

# UPDATES TO THE REFERENCE GUIDE FOR FDP STOCKING STANDARDS (2014): CLIMATE-CHANGE RELATED STOCKING STANDARDS

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**Resources Practices Branch:**

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

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These guidelines reflect a diversity of knowledge provided through the history of the Ecological Classification program and the many who have worked to create and maintain it over the years. The present modifications were developed by FLNRO Ecologists using the best available climate change information for BC including potential projected changes to the present BEC climate envelopes.

Specific guidance was provided by BEC guidebook/former Forest Region by the following Ecologists:

- Cariboo – Ray Coupe (emeritus)
- Nelson – Deb MacKillop
- Prince George – Bruce Rogers
- Kamloops (Thompson Okanagan) – Mike Ryan
- Vancouver - Sari Saunders, Heather Klassen, and Andy MacKinnon
- Prince Rupert Region – Phil LePage, Sari Saunders, Heather Klassen and Andy MacKinnon

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

### INTRODUCTION

Climate change projections suggest that the suitability of some tree species for reforestation will be impacted by the expected changes in climate. As a result, reforestation decisions must take this projected change into account. Reforestation decisions in British Columbia are most often guided by BEC site series level information, and as the BEC classification system is climate based it provides an opportunity to integrate changes in climate into existing guidance. This document outlines BEC-site series-tree species combinations that meet one of the following conditions and provide direction on use:

- Tree species once considered suited to the BEC – Site Series combination, which will be outside of their historical climate envelope for that species based on climate change projections. Limitations on their use will be described.
- Tree species once considered suited to the BEC – Site Series combination, that are projected to be within a climate that will increase the likelihood of increased forest health issues that will limit their ability to provide for the timber objective. Or due to the projected change will no longer be feasible to establish or will have reduced reliability and or productivity again will have limitations ascribed to their use.
- Tree species previously not considered suited to the BEC – Site Series combination, which will be within the climate envelope for that species under climate change projections providing for enhanced adaptation with the changing climate. These species will be elevated and available for limited use subject to seed use standards in place.
- Tree species previously not considered suited to the BEC – Site Series combination, which will be within the climate envelope for that species under climate change projections but may have a limited ability to grow providing for enhanced adaptation with the changing climate and use as an acceptable species. Promotion may be provided with limitations.

The importance of climate change and species suitability over time will vary by BEC-Site Series combinations and species. The following guidelines were developed by the Ministry of Forest Lands and Natural Resources Operations Ecologists and Silviculturalists.

Selecting appropriate tree species to manage on a site is one of the most important decisions a forester makes (e.g., Klinka and Feller 1984). The long-term implications of such decisions in the management costs and value of the final crop are significant. A poor choice of tree species can result in a loss to a range of ecological services and cannot be considered trivial. Climate change provides an additional challenge to select appropriate species. Refer also to the Chief

Forester guidance on tree species composition at the stand and landscape level for context and additional direction.<sup>1</sup>

*NOTE – THIS IS TO BE CONSIDERED A FIRST STEP AT ADDRESSING SPECIES / SITE COMBINATIONS IDENTIFIED AS VULNERABLE IN THE NEAR FUTURE (E.G., BY 2020 - 2050), AND FOR THOSE SPECIES THAT WOULD BE SUITED TO ADJACENT AREAS WHERE CLIMATE WILL BE MORE AMENIABLE IN THE NEAR FUTURE. IT IS MEANT TO BE UPDATED AS NEW INFORMATION EMERGES.*

*NOTE ALSO – TO BEGIN THE PROCESS, THE 01 SITE SERIES WAS TARGETTED, OTHER SITE SERIES MAY BE AT HIGHER RISK TO CHANGE AND WOULD BENEFIT FROM ASSESSMENT WITH THE LENS OF CLIMATE CHANGE IN FUTURE ITERATIONS. ADDITIONALLY NOT ALL BEC UNITS WERE ASSESSED PROVINCIAL IN THIS FIRST ITERATION, THUS WHERE NO CHANGES ARE PROVIDED, IT DOES NOT SUGGEST CHANGES MAY BE WARRANTED, IT REFLECTS THE SCALE OF THIS ORIGINAL PROJECT – I.E. TO IDENTIFY THE UNITS WITH THE GREATEST POTENTIAL FOR IMPACT FIRST. DISCUSSION WITH LOCAL ECOLOGISTS FOR OTHER BEC UNITS OR SITE SERIES WHERE MODIFICATIONS ARE CONSIDERED IS RECOMMENDED.*

This project is intended to provide correlated tree species guidance that may be applied immediately (2014 and beyond) for silviculture planning and practices under Forest Stewardship plans, (new plans, renewals, and extensions) site plans, and Forests for Tomorrow operations.

This guidance has been informed by the best available information. These guidelines identify new species options for high risk ecosystems (identified through FFESC research projects and other climate change information together with expert interpretation) that require different (climate-sensitive) management practices *now* in order to address future effects of climate change on these species and ecosystems.

The present guidance<sup>2</sup> on tree species selection is based on an ecological understanding of species site/climate combinations. It is provided based on the following concepts:

- Feasibility – that is the ability to establish the species on the site – in some cases the species can establish on site with minimal treatment post harvest, in other cases it may require amelioration of some site factors. Added direction, such as establish on south facing slopes only, not in frost pockets, etc. may be provided as guidance in footnotes.
  - While some species may appear to be better suited to future climates, the real time requirement of establishment and early survival may limit options or require different management approaches, e.g., using shelterwoods to allow early survival in frost prone areas.
- Reliability – has been identified, from previous stands in the BEC-Site Series combination, that the tree species will survive and grow without undue mortality or growth losses due to forest health factors.

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<sup>1</sup> [Chief Forester Guidance on Tree Species Composition at the Stand and Landscape Level](#)

<sup>2</sup> [Reference Guide for FDP Stocking Standards](#)

- This is an area where climate change may result in a rethinking of species guidance as the past may not be a good template for the future (e.g., more species to be used to provide a hedge against future mortality agents). Plausible futures and how they may influence forest health and other disturbance agents need to be considered when choosing species (e.g., long term forest health test under FRPA).
- Productivity – takes into account the expected growth and yield of species on different sites. Some species are better suited to low nutrient sites, others to richer sites.
  - Originally productivity was a criterion for individual species. Past productivity may not be a good compass for future productivity, thus seed transfer and matching species to plausible future climates will be an ongoing challenge.

Note species selection at the cutblock level is only one part of managing for desired future forest conditions. It is important to understand the landscape level to help put species use into perspective. Appendix 2, provides an excerpt from Mah et al. (2012) of landscape level concepts and design considerations that should augment local species choice decisions.

Additionally information on species use can be found by TSA to help understand species use over time.<sup>3</sup>

#### BACKGROUND ON TREE SPECIES SELECTION AND STOCKING STANDARD GUIDANCE-<sup>4</sup>

In 1993 the “Guidelines for Tree Species Selection and Stocking Standards for British Columbia” were published. It included the second approximation of stocking standards as well as the first correlated set of tree species selection guidelines. The guidelines included correlated species lists and forest health charts for each major species. The correlated species list categorized species by BEC subzone and variant as Primary, Secondary, or Tertiary. Species were categorized based on a combination of their:

- Maximum sustainable productivity
- Crop reliability
- Silvicultural feasibility

Primary species were considered best suited to timber production. A secondary species ranked lower than a primary species in reliability, feasibility and/or productivity and often had a restriction of some kind on a site. Finally tertiary species ranked lower still and were expected to make up a minor component of a stand or a minor component of all stands in an area.

During development of the Pre Harvest Silviculture Prescriptions preferred and acceptable species from the primary/secondary/tertiary list were expected to be selected based on the objectives, the BEC unit and site series, and species restrictions.

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<sup>3</sup> E.g. provincial link, for individual TSAs Google Species Monitoring Report Name of the TSA, for the provincial version choose the following link: [Provincial Species Monitoring Report](#)

<sup>4</sup> [A Short History of the Control of Species Selection for Reforestation in BC](#) – for a history of stocking direction for BC.

A requirement for a minimum number of well spaced preferred species at free growing and at regeneration was introduced. This was to ensure that the most desirable species occupy the site, and to promote active management of the preferred species and to avoid over deployment of less desirable species.

In 2002 stocking standards became required content in Forest Development Plans. Silviculture prescriptions were replaced by site plans, the site plan was no longer subject to approval, and there was no longer block by block approval of stocking standards. Decisions on stocking standards were now made by the DM when determining whether FDPs adequately managed and conserved forest resources. FDP standards could be approved with pre-defined variations that could be applied by the professional forester based on specific situations and circumstances (“approved variations”) without any subsequent DM review and approval. At this time the primary, secondary, and tertiary designations were augmented with Default provincial FDP stocking standards and published in the Chief Forester’s Reference Guide for FDP stocking standards. These standards included the conventional elements from the tables in the Establishment to Free Growing Guidebooks and a set of preferred and acceptable tree species. The defaults were for use by small tenures such as woodlots and as guidance for others who were developing stocking standards. This Forest Practices Code era document continues to provide guidance for developing stocking standards under FRPA, and as a result climate change guidance has been added to the document.

