CLIMATE CHANGE INFORMED SPECIES SELECTION (CCISS)

ADJUSTING TREE SPECIES SUITABILITY BY SITE SERIES

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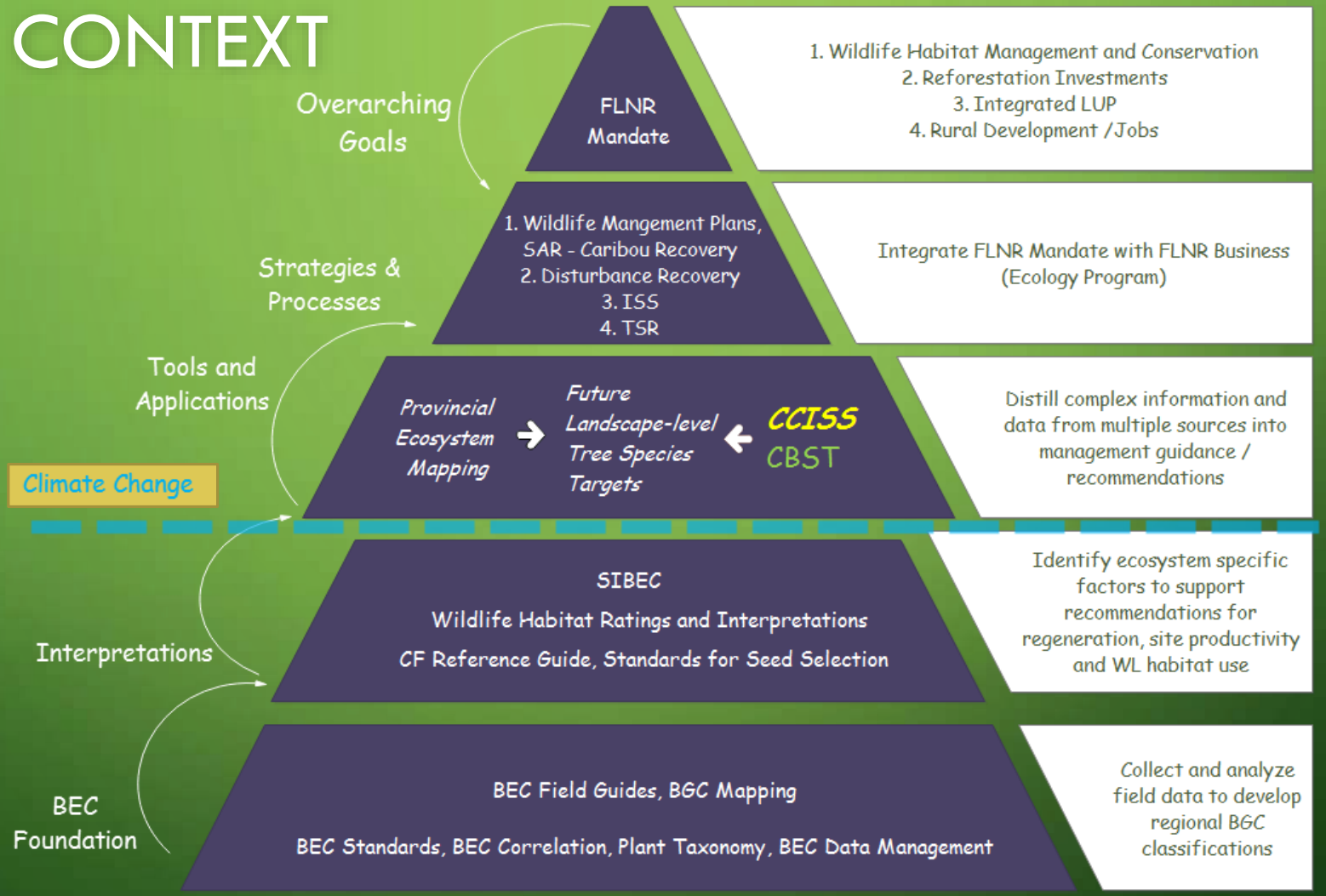
ITAC Meeting January 31, 2018

CONTEXT


Overarching Goals
FLNR Mandate
1. Wildlife Habitat Management and Conservation
2. Reforestation Investments
3. Integrated LUP
4. Rural Development /Jobs
Strategies & Processes
1. Wildlife Mangement Plans, SAR - Caribou Recovery
2. Disturbance Recovery
3. ISS
4. TSR
Integrate FLNR Mandate with FLNR Business (Ecology Program)
Tools and Applications
Provincial Ecosystem Mapping
Future Landscape-level Tree Species Targets
CCISS
CBST
Distill complex information and data from multiple sources into management guidance / recommendations
Climate Change
Interpretations
SIBEC
Wildlife Habitat Ratings and Interpretations
CF Reference Guide, Standards for Seed Selection
Identify ecosystem specific factors to support recommendations for regeneration, site productivity and WL habitat use
BEC Foundation
BEC Field Guides, BGC Mapping
BEC Standards, BEC Correlation, Plant Taxonomy, BEC Data Management
Collect and analyze field data to develop regional BGC classifications

