

CLIMATE CHANGE AND SPECIES SELECTION

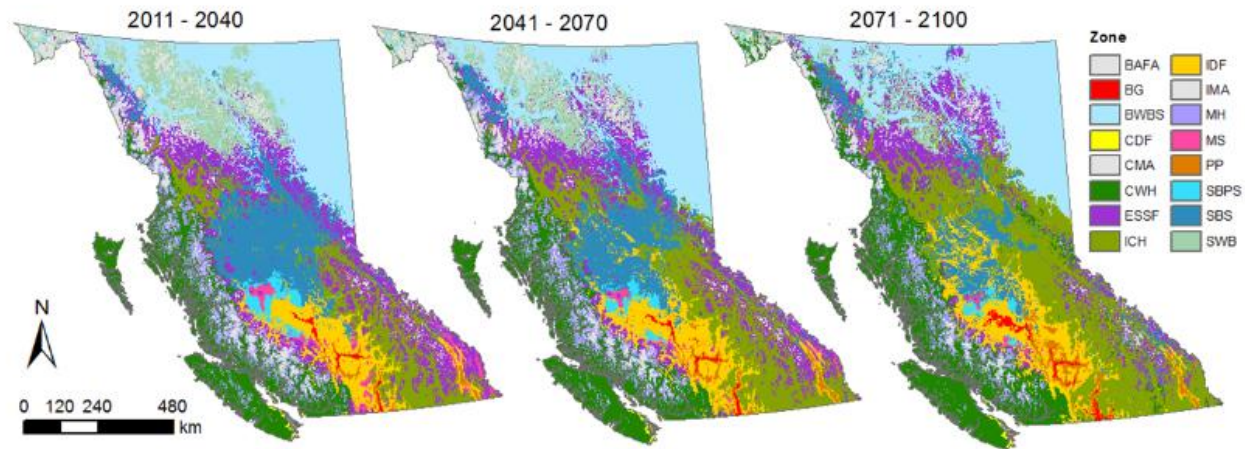
2013-2014 Forests For Tomorrow
Business Meeting

Kevin Astridge RPF
Resource Practice Branch

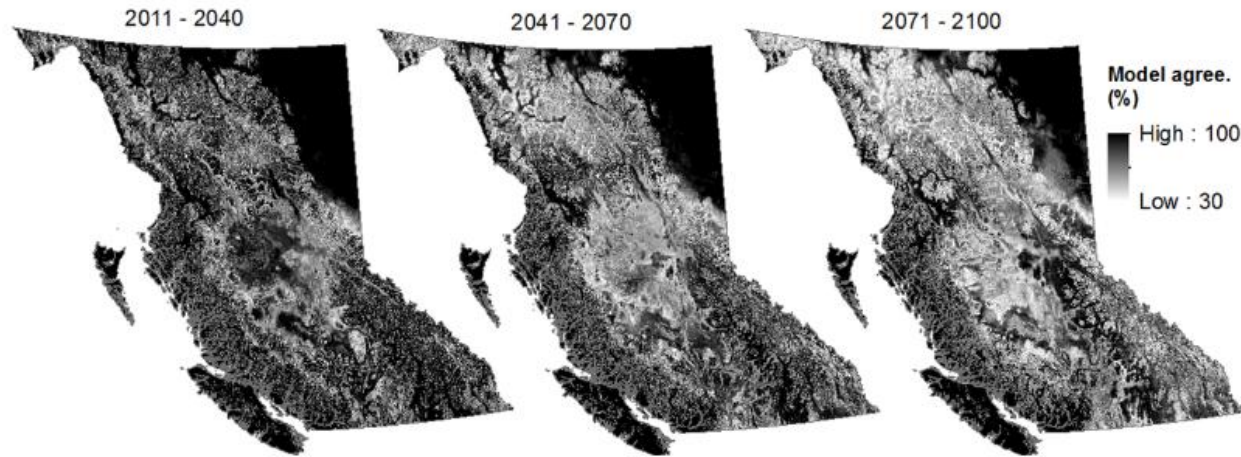
CONSENSUS PROJECTIONS – WANG ET AL

Consensus projections

Based on projected changes in temperature and precipitation, 20 climate change scenarios were selected to represent the range and distribution of the projected changes by over 140 climate change scenarios from the IPCC Fourth Assessment. Shifts in bioclimatic envelopes for BC ecosystem zones were projected based on each of the 20 climate change scenarios. A consensus projection for a future period was generated based on the most frequently projected ecosystem zone for each pixel among the 20 individual projections.



