

Stocking Standards 2011

Stocking Standard Content and Why it Matters

Ministry of **Forests, Mines
and Lands**



Stocking Standards Creating the future

Stocking standards are a critically important decision to maintain options and provide long term benefits.

The following is meant to help create healthy resilient and valuable stands for the future.





Stocking Standards

OVERVIEW – legal direction

FRPA Obligations for
Free-growing
(section 29 - 30)



FPPR provides clarity

FPPR Sec. 16

- Must specify **Situations or Circumstances** that will apply.

FPPR Schedule 1 Section 6

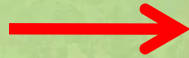
Factors to consider
when designing
standards

Stocking Standards

Definition of stocking standards in Section 1 FPPR

"stocking standards" means the stocking standards that apply when

(a) establishing a free growing stand



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Stocking Standards

Definition of stocking standards in Section 1 FPPR

AND b)

Meeting the requirements of section 44 (4) – which covers **commercial thinning, intermediate cuts and harvesting for special forest products.**



Not today's focus – but we will collate questions if there are any

Stocking Standards

Reference for the Evaluation of Stocking Standards under FRPA

**An Overview Reference for
The Evaluation of Stocking Standards
Under FRPA**

Forest Practices Branch, Ministry of Forests and Range

October 2006

Provides overview
guidance on stocking
standard content and
tests

<http://www.for.gov.bc.ca/ftp/hfp/external/!publish/FSP%20stocking%20standards/FSPstkstdsGuide.pdf>



Stocking Standards Overview

Begin with an overview

FPPR s.26 / FRPA s.16



Evaluating FSP Stocking Standards

Overview

Ministry of Forests, Mines
and Lands

The Tests

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



Stocking Standards

Overview

High Level Evaluation



- **Coarse filter** – does not replace the other steps, provides quick feedback where info is missing.
- **Initial Test** - Do the standards address the range of situations and circumstances?
- Meant to be quick and simple!

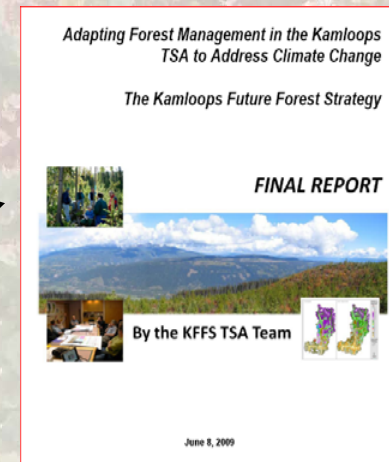
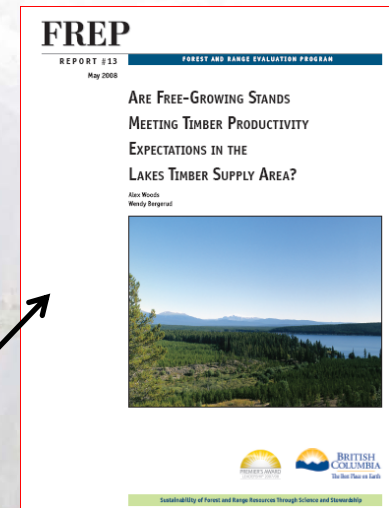


Stocking Standards Overview

High Level Evaluation



- Will all old standards that are being rolled over be appropriate?
- The answer is it depends:
 - May be out of date?
 - New forest health info?
 - New growth and yield info?
 - Climate change info?



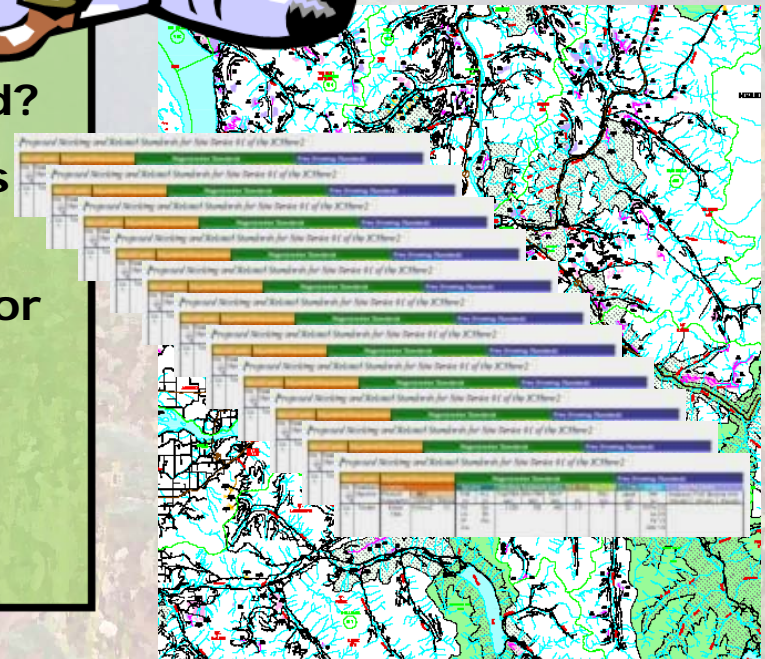
Stocking Standards Overview



Full set of stocking standards for the FSP

Evaluation Criteria

- All situations/circumstances covered?
- All objectives / balance of objectives addressed?
- Valuable species profile maintained or enhanced?
- Standards sets in a form that is measurable and verifiable?

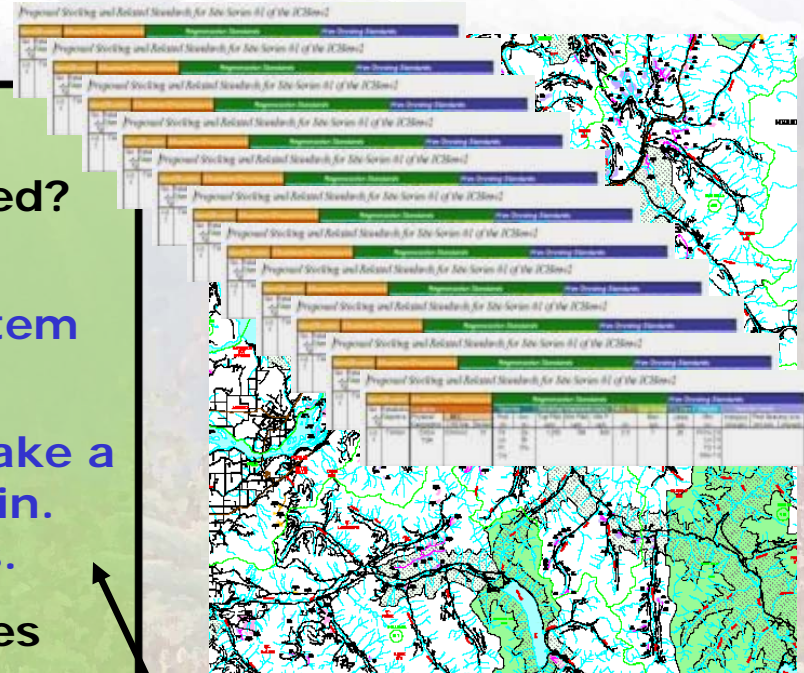


Examined in the context of all FDU's under the FSP

Stocking Standards

Overview - *EVALUATION CRITERIA*

- All situations/circumstances covered?
 - Is a significant stand type / ecosystem /or silvicultural system missing?
 - Example: Licensees in a TSA make a commitment to regenerate a min. % of Cw on certain ecosystems.
- All objectives / balance of objectives addressed?
 - Example: partial-cutting in mule deer winter range is indicated in FSP – are there specific standards for it?



NOTE: This info may come from a LUP or LRMP

Stocking Standards

Overview

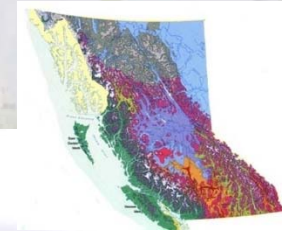
SPECIFY WHERE STOCKING STANDARDS APPLY

- BEC variants and site series

NOTE: Geographic area:

FPPR s.1

- Watershed
- Portion of Watershed
- One cutblock
- Aspects
- Elevation
- Maximum Applicable Area





Stocking Standards

The Tests

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

FPPR s.26 / FRPA s.16



The Tests

1. Addresses established objectives. Meets content requirements.
2. **Includes ecologically suitable species**
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Stocking Standards

Includes ecologically suitable species

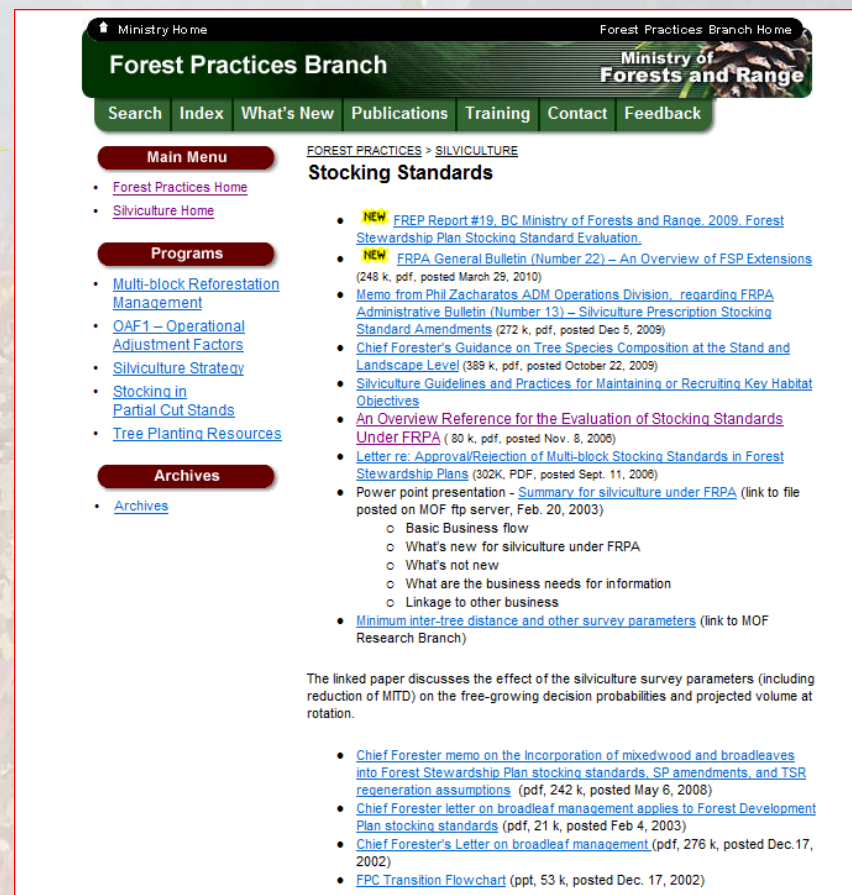
FPPR Schedule 1 (s6)

- **Factors to consider** when designing standards FOR ESTABLISHED OR RETAINED TREES:

Commercially valuable and ecological suitable tree species – information available on SS page

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

FACTOR



The screenshot shows the Forest Practices Branch website. The header includes "Ministry Home" and "Forest Practices Branch Home". The main navigation bar lists "Search", "Index", "What's New", "Publications", "Training", "Contact", and "Feedback". The "Main Menu" section includes links to "Forest Practices Home" and "Silviculture Home". The "Programs" section lists "Multi-block Reforestation Management", "OAF1 – Operational Adjustment Factors", "Silviculture Strategy", "Stocking in Partial Cut Stands", and "Tree Planting Resources". The "Archives" section includes a link to "Archives". The "Stocking Standards" section features a list of documents, including "FREP Report #19, BC Ministry of Forests and Range, 2009, Forest Stewardship Plan Stocking Standard Evaluation", "FRPA General Bulletin (Number 22) – An Overview of FSP Extensions", "Memo from Phil Zacharatos ADM Operations Division, regarding FRPA Administrative Bulletin (Number 13) – Silviculture Prescription Stocking Standard Amendments", "Chief Forester's Guidance on Tree Species Composition at the Stand and Landscape Level", "Silviculture Guidelines and Practices for Maintaining or Recruiting Key Habitat Objectives", "An Overview Reference for the Evaluation of Stocking Standards Under FRPA", "Letter re: Approval/Rejection of Multi-block Stocking Standards in Forest Stewardship Plans", "Power point presentation - Summary for silviculture under FRPA", and "Minimum inter-tree distance and other survey parameters". A note at the bottom states: "The linked paper discusses the effect of the silviculture survey parameters (including reduction of MITD) on the free-growing decision probabilities and projected volume at rotation." A list of documents is provided at the bottom, including "Chief Forester memo on the Incorporation of mixedwood and broadleaves into Forest Stewardship Plan stocking standards, SP amendments, and TSR regeneration assumptions", "Chief Forester letter on broadleaf management applies to Forest Development Plan stocking standards", "Chief Forester's Letter on broadleaf management", and "FPC Transition Flowchart".