In FRPA the legislated tests that stocking standards must meet for approvals by the Minister are prescribed in FPPR 26:

- The area being stocked with ecologically suitable species that address immediate and long-term forest health issues on the area, to a density or to a basal area that, in either case,
  - is consistent with maintaining or enhancing an economically valuable supply of commercial timber from British Columbia’s forests, and
  - is consistent with the timber supply analysis and forest management assumptions that apply to the area covered by the plan on the date that the plan is submitted for approval
- The free growing height is of sufficient height to demonstrate that the tree is adapted to the site, and is growing well and can reasonably be expected to continue to do so.

In 2012 the Deputy Chief Forester issued a memo emphasizing the assumptions on which the stocking standard guidance in the Chief Forester’s Reference Guide for FDP stocking standards were developed and how this may influence whether standards address the immediate and long term forest health issues in an area. See: [Chief Forester Guidance re Stocking Standards and Forest Health](#).

In 2013 the ADM of Stewardship issued a memo indicating that it is the Ministry’s expectation that the impacts of climate change be considered when addressing long term forest health in the development and review of stocking standards.



## BACKGROUND

Regional specialists were asked to identify areas at high risk due to climate change and areas where there were opportunities via species selection to potentially mitigate some of the risk. These areas were identified using the most up to date information that was available together with their detailed understanding of the ecology and species in the area .

Some of the information available to the specialists included:

- Consensus derived biogeoclimatic change information created by Wang et al (2011) for BEC variants in BC for the periods centered at 2020, 2050 and 2080.
  - For added information on the approach taken by Wang et al, please see:

[Projecting future distributions of ecosystem climate niches: Uncertainties and management applications](#)

- Future Forest Ecosystems Science Council projects

[Future Forest Ecosystems Scientific Council of British Columbia](#)

Each regional ecologist provided areas where species direction should be modified (promoted or demoted) based on local understanding of the species ecological tolerance and projected climate change. These changes are provided in a tabular format below. Appendix 1 provides a summary of the changes recommended by each specialist, rationales, and suggested footnotes/limitations to be included.

### SEED TRANSFER

#### **“Seed Use considerations when selecting (and stocking) tree species under a changing climate”**

The use of tree seed (defined as any part of forest tree represented, sold or used to grow a plant) is regulated under *Forest and Range Practices Act* (FRPA) and its regulations and standards. The [Chief Forester’s Standards for Seed Use](#) (CF Standards) apply to persons who use seed to meet their silviculture obligations for the establishment of a free growing stand under section 26 of the FRPA; and, to persons who wish to register seed. The purpose of these standards is to maintain the identity, adaptability, diversity and productivity of the Province’s tree gene resources. Unlike stocking standards, the CF Standards have the weight and force of law.

Transfer standards for seed and vegetative lots are described in section 8 of the CF Standards, Transfer Limits for Registered Lots, and in Appendices 2 through 6. Transfer standards are assigned to natural stand lots as transfer limits and as transfer ranges (tested parent tree areas of use) for orchard lots. Information on all registered lots is stored and managed on the Seed Planning and Registry (SPAR) system. Transfer limits assigned to seed/vegetative lots are defined by one or more natural stand or orchard seed planning zone, and an elevation range;

and, in the case of natural stand lots, a latitudinal and longitudinal range.

Seed transfer limits are based on extensive provenance and progeny tests conducted by the ministry's forest genetics research scientists. Using a seedlot within its prescribed limits ensures that seed selected for reforestation will be genetically adapted to the environment in which it is planted. If not followed, exceeding a lot's transfer limits could result in loss of forest productivity, poor forest health (due to damage caused by frost, drought, snow, insect and/or disease, or seedling/tree death) and even plantation failure.

Recently, amendments to the seed transfer standards were made. These amendments account for both past and anticipated climate change (projected over the next 15-20 years). Two sets of policy changes helped BC move in this direction, including:

- (i) Increases in upper elevation limits by 100 – 200m for most tree species in November 2008; and,
- (ii) Limited range expansion for western larch in June 2010.

All registered seed and vegetative lots that met the criteria for the climate-based interim policies outlined above have been updated on SPAR to reflect these changes.

The CF Standards do permit up to 5% of all the trees planted annually by a licensee and a BC Timber Sales Manager within a single management unit (e.g. TSA) to be transferred beyond the lots' applicable transfer limits. This 5% tolerance is intended to accommodate situations where trees are transferred just beyond their limits for practical reasons. Forest and natural resource professionals are expected to apply sound judgment and to use the best available information in their seed transfer decisions.

Licensees and BC Timber Sales Managers may propose an alternative to the CF Standards. The Chief Forester may approve an alternative to the standards but only if the proposed alternative is consistent with the intent of the standards. Alternatives to the standards should be prepared in accordance with the Chief Forester's policy, which outlines the content requirements and

considerations that will be taken into account when assessing the proposed alternative ([Chief Forester's Standards for Seed Use](#)).

In cases where tree species selection and stocking guidelines have been updated in anticipation of significant climate change impacts, it is recommended that you consult with Tree Improvement Branch staff with your seed transfer questions.

#### DENSITY

For this iteration, density recommendations were not provided. Density direction based on local objectives and forest health considerations remain key in creating resilient forests and should be prescribed locally.

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## LOCATION OF GUIDANCE

Presently guidance on species selection and stocking standards are found online at: [Stocking Standards web page](#) under the stocking standards link.

The updates have been included within the reference guide<sup>5</sup> through insertion of a separate line highlighted in green. Species are highlighted in red to indicate a change in their categorization. See the example below.

BGC			Regeneration Guide			
Classification			Species			
			Conifer			
Zone/SZ	Series	Standards ID	Primary	Preferred (p)	Secondary	Acceptable (a)
ICHmw3	01	82084	Fd	Fd Sx <sup>10,13</sup> Cw <sup>10,13</sup>	PI <sup>51</sup> Sx <sup>10,13</sup>	PI <sup>51</sup> Bl <sup>10,13</sup> Pw <sup>31</sup>
Climate Change 2013	01		Fd	Fd Sx <sup>10,13</sup> Cw <sup>10,13</sup>	Cw <sup>10,13</sup> Hw <sup>10,13</sup> PI <sup>52</sup> Sx <sup>10,13</sup>	Hw <sup>10,13</sup> Lw <sup>23,32</sup> PI <sup>51</sup> Bl <sup>10,13</sup> Pw <sup>31</sup>

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- Wang, T., E.M. Campbell, G. O’Neill, S.N. Aitken. 2012. Projecting future distribution of ecosystem climate niches: Uncertainties and management applications. Forest Ecology and Management 279, 128-140.

<sup>5</sup> See link in legislation in Appendix 3 – FPPR section 46.2

## APPENDIX 1 – ECOLOGIST BACKGROUND AND RATIONALES

Categories in **RED** have been modified from those presently in the guidance document. Where there has been a promotion the line has been **bolded**, except for the comments.

Within the tables below in the Present and Suggested Categories the numbers 1, 2, 3 and 4 stand for primary, secondary, tertiary and 4 relates to presence of Broadleaf species in that unit. Numbers in brackets indicate more than one suggestion for the BEC site series, based on geographic variation within the unit or uncertainty.

Note that most of the modifications are for the 01 association; in some cases other site series were added and will be identified as part of the title.

### CARIBOO

SBPSxc/ 01

#### Trends and Comments

- Majority of unit within IDF climate envelope by 2020
- Approximately ¾ of the unit is with IDF envelope by 2050

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	<b>0</b>	<b>3(2)</b>	Acceptable	Promotion	Greater than 50% of the unit is projected by 2020 to be within a climate envelope that supports Fd.  Allow initially as an acceptable species on sites with good air drainage and between 2020 and 2050 assess if establishment is successful then elevate to preferred species on suitable sites.
PI	<b>1</b>	<b>1(3)</b>	Preferred	Minor Demotion	A small part of the area is projected by 2020 to be within a climate envelope where PI is currently restricted to sites with significant growing season frosts. Ensure ongoing monitoring in these areas to assess continued establishment

					and reliability of PI.
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SBPSdc/ 01

### Trends and Comments

- Climate increasingly more challenging for Sx and more suitable for Fd by 2020

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	0	3(2)	Acceptable	Promotion	Greater than 50% of the unit is projected by 2020 to be within a climate envelope that supports Fd.  Allow initially as an acceptable species on sites with good air drainage and between 2020 and 2050 assess if establishment is successful then elevate to preferred species on suitable sites.
PI	1	1	Preferred	No change	Most of the area is projected by 2020 to be within a climate envelope where PI is currently widespread and therefore is expected to remain a preferred species.
Sx	2	2(3)	Acceptable		Greater than 80% of the unit is projected by 2020 to be within a climate envelope where Sx may experience a moisture deficit.  Recommended footnote #28 <b>limited by moisture deficit</b>

## 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 <sup>(17, 34)</sup>	0	Not suitable	Demotion	Not a suitable species.
Fd	0	3 Fd <sup>(9, 14, 32)</sup>	Acceptable	Promotion	May consider use on warm aspects at low elevations where growing-season frosts are not expected
Cw	0	3 Cw <sup>(14, 32)</sup>	Acceptable	Promotion	Consider using Cw at lowest elevations
Hw	0	3 Hw <sup>(14, 32)</sup>	Acceptable	Promotion	Consider using Hw at lowest elevations
Pw	0	3 Pw <sup>(31, 9, 14)</sup>	Acceptable	Promotion	Use blister-resistant stock on warm aspects at low elevations

**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 PI (too hot and dry) and has more Py. If the scenarios occur as predicted, 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.
- Focus on planting PI 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 PI 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 PI throughout the variant.

