

Questions for consideration regarding regeneration options and species selection organized by themes¹

Objectives / guidance

- What is the management objective for the situation and circumstances which these standards will apply? Is it generic or specific? If specific does it have sufficient detail to provide species selection guidance?

Information sources

- Higher level plans,
- SFMPs
- FSPs, Can use FSP tracker to obtain a copy of the relevant FSP – note you will need authorization for this feature. The location of the FSP may not be readily apparent; it may require searching within the structure to find the original and any amendments if present. <http://www.for.gov.bc.ca/his/fsp>
- Stocking Standard Guidance - http://www.for.gov.bc.ca/hfp/silviculture/stocking_stds.htm
- Overview of stocking standards and FRPA
http://www.for.gov.bc.ca/ftp/hfp/external/!publish/FSP%20stocking%20standards/FSPstk_stdsGuide.pdf
- FSP stocking standards evaluation FREP report number 19.
http://www.for.gov.bc.ca/ftp/hfp/external/!publish/FREP/reports/FREP_Report_19_FSP_Stocking_Standards.pdf

Mixed wood direction

- [Chief Forester memo on the Incorporation of mixedwood and broadleaves into Forest Stewardship Plan stocking standards, SP amendments, and TSR regeneration assumptions](#) (pdf, 242 k, posted May 6, 2008)

Broadleaf management

- [Chief Forester letter on broadleaf management applies to Forest Development Plan stocking standards](#) (pdf, 21 k, posted Feb 4, 2003)
- [Chief Forester's Letter on broadleaf management](#) (pdf, 276 k, posted Dec.17, 2002)

Stocking Standards

- Reference Guide in excel format;
http://www.for.gov.bc.ca/ftp/hfp/external/!publish/Stocking%20Standards%20for%20FDPs/Reference_Guide.xlsm
- Tree species composition - [Chief Forester's Guidance on Tree Species Composition at the Stand and Landscape Level](#)

¹ Questions are provided by general category followed by information sources. The list of information sources is meant to be additive and built upon by local users. This list could be further annotated to provide additional usability.

Silviculture Guidelines for Key Habitat Objectives

- 2004 Report written to provide operation management guidelines to forest managers for maintaining broad level habitat objectives
- http://www.env.gov.bc.ca/fia/documents/mca_silvbmp.pdf

Multi block approvals

- Letter re multi block approvals in FSPs
http://www.for.gov.bc.ca/hfp/silviculture/multi_block/Martin%20060710%20Multi%20bl%20Stock%20Stnds%20FS%20Plans%20MEMO.doc.pdf

Cedar management

- http://www.for.gov.bc.ca/hfp/silviculture/TreeSpeciesSelection/Cw_report.pdf

Carbon sequestration, Some example reference sites

- http://www.for.gov.bc.ca/mof/climate_change
- http://www.cif-ifc.org/uploads//Website_Assets/APEBC-CIF_presentation_13-04-10.pdf
- <http://www.fs.fed.us/ecosystems/services/carbon.shtml>

FSP Extension approvals

- <http://www.for.gov.bc.ca/hfp/silviculture/Memo%20123796.pdf>
- <http://www.for.gov.bc.ca/hth/frpa-admin/frpa-implementation/index.htm>

Artificial Regeneration - planting

Is there select seed (seed from orchard and superior provenance natural stand genetic sources with a known level of genetic gain for growth, pest/disease resistance and/or wood density) available for my planting site? Now? Or, in the future?

Information sources:

- SPAR – (need access authority to access) <https://apps20.for.gov.bc.ca/spar/index.jsp>
- Seed planning units – provides gain by planning unit
<http://www.for.gov.bc.ca/hti/speciesplan/index.htm>

Is seed available for artificial regeneration (planting) of the tree species identified as most suitable for my site? If not, will I need to plan for a natural stand cone collection?

Information sources:

- Nursery links <http://www.for.gov.bc.ca/nursery/extensn/bcdirectory.htm>

What about climate change? Are there options to augment natural regeneration with species and provenances that are more likely suited to future conditions?

Information sources:

- KFFS K1 for Kamloops TSA <http://www.for.gov.bc.ca/hcp/ffs/kamloopsFFS.htm>
- Tree improvement links <http://www.for.gov.bc.ca/hti/>

Competition

Is this site prone to non crop competition?

Information sources:

- BEC field guides – locate at <http://www.for.gov.bc.ca/hfd/pubs/lmh.htm>
- Local knowledge – local practitioners

What regimes have been used on this site to achieve the desired future condition? Are they still relevant and available (e.g., use of large stock, broadcast burning, manual brushing, or herbicide use)?

Information sources

- Local knowledge
- Forrex Stand Establishment Decision Aids <http://www.forrex.org/tools/sedas>
- Various FRDA reports e.g., 001 <http://www.for.gov.bc.ca/hfd/pubs/frr.htm>

Will ingress likely occur, if so will it help stock the site or overstock it? How do you know?