Ministry Home Forest Practices Branch Home

Forest Practices Branch Ministry of Forests and Range

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FOREST PRACTICES > SILVICULTURE

Stocking Standards

- **NEW** [FREP Report #19, BC Ministry of Forests and Range, 2009, Forest Stewardship Plan Stocking Standard Evaluation](#)
- **NEW** [FRPA General Bulletin \(Number 22\) – An Overview of FSP Extensions](#) (248 k, pdf, posted March 29, 2010)
- [Memo from Phil Zacharatos ADM Operations Division, regarding FRPA Administrative Bulletin \(Number 13\) – Silviculture Prescription Stocking Standard Amendments](#) (272 k, pdf, posted Dec 5, 2009)
- [Chief Forester's Guidance on Tree Species Composition at the Stand and Landscape Level](#) (389 k, pdf, posted October 22, 2009)
- [Silviculture Guidelines and Practices for Maintaining or Recruiting Key Habitat Objectives](#)
- [An Overview Reference for the Evaluation of Stocking Standards Under FRPA](#) (80 k, pdf, posted Nov. 8, 2008)
- [Letter re: Approval/Rejection of Multi-block Stocking Standards in Forest Stewardship Plans](#) (302K, PDF, posted Sept. 11, 2008)
- [Power point presentation - Summary for silviculture under FRPA](#) (link to file posted on MOF ftp server, Feb. 20, 2003)
 - o Basic Business flow
 - o What's new for silviculture under FRPA
 - o What's not new
 - o What are the business needs for information
 - o Linkage to other business
- [Minimum inter-tree distance and other survey parameters](#) (link to MOF Research Branch)

The linked paper discusses the effect of the silviculture survey parameters (including reduction of MITD) on the free-growing decision probabilities and projected volume at rotation.

- [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)
- [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)
- [FPC Transition Flowchart](#) (ppt, 53 k, posted Dec. 17, 2002)



```

graph TD
    Stand[Stand] --> Diagnosis[Conduct site diagnosis and stratify into similar ecological units]
    Diagnosis --> Site1[Site 1]
    Diagnosis --> Site2[Site 2]
    Diagnosis --> Site3[Site 3]
    Site1 --> Guidelines[Apply the species selection guidelines:  
1. identify the biogeoclimatic unit  
2. identify the site series  
3. review the recommended species  
4. consider the primary, secondary, and tertiary designations  
5. review the footnotes detailing the species restrictions]
    Site2 --> Guidelines
    Site3 --> Guidelines
    Guidelines --> Determine[Determine the composition, vigour, and stocking of advance natural regeneration]
    Guidelines --> Consider[Consider local biological, environmental, and management reasons for choosing the tree species]
    Determine --> Predict[Predict the composition, vigour, and stocking potential of natural regeneration]
    Predict --> Assess[Assess the role of natural regeneration]
    Assess --> Choose[Choose the preferred and acceptable species  
choose the most appropriate combination of species]
    Consider --> Choose
    Choose --> Planting[Determine planting and site preparation needs]
    Planting --> Prescription[Prepare the silviculture prescription]
  
```

Stand

Conduct site diagnosis and stratify into similar ecological units

Site 1 **Site 2** **Site 3**

Apply the species selection guidelines:

1. identify the biogeoclimatic unit
2. identify the site series
3. review the recommended species
4. consider the primary, secondary, and tertiary designations
5. review the footnotes detailing the species restrictions

Determine the composition, vigour, and stocking of advance natural regeneration

Predict the composition, vigour, and stocking potential of natural regeneration

Assess the role of natural regeneration

Choose the preferred and acceptable species
choose the most appropriate combination of species

Determine planting and site preparation needs

Prepare the silviculture prescription

Consider local biological, environmental, and management reasons for choosing the tree species

Figure 2. Decision making for the site selection of species to regenerate forest sites on a site- and situation-specific basis (modified from Klinka *et al.* 1984).

http://www.for.gov.bc.ca/hfp/silviculture/Silviculture_Surveys.html

[illegible]



Stocking Standards

Includes ecologically suitable species

The reference guide

BGC			Regeneration Guide									
Classification			Species					Stocking(i)			Regen Delay (Max yrs)	
Zone/SZ	Series	Standards ID	Conifer					Broadleaf	Target MIN pa MIN p (well-spaced/ha)			
			Primary	Preferred (p)	Secondary	Acceptable (a)	Tertiary					
ICHmw1	01	83053	Fd PI	Fd PI Cw Pw ^{31,49} Sx	Cw Pw ^{31,49} Sx		BI Hw Lw ²³	At ³ Ep ³	1200	700	600	4
	02	83054	Fd	Fd Pw ^{31,49}	Pl ⁴⁹ Pw ^{31,49}	Pl ⁴⁹ Cw ²⁸ Sx ²⁸	Bl ²⁸ Cw ²⁸ Hw ²⁸ Lw ²³ Sx ²⁸	At ³ Ep ³	1200	700	600	7
	03	83055	Fd PI	Fd PI Pw ^{31,49} Sx ^{10,13,28}	Pl ²⁸ Pw ^{31,49} Sx ^{10,13,28}	Bl ²⁸ Cw ²⁸	Cw ²⁸ Hw ²⁸ Lw ²³	At ³ Ep ³	1200	700	600	7
	04	83056	Fd PI	Fd PI Pw ^{31,49}	Pw ^{31,49}	Bl ²⁸ Cw ²⁸ Sx ²⁸	Bl ²⁸ Cw ²⁸ Hw ²⁸ Lw ²³ Pa Sx ²⁸	At ³ Ep ³	1200	700	600	7
	05	83057	Cw ³² Fd ^{1,32} Hw ³² Sx	Cw ³² Fd ^{1,32} Hw ³² Sx Pw ^{1,32,49}	Bl PI Pw ^{1,32,49}	Bl PI		Act ³ At ³ Ep ³	1200	700	600	4

The reference guide was based on extensive ecological and G and Y plot data filtered through expert opinion. It does not take into account climate change, however, **the forest health information in the footnotes was updated in 2010.**

³¹ use of resistant stock mitigates risk of white pine blister rust. Do not use non-resistant stock for reforestation. See BC Journal of Ecosystems and Management 10(1): 97-100.

Stocking Standards

Includes ecologically suitable species

Primary species

Primary tree species are ecologically acceptable and have a high rating for silvicultural feasibility, reliability, and productivity under the average conditions for a site series. Primary species can be managed as a major component in a stand if the restrictions have been adequately addressed.

Note: Primary species are not by default the preferred species. Species from any of the three categories can be chosen as preferred, if the species meets the identified management objectives and if restrictions can be dealt with through treatments.

Secondary species

Secondary species are ecologically acceptable, but rank lower than primary species for one or more of silvicultural feasibility, reliability, or productivity. Depending on the nature and extent of these limitations, secondary species can be managed as either a major or a minor component in a stand.

Tertiary species

Tertiary species are ecologically acceptable, but rank lower than primary or secondary species for one or more of silvicultural feasibility, reliability, or productivity. Depending on the nature of their limitations, on local conditions, and on management objectives, tertiary species are normally suitable only as a minor component within a stand.

For example, tertiary species can be used as a minor component of all stands within an area.

The key elements are:

*Feasibility
Reliability and
Productivity*

[illegible]



Stocking Standards

Includes ecologically suitable species

What about species suitability for Partial Cutting?

SILVICS AND PARTIAL CUTTING FIELD CARDS

Species List

Abies amabilis (Amabilis fir – Ba)
Abies grandis (Grand fir – Bg)
Abies lasiocarpa (Subalpine fir – Bl)
Thuja plicata (Western redcedar – Cw)
Pseudotsuga menziesii (Douglas-fir – Fd)
Tsuga mertensiana (Mountain hemlock – Hm)
Tsuga heterophylla (Western hemlock – Hw)
Larix occidentalis (Western larch – Lw)
Pinus contorta var. *latifolia* (Lodgepole pine – Pl)
Pinus monticola (Western white pine – Pw)
Pinus ponderosa (Ponderosa pine – Py)
Picea sitchensis (Sitka spruce – Ss)
Picea spp. (Interior spruce – Sx)
Chamaecyparis nootkatensis (Yellow-cedar – Yc)



Be aware of forest health concerns, understand the silvics of the species involved – see partial cutting field cards for background information.

www.for.gov.bc.ca/hfp/publications/00009/silvic.pdf



Stocking Standards

The Tests

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

FPPR s.26 / FRPA s.16



Spruce budworm in Fdc plantation
(Craig Wickland photo).

The Tests

1. Addresses established objectives. Meets content requirements.
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3. **Addresses immediate or long-term forest health risks.**
4. Maintains or enhances an economically valuable supply of commercial timber.
5. Is consistent with TSR analysis and assumptions.



Stocking Standards

Addresses immediate and long-term forest health

FPPR Schedule 1 (s.6)

- **Factors to consider** when designing standards FOR ESTABLISHED OR RETAINED TREES:

The factor states – the following factors apply to the development of stocking standards, generally:

- The long term forest health risks that are relevant to species selection for the purposes of establishing a free growing stand, and the occurrence and extent of forest health factors.

Things to consider: The relative impact of the agent – e.g., mortality, stem defect, growth loss.

What are your options?

- Species change,
- Change in density,
- Increase minimum heights,
- Silvicultural treatments





Stocking Standards

Addresses immediate and long-term forest health

Direction on minimum height:

FPPR 26 3 (b) 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.





Stocking Standards

Addresses immediate and long-term forest health

FPPR Schedule 1 (s.6)

- **Factors to consider** when designing standards FOR ESTABLISHED OR RETAINED TREES:

Sources of information

Forest Health Strategies

Identify significant forest health risks to second growth stands.

Promote minimizing the risks of forest health losses through the application of best management practices.



Stocking Standards

Addresses immediate and long-term forest health

INFORMATION SOURCES

Location of District Forest Health Strategies

MFML forest health website

Also has numerous other useful links and references!

<http://www.for.gov.bc.ca/hfp/health/index.htm>

Regional and District/TSA Forest Health Strategies

- ➔ [Introduction](#)
- ➔ [Coast Forest Region Strategies](#)
- ➔ [Northern Interior Forest Region Strategies](#)
- ➔ [Southern Interior Forest Region Strategies](#)

Each TSA in the province is expected to maintain and regularly update a Forest Health Strategy. The strategy describes the main forest health issues in the TSA, the recommended activities to address these issues, and the priorities for management and research. A [template of the forest health strategy](#) is available on-line. This page provides access to the most current version of these documents that were prepared by district and regional forest health specialists in cooperation with TSA stakeholders.