Species	Present Category	Suggested Category	Preferred/ Acceptable	Promotion or Demotion	Rationale/Footnotes
Fd	1 Fd <sup>(32)</sup>	1 Fd <sup>(32)</sup>	Preferred	No change	Retain – dominant species in all IDF units. Avoid use in depressions and frost-prone sites.
PI	1 PI	2 PI <sup>(13)</sup>	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. <b>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.</b>
Py	2 Py <sup>(9, 14)</sup>	2 Py <sup>(9, 14)</sup>	Preferred	Promotion	Shift to preferred. Opportunity for greater use at low elevations on warm aspects
Sx	3 Sx <sup>(10, 13)</sup>	0	Not suitable	Demotion	Increased risk due to drought - should avoid planting on zonal sites



Lw	3 Lw <sup>(9,14, 23, 32)</sup>	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
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IDFdk2/01 (Kamloops)

### Trends and Comments

- The IDFdk2 encompasses approximately 264,995 ha of which 25% is expected to shift to the IDFxh1 by 2020 (65, 229 ha).
- However, in future scenarios there is also a shift to wetter conditions (IDFww and ICHdw1) along eastern and western borders of this BGC unit. Monitor these areas for future opportunities to consider Cw and Lw.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	1 Fd <sup>(32)</sup>	1 Fd <sup>(32)</sup>	Preferred	No change	Retain – dominant species in all IDF units. Avoid use in frost-prone sites.
PI	1 PI	2 PI*	Preferred/ Acceptable	Demotion	increased risk due to drought *do not plant on warm aspects at low elevations. 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 <sup>(9, 14)</sup>	2 Py <sup>(9, 14)</sup>	Preferred	Promotion	Shift to preferred. Opportunity for greater use at low elevations on warm aspects
Sx	3 Sx <sup>(10, 13)</sup>	0	Not suitable	Demotion	Increased risk due to drought - should avoid planting on zonal sites
Lw	3 Lw <sup>(23, 32)</sup>	3 Lw <sup>(23, 32, 10, 13)</sup>	Acceptable	No change	Only allow on north slopes at upper elevations on a trial basis in the short term.

ICHmw3/01 (Kamloops)

**Trends and Comments**

- ICHmw3 encompasses 354,023 ha.
- By 2020, 65,791 ha will shift to the wetter ICHwk1 but by 2050, 18% will shift to the slightly drier ICHmw2 variant.
- Not a huge shift in BGC units like other BGC units.
- PI originally listed as a secondary species with footnote 51 (restricted to areas with proven PI performance) - has had significant issues with respect to snow press and diseases.
- Unclear as to why Cw and Hw have footnotes for high elevation and cool aspects given they dominate 01 sites.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	1 Fd	1 Fd	Preferred	No change	
PI	2 PI <sup>(51)</sup>	3 PI	Acceptable	Demotion	Disease issues and risk of snow press – very uncommon on zonal sites. Should only be used in stands where PI was formerly present and abundant.
Sx	2 Sx <sup>(10,13)</sup>	2 Sx <sup>(10,13)</sup>	Preferred	No change	
Bl	3 Bl <sup>(10,13)</sup>	3 Bl <sup>(10,13)</sup>	Acceptable	No change	Sometimes present on zonal sites at high elevations on cool aspects and cold air drainages.
Cw	3 Cw <sup>(10,13)</sup>	2 Cw	Preferred	Promotion	Currently listed as tertiary but assigned to preferred. Changed to secondary and preferred.
Hw	3 Hw <sup>(10,13)</sup>	2 Hw	Acceptable	Promotion	Hw is widespread – no need for footnotes
Lw	3 Lw <sup>(23,32)</sup>	3 Lw <sup>(23* 32)</sup>	Acceptable	Promotion	*Trial use (footnote 23) no longer applies to the Okanagan-Shuswap District
Pw	3 Pw <sup>(31)</sup>	3 Pw <sup>(31)</sup>	Acceptable	No change	

IDFxh1/01 (Kamloops)

**Trends and Comments**

- IDFxh1 encompasses 286,659 ha.
- Approximately 21% shifts to the PPxh1 by 2020 with more shifting by 2080.
- Shift towards hotter and drier conditions.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	1 Fd <sup>27</sup>	1 Fd <sup>27*</sup>	Preferred	Minor Demotion	*Avoid use on steep warm aspects at low elevations. In future, restrict to cool aspects.
Py	1 Py	1 Py*	Preferred	Minor Promotion	*Encourage increased planting of Py on warm aspects.
Lw	2 Lw ( <sup>1, 10, 13, 32</sup> )	0	Not suitable	Demotion	Do not include. Too dry for this species on zonal sites.

IDFxh2/01 (KAMLOOPS)

**Trends and Comments**

- IDFxh2 encompasses 442,026 ha
- 86,121 is shifting to IDFxh1 by 2020 which is not a significant change in climate.
- Shift towards hotter and drier conditions.
- 25% shift to PPxh2 by 2020
- Over time, about 50% of IDFxh2 switches to PPxh1 and PPxh2

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	1 Fd <sup>27</sup>	1 Fd <sup>27*</sup>	Preferred	Minor Demotion	*Avoid use on steep warm aspects at low elevations. In future, restrict to cool aspects.
Py	1 Py	1 Py*	Preferred	Minor Promotion	*Encourage increased planting of Py on warm aspects.

MSdm2/01 (Kamloops)

**Trends and Comments**

- MSdm2 encompasses 289, 169 ha.
- About a third (90,069 ha) of the MSdm2 is projected to shift to the IDFdk2 by 2020
- Most obvious trend is that the MSdm2 shifts to warmer conditions by 2020 but warmer and wetter conditions thereafter.
- Shift to IDFdk2 decreases by 2050 and bulk of MSdm2 shifts to ICHdw1 and IDFww by 2080.
- Consider including Cw in the long-term if climate exhibits a shift to wetter conditions

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
PI	1 PI	1 PI	Preferred	No change	No change – PI remains a preferred species in projected BGC units.
Sx	1 Sx	1 Sx <sup>(10 13)</sup>	Preferred	Minor Demotion	May want to limit Sx to cool aspects and upper elevations particularly in western portion of BGC unit
Bl	2 Bl	2 Bl <sup>(10 13)</sup>	Acceptable	Minor Demotion	May want to limit Bl to cool aspects and upper elevations particularly in western portion of BGC unit
Fd	2 Fd <sup>(9, 14, 32)</sup>	2 Fd* <sup>(32)</sup>	Preferred	Minor Demotion	*At upper elevations, restrict Fd to warm aspects
Lw	2 Lw <sup>(9, 14, 32)</sup>	3 Lw* <sup>(23, 32)</sup>	Acceptable	Minor Demotion	*Not native to this BGC unit. Plant on a trial basis. Use at lower elevations and avoid frost pockets.

MSxk1/01 (Kamloops)

**Trends and Comments**

- **MSxk1 is a new unit lacking guidelines. MSxk guidelines are used by default.**
- In 2020 about 50% of MSxk1 goes to IDFd1 and IDFd2 and 32% to MSdm2
- But by 2050 it changes to 50% to ICHdw1, 22% to IDFd2 and 13% to IDFxh1
- Future scenarios show inconsistent trends so species guidelines are difficult to provide with much certainty
- Current standards have Fd, Sx and PI as preferred species. Having Fd as a preferred species is wrong given restrictions by frost but it will likely become suitable in the future

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
PI	1 PI	1 PI	Preferred		No change – PI remains a preferred species in most projected BGC units.
Fd	2 Fd ( <sup>9,14,32</sup> )	2 Fd ( <sup>9,14,32</sup> )	Preferred	Minor Promotion	Consider increased planting of Fd at low elevations on warm aspects.
Sx	2 Sx( <sup>10,13</sup> )	2 Sx( <sup>10,13</sup> )	Acceptable	Minor Demotion	Increased risk to Sx due to drought.
Bl	3 Bl ( <sup>10,13</sup> )	3 Bl ( <sup>10,13</sup> )	Acceptable	Minor Demotion	Increased risk for Bl due to drought - particularly in western portion of BGC unit.
Lw	<b>0</b>	<b>3 Lw (<sup>14,23</sup>)</b>	<b>Acceptable</b>	<b>Promotion</b>	Consider planting Lw on trial basis in non-frost prone areas at low elevations.