We used the level of the model agreement among the 20 individual projections to represent the level of uncertainty of the ecosystem climate niche under climate change.



CHIEF FORESTER GUIDANCE

File: 280-30/TREESP

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SEP 24 2009

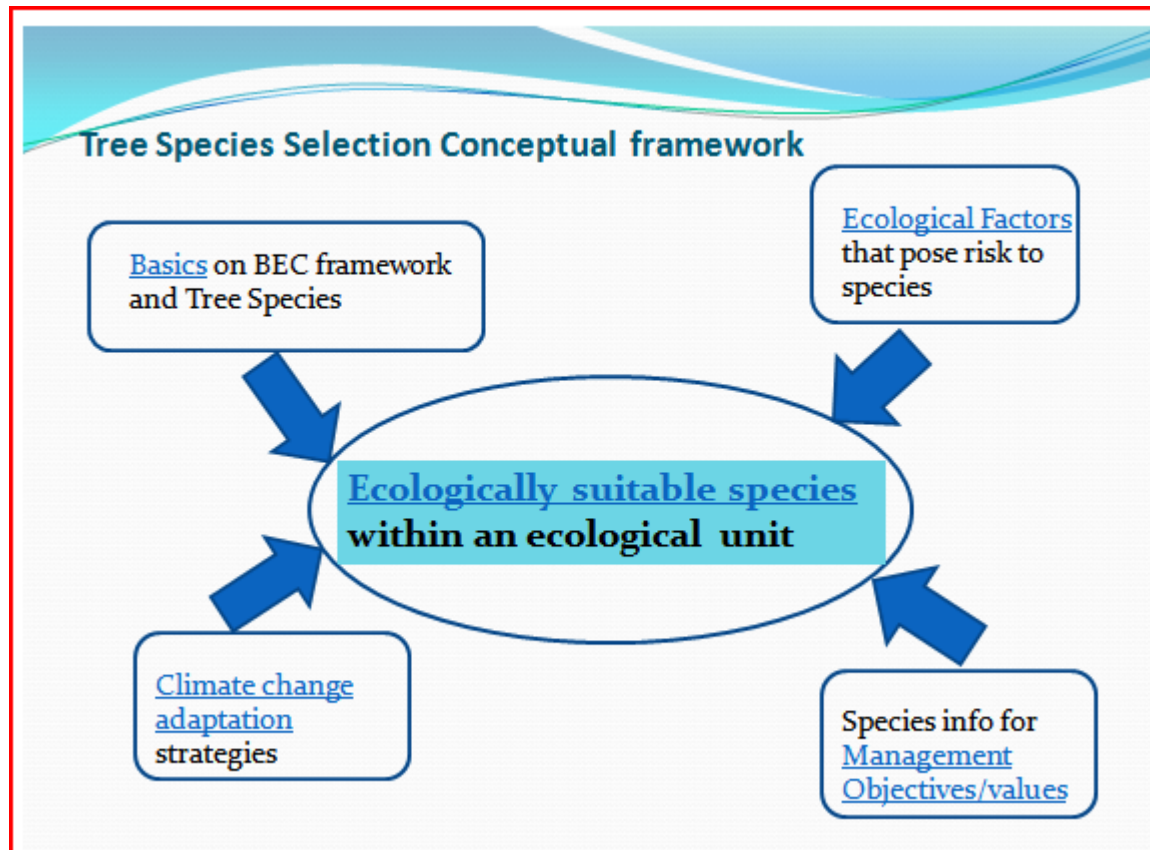
To: Distribution List

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

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

- A diversity of well adapted, healthy, resilient, stands across the landscape
- Tree species diversity at multiple scales
- No single “right” answer
- Use the best science available