Information sources:

- Silviculture surveys, RESULTS <http://www.for.gov.bc.ca/his/results/training/index.htm>

Natural regeneration

- What factors should I consider when leaving retention for species diversity and natural regeneration?
- Should there be some level of retention to aid regeneration or the long term structure and desired species mix?
- Will ingress likely occur, if so will it help stock the site or overstock it? How do you know? How reliable is my estimation of the future forest condition – what am I using to base it on?
- Over what time frame would it take to become fully stocked?
- What if the area was harvested differently – e.g., shelterwood, site prepared...?
- What species composition is likely to occur based on local conditions and history – even if you plant?
- What would happen if we do nothing? Will a site regenerate naturally? Will there be incremental value in spending money silviculturally to modify what will come in naturally?
- What non-target species will I get by natural regeneration? How will they compete with the target species?
- What benefits will non crop species provide? Will I have to manage their density to facilitate my crop species?
- What is the genotypic quality of the parents for natural regeneration?
- Is seed available for natural regeneration of the species I want? What conditions are required for its germination and future success?
- What issues regarding establishment could affect early establishment (e.g., frost, drought, seed frequency, herbivory...)

Information sources

- Local survey results – RESULTS reports
- Partial cutting Silvics field cards
<http://www.for.gov.bc.ca/hfp/publications/00009/silvic.pdf>
- Old burns, areas with windthrow, other disturbance types – local knowledge

- Can I use nearby stands to gauge species trajectories? What may or may not have been different in those stands than mine?
- Private land guidance: <http://www.pmflc.ca/docs10/Interior-Workshop-Regeneration.pdf>

Partial cutting

- How should I cut the stand to favour the species I want to regenerate? That is what environment do I want to create?
- Are the species forming the overstory the species I would like to regenerate?
- What seedbed conditions do I need to promote natural ingress?
- Am I willing to plant, and if so how open does it need to be for growth? E.g., What level of RBA will promote establishment and growth of desired understory species?

Information sources

- Silvicultural Systems Handbook
<http://www.for.gov.bc.ca/hfp/publications/00085/silvsystemshdbk-web.pdf>
- Partial cutting Silvics field cards
<http://www.for.gov.bc.ca/hfp/publications/00009/silvic.pdf>
- Deviation from Potential <http://www.for.gov.bc.ca/hfp/silviculture/MPBI/index.htm>
- [Single Entry Dispersed Retention System Stocking Standard Discussion Paper](#)
- Single tree selection
http://www.for.gov.bc.ca/ftp/hfp/external/!publish/Stocking%20Standards%20for%20FDPs/Single_Tree_Selection_Stocking_Standards.pdf

Habitat

- What are some available options for maintaining or recruiting habitat features?

Information sources

- Silviculture Guidelines and Practices for Maintaining or Recruiting Key Habitat Objectives http://www.env.gov.bc.ca/fia/documents/mca_silvbmp.pdf
- Sample DRAFT habitat stocking standards [Sample Habitat Stocking Standards](#) (pdf, 11 k, posted Dec.12, 2002)

Which species grow best where?

Information sources

- Tree species compendium
<http://www.for.gov.bc.ca/hfp/silviculture/Compendium/index.htm>
- BEC field guides – locate at <http://www.for.gov.bc.ca/hfd/pubs/lmh.htm>
- Growth and Yield data, Models - <http://www.for.gov.bc.ca/hre/qymodels>
- Seed planning units – provides gain by planning unit
<http://www.for.gov.bc.ca/hti/speciesplan/index.htm>

Forest Health Factors

- What species are at risk to what and when?
- What issues might affect the longevity of the stand? (e.g., MPB)
- Which species will be winners, which not? What will influence this – prompt planting? Frost tolerance, weevil resistance?
- How predictable is the trajectory of your desired stand - what risks are out there – which are known – e.g., various rusts, which are not know – e.g., effects of climate change?
- What issues regarding juvenile survival may affect stocking? (e.g., rusts in pine, root rots...)

Information sources

Note there are many information sources, contact your local forest health specialist for additional guidance.

- Forest Practices Branch – Forest Health Website, has numerous useful links and contacts
 - Located at <http://www.for.gov.bc.ca/hfp/health/index.htm>
- Regional Forest Health Websites, e.g. Southern Interior
 - Located at <http://www.for.gov.bc.ca/rsi/ForestHealth/index.htm>
- BEC field guides – locate at <http://www.for.gov.bc.ca/hfd/pubs/lmh.htm> - see appendix 1 for location of Forest Health information within the various field guides.
- Forrex Stand Establishment Decision Aids <http://www.forrex.org/tools/sedas>
- Sitka spruce weevil tool [Sitka spruce weevil decision tool for Vancouver Island Extension Note 95: User-friendly Web Tool to Support Silviculture for Sitka Spruce on the South Coast](#)

Cost / risk

- What are the costs and benefits of the various approaches vis a vis risk.

Information sources:

- RESULTS?
- Kamloops Future Forest Strategy – general discussion of risk.
<http://www.for.gov.bc.ca/hcp/ffs/kamloopsFFS.htm>
- Local knowledge – other?