OBJECTIVE

We want our managed stands to adapt or self-organize after unexpected disturbances or changes and to continue to provide desired goods and services. (D. Coates NSC presentation 2011)

We want our forest landscapes to have sufficient diversity to limit the impacts of a single species-specific disturbances and improve adaptability to a changing environment

REFORESTATION DECISIONS

- STEP 1: Species selection (CF Reference Guide)
  - Species suitable for the climate + site conditions
  - Species meeting Management Objectives
- STEP 2: Seedlot selection (CBST)
  - Seedlots adapted to climate
- Both need a climate change focus

SPECIES SELECTION MUST ALSO CONSIDER SITE CONDITION WITHIN CLIMATE

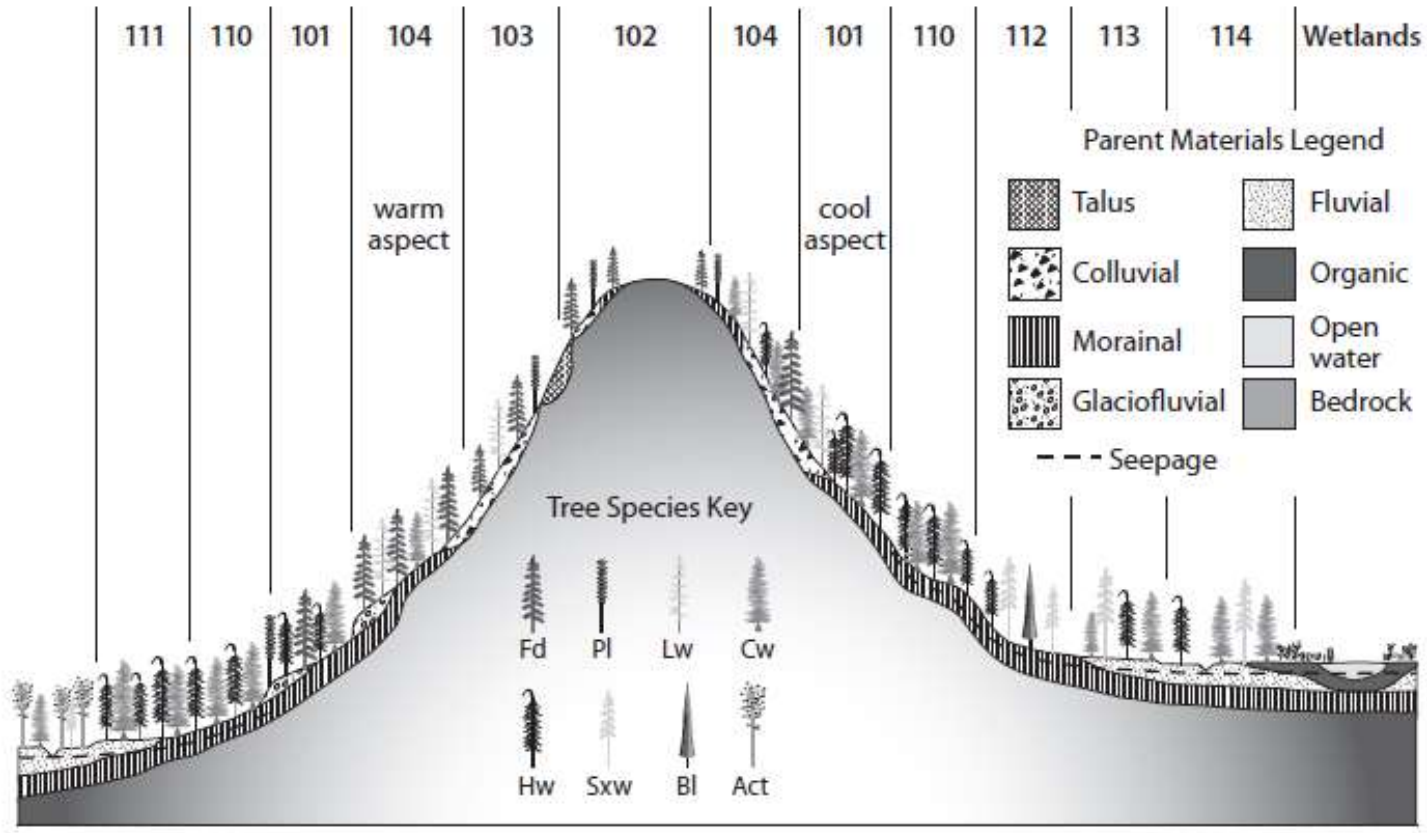


FIGURE 4.4 *Typical pattern of site series distribution within a biogeoclimatic subzone/variant across mountainous terrain of southeast British Columbia.*