TREE SPECIES SELECTION TOOL



TREE SPECIES SELECTION TOOL

Tree Species Selection Tool: BEC ZONES: Sub-Boreal Spruce

SBSdw3 - Dry Warm Stuart Variant

Historically the forests of the Stuart variant of the Dry Warm Sub-boreal Spruce biogeoclimatic unit (SBSdw3) were dominated by fire-origin seral forests. Lodgepole pine dominated stands mixed with hybrid white spruce and Douglas-fir and a hybrid white spruce and subalpine-fir understory were widespread on upland sites with deeper soils while hybrid white spruce and subalpine-fir dominated stands were generally restricted to lower to toe slopes and along riparian features. On compact or lacustrine soils with shallow rooting depth black spruce dominated the understory of lodgepole pine dominated stands. Black spruce was also common in the localized wetlands that dot the landscape and occasionally richer wetlands are dominated by tamarack. Douglas-fir dominated forests were common on dry ridges and coarser-textured soils on warm aspects. In areas near historic settlements, aboriginal burning and land clearing increased the number of stands dominated by trembling aspen and paper birch.

Age class distribution as a % of total forest area [Source: VRIMS 2008]

Stand age class	7-9 natural forest	7-9 harvested forest	4-6 natural forest	4-6 harvested forest	1-3 natural forest	1-3 harvested forest
% of total forest area	40	1	38	1	6	15

TREE SPECIES SELECTION TOOL

Tree species distribution in natural old/mature (age class 7-9) and natural immature (age class 4-6) as a % of the total natural old/mature and natural immature forest cover respectively [Source: VRIMS 2008]

Species	At	B	E	Fd	PI	S
% of total natural old/mature (age class 7-9) forest cover	13	1	1	8	46	30
% of total natural immature (age class 4-6) forest cover	23	1	2	4	50	20

Localized forest high grading of hybrid spruce in the 1950's lead to an increase in subalpine fir (see 4-6 IMM HARV Figure 1). Clearcut harvesting of the 1960's to present have resulted in stand compositions that are similar to those on the natural landscape. A reduction of Douglas-fir stocking on average sites may be one exception as well more open stocking of recently planted stands where natural ingress has been limited. Trembling aspen also tends to be more dispersed and not in denser patches as it was in the natural landscape due to brushing and weeding practices.

% species composition of post-harvested stands [Source: RESULTS 1988-2007]

Species	BI	Fd	PI	S	Hardwoods
% of harvested area	3	4	67	15	10

Author: C. DeLong (March 2011)

TREE SPECIES SELECTION TOOL

SiteUnit	Source	nPlots or I	Act	At	Bl	Ep	Fd	Lt	Pl	Sb	Sx
SBSdw3/01	Guide	Pr George		X	X	X	X		X		X
SBSdw3/02	Guide	Pr George					X		X		X
SBSdw3/03	Guide	Pr George		X					X		X
SBSdw3/04	Guide	Pr George		X	X	X	X		X		X
SBSdw3/05	Guide	Pr George		X					X	X	X
SBSdw3/06	Guide	Pr George	X	X	X	X	X		X	X	X
SBSdw3/07	Guide	Pr George	X	X	X	X			X		X
SBSdw3/08	Guide	Pr George	X	X	X	X	X		X		X
SBSdw3/09	Guide	Pr George			X				X	X	X
SBSdw3/10	Guide	Pr George			X			X	X	X	X

- Updated ecologically suitable species lists for Northern Interior and Cariboo
- Comparison of P/S/T from reference guide with BEC plot database
- Provide the widest selection of species