MSxk2/01 (Kamloops)

**Trends and Comments**

- **MSxk2 is a new unit lacking guidelines. MSxk guidelines are used by default.**
- Msxk2 encompasses 227,746 ha
- Over 60% change in MSxk2 to IDFd1 by 2020 and, by 2050, about 40% to IDFd1, 25% to IDFmw and 25% to IDFxh1.
- Monitor MSxk2 north of Kamloops to see if it shifts to IDFmw1 as suggested by 2050 scenario.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
PI	1 PI	1 PI	Preferred	No change	No change – PI remains a preferred species in most projected BGC units.
Fd	2 Fd ( <sup>9, 14, 32</sup> )	2 Fd ( <sup>9, 14, 32</sup> )	Preferred	Minor Promotion	Consider increased planting of Fd at low elevations on warm aspects particularly in southern portion of BGC unit
Sx	2 Sx( <sup>10 13</sup> )	2 Sx( <sup>10 13</sup> )	Acceptable	Minor Demotion	Increased risk to Sx due to drought.
Bl	3 Bl ( <sup>10 13</sup> )	3 Bl ( <sup>10 13</sup> )	Acceptable	Minor Demotion	Increased risk for Bl due to drought
Lw	<b>0</b>	<b>3 Lw (<sup>14,23</sup>)</b>	<b>Acceptable</b>	<b>Promotion</b>	Consider planting Lw on trial basis in non-frost prone areas in the northeastern portion of the MSx2

## KOOTENAY BOUNDARY

BEC in the Kootenay-Boundary Region is currently in flux, with a number of BGC units mapped between 2003 and 2007 that still do not have site series. Site series development, adjustments to mapping, and new Field Guides are underway for the Region. This will involve significant changes, with new site series for the entire region, and will require a full upgrade of the Chief Forester's Reference Guide for stocking standards in the Region. In the interim, where BGC units exist without site series, users are advised to consult the crosswalk table for BGC units in the most recent Kootenay-Boundary BEC update at: [Kootenay Boundary BEC updates](#)

The following recommendations to stocking standards changes are based on review of existing district-level stocking standards in Columbia, Rocky Mountain, and Kootenay Lake, and on climate change projections based on Wang et al. (2012) and Utzig et al. 2012.

ESSFwc1/01 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Hw	3	3	Acceptable	Minor Promotion	Promote Hw to acceptable with footnotes 14, 16, 32, 34; grows there already and will contribute to diversity; future projections indicate ICHmw2.

ESSFwc1/02 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Fd</b>	<b>0</b>	<b>2</b>	<b>Preferred</b>	<b>Promotion</b>	Promote to preferred with footnotes 9, 14, 16, 34; these species already occur there and grow well; where present, licensees tend to manage as ICHmw2 so they can plant Fd and Lw. 2020 projections are 60% ICHmw2; I don't believe this is accurate - ESSFwc1 is transitional between ICHmw2 and "true" ESSF, so this projection is not surprising.
<b>Lw</b>	<b>0</b>	<b>2</b>	<b>Preferred</b>	<b>Promotion</b>	Promote to preferred with footnotes 9, 14, 16, 34; these species already occur there and grow well; where present, licensees tend to manage as ICHmw2 so they can plant Fd and Lw. 2020 projections are 60% ICHmw2; I don't believe this is accurate - ESSFwc1 is transitional between ICHmw2 and "true" ESSF, so this projection is not surprising.

ESSFwc1/03 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Hw</b>	3	3	<b>Acceptable</b>	<b>Minor Promotion</b>	Promote Hw to acceptable with footnotes 14, 16, 32, 34; grows there already and will contribute to diversity; future projections indicate ICHmw2.



ICHmk1/05 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Lw	2	2	Preferred	Minor Promotion	Already preferred in DRM and DKL standards, with footnotes 9, 14, 32; already preferred in KA standards for same unit; 2020 projection is 33% ICHdw1, 17% ICHmw2, 10% IDFdm - all BGC units where Lw is suitable (primary).

ICHmw1/01, 03 and 04 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Lw	3	2	Acceptable – possibly preferred	Promotion	Already acceptable in DRM standards, with footnotes 23, 71 and preferred in DCO (23); trials have shown that Lw grows there; BGC predictions do not have a lot of change in 2020 (19% becomes wetter ICHwk1 - likely due to a current mapping issue); 2050 prediction is 22% ICHmw2 (where Lw grows), 23% ICHmw1, and 26% SBS.

ICHmw2/04 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
PI	1	3	Acceptable	Demotion	Demote PI from Primary to Tertiary due to forest health concerns; BGC mapping is changing and will affect distribution of PI, but there are current concerns, particularly in the northern extent.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Sx	2	3	Acceptable	Demotion	Demote Sx from Preferred and Secondary to Acceptable and Tertiary due to concerns re: drought stress and forest health. Maintain footnotes 10, 13.

ICHmw3/01-01-YC, 03, 04, 05 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Lw	3	2	Preferred	Promotion	Proposed to add Lw as preferred with footnote 9, 32; note that KA is taking a different approach. If these were synchronized across regions, I would also add footnote 18 (eastern portion) since the ICHmw3 in Revelstoke is somewhat transitional to ICHmw2. Lw is already preferred in DCO district standards.

IDFdm2/04 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Py	3	3	Acceptable	Minor Promotion	Proposed acceptable with footnotes 9, 14, 16; already acceptable in DRM stocking standard; already occurs there; 25% of IDFdm2 is predicted to be PPdh2 by 2020. Note addition of footnote 16 to Acceptable.

MSdk/03 and 04 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Py	0	3	Acceptable	Promotion	Proposed acceptable with footnotes 9, 14, 16; use of footnote 16 is intended for this to apply to MSdk1 only. Already occurs there; projection is for 30% of MSdk1 to be ICHdw1 by 2020 (Py is preferred on 01b); 15% of MSdk1 is anticipated to be IDFdm2 by 2020 (Py is preferred on 01).

MSdm1/02 and 03 (Kootenay Boundary)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Py	0	3	Acceptable	Promotion	Proposed as tertiary and acceptable with footnote 9, 14, 16; In 2020, projected to be: 28% ICHdw1; 13% IDFdm1; 10%IDFhx1; 26% ICHmk1; 12% ICHmw2 (only 8% MSdm1) -therefore Py would be acceptable or preferred on mesic in 51% of projected area.

## PRINCE GEORGE

When considering the following suggested stocking status amendments it must be recognized that this exercise refers only to adaptation on zonal sites, thus when it is suggested that species be added, removed or have status promoted or demoted this does not reflect the whole BGC unit but only the zonal site series in question (e.g. By 2080 a species may not be suitable on a now mesic site that has become submesic but will still be suitable on a now subhygric site that will become mesic). Also, the suggested changes in stocking status are based purely on assumptions that climate trends projected from BGC consensus modeling and predicted shifts in available on site water will be realized. Because species limits in 2080 have been used as the final filter, current conditions, especially at higher elevations may not yet be conducive to planting those species. Therefore, some have been given a tertiary status (3) along with cautionary site choice comments intended as footnotes for current management of that species with the intent that over time, if projected climate trends are realized, then the status for that species may be elevated.