CHIEF FORESTERS REFERENCE GUIDE

BGC Classification		Regeneration Guide: Species						Stocking(i)			Regen
			Conifer				Broadleaf	Target	MIN pa	MIN p	Delay
Zone/SZ	Series	Standards ID	Primary	Preferred (p)	Secondary	Acceptable (a)	Tertiary	(well-spaced/ha)			(Max yrs)
ICHmw2	101	1050312	Fd[58] Lw	Fd[58] Lw Cw Hw[201] Pw[31]	Cw Hw Sx[10,13] Pw[31]	Bl[10,13,202] Sx[10,13]	Bl[10,13]	Act[b] At[a] Ep[a]	1200	700	600	4
	102	1050313	Fd[58] Pl	Fd[58] Pl	Lw	Lw Py[9,14,203]	Py[9,14,203]	At[b]	1000	500	400	7
	103	1050314	Fd[58] Lw	Fd[58] Lw		Pl[200] Pw[31] Cw[13] Py[9,14,203]	Pl Pw[31] Cw[13] Py[9,14,203]	At[a] Ep[b]	1000	500	400	7
	104	1050315	Fd[58] Lw	Cw[10,201] Fd[58] Lw Pw[31]	Cw Hw Pw[31]	Pl Hw Py[9,14,203] Sx[10,13]	Pl Sx[10,13] Bl[10,13] Py[9,14,203]	At[a] Ep[a]	1200	700	600	7
	110	1050316	Cw	Cw Hw[201] Fd[1,14,32,58] Lw[1,14,32]	Fd[1,14,32,58] Hw Lw[1,14] Pw[31] Sx	Sx[10,13]	Bl[10,13]	Act[a] At[a] Ep[a]	1200	700	600	4
	111	1050317	Cw[32] Sx	Cw[32] Pw[1,31] Sx	Hw[32] Pw[31]	Fd[1,14,32,58] Hw[32] Lw[1,14,32]	Fd[1,32] Lw[1,32] Bl	Act[a] At[a] Ep[a]	1200	700	600	4
	112	1050318	Sx	Sx Cw[1,32]	Bl[202] Cw[1,32]	Hw[1,32] Bl[202]	Hw[1,32]	Act[a]	1200	700	600	4

Species Ranked in Each Site Series

Feasibility – ecological suitability

Reliability –forest health/environ hazards

Productivity – growth potential (saw log focus)

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

Not suitable

CCISS IS BEC-BASED

- Biogeoclimatic Ecosystem Classification
  - Bioclimates that can be modeled with climate change
  - Link climate- to site-level change
- If a future projected climate is like a current BEC climate - we already know what to expect & do

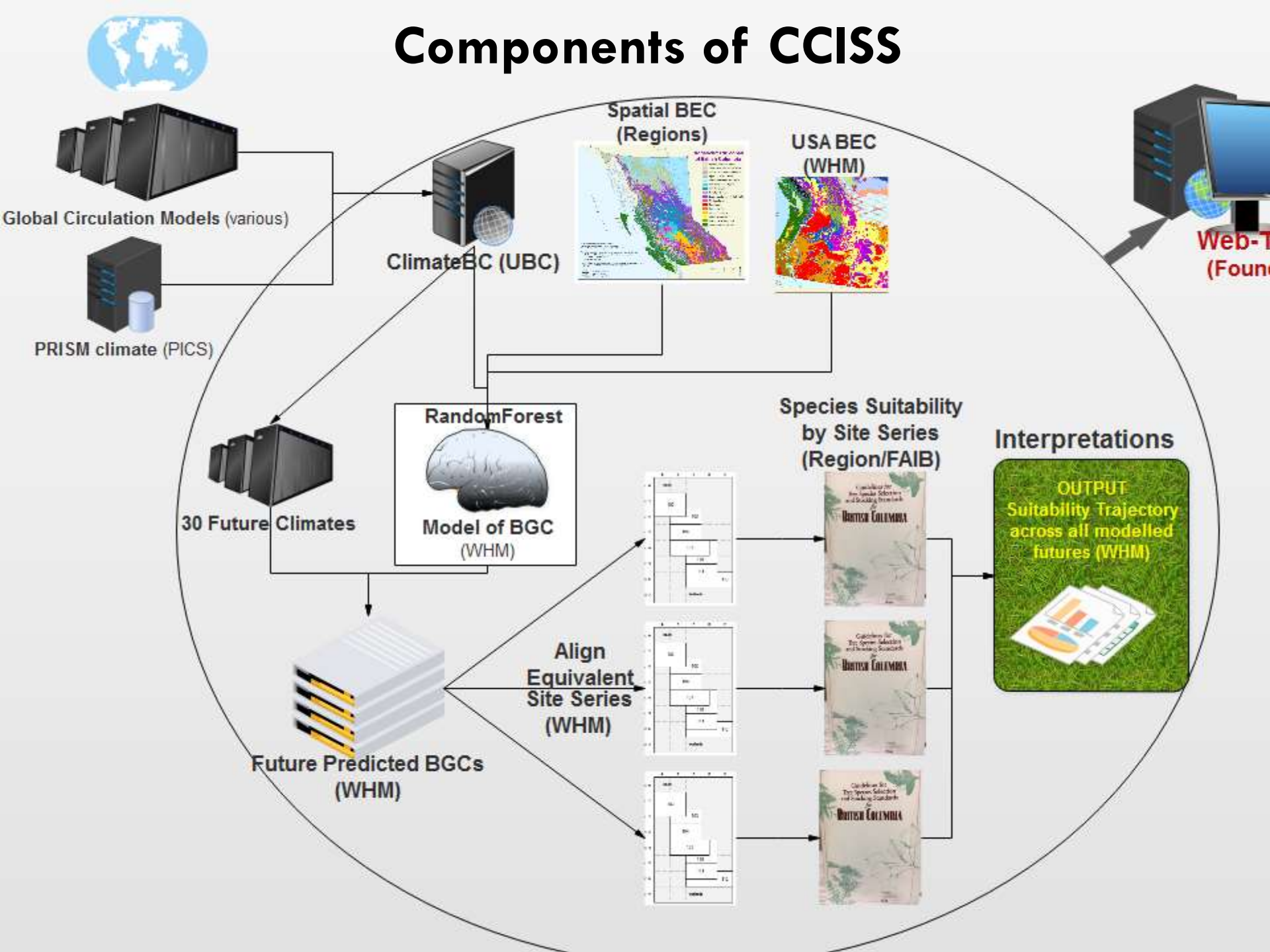
Allows leveraging of existing BEC interpretations:

- Tree species selection
- Habitat, biodiversity, forage values
- Changes to site productivity/carbon sequestration
- Other

CCISS APPROACH

- Predict future BEC from each of 30 model/scenarios using machine-learning analysis (randomForest)
- Align species suitability ranks for each of the predicted future site series.
- Based on the degree of model agreement:
  - Promote/Demote/remove current species based on projected suitability trajectories
  - Identify range expansion opportunities
  - Identify the range/diversity of species suitable to address the range of future climate uncertainty

Components of CCISS

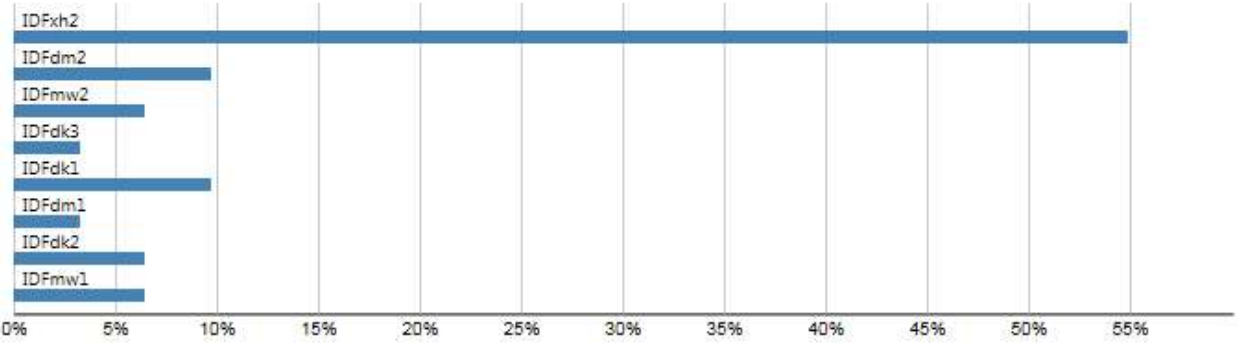


CCISS WEB TOOL (REVIEW PHASE)

Predictions for a single point

Future Model (2025)

BGC Prediction:



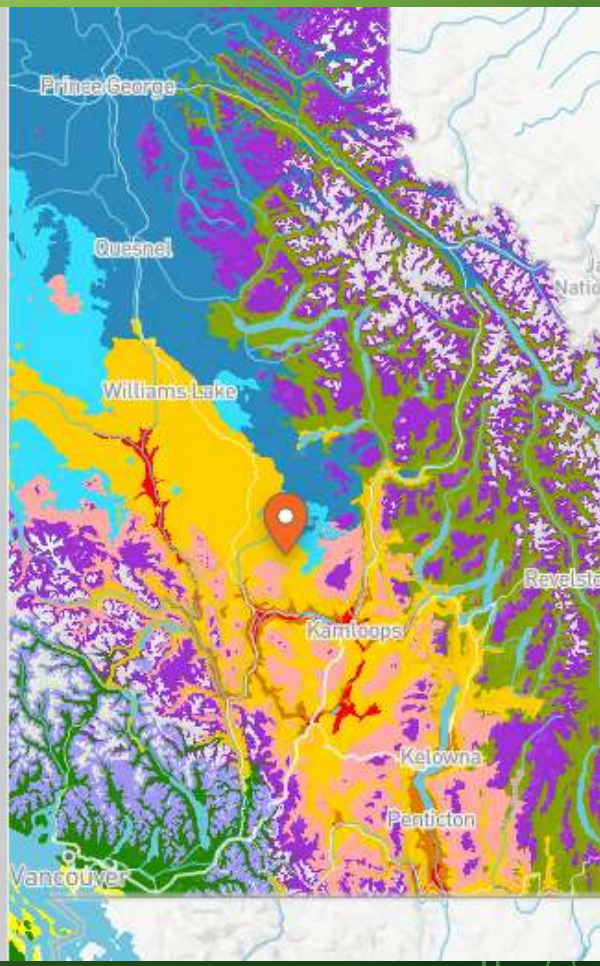
Tree Species Suitability

Site Series: IDFdk3/01

Species	Current Suit.		Future Suit.	Same	Improve Minor	Improve Major	Decline Minor	Decline Major	New Primary	New Secondary	New Tertiary	Not Suit.
Trembling Aspen	2	X	0	35.0%			48.0%	48.0%				17.0%
Douglas-Fir	1	-	1	97.0%								3.0%
Lodgepole Pine	1	X	0	27.0%			15.0%	15.0%				58.0%
Ponderosa Pine	0	+++	1						89.0%	60.0%	19.0%	10.0%	12.0%
Hybrid Spruce	3	X	0	21.0%	15.0%	9.0%	6.0%					64.0%

Notes/Footnotes:

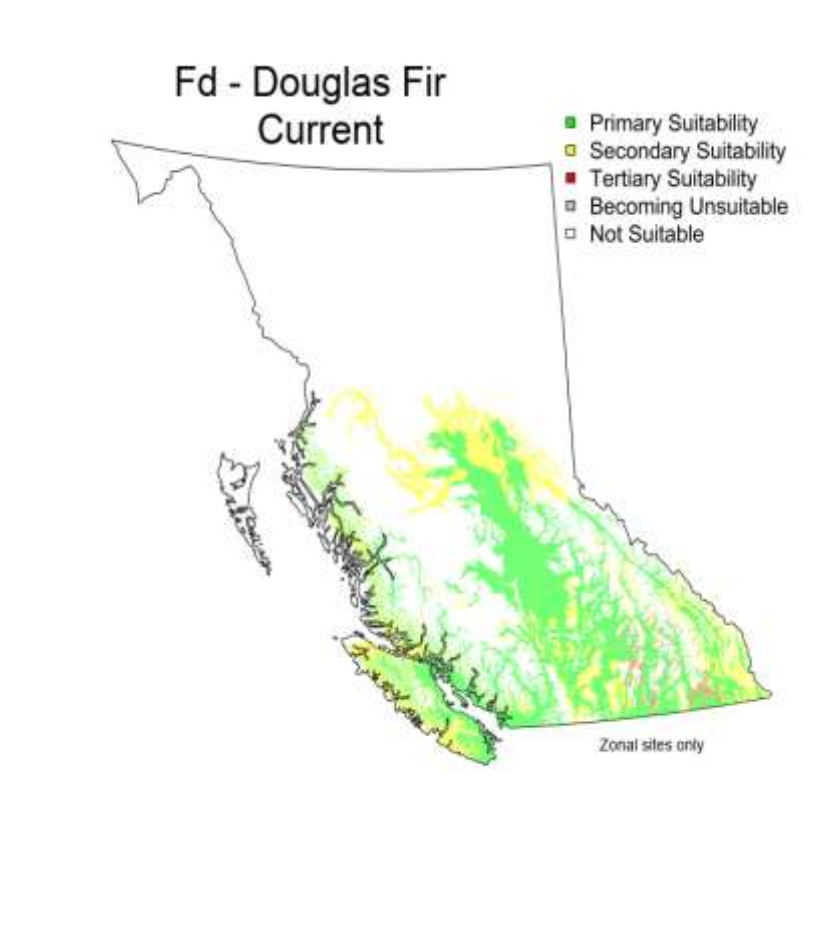
Interpretive notes about the above tables i.e. 31 General circulation models were