SPECIES DIVERSITY

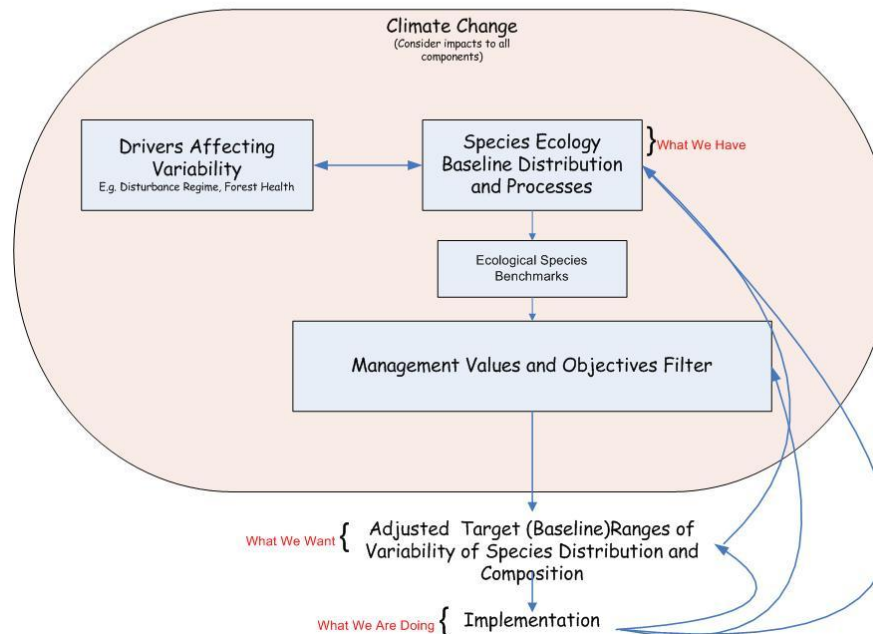
- “Where feasible establish mixed species plantations”
- “If exotics are chosen for reforestation, they should be established in mixes with native species”
- “Maximizing diversity on every site may result in stands that are difficult to manage”
- “The determination of an appropriate species mix, however, will be unique to each site and should include consideration, at the landscape level, of what percentage of cutblocks should have a species mix, and the species distribution within each cutblock”
- “Reasons for promoting a species mix include.....improving stand resilience to damaging agents.....enhancing biodiversity”
- “The choice between establishing a single species or a mixture depends on.....species compatibility”

READ THE ESTABLISHMENT TO FREE GROWING GUIDEBOOK (not just the tables in the reference guide)

LANDSCAPE LEVEL SPECIES STRATEGIES

- Technical Report 67 - A Landscape-level Species Strategy for Forest Management in British Columbia Exploration of Development and Implementation Issues (Mah *et al.* 2012)

Framework of Key Elements of Landscape
Level Species Strategies
(Revised, July 10, 2013)