### BWBSwk2 (Prince George)

- Important to maintain broadleaved species. Where proportionally varying mixedwood management strategies apply, At and Acb may vary from Acceptable to Preferred
- Climate trends for 2080: increase in MAT, MSP and a decrease in SMH by 3.6 C, 122 mm and <-1.3 respectively. Conductance buffered by considerable increase in ppt relative to temp so available water still about the same

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Acb</b>	<b>0</b>	<b>3</b>	<b>Preferred/Acceptable</b>	<b>Promotion</b>	May be preferred or acceptable depending on mixedwood management objectives. Consensus BGC projections see BWBSwk2 climate shifting to BWBSmw (formerly BWBSmw1) by 2080. Conductance projections for ClimateBC 2080 are minimal. Acb is common on mesic sites in BWBSmw (footnote a)
<b>At</b>	<b>4</b>	<b>3</b>	<b>Preferred/Acceptable</b>	<b>Promotion</b>	May be preferred or acceptable depending on mixedwood management objectives in BWBSmw future climate

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ep	0	4	Acceptable	Promotion	Consensus BGC projections see BWBSwk2 climate shifting to BWBSmw (formerly BWBSmw1) by 2080. Conductance projections for ClimateBC 2080 are minimal. Ep is common on mesic sites in BWBSmw
Fd	0	3	Acceptable	Promotion	Suggest planting Fd on warmer non frost prone sites at lower latitudes. A considerable proportion of the BWBSwk2 climate will approximate that of the warmer BWBSmw climate Fd is already found on circum-mesic sites at lower latitudes of this BGC unit (footnote 9)
Lw	0	3	Acceptable	Promotion	Suggest planting Lw on warmer non frost prone sites at lower latitudes. A considerable proportion of the BWBSwk2 climate will approximate that of the warmer BWBSmw climate Fd with similar silvics to that of Lw is already found on circum-mesic sites at lower latitudes of this BGC unit (footnote 9)

### BWBSwk3 (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and a decrease in SMH by 1.6 C, 161 mm and <-0.1 respectively. Conductance buffered by considerable increase in ppt relative to temp so available water still about the same.
- **General comments:** Because of the BWBSwk3 northerly location, even though much is projected as BWBSmw, Fd and Lw may still be unsuitable if frost dominates sites more

than in the southerly portion of the projected future BWBSmw. If it can be established at all now on ideal sites then we should try. Trials around Ft Nelson

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Acb</b>	<b>0</b>	<b>3</b>	<b>Preferred/Acceptable</b>	<b>Promotion</b>	May be preferred or acceptable depending on mixedwood management objectives. Consensus BGC projections see most of the BWBSwk3 climate shifting to BWBSmw (formerly BWBSmw1) by 2080. Acb is common on mesic sites in BWBSmw. (footnote a)
<b>At</b>	<b>4</b>	<b>3</b>	<b>Preferred/Acceptable</b>	<b>Promotion</b>	May be preferred or acceptable depending on mixedwood management objectives in BWBSmw future climate. (footnote a)
<b>Ep</b>	<b>0</b>	<b>4</b>	<b>Acceptable</b>	<b>Promotion</b>	Consensus BGC projections see most of the BWBSwk3 climate shifting to BWBSmw (formerly BWBSmw1) by 2080. Conductance projections for ClimateBC 2080 are minimal. Ep is common on mesic sites in BWBSmw.
<b>Fd</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	Can start planting Fd on warmer non frost prone sites at lower latitudes. A considerable proportion of the most of the BWBSwk3 climate will approximate that of the warmer BWBSmw climate Fd is already found on circum-mesic sites at lower latitudes of this BGC unit. (footnote 9)
<b>Lw</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	Can start planting Lw on warmer non frost prone sites at lower latitudes. A considerable proportion of the most of the BWBSwk3 climate will approximate that of the warmer BWBSmw climate Fd with similar silvics to that of Lw

					is already found on circum-mesic sites at lower latitudes of this BGC unit. (footnote 9)
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ESSFmv1 (Prince George)

- Climate trends 2080: increase in MAT, MSP and a decrease in SMH by 2.3 C, 60 mm and <-0.5 respectively.
- General comments: Fd in ESSFmv1 may be difficult to establish over the current SBSmc2 so adding may be a “stretch” but should be added and promoted over time if projected climate trends are realized.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
At	0	4		Promotion	Ignore in stocking survey. Attempt to maintain current populations of At that may occur lower elevation in this unit. Considerable proportion of the ESSFmv1 climate will approximate that of the drier SBS (dw3, mc2, dk) in which At is frequently present on mesic sites.
Bl	1	2	Acceptable	Demotion	2080 consensus climate projections see ESSFmv1 climate shift to drier warmer SBSdw3, SBSdk and SBSmc2 like climates where for the most part Bl exists in understory in mature seral stands and is not a dominant component on mesic sites.
Ep	0	4	Acceptable	Promotion	No planting but attempt to maintain current populations of Ep that may occur at lower elevation in this unit. Considerable proportion of the ESSFmv1 climate will approximate that of the drier SBS (dw3, mc2, dk) in which Ep is occasionally present on mesic sites.
Fd	0	3	Acceptable	Promotion	Can start planting Fd on warmer non frost prone sites in transitional areas. A considerable proportion of the ESSFmv1 climate will approximate that of the drier SBS (dw3, mc2, dk) Fd is commonly present on mesic sites

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					in the SBSdw3 and less so in the SBSdk. Currently much of the ESSFmv1 is transitional to SBSmc2 which is not conducive to Fd. (footnote 9)
<b>Lw</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	Can start planting Lw on warmer non frost prone sites in transitional areas. A considerable proportion of the ESSFmv1 climate will approximate that of the drier SBS (dw3, mc2, dk) Lw silvics parallel that of Fd. (footnote 9)
<b>PI</b>	<b>2</b>	<b>1</b>	<b>Acceptable</b>	<b>Promotion</b>	A considerable proportion of the ESSFmv1 climate will approximate that of the drier SBS (dw3, mc2, dk) PI is commonly present on mesic site in these units and currently present on mesic sites at lower elevation in the ESSFmv1.

ESSFwc2 (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and SMH by 4.2 C, 32 mm and ->5.9 respectively.
- **General comments:** if projected climate trends are realized, Cw and Hw secondary at this point but move towards primary over time and demote Sx to secondary

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Bl</b>	<b>1</b>	<b>2</b>	<b>Acceptable?</b>	<b>Demotion</b>	ESSFwc2 climate is projected to approximate ICHkk1 and ICHvk1 where Bl is a minor component. SMH is projected to increase dramatically which would not favor Bl
<b>Cw</b>	<b>0</b>	<b>2</b>	<b>Acceptable?</b>	<b>Promotion</b>	Can start planting at lower elevations in transitional areas. ESSFwc2 climate is projected to approximate ICHkk1 and ICHvk1 where Cw is a significant component.



Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Fd</b>	<b>0</b>	<b>2</b>	<b>Acceptable</b>	<b>Promotion</b>	Can plant now at lower elevations in transitional areas on steep warm aspects. Future climate analogues will approximate ICHmw2 and ICHwk1 which support Fd - Choose warmer non frost prone sites.
<b>Hw</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	Can start planting at lower elevations in transitional area. - ESSFwc2 climate is projected to approximate ICHkk1 and ICHvk1 where Hw is a significant component
<b>Lw</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	Can plant now at lower elevations in transitional areas on steep warm aspects. Future climate analogues will approximate ICHmw2 and ICHwk1 which support Lw on mesic sites

ESSFwc3 (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and SMH by 4.2 C, 32 mm and ->5.9 respectively.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Atc</b>	<b>0</b>	<b>4</b>		<b>Promotion</b>	Ignore in stocking survey. Attempt to maintain current populations of Act on lower fluvial benches at low elevation in this unit. considerable proportion of the ESSFwc3 climate will approximate that of the ICHmw2 and ICHwk1 which support Act on mesic sites
<b>At</b>	<b>0</b>	<b>4</b>		<b>Promotion</b>	Ignore in stocking survey. Attempt to maintain current populations of At low elevation in this unit. considerable proportion of the ESSFwc3 climate will approximate that of the ICHmw2 which

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					supports At on mesic sites
Bl	1	2	Acceptable	Demotion	Considerable proportion of the ESSFwc3 climate will approximate that of the ICHmw2 and ICHwk1 which supports Bl on mesic sites. Bl is not common in this unit but may be planted where cold air drainage is of concern.
Cw	0	2	Acceptable	Promotion	Can start planting at lower elevations in transitional areas on frost free sites. Cw is a dominant species on mesic sites in the ICHmw2 climate.
Fd	0	2	Acceptable	Promotion	Can plant now at lower elevations in transitional areas on steep warm aspects. Future climate analogues will approximate ICHmw2 and ICHwk1 which support Fd - Choose warmer non frost prone sites.
Hw	0	3	Acceptable	Promotion	Can start planting at lower elevations in transitional areas on frost free sites. Hw is a dominant species on mesic sites in the ICHmw2 climate.
Lw	0	3	Acceptable	Promotion	Can start planting at lower elevations in transitional areas on frost free sites. Lw less common but does occur on mesic sites in the ICHmw2 climate.
Pw	0	2	Acceptable	Promotion	Can start planting at lower elevations in transitional areas on frost free sites.. Pw is a common species on mesic sites in the ICHmw2 and ICHwk1 climate. Avoid frost prone sites and/or sites with Ribes spp.

### General Comment regarding wetter ICH (Northern Trench)

Climate projections see much of ICHwk3 approximate that of the ICHmw3, similar to the ICHvk2 climate shift to ICHmw3. However, because the ICHwk3 is projected to have lower MAP, higher

MAT and considerably higher SMH (conductance) than both the IVHvk2 and ICHwk4, caution must be taken not to treat these BGC's the same even though they are projected through consensus BGC modeling to be either ICHmw3 or ICHmw2. Climate WNA seems to disagree???