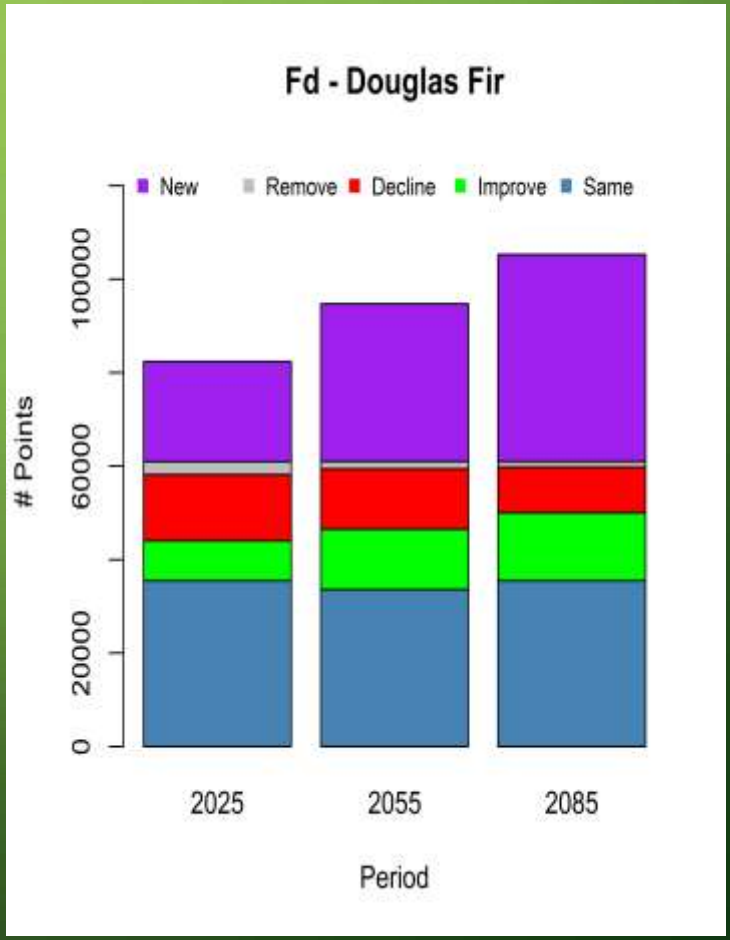


PROVINCIAL TRENDS IN SPECIES SUITABILITY

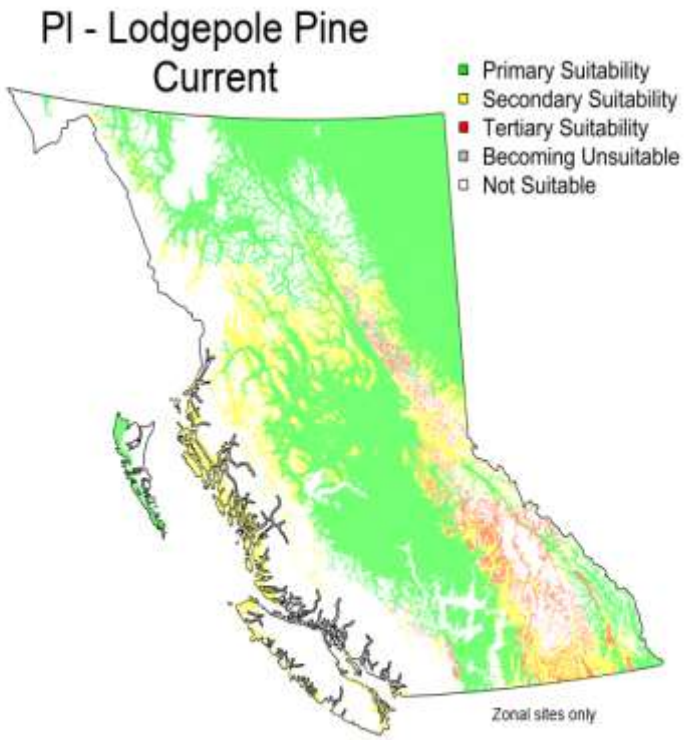
- Temperate species: improving suitability and expanding range (Fd, Py, Lw, Bg, Pw)
- Boreal species: declining suitability and declining range (Pl, Sx, Bl, Sb)
- Rainforest species: expanding range (Cw, Hw)

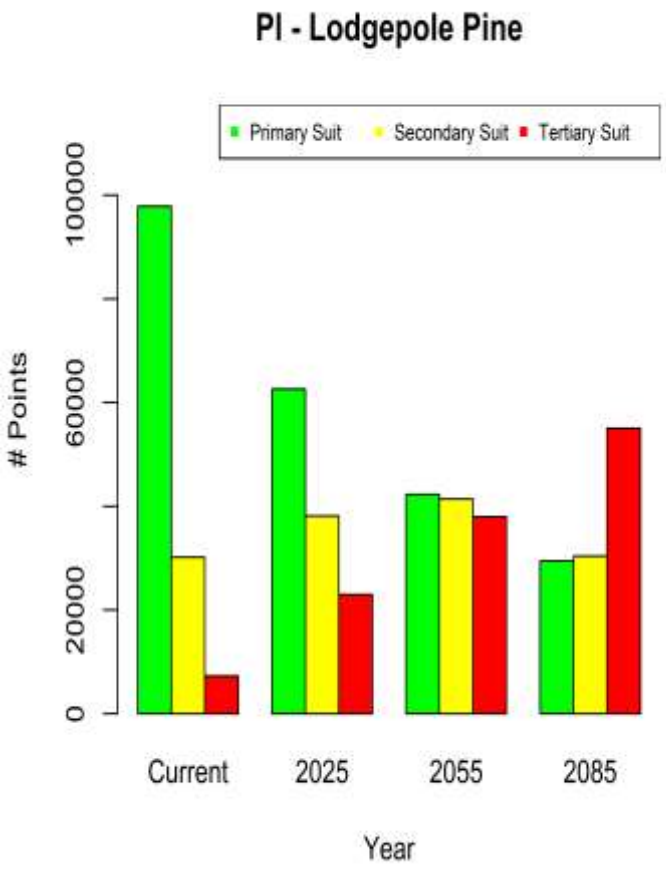
CHANGE IN DOUGLAS-FIR SUITABILITY
(ONLY ZONAL SITES)