Current Forest Health Strategies

Coast Forest Region

- [CFR Overview](#) (covers all TSAs - North Coast, Queen Charlotte Islands, Mid-Coast, Kingcome, Sunshine Coast, Strathcona, Soa, Arrowsmith, and Fraser TSAs)

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Northern Interior Forest Region

- [Kalum FD \(Kalum and Nass TSAs\)](#)
- [Skeena Stikine FD \(Cassiar, Cranberry, Kispiox, Bulkley TSAs\)](#)
- [Nadina FD \(Morice and Lakes TSAs\)](#)
- [PG TSA \(Ft St James, Vanderhoof, Pr. George FD\)](#)
- [Mackenzie FD \(Mackenzie TSA\)](#)
- [Ft Nelson FD \(Ft Nelson TSA\)](#)
- [Peace FD \(Ft St John and Dawson Ck TSAs\)](#)

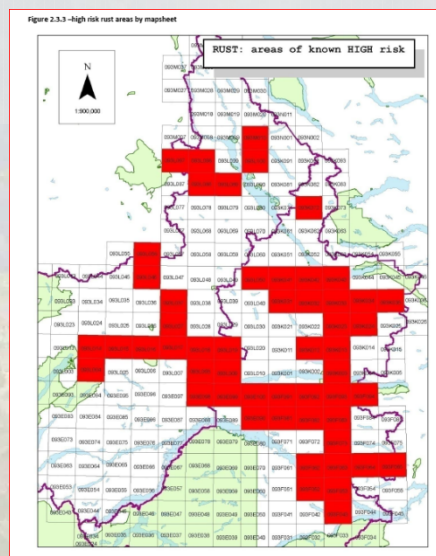
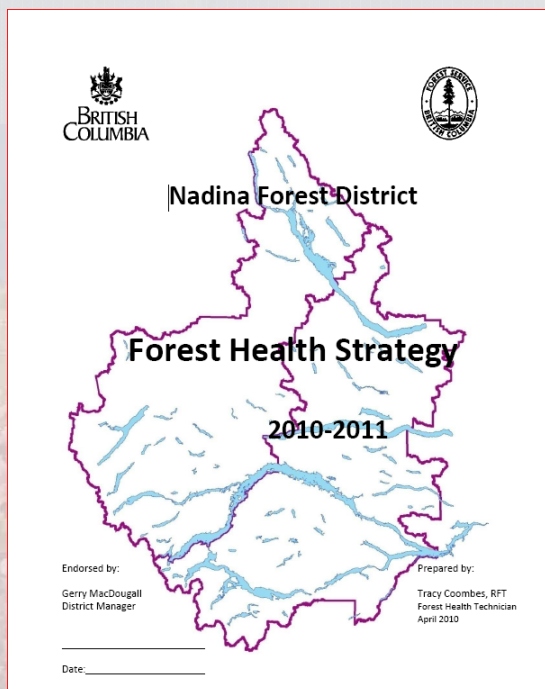
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Stocking Standards

Addresses immediate and long-term forest health

Forest Health Strategy - Example

See Forest Health Strategies for guidance – e.g., Nadina map sheets with high risk for rusts – also provides tactics.



Management Tactic

Increase planting densities to 2200-2500 stems per hectare;
Plant non-host species such as Hybrid spruce, Subalpine fir, Western Larch and Interior Douglas fir.

INTENT: Management recommendations provide guidance for standards in high risk areas.

Stocking Standards

Addresses immediate and long-term forest health

Stand Establishment Decision Aids



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Wildlife Habitat Decision Aids (WHDA)

SEDA/WHDA

Stand Establishment Decision Aids (SEDAs) are extension notes that synthesize the latest information on silvicultural tools and practices that can help deal with environmentally limiting factor within the context of the Biogeoclimatic Ecosystem Classification (BEC) Zone System. These extension notes present information in a user-friendly format for the professional operational community. The information presented in each SEDA looks at the broad silvicultural tool kit including silvicultural systems, site preparation options, regeneration options, etc. They also provide information on cost/risk/trade-off options in reaching specific target management objectives.

For further information on the SEDA series, contact [Kathie Swift](#), and view the following SEDAs published to date in the *BC Journal of Ecosystems and Management*:

Competing Vegetation SEDAs

Coastal BC

- Red Alder Stand Establishment Decision Aids - Volume 7, Issue 2 (228 KB)
- Paper Birch and Fireweed Stand Establishment Decision Aid - Volume 7, Issue 3 (576 KB)

Cariboo Forest Region

- Part 1 of 3: Vegetation Complex Stand Establishment Decision Aids - Volume 2, Issue 1 (447 KB)
- Part 2 of 3: Vegetation Complex Stand Establishment Decision Aids - Volume 2, Issue 2 (330 KB)
- Part 3 of 3: Vegetation Complex Stand Establishment Decision Aids - Volume 5, Issue 1 (628 KB)

Forest Health SEDAs

Coastal BC

- Hemlock Dwarf Mistletoe Stand Establishment Decision Aid - Volume 5, Issue 1 (185 KB)
- Laminated Root Rot Forest Health Stand Establishment Decision Aid - Volume 7, Issue 3 (318 KB)
- Spruce Weevil and Western Spruce Budworm Forest Health Stand Establishment Decision Aid - Volume 7, Issue 3 (580 KB)
- British Columbia's Forests: White Pine Blister Rust Forest Health Stand Establishment Decision Aid - Volume 10, Issue 1 (728 KB)

Cariboo Forest Region

- Part 1 of 2: Forest Health Stand Establishment Decision Aids - Volume 2, Issue 1 (305 KB)
- Part 2 of 2: Forest Health Stand Establishment Decision Aids - Volume 2, Issue 2 (283 KB)
- Southern Interior Forest Region: Forest Health Stand Establishment Decision Aids - Volume 6, Issue 1 (815 KB)

Southern BC

- British Columbia's Southern Interior Forests: Armillaria Root Disease Stand Establishment Decision Aid - Volume 9, Issue 2 (316 KB)

Northern BC

- British Columbia's Northern Interior Forests: Dothistroma Stand Establishment Decision Aid - Volume 10, Issue 1 (296 KB)
- British Columbia's Northeastern Forests: Aspen Complex Stand Establishment Decision Aid - Volume 10, Issue 2 (328 KB)
- British Columbia's Northern Interior Forests: Warren Root Collar Weevil Stand Establishment Decision Aid - Volume 10, Issue 2 (327 KB)

SEDAs for Specific Situations

- Coastal Western Hemlock Biogeoclimatic Zone: Stand Establishment Decision Aid for Nutrient Deficient Salal-dominated sites - Volume 3, Issue 1 (136 KB)
- British Columbia's Coastal Forest: Variable Retention Decision Aid for Biodiversity Habitat and Retention - Volume 9, Issue 2 (178 KB)

Dothistroma Needle Blight – Northern Interior Forest Region



Dothistroma-infected lodgepole pine needles with characteristic red bands

Characteristics of susceptible stands

- All pine species native to British Columbia are susceptible.
- Non-native pine species established in the province (e.g., Monterey pine and bishop pine) are highly susceptible.
- The most severe infections have occurred in northwest British Columbia in managed plantations of lodgepole pine (up to 30 years old). Mortality has also been observed in mature lodgepole pine in this area.
- Cold air ponding sites and areas along major watercourses are typically the areas worst affected.

Description and biology

- Crowns tend to be thin and tufted in appearance. The lower crown is often most severely affected.
- In severely affected stands, crowns are thin with extensive red foliage making it appear as though a fire has been through the stand.
- Needles of all ages are susceptible.
- Spots and bands appear on the needles and turn reddish brown (see the left side of the photo above), although the base of the needles often remains green.
- The best time of year to identify the disease is in the spring when needles that were affected the previous year show up most clearly. Needles that have been killed 1–2 years earlier are best for positive identification (dark red bands on straw-coloured needles – see right side of photo above).
- Spores are released from previously infected needles and infections can occur throughout the growing season provided temperatures are above 5°C and moisture is present. Temperatures between 15 and 20°C during extended periods of moisture are optimal for infection.
- Spores can be transported long distances in moisture-saturated air (e.g., mist or cloud). If spores land on host material during periods of high humidity, these can germinate and penetrate the unaffected needles.
- The fungus goes through a period of vegetative growth within the needle. This growth produces a toxin that causes the red pigmentation in diseased needles. Fruiting bodies (pseudothecia) form on dead needles and appear as small, dark structures that break through the epidermis (see right side of photo above).
- During periods of high humidity, mature fruiting bodies release new spores to complete the life cycle. Depending on climatic conditions and other factors, this can take 1–2 years.
- Recent research indicates that a strong correlation exists between infection levels and the frequency of warm rain events (i.e., daily high temperatures exceeding 18°C for 3 or more consecutive days in July or August). In north-central British Columbia, the frequency of such events is increasing.

Hazard ratings¹

BEC Zone ^a	Drier subzones	Wetter subzones
BWRS	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100
CWH	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100
ICH	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100
PP	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100
SBS	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100

^a See Madinger and Poir (1991) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

^b In areas adjacent to the ICH.

Hazard Rating Key		
Low hazard	Moderate hazard	High hazard
db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100	db1, db2, db3, db4, db5, db6, db7, db8, db9, db10, db11, db12, db13, db14, db15, db16, db17, db18, db19, db20, db21, db22, db23, db24, db25, db26, db27, db28, db29, db30, db31, db32, db33, db34, db35, db36, db37, db38, db39, db40, db41, db42, db43, db44, db45, db46, db47, db48, db49, db50, db51, db52, db53, db54, db55, db56, db57, db58, db59, db60, db61, db62, db63, db64, db65, db66, db67, db68, db69, db70, db71, db72, db73, db74, db75, db76, db77, db78, db79, db80, db81, db82, db83, db84, db85, db86, db87, db88, db89, db90, db91, db92, db93, db94, db95, db96, db97, db98, db99, db100

Management considerations

Until recently, the damage caused to pine species in British Columbia by Dothistroma needle blight was of little concern. With changing climate and the potential for Dothistroma to spread into drier areas such as the Sub-Boreal Spruce (SBS) zone, more effort will be needed to prevent and control this disease if management for lodgepole pine continues to be a priority. Some treatment options are described below by stage of management intervention.

Harvesting

- Ensure silviculture prescriptions for moderate- and high-hazard areas require establishment of a species mix; pine should not be favoured in high-hazard areas.
- If the intention is to re-establish pine, avoid clearcutting in potential cold air ponding sites in high-hazard areas.

Stand establishment

- Regeneration with a tree species mix is imperative. The proportion of regenerated pine should not exceed 20% in high-hazard areas. By the year 2025, the northern portion of the SBS zone is predicted to experience a shift in climatic conditions that will more closely resemble the Interior Cedar-Hemlock (ICH) zone (see Hamann and Wang 2006). Such a shift will make these areas a high hazard for Dothistroma in the future.
- Consider establishing Douglas-fir as a replacement for pine even in some of the warmer BEC subzones where it is not currently listed as an acceptable species. Subzones in which Douglas-fir might be acceptable must be chosen carefully with consideration given to both anticipated changes in climate and root disease hazard.
- Consider establishing a breeding program in which Dothistroma-resistant provenances of lodgepole pine are identified and developed. In other locations, host-resistance trials with ponderosa, radiata, and Austrian pine have shown promise. The Dothistroma fungus itself shows some genetic diversity; further genetic research may help managers identify and create conditions to minimize infection and spread.

Location of FORREX SEDAs

<http://www.forrex.org/tools/sedas/>

Stocking Standards

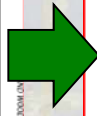
Addresses immediate and long-term forest health

What guidance is available for suitable situation and circumstances for PI



Example – PI use and *Dothistroma* in the ICH

Guidance from the Dothistroma SEDA



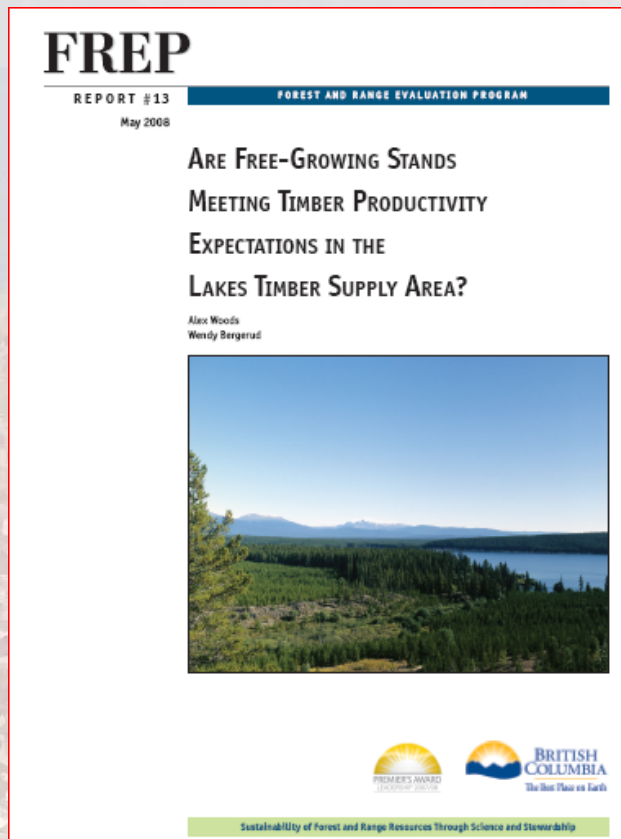
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Stocking Standards

Addresses immediate and long-term forest health

- Other sources include:
- FREP reports and ongoing FREP data – e.g., Stand Development Monitoring Data



In our 2005 assessment 18% of stands no longer contained the minimum of 700 free growing stems/ha based on the lower confidence decision rule, **due mainly to the high incidence of hard pine rusts.**

http://www.for.gov.bc.ca/hfp/frep/site_files/reports/FREP_Report_13.pdf

Stocking Standards

Addresses immediate and long-term forest health

- Other sources – e.g., climate change analysis
- ***Kamloops Future Forest Strategy*** output for ICH to IDF transitional subzones (p. 81)

Lodgepole pine plantations will see significant mortality as problems with rusts, root collar weevil and other pests increase. As these stands mature after 2050 they will likely see significant mortality from bark beetles. Stands mixed with other species (Douglas-fir, larch, ponderosa pine and white pine and broadleaf species) will see less mortality in general.