- - - - Depending on snow pack sublimation/evaporation rates, net summer snow pack levels may not decrease significantly in this unit with increasing MAP. Full growing season snowpack run off and seepage which currently maintain the ICH units with prolonged high levels of available soil moisture, may continue to do so in 2080, thus, the SMH calculated through Climate WNA may not contribute to drought as much as equivalent SMH values in other BGC units.

ICHvk2 (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and SMH by 3.5 C, 56 mm and ->3.3 respectively.
- **General comments:** Western Hemlock Looper attacks all species

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Bl	2	3	Acceptable	Minor demotion	ICHvk2 climate will approximate ICHmw3 climate by 2080. Bi is generally on moister sites in this BGC unit but could be used on mesic sites with cold air drainage.
Cw	2	1	Preferred	Promotion	Much of the ICHvk2 climate will approximate the ICHmw3 climate. Fd is a component of this unit and future climate will favor its drought tolerance - Choose warmer non frost prone sites
Fd	2	1	Preferred	Minor promotion	Much of the ICHvk2 climate will approximate the ICHmw3 climate. Fd is a component of this unit and future climate will favor its drought tolerance - Choose warmer non frost prone sites.
Hw	3	1	Acceptable	Promotion	ICHvk2 climate will approximate ICHmw3 climate by 2080. Hw is a large component of mesic sites in this unit.
Lw	0	3	Acceptable	Promotion	Much of the ICHvk2 climate will approximate the ICHmw3 climate. Lw is a component of this unit and future climate will favor its

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					drought tolerance -choose frost free sites
<b>Pw</b>	<b>0</b>	<b>2</b>	<b>Acceptable</b>	<b>Promotion</b>	Climate projections see much of ICHvk2 approximate that of the ICHmw3 by 2080. Pw is a moderate component on mesic sites in this unit. Pw is sensitive to desiccation and minimal change is projected for conductance in this unit. Avoid frost prone sites and/or sites with <i>Ribes</i> spp.
<b>Sx</b>	<b>1</b>	<b>2</b>	<b>Acceptable</b>	<b>Demotion</b>	Conductance increase is projected to be minimal so drought likely not an issue and much of the ICHvk2 climate will approximate the ICHmw3 climate where Sx is rare component on mesic sites.

#### ICHwk3 (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and SMH by 3.5 C, 47 mm and ->4.6 respectively.
- **General comments:** Western Hemlock Looper attacks all species, Spruce (White Pine) Weevil

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
<b>Bl</b>	<b>2</b>	<b>3</b>	<b>Acceptable</b>	<b>Minor demotion</b>	High conductance expected in this unit, thus Bl not likely a viable component on mesic sites. Better on moist-wet sites.
<b>Fd</b>	<b>2</b>	<b>1</b>	<b>Preferred? Or Acceptable?</b>	<b>Promotion</b>	Climate projections see much of ICHwk3 approximate that of the ICHmw2. Fd is a significant component on mesic sites in this unit (seral species). Choose warmer non frost prone sites.
<b>Lw</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	Much of the ICHwk3 climate will approximate the ICHmw3 climate. Lw is a component of

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					this unit and future climate will favor its drought tolerance - choose warmer non frost prone sites.
Pw	0	2	Acceptable	Promotion	Climate projections see much of ICHvk2 approximate that of the ICHmw3 by 2080. Pw is a moderate component on mesic sites in this unit. Pw is sensitive to desiccation and minimal change is projected to conductance in this unit. Avoid frost prone sites and/or sites with <i>Ribes</i> spp.
Sx	1	2	Acceptable	Demotion	Climate projections see much of ICHwk4 approximate that of the ICHmw2. Se (Sx) is often in the ICHmw2 at higher elevations sometimes on mesic but more commonly on moister sites than zonal.

ICHwk4 (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and SMH by 3.1 C, 79 mm and ->1.2 respectively.
- **General comments:** Western Hemlock Looper attacks all species

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Bl	2	3	Acceptable	Minor demotion	Climate projections see much of ICHwk4 approximate that of the ICHmw2. Bl is not common in this unit on mesic sites but may be planted where cold air drainage is of concern.
Cw	2	1	Preferred	Promotion	Cw is a dominant species on mesic sites in the ICHmw2 climate.
Hw	3	1	Preferred? Or Acceptable?	Promotion	Hw is a dominant species on mesic sites in the ICHmw2 climate
Lw	0	3	Preferred? Or	Promotion	Climate projections see much

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
			Acceptable?		of ICHwk4 approximate that of the ICHmw2. Lw is a significant component on mesic sites in this unit (seral species).
PI	1	3	Acceptable/Preferred	Demotion	PI not common in either the ICHwk1 or ICHmw2 which account for over 1/2 the future 2080 climate envelope.
Pw	0	2	Acceptable	Promotion	Climate projections see much of ICHwk4 approximate that of the ICHmw2 by 2080. Pw is a moderate component on mesic sites in this unit. Pw is sensitive to desiccation and minimal change is projected to conductance in this unit. Avoid frost prone sites and/or sites with <i>Ribes</i> spp.
Sx	1	2	Acceptable	Demotion	Climate projections see much of ICHwk4 approximate that of the ICHmw2. Se (Sx) is often in the ICHmw2 at higher elevations sometimes on mesic but more commonly on moister sites than zonal

SBPSmc (Prince George)

- **Climate trends 2080:** increase in MAT, MSP and SMH by 3.6 C, 8 mm and **->14.2** respectively.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	0	2	Acceptable	Promotion	Consensus BGC projections see most of the SBPSmc climate shift to SBSdk and to lesser degree IDFxh2 climate. Fd is sometimes found on circum-mesic sites in the SBSdk and on mesic sites in the IDFxh2.
Lw	0	2	Acceptable	Promotion	Consensus BGC projections see

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					most of the SBPSmc climate shift to SBSdk and to lesser degree IDFxh2 climate. Lw silvics parallel that of Fd which is sometimes found on circum-mesic sites in the SBSdk and on mesic sites in the IDFxh2.
Py	0	3	Acceptable	Promotion	Consensus BGC projections see most of the SBPSmc climate shift to SBSdk and to lesser degree IDFxh2 climate. Py is found on mesic sites in the IDFxh2 and is more able to withstand the high increase in SMH than other species
Sx	3	2	Acceptable	Promotion	Consensus BGC projections see most of the SBPSmc climate shift to SBSdk and to lesser degree IDFxh2 climate. Although Sx is common on mesic sites in SBPSmc and SBSdk, high projected 2080 SMH warrants caution is site selection (avoid submesic wind exposed sites prone to desiccation)

SBSdw3 (Prince George)

- **Climate trends 2080:** Increase in MAT, MSP and SMH by 3.4 C, 39 mm and ->4.4 respectively.
- **General comments:** Fd Beetle on droughty sites

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Bl	0	3	Acceptable	Promotion	Significant proportion of SBSdw3 climate will approximate ICHmw2 and ICHmw3 and IDFmw2. Bl currently exists mostly as an understory species in the SBSdw3 NDT3 unit. In the ICHmw2 it is often present on mesic sites as an upper canopy species.

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Lw	0	2	Acceptable	Promotion	30 % of original unit moves to SBSdw3 climate. Unknown risk of needle blights and larch case bearer
Pl	1	2	Preferred	Demotion	By 2080 a considerable proportion of SBSdw3 climate will approximate ICHmw3 climate. Pl is not a major component on mesic sites in this unit but does occur in mesic seral stands - Also need to consider rust and other disease hazards associated with moister warmer climates.
Pw	0	3	Acceptable	Promotion	Climate projections for the SBSdw3 see significant proportional change approximating that of the ICHmw2 and ICHmw3 by 2080. Pw is a moderate component on mesic sites in this unit. Pw is sensitive to desiccation and minimal change is projected to conductance in this unit. Avoid frost prone sites and/or sites with <i>Ribes</i> spp.
Py	0	3	Acceptable	Promotion	A considerable proportion of the SBSdw3 climate will approximate IDFmw2 and Py although rare is found on mesic sites in this unit.
Sx	1	2	Preferred	Demotion	Conductance increase is projected to be moderate so drought likely not an issue in areas transitional to wetter units and much of the SBSdw3 climate will approximate the ICHmw3 and ICHmw2 climate where Sx is rare component on mesic sites. On SBSdw3 mesic sites Sx is common. It is less common but still present on mesic sites in the ICHmw2

SBSmc3 (Prince George)



- **Climate trends 2080:** increase in MAT, MSP and SMH by 3.5 C, 31 mm and ->7.7 respectively.
- **General comments:** Warren's collar weevil - thick organic on planted blocks