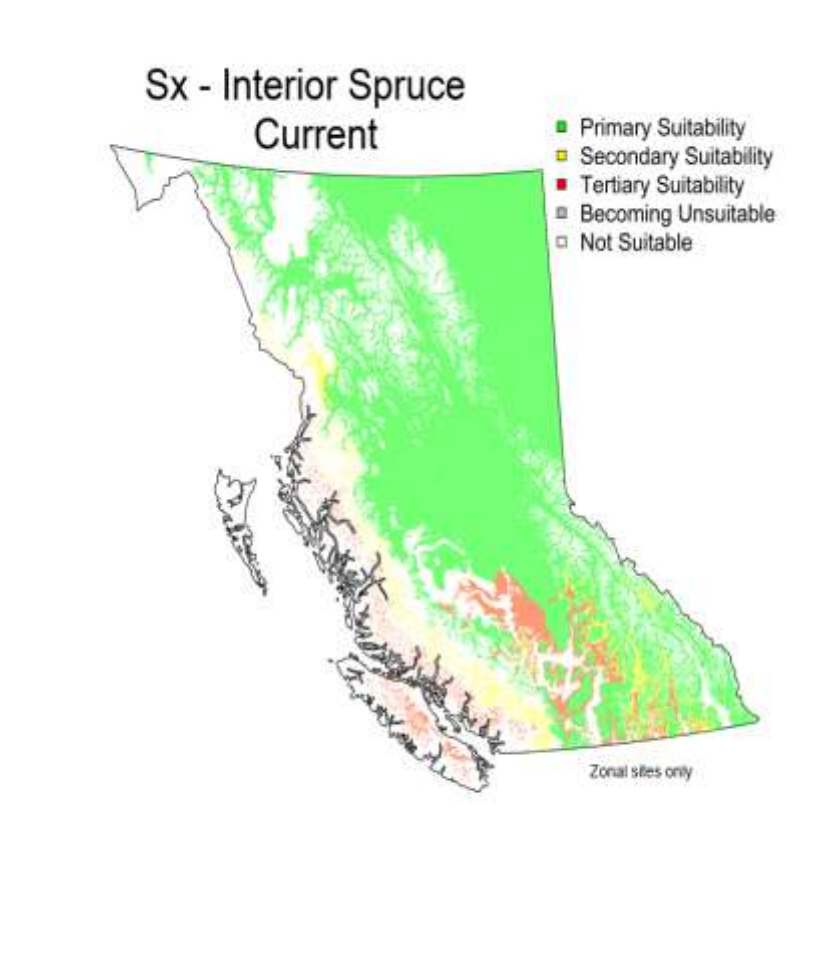


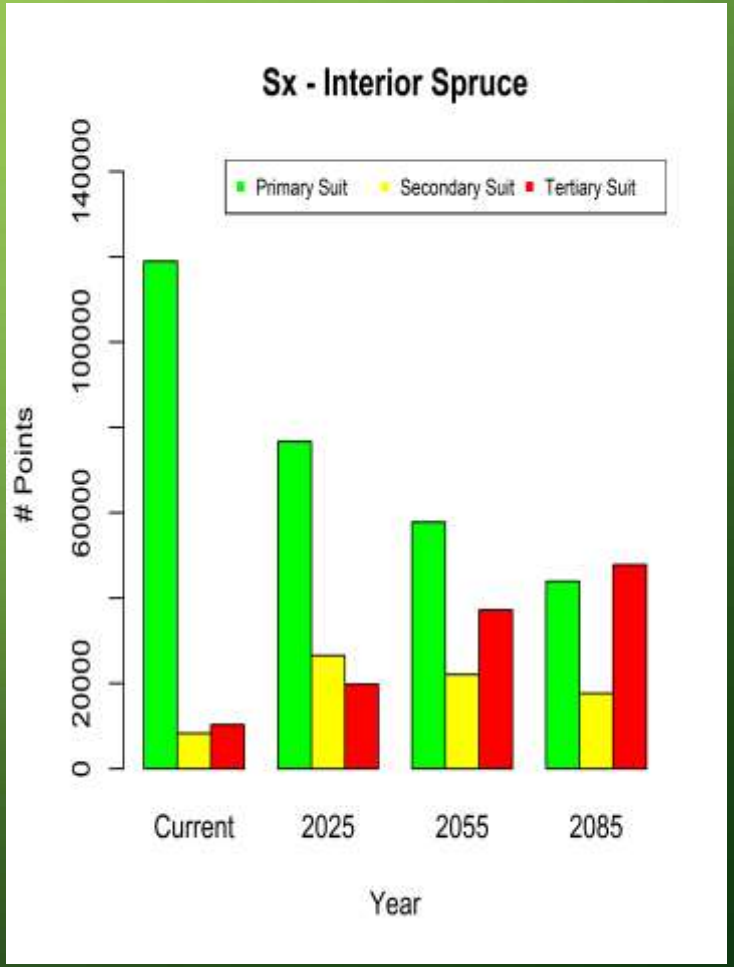
CHANGE IN LODGEPOLE PINE SUITABILITY (ZONAL SITES)