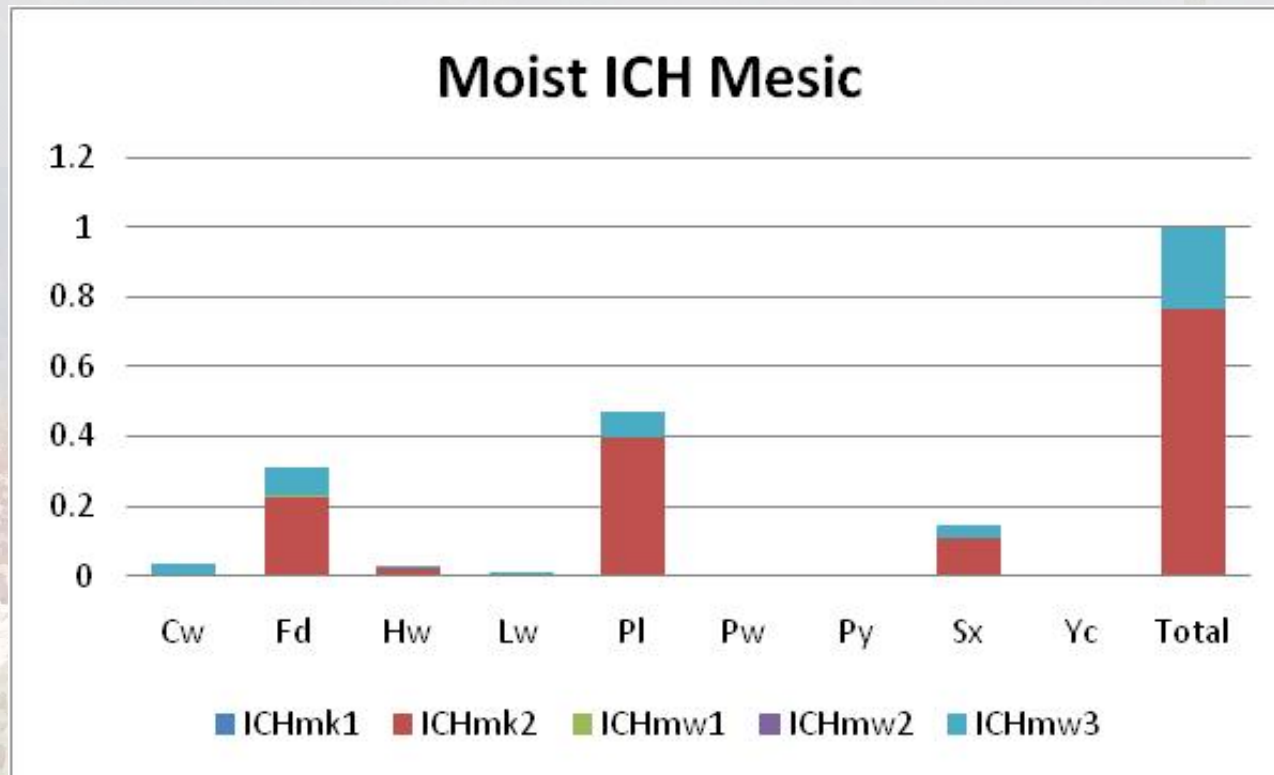


Stocking Standards

Addresses immediate and long-term forest health

How much is already out there?

RESULTS runs of species planted by BEC unit – compared against risk factors – note the amount of PI as a proportion planted.



Graph shows the proportion planted for the units over a ten year period 2000-2010.

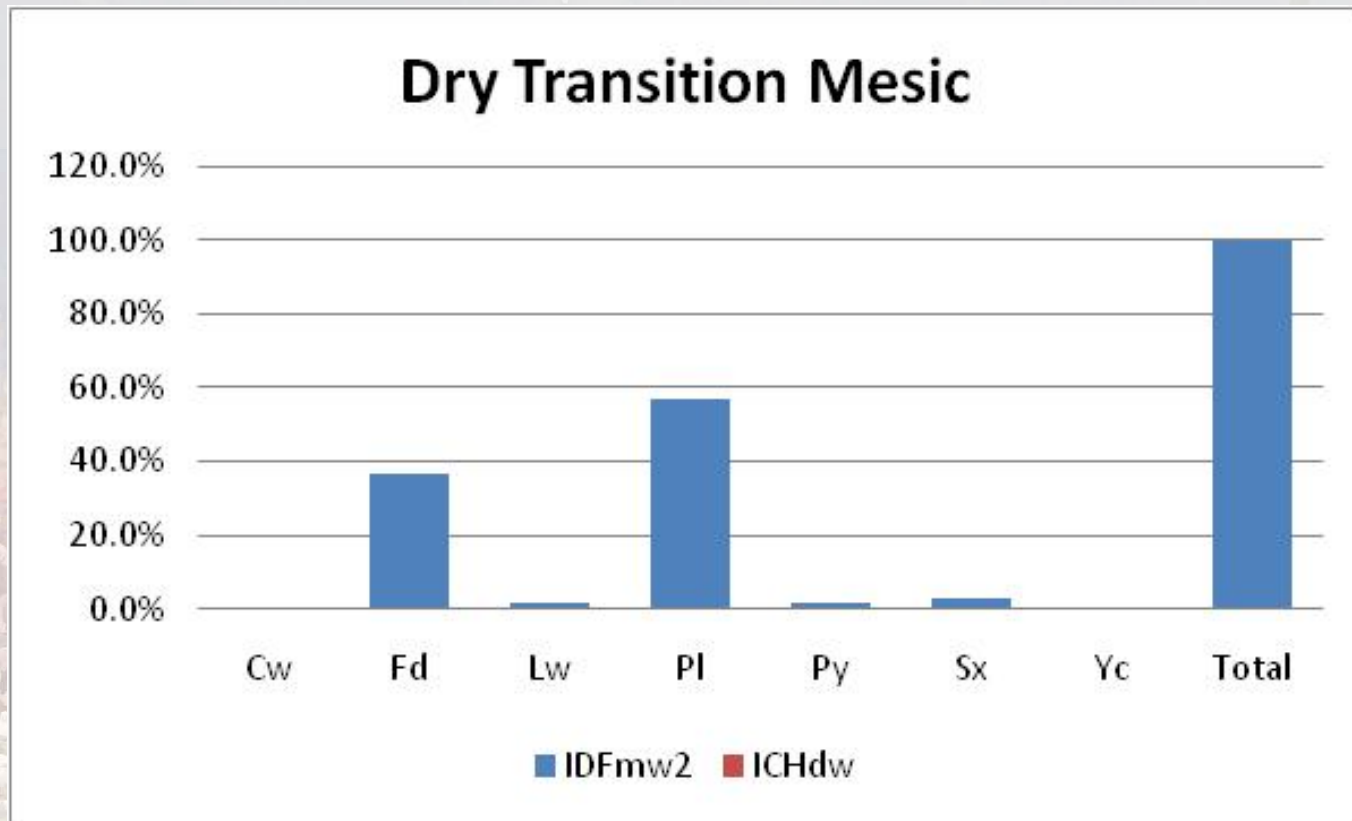


Stocking Standards

Addresses immediate and long-term forest health

How much is already out there?

RESULTS runs of species planted by BEC unit – compared against risk factors – note the amount of PI as a proportion planted.



Graph shows the proportion planted for the units over a ten year period 2000-2010.

Stocking Standards

Addresses immediate and long-term forest health

For consideration - climate change analysis

CWHxm - Strathcona TSA – ecological narratives based on model results and expert opinion (March 2009 Workshop output)

At lower elevations and on mesic and drier sites established *western hemlock, western redcedar and grand fir* will experience drought stress resulting in slower growth and pulses of mortality especially when climate cycles produce a series of hot dry years. The incidence of powder worm has the potential to increase on southern and other warm exposures, impacting cedar value. Wetter sites will provide conditions suitable for maintaining or increasing growth potential of the species found on those sites.



Stocking Standards

Addresses immediate and long-term forest health

E.g., SIFR website

<http://www.for.gov.bc.ca/rsi/ForestHealth/index.htm>

Ministry of Forests, Mines and Lands

Forest Health



The Forest Health program within the Southern Interior Forest Region oversees operational and research projects that deal with Entomology and Pathology issues.

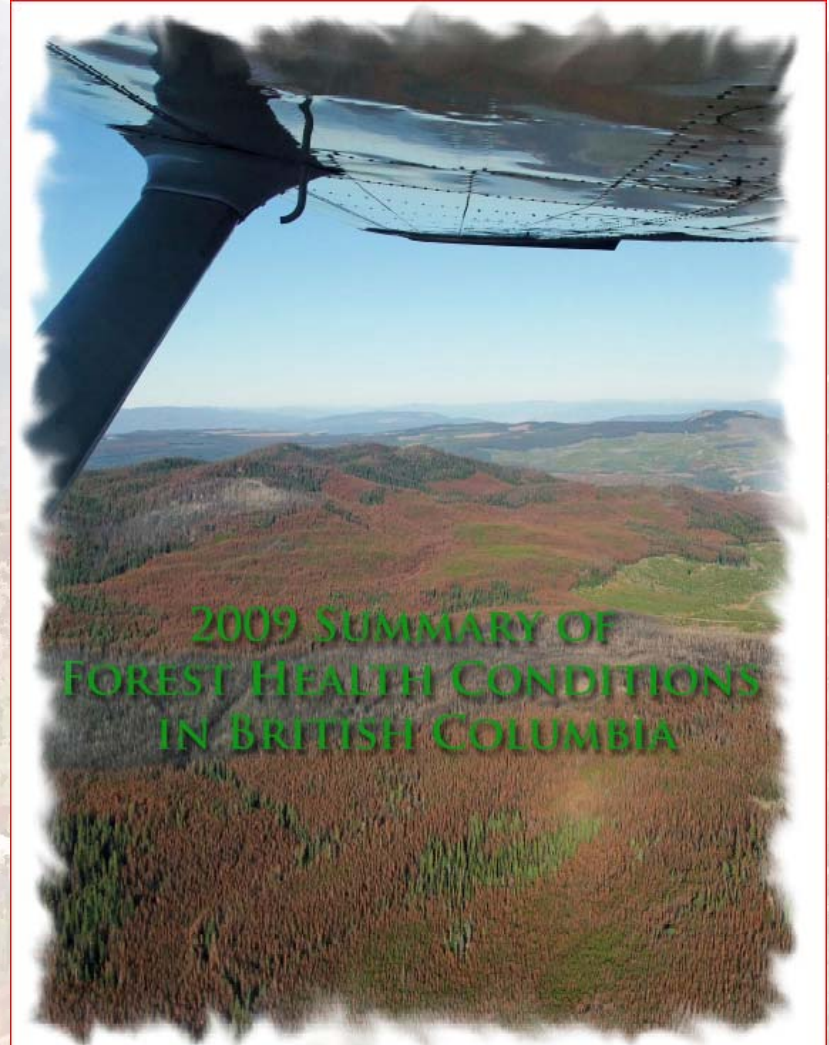
The Southern Interior Forest Region (SIR) covers a large and diverse area. These forest lands span many ecosystems and zones. This area includes: desert, drybelt, moist, alpine, and sub alpine ecosystems. The geographic area extends from Quesnel in the Northwest to the Alberta Border in the North East and to the US border in the South.