Modeling

- What are you using to project productivity and growth? How confident are you in the estimate of Site Index, of the model used to project growth?
- What is the expected rotation length, what would that produce in volume and piece size (by species)? How do you know?

Information sources:

- Growth and Yield models <http://www.for.gov.bc.ca/hre/gymodels/index.htm>
- Site index estimation <http://www.for.gov.bc.ca/hre/sibec>
- Local knowledge – other?

Survey parameters

- What is the impact of different survey assessment parameters?

Information sources

- <http://www.for.gov.bc.ca/hre/pubs/pubs/1184.htm>
- Chief forester letter on averaging over standards units
<http://www.for.gov.bc.ca/hfp/silviculture/FSP%20stocking%20standards%20based%20on%20tree%20density%20averaged%20over%20the%20standards%20unit.pdf>
- Survey manual
http://www.for.gov.bc.ca/hfp/silviculture/Surveys/SilvicultureSurveyProceduresManual_April_1_2010.pdf

Appendix 1 Location of Forest Health Info in BEC field guides²

Old Region	Info summary/format/comments	Web link
Kamloops	<p>Matrix using pest intensity both observed and speculated. They have four classes:</p> <ul style="list-style-type: none"> • no evidence, • low pest intensity, • moderate and • high intensity <p>The table is organized by pests of different conifer species and sorted by BEC Variant.</p>	<p>http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh23-6.pdf pages 11-14 in this section. The pdf is fuzzy and looks to have been scanned.</p> <p>Pages 287 – 290 in Part 2 of LMHB number 23 (1990)</p>
Prince Rupert	<p>Only four zones are shown, not broken into subzone or variant due to lack of data. The tables are divided into four categories of host damage by conifer species:</p> <ul style="list-style-type: none"> • Young stand mortality • Growth reduction • Mature stand mortality • Loss of form <p>Pest species are then listed under damage categories using two type faces. Bold type indicates pests that present a high risk and are a widespread problem in the zone. Those in non bold pose less of risk or are limited to specific locations in the zone.</p>	<p>http://www.for.gov.bc.ca/hfd/pubs/docs/Lmh/Lmh26/Lmh26part2c.pdf</p> <p>Pages 7.74 – 7.80</p> <p>Part 2 of LMHB number 26 (1993)</p>
Cariboo	<p>Under the Silviculture Considerations section there is a section entitled Principal Insect and Disease Concerns. Comments are made such as:</p> <p>Two-year cycle budworm could have severe impacts on regeneration in partial harvest systems... They refer you to the following: Insects and Diseases Principal damaging insects and diseases of managed forests in British Columbia are described with photographs in Finck et al. (1992). Common tree diseases of British</p>	<p>http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh39-2c.pdf</p> <p>Found within each of the silviculture considerations sections by Variant e.g., 7.9-1 LMHB number 39 (1997)</p>

² BEC field guides are for the six original Forest Regions, they have since been amalgamated and restructured. This information may be considered a first approximation, see also other references for updated information.

Old Region	Info summary/format/comments	Web link
	<p>Columbia are described with photographs by Allen et al. (1996).</p> <p>Finck et al. (1990) describe damage potentials and signs and symptoms of insect pests in regenerating British Columbia forests.</p> <p>http://www.for.gov.bc.ca/hfp/publications/00198/ - the descriptions provide a general range such as coastal or below 53 degrees</p> <p>Here is another excerpt:</p> <p>Principal Insect, Disease, and Abiotic Damage Concerns There are relatively few insect and disease concerns in the ESSFxv1. The incidence and severity of mountain pine beetle attacks, dwarf mistletoe, and rusts are much less than in the SBPS. Abiotic damage, especially summer frost effects, are generally of greatest concern.</p>	
Nelson	<p>The guide has a separate section (7). They have grouped pests into three categories: P (probable and persistent incidence), C (Conditional or cyclic incidence) and ? (Speculative or uncommon incidence). The information is organized by common broad spectrum agents by crop tree species, then by crop tree species and variant.</p>	<p>http://www.for.gov.bc.ca/hfp/pubs/docs/Lmh/Lmh20-p2.pdf</p> <p>Pages 214 to 224 in LMHB number 20 (1992) – reprinted in 2002 with update. Pages 115 to 127 of this pdf version.</p>
Vancouver	<p>In the Red book forest pest risk is separated out by crop tree species with a set of bars both clear and solid along with ? by variant broken into insects, mammals and diseases. The pest risk is broken up into risk of low medium and high (width of bar) and incidence either black (persistent) or clear (periodic). ? indicates assessment speculative or anticipated but significance unconfirmed.</p>	<p>http://www.for.gov.bc.ca/hfp/pubs/Docs/Lmh/Lmh28/lmh28-05.pdf pages Pages 221 – 229 in LMHB number 28 (1994 version) Pages 30 - 38 in this version.</p>
Prince George	<p>Not in field guides. Contact Craig Delong for information.</p>	<p>Craig Delong mailto:Craig.Delong@gov.bc.ca 250 565-4113</p>