CHANGE IN INTERIOR SPRUCE SUITABILITY (ZONAL SITES)





CCISS

- Assist in Climate Change Informed Stocking Standards
- Identify areas of opportunity and risk

ONGOING WORK

- Review of model components
- USA_BEC mapping and species suitability
- Assessment of historic “offsite” species trials

END

GOALS OF CCISS

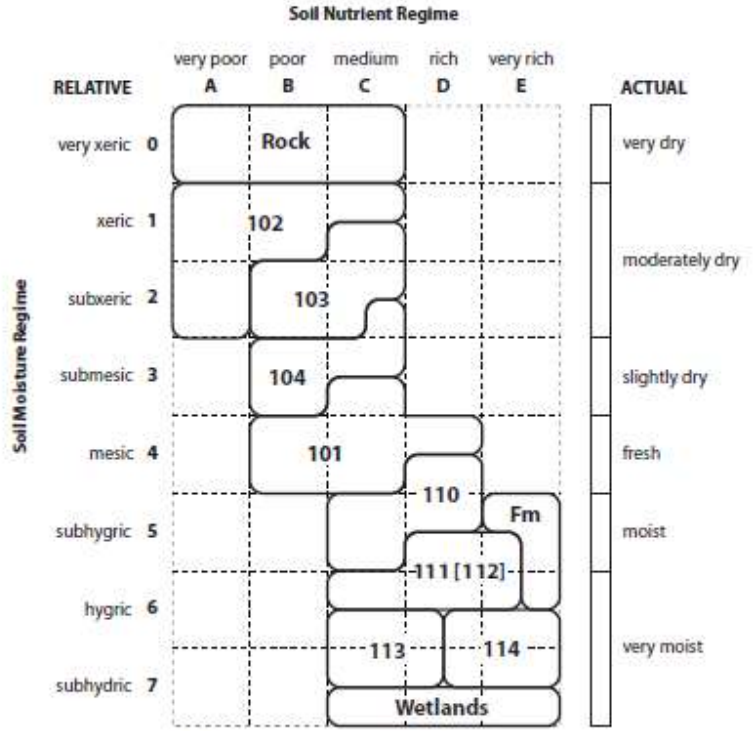
- Leverage what we already know (BEC)
- Produce an Adaptive Management analysis framework
  - easily updatable to convert improved information into guidance adjustments
- Web-based delivery of guidance derived from real-time analysis
  - Promote/Demote current species based on projected suitability trajectories
  - Identify range expansion opportunities
  - Identify the range/diversity of species suitable to address climate future uncertainty

SITE VARIATION REFLECTED IN VEGETATION INCLUDING TREE SPECIES

Site relationships modelled in the edatopic grid

ICHmw2

Edatopic Grid



Site series

101	HwCw – Falsebox – Feathermoss
102	Fd(Pl) – Falsebox – Pinegrass
103	Fd – Douglas maple – Falsebox
104	FdCw – Falsebox – Prince's pine
110	CwHw – Oak fern
111	CwHw – Devil's club – Lady fern
112	Sxw(Hw) – Huckleberry – Oak fern
113	CwHw – Horsetail – Lady fern
114	CwSxw – Skunk cabbage
Fm01	Cottonwood – Snowberry – Rose[1]
Fm02	Cottonwood – Spruce – Horsetail[1]
Fm04	Cottonwood – Western redcedar – Dogwood – Lady fern[1]

[1] See section 6.3 for descriptions

BEC-BASED TREE SPECIES SUITABILITY AT CLIMATE AND SITE SCALES

- Climate has an overarching effect on vegetation
- Site condition within a climatic area also profoundly effects vegetation.
- BEC is the tool for linking these two levels of control together.
- BEC is critical for successful tree species suitability guidance.

TREE SPECIES SUITABILITY ASSESSMENT

- By Ecologists and Silviculturalists
- Assess the following 3 key elements for each species in each **site series**:
  - **Feasibility** – ecological suitability
  - **Reliability** –forest health constraints
  - **Productivity** – growth potential (saw log focus)

REFORESTATION SPECIES DECISIONS