With this highly variable and diverse environment comes a wide range of potentially damaging pests and pathogens. Pests may include various species of bark beetles, defoliators such as western hemlock looper, western spruce budworm, and many pests which affect young stands. Forest pathogens cause tree mortality, growth loss and defects. These may include: needle cast fungi, root diseases, stem decays, mistletoes, and rust fungi.



ANNOUNCEMENTS

- [Defoliator Spray Programs](#)
 - [Western Spruce Budworm](#)
 - [Douglas-fir Tussock Moth](#)



Stocking Standards

Addresses immediate and long-term forest health

Keep current - ***forest health issues must be addressed***, be informed and stay informed.

Talk to your district, regional and provincial forest health specialists!





Stocking Standards

The tests



The Tests FPPR s 26

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



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

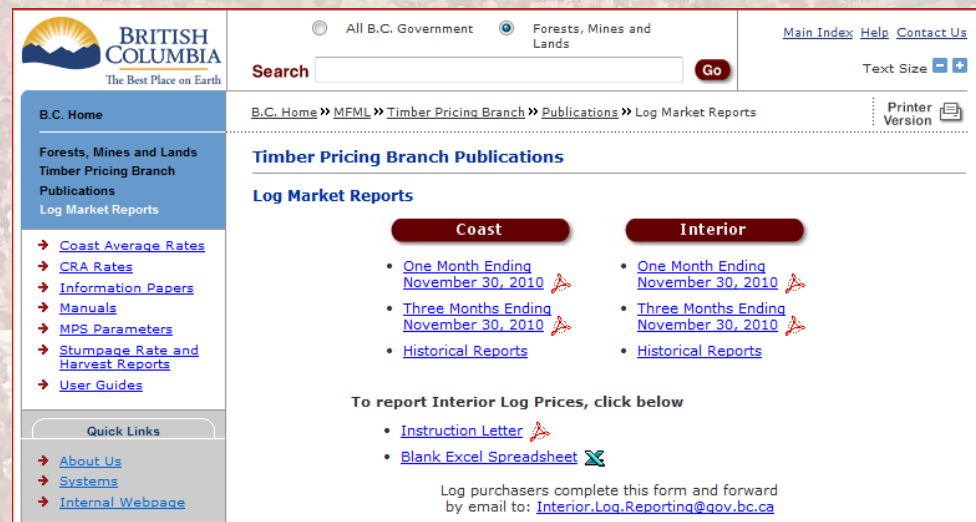
FPPR Schedule 1 (s.6)

- **Factors to consider** when designing standards FOR ESTABLISHED OR RETAINED TREES:

FACTOR The types of commercially valuable suitable species



The screenshot shows the homepage of 'MADISON'S Lumber Reporter'. It features a green and white logo on the left with a list of navigation links: HOME, NEWS, MADISON'S REPORTER, TIMBER PREVIEW, LUMBER PRODUCER LIST, LUMBER PRICE HISTORY STATISTICAL DATA, ORDER A SUBSCRIPTION, LINKS, and MEDIA MENTIONS. The main content area includes 'Key Prices' with a link to 'Madison's Lumber RETROspective', 'The Latest Key Prices from Madison's Canadian Lumber Reporter', and 'NEWS THIS WEEK' with links to 'Canadian BEACON Project', 'Madison's Timber Preview: Port of Prince Rupert: Community Forestry Meeting in West Kootenays', 'Quarterly Reports', 'Link to Lumber Price Graphs', 'Link to Lumber News Archives', and 'Link to Madison's Press Releases'. It also has a 'QUOTE OF THE WEEK' section. On the right, there's a sidebar with 'Act by Google' and various tools like 'JoeScan', 'Sawmill Scanning', 'Easy Affordable 3D Scanning for Demanding Sawmill Applications', and 'Delivered Timber Prices'.



The screenshot shows the 'Timber Pricing Branch Publications' page on the British Columbia government website. The page has a search bar at the top with a 'Go' button and a 'Text Size' dropdown. Below the search bar, there's a breadcrumb trail: 'B.C. Home > MFML > Timber Pricing Branch > Publications > Log Market Reports'. The main heading is 'Timber Pricing Branch Publications'. Underneath, there's a section for 'Log Market Reports' with two columns: 'Coast' and 'Interior'. Each column lists reports: 'One Month Ending November 30, 2010', 'Three Months Ending November 30, 2010', and 'Historical Reports'. Below these, there's a section 'To report Interior Log Prices, click below' with links to 'Instruction Letter' and 'Blank Excel Spreadsheet'. At the bottom, it says 'Log purchasers complete this form and forward by email to: Interior.Log.Reporting@gov.bc.ca'.

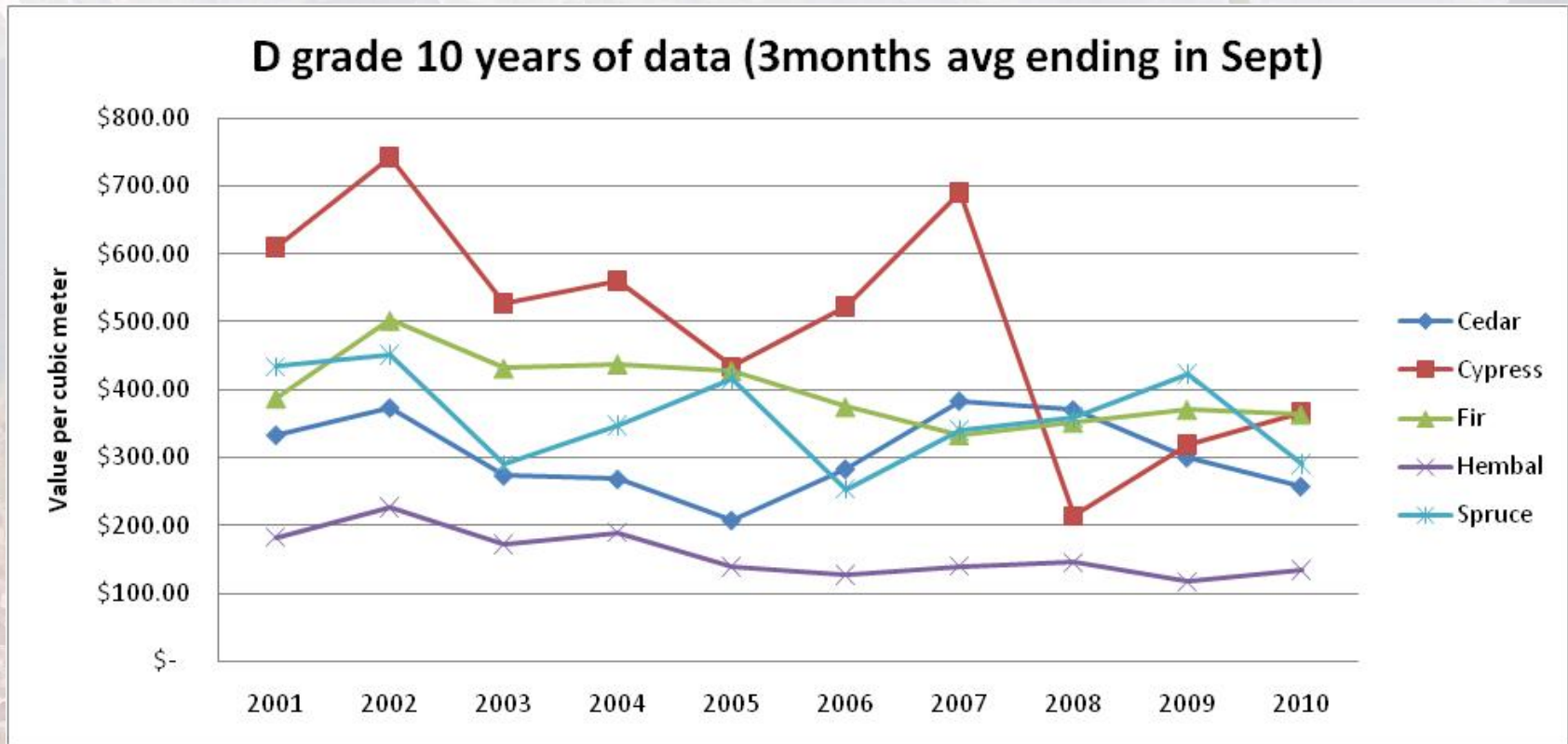
Some value sources



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Coastal example 2000 – 2010 Value by species



Source MFML weblink

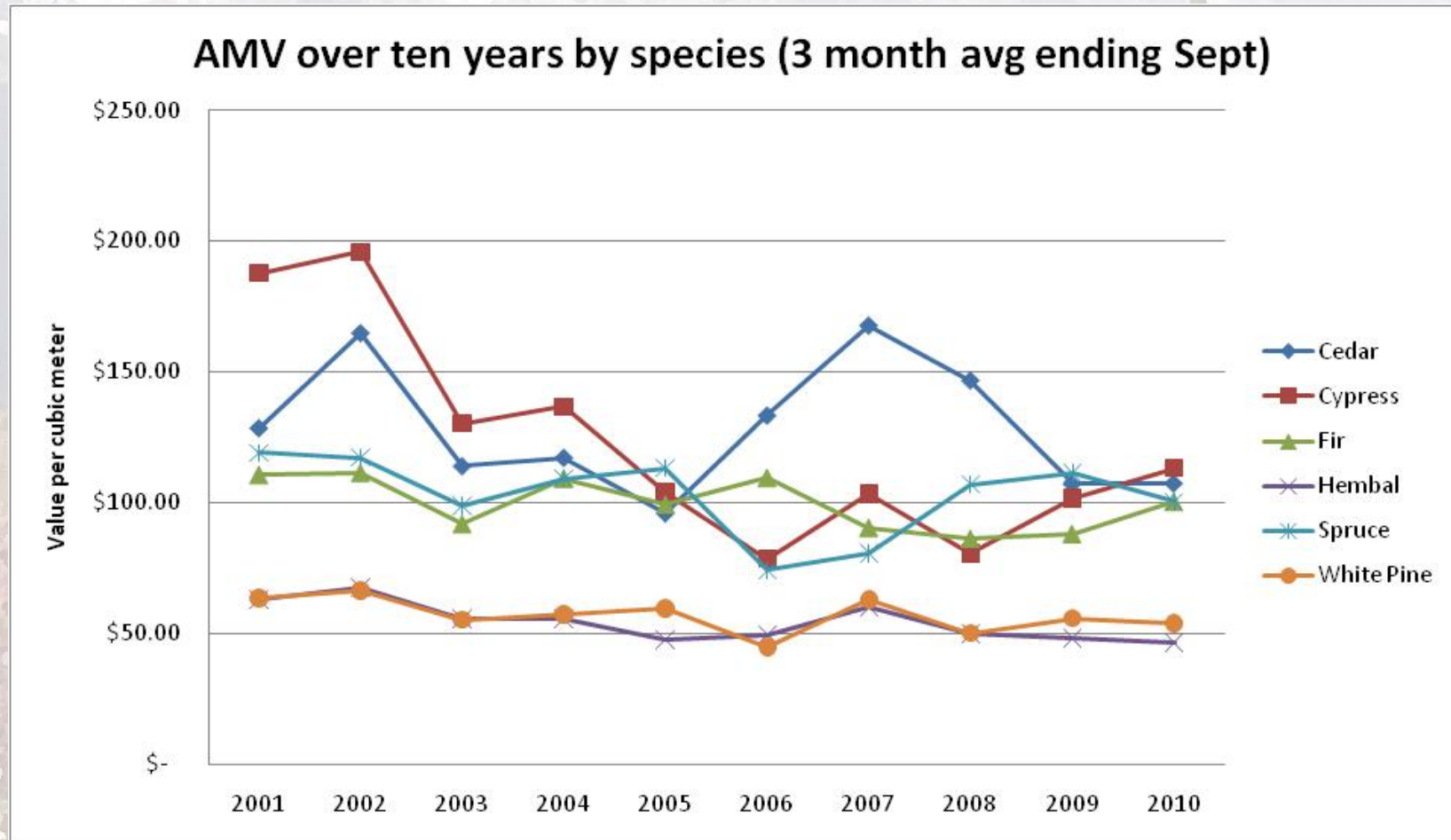
<http://www.for.gov.bc.ca/hva/logreports.htm>