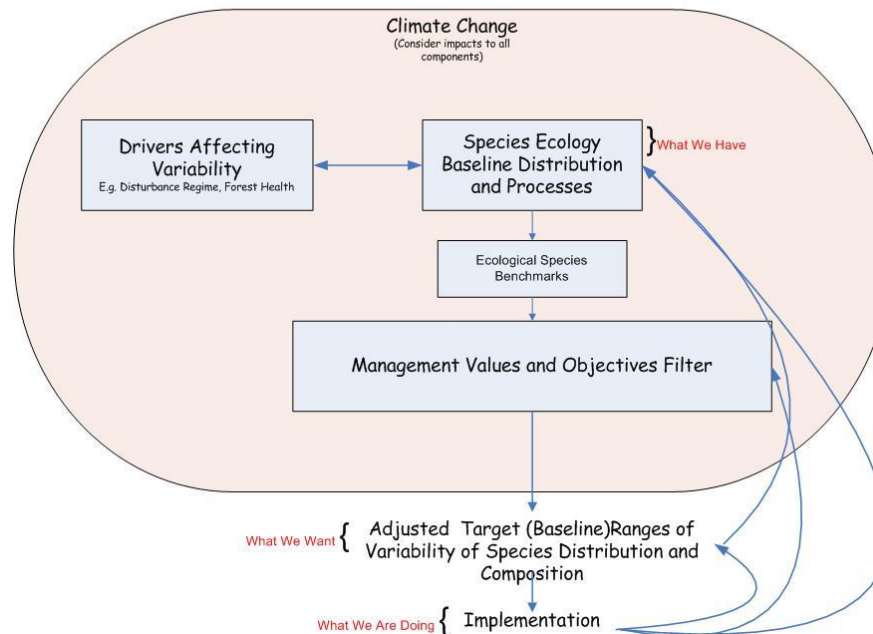
ECOLOGICAL BENCHMARKS

- Ecological benchmarks species targets or ranges
 - biological baselines without management objectives
 - guiding principle of building resilient stands through species diversity
- Developed for Bulkley, Nadina, Vanderhoof, Prince George, Ft. St. James, Quesnel, and portion of Williams Lake Districts
- Regional Specialists and Researchers, District Staff
- Synthesis of existing species information at a landscape scale
 - Landscape-level tree species composition
 - Age-class distribution in the natural and harvested stands
 - Reforestation trends for the BEC subzone/variants in the TSA
 - Climate envelope projections
 - Any other available information on potential risk to tree species establishment

LANDSCAPE LEVEL SPECIES STRATEGIES

- Ecological Benchmarks input into Type IV process
- Development of specific targets for tree species composition and density variability at the landscape level for a management unit

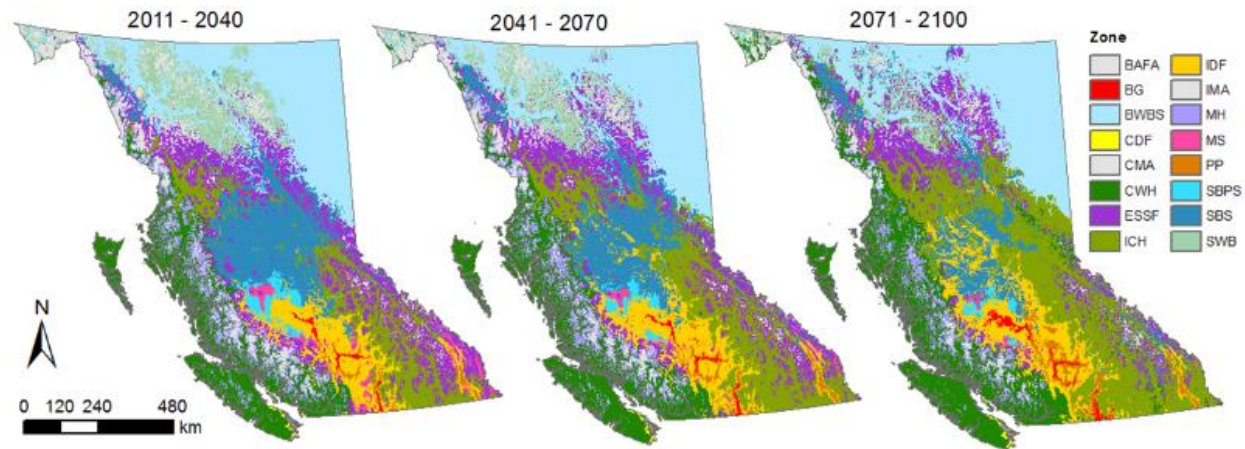
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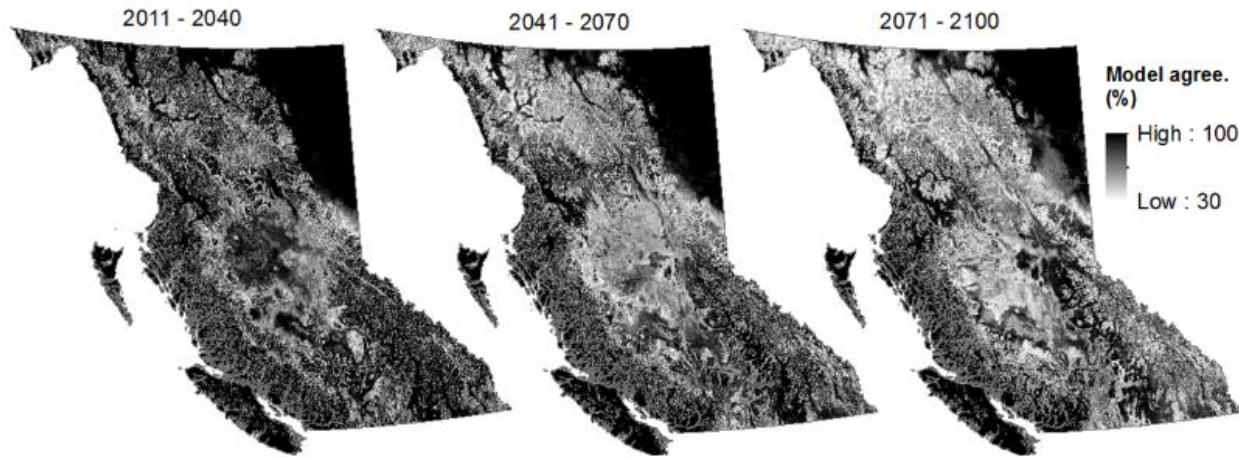
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ADDING THE CLIMATE CHANGE LENS