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
At	0	4	Acceptable? Or some description of situation and circumstance?	Promotion	Ignore in stocking survey. Attempt to maintain current populations of At that may occur to lower elevation in this unit. Consensus BGC projects see much of the SBSmc3 climate shift to SBSdk and SBSdw climates. At is relatively common on mesic to circum-mesic sites in SBSdk and to a lesser degree in the SBSdw2. Where SBSdw2 and SBSdk transitions to SBSmc2 populations of At should be maintained and aloud to expand into the adjacent SBSmc3
Ep	0	4	Acceptable? Or some description of situation and circumstance?	Promotion	Consensus BGC projects see much of the SBSmc3 climate shift to SBSdk and SBSdw climates. Ep is relatively common on mesic to circum-mesic sites in SBSdk and SBSdw2. Where SBSdw2 and SBSdk transitions to SBSmc3, populations of At should be maintained and aloud to expand into the adjacent SBSmc3.
Fd	0	3	Acceptable	Promotion	Can start planting Fd on warmer non frost prone sites. Consensus BGC projects see much of the SBSmc3 climate shift to SBSdk and SBSdw2 climates. Fd is common on mesic sites in the SBSdw2 and less so on mesic sites in the SBSdk.
Lw	0	3	Acceptable	Promotion	Can start planting Lw on warmer non frost prone sites. Consensus BGC projections see much of the SBSmc3 climate shift to SBSdk and SBSdw2 climates. Lw with silvics parallel to that of Fd which is common on mesic sites in the SBSdw2 and less so on mesic sites

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					in the SBSdk.

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## PRINCE RUPERT

### ICHmc2 (Prince Rupert)

#### ICHmc2/ 01a, 03, 04

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	0	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.

#### ICHmc2/ 01b (Prince Rupert)

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

The remaining site series within the ICHmc2 are currently considered inappropriate for either species due to moisture, cold air ponding, productivity, or vegetation competition issues.

#### SBSdk/ 01, 04, 06, 07a (Prince Rupert)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	0	3(2)	Preferred	Promotion	Well drained somewhat drier soils. Avoid areas where there

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
					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.

SBSdk/ 03, 05 (Prince Rupert)

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

SBSmc2/ 01, 05, 06 (Prince Rupert)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Fd	0	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.

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

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## VANCOUVER

### COAST AREA STATEMENTS ON TREE SPECIES SELECTION UNDER PROJECTED CLIMATE SCENARIOS

#### CWHvm1/01 (Vancouver)

Considered this variant as it is the largest in our Regions collectively and one of the most productive (in terms of timber)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	Minor demotion see rationale	Where CWHvm1 is adjacent to geographically or above CWHdm limit use
Fd	2	2	Preferred	Minor promotion	Where CWHvm1 is adjacent to geographically or above dm expand use
Cw	1	1	Preferred	Minor demotion	Where CWHvm1 is adjacent to geographically or above CWHdm limit use
Hw	1	1	Preferred	Minor demotion	Where CWHvm1 is adjacent to geographically or above CWHdm limit use
Ss	3	3	Acceptable	Minor demotion	Where CWHvm1 is adjacent to geographically or above CWHdm limit use

Recommend keeping categories the same because vast majority of vm1 projected to have similar climate through 2080 (>75%)

CWHvm1/01 (**Prince Rupert**) – considered this variant as it is the largest in our Regions collectively and one of the most productive (in terms of timber. Recommend keeping categories the same because <1% changes by 2080 climatically in this portion of the CWHvm1

CWHvm2/01 (Vancouver)

Considered this variant because it is adjacent to our largest and most productive coast unit (for timber) and projected to be up to approximately 40% in this climate envelope (of vm1) by 2020 and perhaps up to 80% by 2080

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	Minor demotion	Limit use in interior transition areas
Fd	1	2	Acceptable??	Demotion	Demotion because current standards are inappropriate for vm2 (vs vm1); also restrict to use on southerly aspects and elevated microsites at lower elevations of the variant
<b>Cw</b>	<b>2</b>	<b>1</b>	<b>Preferred</b>	<b>Promotion</b>	<b>Encourage use at lower elevations</b>
Hw	1	1	Preferred	No change	
Ss	2	3	Acceptable	Demotion	Discourage use of species at lower elevations in the southern portion of the range of the variant
Hm	3	3	Acceptable	Minor demotion	Restrict use to upper elevations
Yc	2	3	Acceptable	Minor demotion	Discourage use of species at lower elevations

CWHvm2/01 (Prince Rupert)

Considered this variant because it is adjacent to our largest and most productive coast unit (for timber) and projected to be up to approximately 46% in this climate envelope (of vm1) by 2020 and perhaps up to 90% by 2080

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	No change	
<b>Cw</b>	<b>2</b>	<b>1</b>	<b>Preferred</b>	<b>Promotion</b>	Encourage use at lower elevations
Hw	2	2	Preferred	No change,	Suggest category should be reconsidered for promotion outside discussion of climate change
Ss	2	2	Acceptable	No change	
Hm	3	3	Acceptable	Minor demotion	Restrict use to upper elevations
Yc	<b>2</b>	<b>3</b>	Acceptable	Minor demotion	Discourage use of species at lower elevations

MHmm1/01 (Vancouver)

Upper elevation system that will have climate envelopes of more operable (productive) units; up to 40% CWHvm by 2050

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	No change	
Bp	3	3	Acceptable	Minor demotion	Restrict to experimental use in upper elevations
<b>Cw</b>	<b>0</b>	<b>2</b>	<b>Acceptable??</b>	<b>Promotion</b>	<b>Promote use in lower elevations</b>
<b>Fd</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	<b>Trial use on south facing slopes and drier sites at lower elevations of the variant</b>
Hm	<b>1</b>	<b>2</b>	Acceptable??	Demotion	Use primarily at upper elevations
<b>Hw</b>	<b>3</b>	<b>2</b>	<b>Acceptable??</b>	<b>Promotion</b>	<b>Use primarily at lower elevations</b>
Yc	<b>1</b>	<b>2</b>	Acceptable from Preferred?	Demotion	Use primarily at upper elevations

For some of the climate envelope projections, Ss or Se may be acceptable in the future; however, no recommendations are made as RCO ecologists are not sure whether a hybrid spruce maybe be the more appropriate choice (because it is actually what occurred historically in transition areas).



MHmm1/01 (Rupert)

Upper elevation system that will have climate envelopes of more operable (productive) units; up to 40% CWHvm by 2050

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	No change	
<b>Cw</b>	<b>0</b>	<b>2</b>	<b>Acceptable?</b>	<b>Promotion</b>	<b>Promote use in lower elevations</b>
Hm	1	2	Preferred still?	Demotion	Use primarily at upper elevations
<b>Hw</b>	<b>3</b>	<b>2</b>	<b>Acceptable</b>	<b>Promotion</b>	<b>Use primarily at lower elevations</b>
Yc	1	2	Preferred still?	Demotion	Use primarily at upper elevations
<b>Ss</b>	<b>0</b>	<b>3</b>	<b>Acceptable</b>	<b>Promotion</b>	<b>Trial basis at lower elevations; suggest Sxs in interior transition areas (also trial)</b>

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MHmm2/01 (Vancouver)

Upper elevation system that will have climate envelopes of more operable (productive) units; up to >40% lower elevation (CWH) subarctic climatic envelopes by 2050

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	No change	
Bl	3	3	Acceptable	Minor demotion	Restrict to upper elevations
Bp	3	3	Acceptable	No change	Trial basis restricted to upper elevation
Hm	1	2	Preferred still?	Demotion	Use primarily at upper elevations
Se	2	2	Preferred	Minor demotion	Restrict to upper elevations <sup>1</sup> ; Sxs may be more appropriate at lower elevations (trial only)
Yc	2	2	Preferred	Minor demotion	Restrict to upper elevations <sup>1</sup>
Cw	0	2	Acceptable	Promotion	Restrict to lower elevations <sup>1</sup>
Fd	0	3	Acceptable	Promotion	Trial basis at lower elevations
Hw	0	2	Acceptable	Promotion	Restrict to lower elevations <sup>1</sup>

<sup>1</sup>This ranking is based only on the areas to which planting is restricted (i.e., category should be 3 if it were planted on a lower elevation site)

MHmm2/01 (Rupert)

Upper elevation system that will have climate envelopes of more operable (productive) units; up to >55% lower elevation (CWH) climatic envelopes by 2080

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	No change	
Bl	3	3	Acceptable	Minor demotion	Restrict to upper elevations
Hm	1	2	Preferred still?	Minor demotion	Use primarily at upper elevations
Yc	2	2	Acceptable	Minor demotion	Restrict to upper elevations <sup>1</sup>
Cw	0	3	Acceptable	Promotion	Restrict to lower elevations <sup>1</sup>
Hw	3	2	Acceptable?	Promotion	Expect better productivity at lower elevations

<sup>1</sup>This ranking is based only on the areas to which planting is restricted (i.e., category should be 3 if it were planted on a lower elevation site)