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Coastal example 2000 – 2010 – Average of all grades



Source MFML weblink

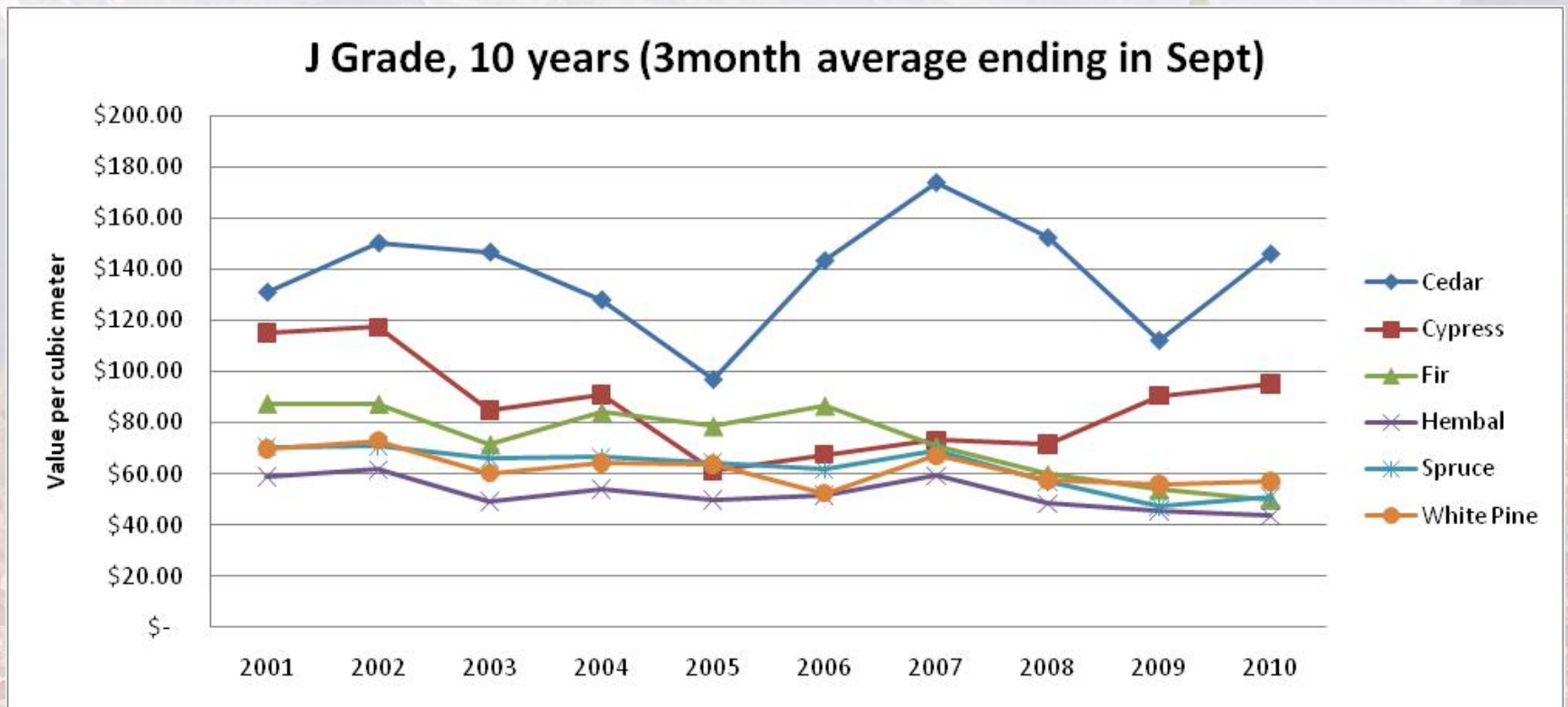
<http://www.for.gov.bc.ca/hva/logreports.htm>



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Coastal example 2000 – 2010 J grade



Source MFML weblink

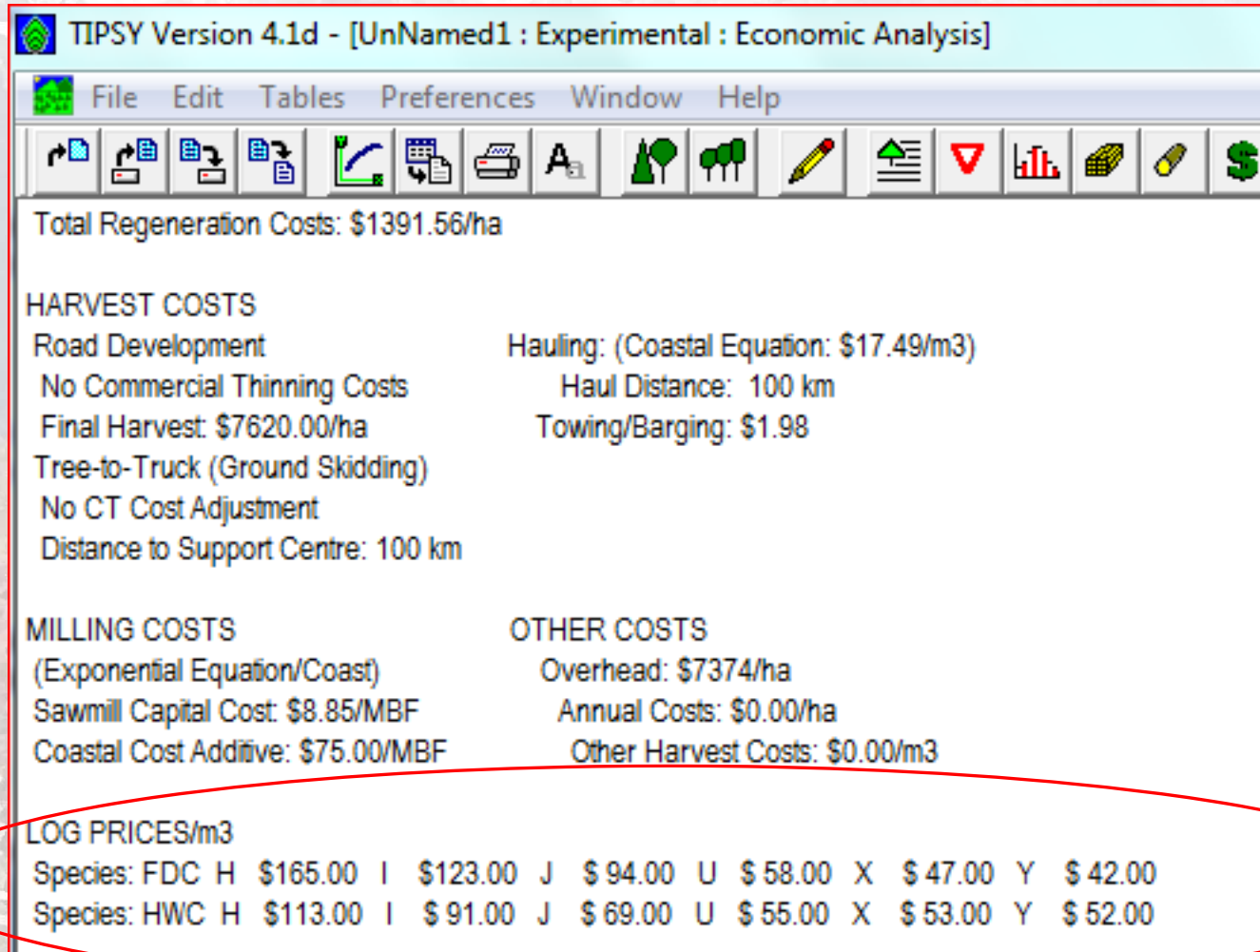
<http://www.for.gov.bc.ca/hva/logreports.htm>



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

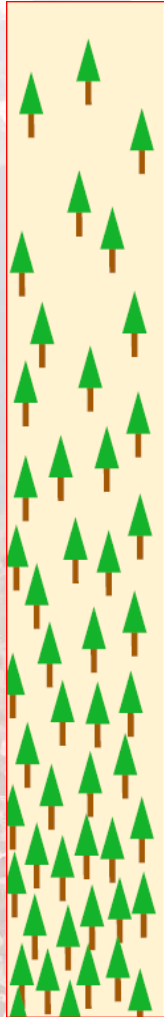
TIPSY OUTPUT



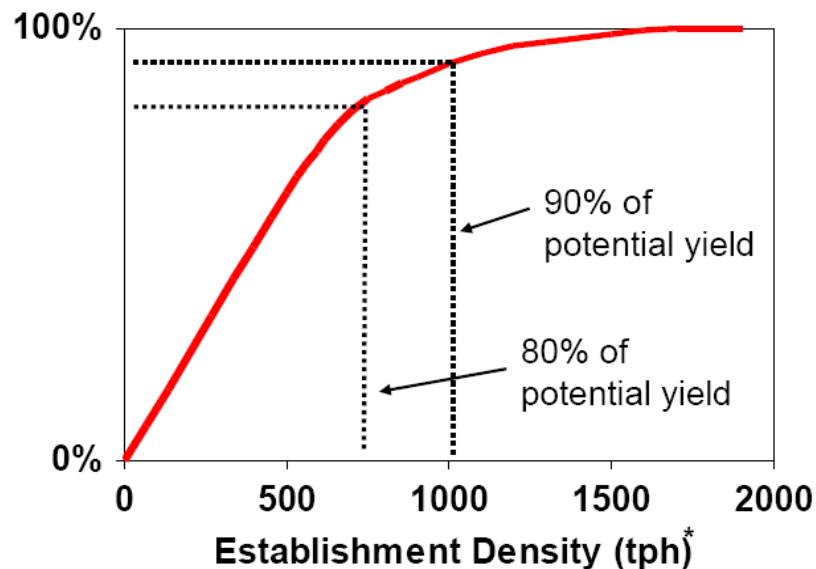


Stocking Standards

Maintains or enhances economically valuable commercial timber supply



Stocking / Density Impacts: Merch. Vol/ha



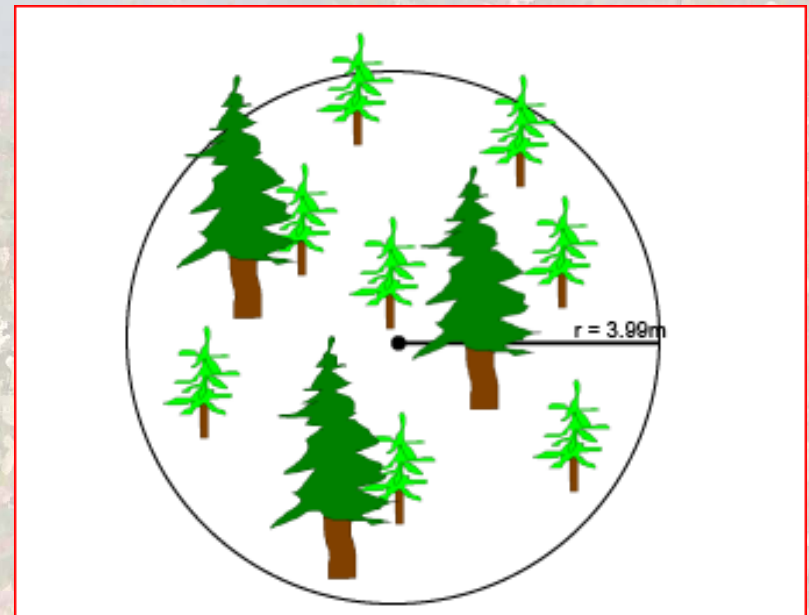
Stocking Standards

Maintains or enhances economically valuable commercial timber supply

FPPR Schedule 1 (s.6)

- **Factors to consider** when designing standards FOR ESTABLISHED OR RETAINED TREES:

FACTOR The numbers and the distribution of healthy trees



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Distribution of trees

- Minimum, target and maximum density
- Minimum inter-tree spacing and M value

The survey method comes into play here

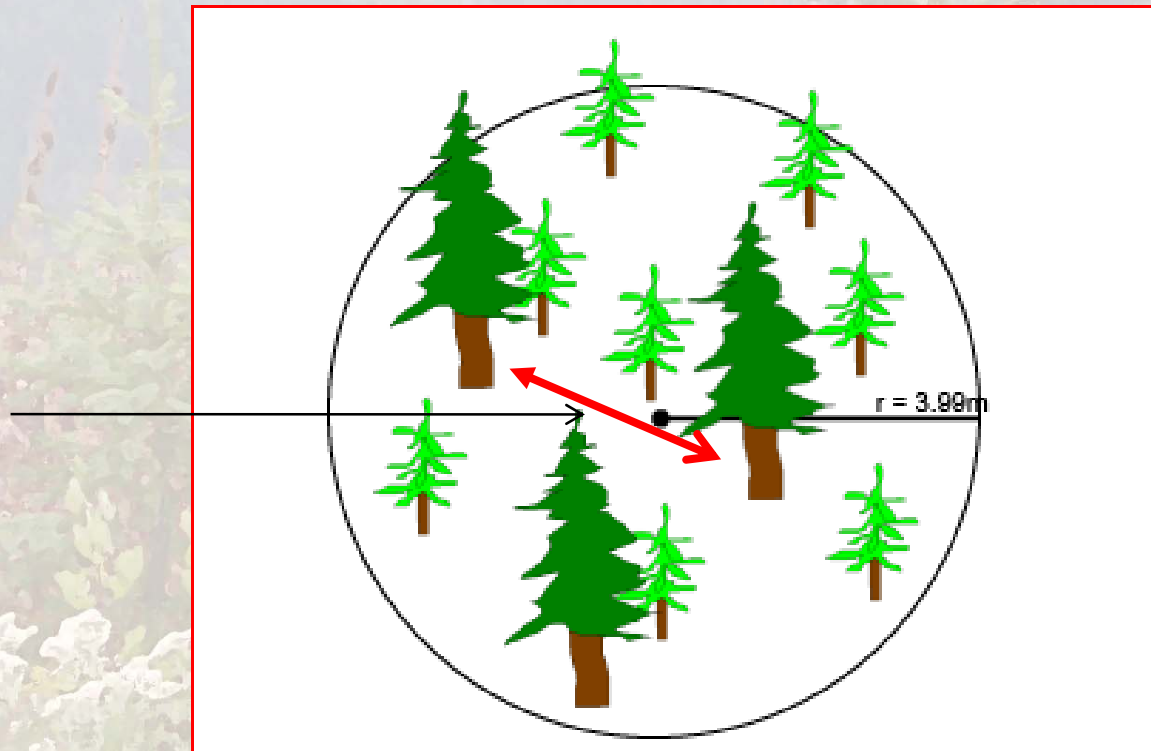


Stocking Standards

Maintains or enhances economically valuable commercial timber supply

- Well-spaced is defined by the Minimum Inter-tree Distance (**MITD**)
- Count is capped by the **M-value** (this is the equivalent plot count for the Target Stocking Standard, **TSS**, i.e., $M = TSS/200$)

2 m is most
common **MITD**





Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Distribution of trees



For more detail SEE
*Land Management
Handbook 50 2002*

50

LAND MANAGEMENT HANDBOOK

The Effect of the Silviculture Survey
Parameters on the Free-Growing Decision
Probabilities and Projected Volume
at Rotation



2002



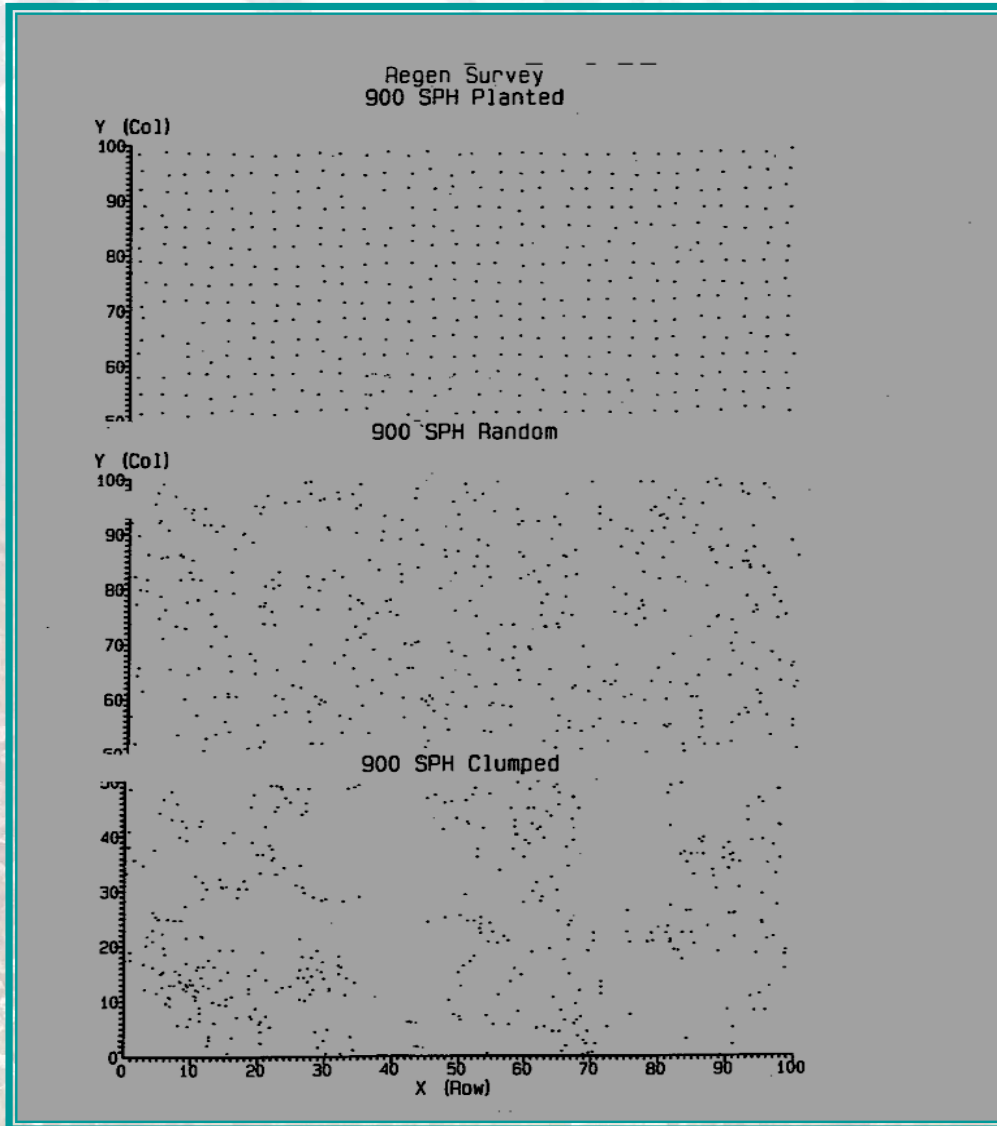
BRITISH
COLUMBIA

Ministry of Forests
Forest Science Program

<http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh50.htm>

Stocking Standards

Maintains or enhances economically valuable commercial timber supply



Example Density
showing spatial
distributions

Planted
Random
Clumped

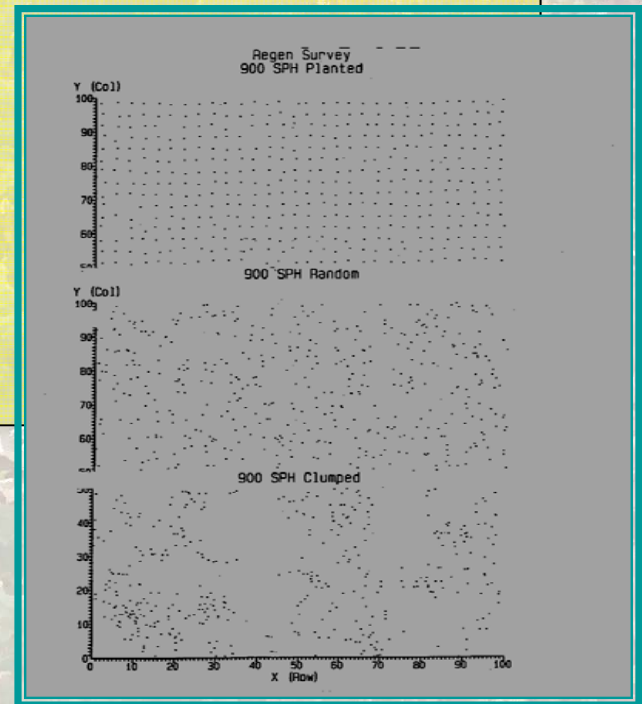
With the same 900sph
(nominal density)

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Which type of Density to use?
(assuming even-aged stands)

- **Total** - All trees (regardless of spacing)
 - **Predicted Merchantable Volume is very sensitive to spatial distribution**

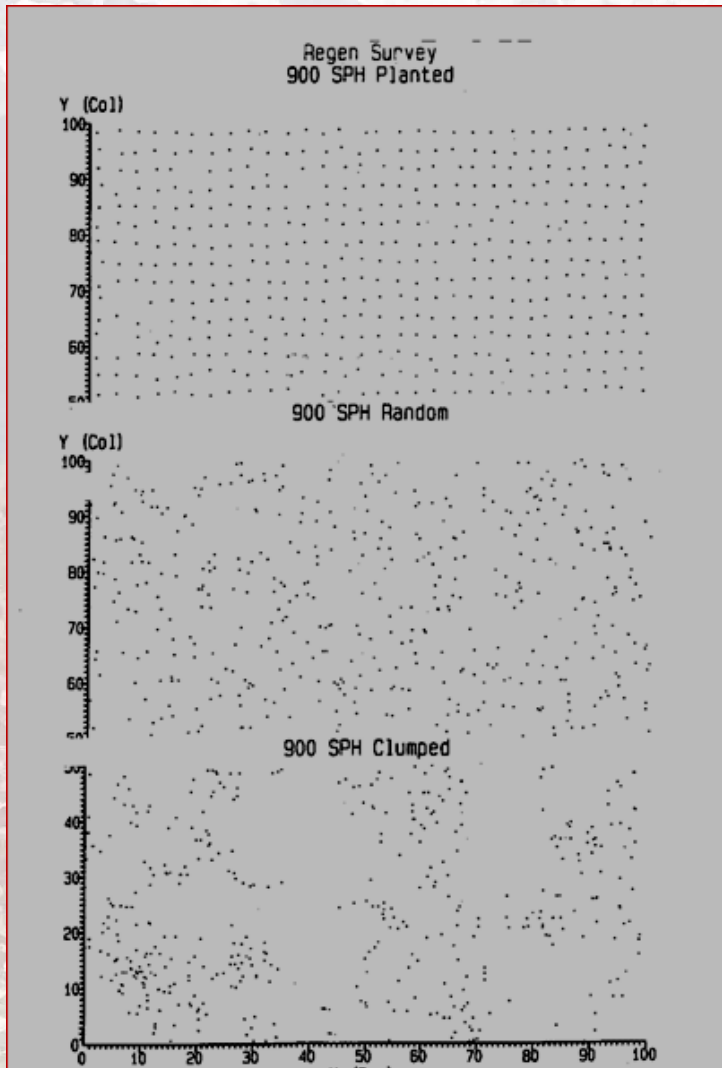




Stocking Standards

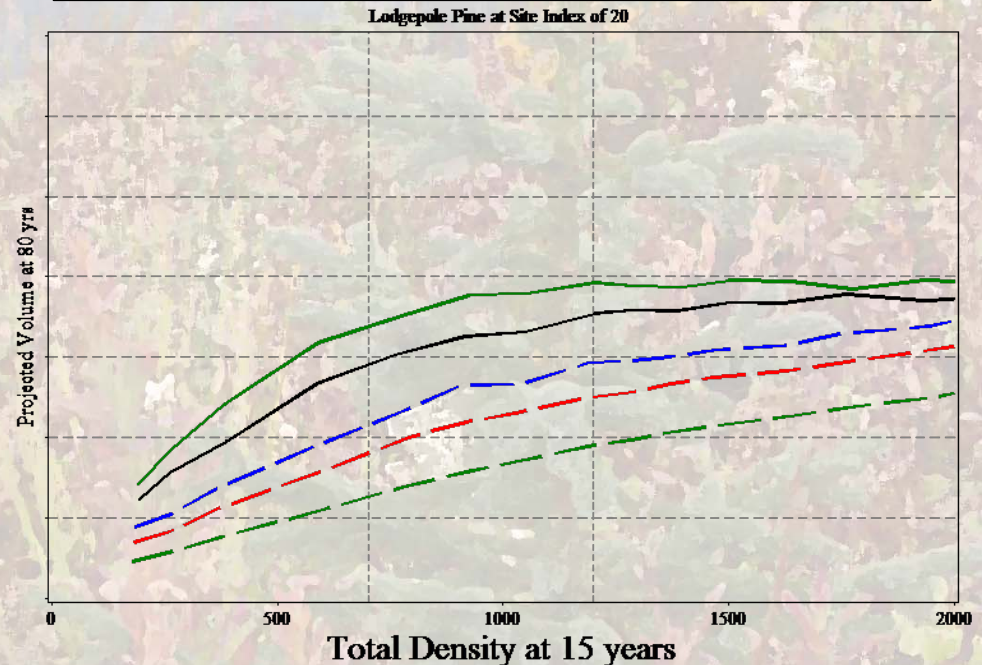
Maintains or enhances economically valuable commercial timber supply

Projected Merch Volume (80 yrs) vs Total density at 15 years (SI = 20)



Large difference between regular spacing – green line, than random spacing – black line and the three clumpy distributions – dashed lines

What does this mean for forecasting timber supply?

