charleson

Lee.Charleson@gov.bc.ca

1 250 387-4839

Climate Change: Guidance for Tree Species Selection

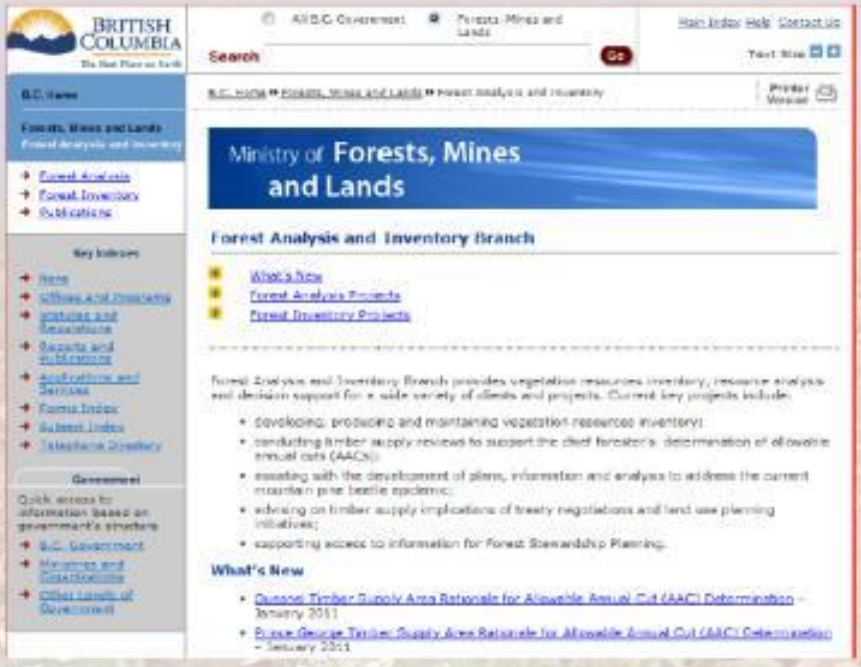
What can be done now? - FRPA tests

Stocking Standards

The Tests

After the overview need to be confident that the other tests have been met

FPPR s.26 / FRPA s.16



The Tests

1. Addresses established objectives. Meets content requirements.
2. Includes ecologically suitable species
3. Poses no immediate or long-term forest health risks.
4. Maintains or enhances an economically valuable supply of commercial timber.
5. **Is consistent with TSR analysis and assumptions.**

Climate Change: Guidance for Tree Species Selection

What can be done now? FRPA tests

Stocking Standards

Consistent with TSR analysis and assumptions

What if it is not consistent?

DDM MAY confer with licensee and:

- Consider for discretionary approval
- Must be deemed reasonable according to criteria

The Tests

1. Addresses established objectives. Meets content requirements.
2. Includes ecologically suitable species
3. Poses no immediate or long-term forest health risks.
4. Maintains or enhances economically valuable commercial timber supply.
5. **Is consistent with TSR analysis and assumptions.**

Climate Change: Guidance for Tree Species Selection

What can be done now? FRPA tests

Stocking Standards

Consistent with TSR analysis and assumptions

Test 5

- **Sec 26 (5)**

Discretionary Approval

PURPOSE:

- **New situations, priorities etc**
- **Allows for innovation**
- **Situations where appropriate standards are not currently consistent with TSR.**

Discretionary Approval – where the standards are reasonable having regard for the future timber supply for the area.

Climate Change: Guidance for Tree Species Selection

What can be done now? FRPA tests

Stocking Standards

Consistent with TSR analysis and assumptions

Discretionary Approval

Section 26 (5)The minister may approve the stocking standards...even though they do not conform to subsection (3) or (4) of this section, if the minister is satisfied that the regeneration date and stocking standards are reasonable, having regard to the future timber supply for the area

Must Approve if it: *FPPR s.26(1,3,4)*

1. **Addresses established objectives. Meets content requirements.**
2. **Includes ecologically suitable species**
3. **Poses no immediate or long-term forest health risks.**
4. **Maintains or enhances economically valuable commercial timber supply.**
5. Is consistent with TSR analysis and assumptions. *FPPR s.26(3)(ii)*

Climate Change: Guidance for Tree Species Selection

What can be done now? FRPA tests

Stocking Standards

Consistent with TSR analysis and assumptions

Discretionary Approval

1. Has it been successfully used on similar sites?, or,
   - Is it suitable for a trial on a limited area, with monitoring plan.
2. Rationale shows neutral or positive TSR impact
   - Or negative impact is offset by other positive benefits

Climate Change: Guidance for Tree Species Selection

What can be done now?

Guidance http://www.for.gov.bc.ca/hfp/silviculture/stocking_stds.htm

From: Tom Ethier
Assistant Deputy Minister
Resource Stewardship Division

Re: Consideration of Climate Change When Addressing Long-Term Forest Health in Stocking Standards

This memo builds on the Chief Forester's "Guidance on Tree Species Composition at the Stand and Landscape Level" released on September 24, 2009, and highlights mechanisms within the existing legislative framework that can be used to manage risks associated with innovative and/or unproven practices.

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Forests and Range — Forest Stewardship Division

MEMORANDUM

File: 280-30/TREESP
Ref. 119378

SEP 24 2009

To: Distribution List

From: Jim Snetsinger, R.P.F.
Chief Forester

Re: Guidance on Tree Species Composition at the Stand and Landscape Level

Lessons Learned

What are you going to do differently based on what you learned today?

Change is here Think, Learn, Act, Think again …

Thanks