Suggested changes to the Reference Guide for FDP stocking standards – for species considered at high risk or opportunity due to climate change



DRAFT Ecologist input

IDFdk1/ 01 (KAMLOOPS)

Trends and Comments

- IDFdk1 encompasses 526,856 ha.
- Approximately 326,651 ha are expected to change in the IDFxh by 2020
- This is one of the largest changes (by area) for a BGC unit in the Thompson Okanagan Region.
- Over half of the IDFdk1 is proposed to be IDFxh subzone by 2020. This lower drier unit lacks Pl (too hot and dry) and has more Py. If the scenarios occur as predicted, Pl will become an unsuitable species throughout the lower half of the IDFdk1 in a few years and 3/4 of the BGC unit by 2050.
- Focus on planting Pl at higher elevations and on cool aspects and planting Py at lower elevations on warm aspect over the next few years.
- Should also consider shifting from clearcut to partial cutting silvicultural systems, e.g., shelterwoods, particularly on south aspects (if so, Fd becomes the major form of regeneration). This may create a problem for planting Pl and Py due to shade intolerance.
- Do not include Lw - it is too dry for this unit (even more so in future).
- Avoid species conversion to Pl throughout the variant.

EXAMPLE

IDFdk – with a lens of climate change

Species	Present Category	Suggested Category	Preferred/ Acceptable	Promotion or Demotion	Rationale/Footnotes
Fd	1 Fd ⁽³²⁾	1 Fd ⁽³²⁾	Preferred	No change	Retain – dominant species in all IDF units. Avoid use in depressions and frost-prone sites.
PI	1 PI	2 PI ⁽¹³⁾	Preferred/ Acceptable	Demotion	Increased risk – shift planting to upper elevations. Over half of the IDFdk1 is proposed to be IDFxh subzone by 2020. This lower drier unit lacks PI (too hot and dry) and has more Py. If the scenario occurs, PI will become an unsuitable species throughout the lower half of the IDFdk1 in a few years and 3/4 of the BGC unit by 2050. Consider only using PI as a preferred species on sites unsuitable for other species (cold air drainages and frost pockets) and where the previous stand was dominated by PI.
Py	2 Py ^(9, 14)	2 Py ^(9, 14)	Preferred	Promotion	Shift to preferred. Opportunity for greater use at low elevations on warm aspects
Sx	3 Sx ^(10, 13)	0	Not suitable	Demotion	Increased risk due to drought - should avoid planting on zonal sites
Lw	3 Lw ^(9, 14, 23, 32)	0	Not suitable	Demotion	Increased risk due to drought - should avoid planting on zonal sites. Appears to be error in footnotes – Lw should not be planted on warm aspects at low elevations in the IDFdk1

Consider only using PI as a preferred species on sites unsuitable for other species (cold air drainages and frost pockets) and where the previous stand was dominated by PI.