MHwh1/01 (Rupert)

Almost all projected to have climate envelopes of lower elevation units of lower elevation units by 2020 (CWHvh2,vm1,wh1/2)

Species	Present Category	Suggested Category	Preferred/ Acceptable Recommendation	Promotion or Demotion	Rationale/Footnotes
Ba	1	1	Preferred	No change	
<b>Cw</b>	<b>2</b>	<b>1</b>	<b>Preferred?</b>	<b>Promotion</b>	<b>Encourage at lower elevations</b>
Hm	1	2	Preferred still?	Demotion	Limit use to upper elevations
Hw	2	2	Acceptable	No change	
Ss	2	2	Acceptable	No change	
Yc	1	2	Preferred still?	Demotion	Limit use to upper elevations

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## FOOTNOTES

#

- 1 elevated microsites are preferred
- 2 suitable on thick forest floors
- 3 restricted to coarse-textured soils
- 4 restricted to medium-textured soils
- 5 footnote retired
- 6 restricted to nutrient-very-poor sites
- 7 restricted to nutrient-medium sites
- 8 restricted to steep slopes
- 9 restricted to southerly aspects
- 10 restricted to northerly aspects
- 11 restricted to crest slope positions
- 12 suitable on cold air drainage sites
- 13 restricted to upper elevations of biogeoclimatic unit
- 14 restricted to lower elevations of biogeoclimatic unit
- 15 restricted to northern portion of biogeoclimatic unit in region
- 16 restricted to southern portion of biogeoclimatic unit in region
- 17 restricted to western portion of biogeoclimatic unit in region
- 18 restricted to eastern portion of biogeoclimatic unit in region
- 19 restricted, not in Queen Charlotte Islands
- 20 restricted, not near outer coast
- 21 restricted to mainland
- 22 restricted to southern Gardner Canal-Kitlope area
- 23 restricted to trial use
- 24 suitable (as a major species) in wetter portion of biogeoclimatic unit
- 25 suitable on sites lacking salal
- 26 suitable minor species on salal-dominated sites
- 27 partial canopy cover required for successful establishment
- 28 limited by moisture deficit
- 29 risk of heavy browsing by moose
- 30 risk of porcupine damage
- 31 risk of white pine blister rust
- 32 limited by growing-season frosts
- 33 footnote retired and replaced with footnote 'a'
- 34 risk of snow damage
- 35 risk of weevil damage
- 36 suitable major species on salal-dominated sites
- 37 risk of heart rots

- 38 footnote retired
- 39 avoid exposed and windy sites
- 40 risk of redheart
- 41 limited by poorly drained soils
- 42 restricted to fresh soil moisture regimes
- 43 suitable on mainland coast only (QCI only)
- 44 suitable in areas with stronger maritime influence
- 45 suitable in areas with stronger continental influence
- 46 restricted to area north of the Dean Channel
- 47 risk of balsam woolly adelgid – applies to all Abies species in subzones within the regulated quarantine area (<http://www.al.gov.bc.ca/cropprot/balsamwa.htm> )
- 48 risk of heavy browsing by deer
- 49 retired November 2010
- 50 restricted to sites where the species occurs as a major species in a pre-harvest, natural stand
- 51 restricted to areas with proven PI performance
- 52 restricted to sheltered microsites with deep soil
- 53 minor component
- 54 risk of unsuccessful release of advance regeneration
- 55 acceptable in sx-sm portion of site series

# **Broadleaf Management Constraints**

- a productive, reliable, and feasible regeneration option
- b limited in productivity, reliability and/or feasibility

# **Localized Footnotes**

- 56 **Kalum** forest district - spruce content restricted to < 20% well-spaced and free growing trees on a standards unit due to leader weevil.
- 57 **Arrow** forest district - Pw rust-resistant stock may be preferred to a max 50% of preferred and acceptable well-spaced stems.
- 58 **Arrow** forest district - Fd limited to a max 50% of preferred and acceptable well-spaced stems due to root rot.
- 59 **Prince George region** - max 1,400 total sph of aspen and cottonwood. Treat as 'ghost' tree in surveys.
- 60 **Squamish** forest district - species is acceptable in Squamish forest district only.
- 61 **Squamish** forest district only - acceptable on cold air drainage sites only.
- 62 **S. Island** forest district - may only be used as acceptable species within the balsam woolly adelgid quarantine zone.
- 63 **Queen Charlotte Islands** forest district - must meet district manager specified

minimum well-spaced preferred stems per hectare and minimum height requirements for Cw / Yc

- 66 **Mackenzie** forest district - may be preferred where risk of snow damage is low or where risk of frost damage is excessive on spruce
- 67 **Chilliwack** forest district - species is acceptable in Chilliwack forest district only.
- 68 **Chilliwack** forest district - species is preferred in Chilliwack forest district only. Species is restricted to upper elevations when used in the southern portion of the biogeoclimatic unit
- 69
- 70 **Pr Rupert** region - Hw is restricted to a maximum of 50% of the well spaced stems at free growing

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## APPENDIX 2: PERTINENT EXCERPTS FROM LANDSCAPE DIRECTION REGARDING SPECIES SHIFTS<sup>6</sup>

*Species will respond individualistically to climate change, which will result in new configurations of forest ecosystems. Species distributions will shift: some species will become vulnerable to (local) extinction (e.g., whitebark pine, limber pine, alpine larch, yellow cedar in the Interior) in British Columbia; other species will expand their range, including non-native species that migrate from southern regions. Current forest ecosystems will change and novel ones will likely emerge. The current landscape provides the context for change. Not only does it provide the gene pool for migration and adaptation of species, it provides stability and ecosystem functions at the site level for species to assemble. Moreover, the current forested landscape of long-lived trees will be critically important as a buffer against chaotic changes, catastrophic disturbances, and rapid releases of carbon to the atmosphere. The current mature age class structure will cause lag effects by inhibiting new tree species from migrating due to the competitive or transiently inhospitable environment, and by inhibiting the rapid invasion of nuisance plants and novel pests (Aitken et al. 2008; Pringle et al. 2009).*

*Natural regeneration will form the basis of species distribution shifts in our changing climate. However, site limitations that restrict the natural establishment of a tree species (e.g., lack of mineral soil exposure) can be overcome by particular forest management practices (e.g., planting); therefore, we have the ability to modify species distributions. **For example, in many of the biogeoclimatic units within the Interior Cedar-Hemlock (ICH) zone, lodgepole pine has been planted extensively, even though it was naturally uncommon in these stands. Early survival has generally been good, but lodgepole pine is very susceptible to a number of foliar diseases and hard pine stem rusts. An outbreak of Dothistroma needle blight has caused significant mortality of pine in the ICH moist cold subzone (Woods et al. 2005). A recent study suggests that the risk of damage by forest health agents to lodgepole pine plantations is likely to increase with predicted warmer winters and higher frequency of extreme climatic events (Heineman et al. 2010).***

*More than one species is capable of establishing on many sites, and most plantations are augmented by natural regeneration; therefore, it is important to know how different species interact with one another. Basic ecology will determine this. For instance, where two tree species are similar in shade tolerance but one species has a faster growth rate, the species may be incompatible since the one with the faster growth rate will shade out the other. However, other species traits, such as differences in nutrient acquisition or water uptake, may compensate for shading effects and allow these species to co-exist in certain climates. Observations of species combinations in older naturally regenerated stands provide a good starting point for determining species compatibility. It is important to try to monitor micro-evolutionary processes, however, to understand how species interactions change with climate change. Mixtures of tree species on a site are beneficial because different tree species respond differentially to mortality agents such as fire, wind, and pests; therefore, mortality risks are reduced. Species mixtures have also been shown to increase ecosystem functioning (e.g.,*

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<sup>6</sup>Quoted from: Mah et al. 2012. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr067.pdf>



increased productivity or reduced mortality) through niche complementarity or facilitation (Tilman et al. 1997; Kelty 2006; Schaberg et al. 2008).

#### *Species vulnerability*

*The vulnerability of species to changes in climate and disturbance regimes will depend on the degree and pace of regional climate change. Predicting the implications and developing outcome scenarios for species distributions will be key to developing a flexible, dynamic landscape species strategy. This is becoming increasingly sophisticated as we combine higher-resolution regional climate models with a greater range of species traits, greater spatial resolution, and even soil and microhabitat characteristics. Because BEC subzones/variants comprise the current ecological framework for supporting forest management decisions (e.g., species selection), projecting how BEC subzones/variants (or climate envelopes) and species ranges will shift under a changing climate will be of fundamental importance. The projections are most applicable to the BEC subzone/variant zonal sites. It is anticipated that the BEC site classification will remain relatively stable due to the enduring features of the site component (i.e., soil, terrain, and site properties) and will continue to be useful in assessing growing conditions, even if vegetation changes.*

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