Make changes to trends or targets on previous slide

EXAMPLE

MSdc – with a lens of Climate Change

Zone	Region	Series	At	Bl	Cw	Fd	Lw	Pl	Py	Sx	
MSdc1	Kamloops	01	4	2		2		1		1	
2050	Region	Series	At	Bl	Cw	Fd	Lw	Pl	Py	Sx	Proportion
IDFdk2	Kamloops	01	0	-2		1	1	0	2	-2	16.47%
IDFww	Kamloops	01	rem	-2	1	1	1	-1	2	-3	31.23%
MSdc1	Kamloops	01	0	0		0		0		0	31.06%
IDFdk2	Kamloops	01	4			1	3	1	2	3	
IDFww	Kamloops	01			3	1	3	2	2		
MSdc1	Kamloops	01	4	2		2		1		1	

Criteria

Projected year: 2050

Proportion limit > 9.99%

Chart breakout limit < 5.00%

Consensus output
for 2050 shown
(Wang 2013)

CLIMATE CHANGE UPDATES TO REFERENCE GUIDE

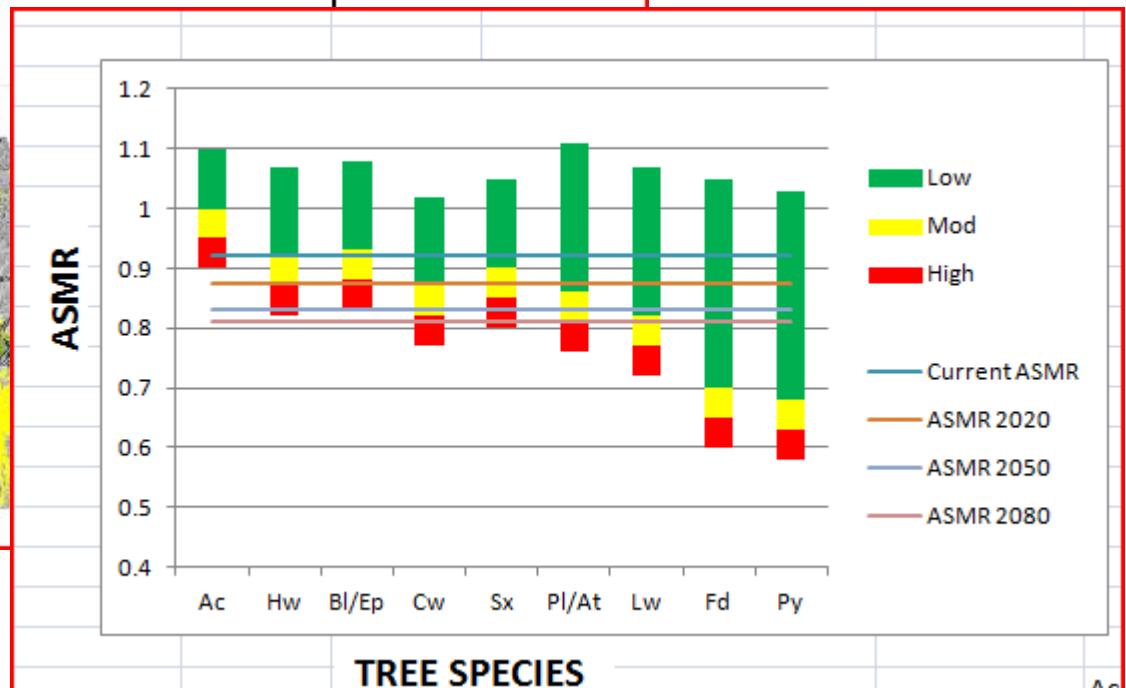
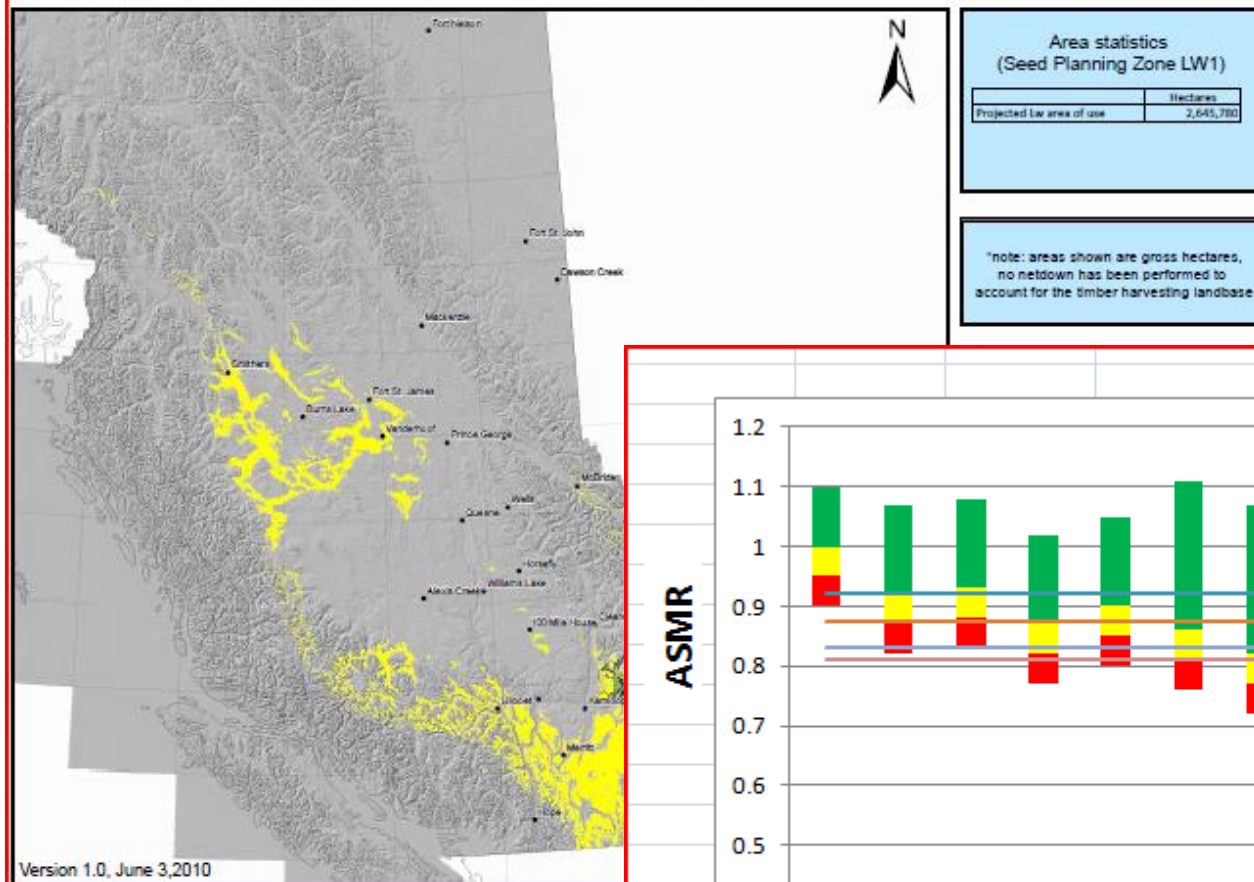
Zone/SZ	Series	Standards ID	Primary	Preferred (p)	Secondary	Acceptable (a)	Tertiary	Broadleaf
SBSmc3	01	81222	PI Sx	PI Sx	BI ²⁹	BI ²⁹		
Climate Change 2013	01					Fd Lw	Fd Lw	At Ep

IDFdk1	01	82106	Fd ³² PI	Fd ³² PI	Py ^{9,14}	Py ^{9,14} Sx ^{10,13}	Lw ^{9,14,23,32} Sx ^{10,13}	At ^a
Climate Change 2013	01			Py ^{9,14}	PI ¹³	PI ¹³ Sx	Sx Lw	

- Incorporate into reference guide as an additional line
- Should be used in conjunction the background information/rationale from ecologists

OTHER TOOLS

Range and Population Expansion of Western larch (2030) Climate Change -- Seed Planning Zone (LW1)



SUMMARY

- Tree Species Diversity at multiple scales
- Tools available to aid in understanding diversity of natural forests and managed stands
- Landscape level and stand level guidance is available/in development
- Information will be in a permanent state of flux as climate change science and models change over time (Flying BEC version 3?)
- “In the interim I expect that we will utilize the diversity of desirable tree species that are currently recognized as ecologically suitable” (Chief Forester 2009)