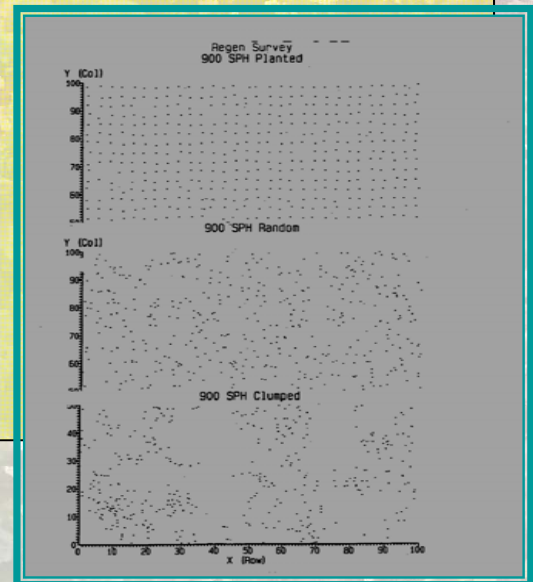


Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Which type of Density to use?
(assuming even-aged stands)

- **Well-spaced** - depends on choice of Minimum Inter-tree Distance
 - **Predicted Merchantable Volume is less sensitive to spatial distribution!**

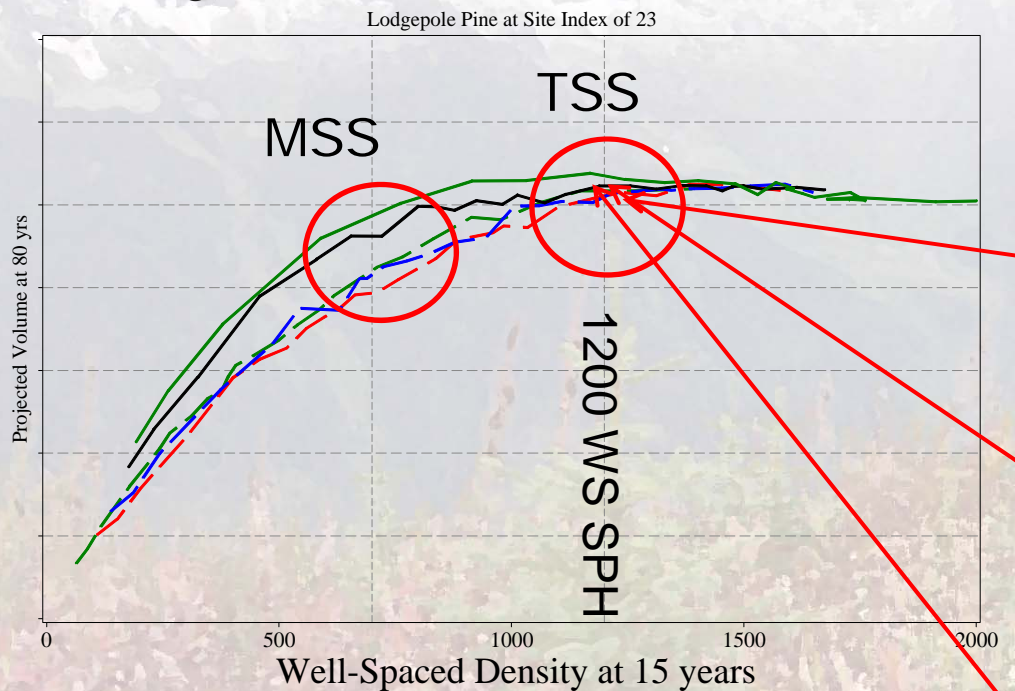




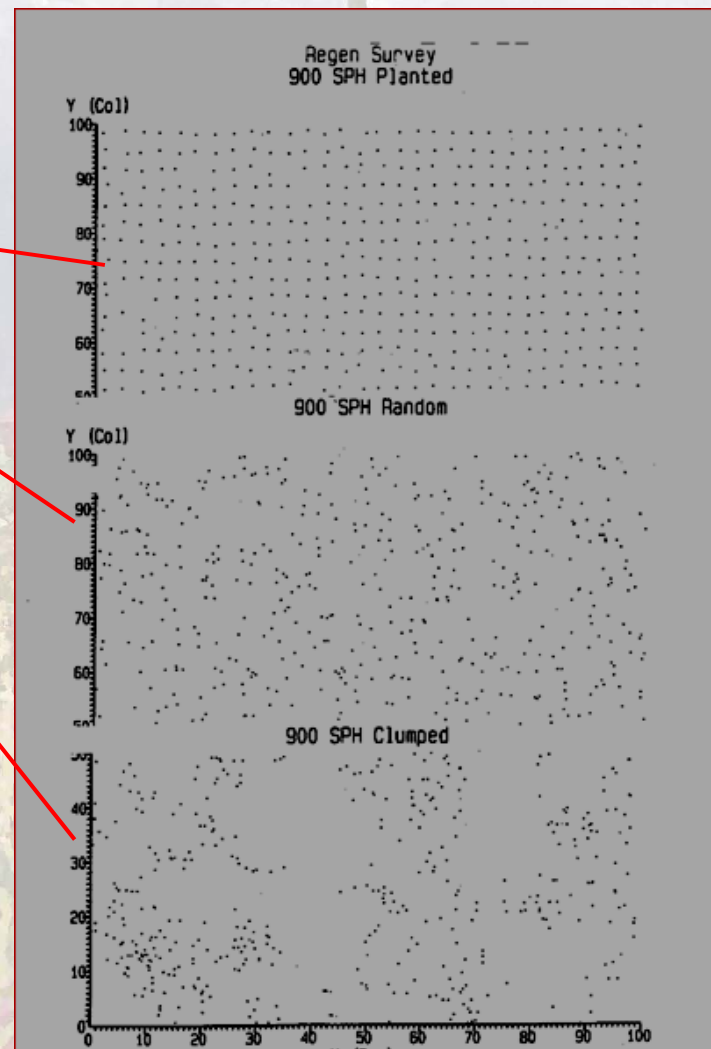
Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Projected Merchantable Volume vs Well Spaced at 15 years



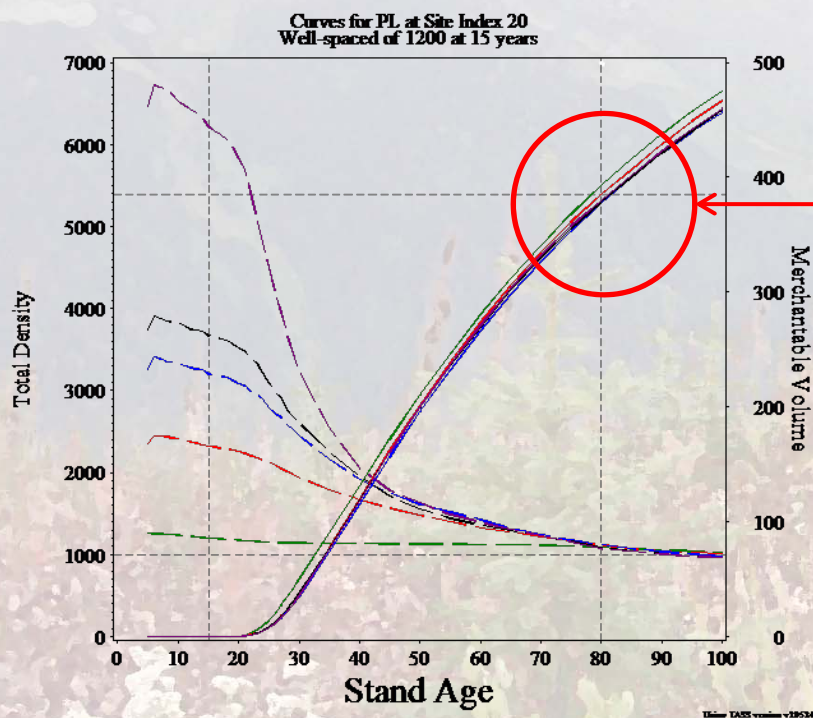
Note convergence with the different distributions at Target WS Stocking – remain divergent at MSS



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Stands with the same Well Spaced density of 1200 produce about the same Volume



Spatial Distribution	Total Trees at 15 years	Volume at 80 yrs
Regular	1202	393
Natural	2336	385
Clump (3)	3199	378
Clump (2)	3669	378
Clump (1)	6224	380

Note the number of total trees needed to get 1200 WS with Clump 1 (6224)

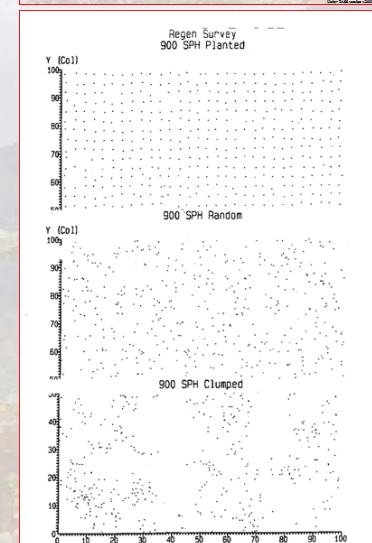
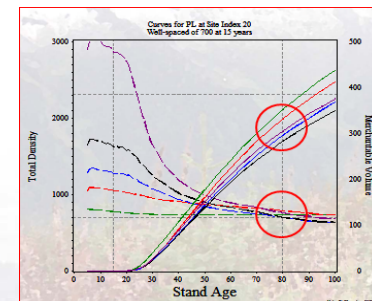


Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Density at 15 years (about 700 ws/h - MSS)

Spatial Distribution	Nominal	Total	Well-spaced	Free-growing	Total at 80 yrs	Volume at 80 yrs
<u>Regular</u>	<u>816</u>	<u>775</u>	<u>775</u>	<u>608</u>	<u>733</u>	<u>352</u>
Natural	1111	1049	736	473	786	332
Clump (3)	1372	1276	696	469	695	295
<u>Clump (2)</u>	<u>1736</u>	<u>1627</u>	<u>715</u>	<u>517</u>	<u>702</u>	<u>283</u>
Clump (1)	3086	2860	706	595	757	305



Distribution matters

Projected volumes near MSS show a 24% difference between regular and Clump 2 spacing.

Minimum stocking is 11% lower for regular spacing when compared with target stocking, while clumped minimums provide 39% less volume!

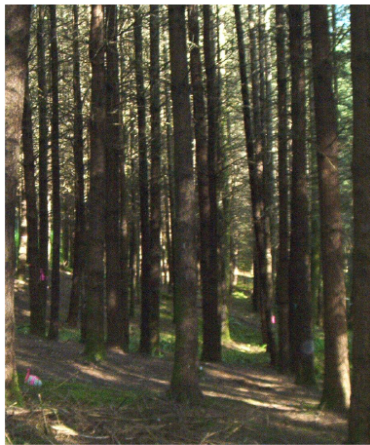
Stocking Standards

Maintains or enhances economically valuable commercial timber supply

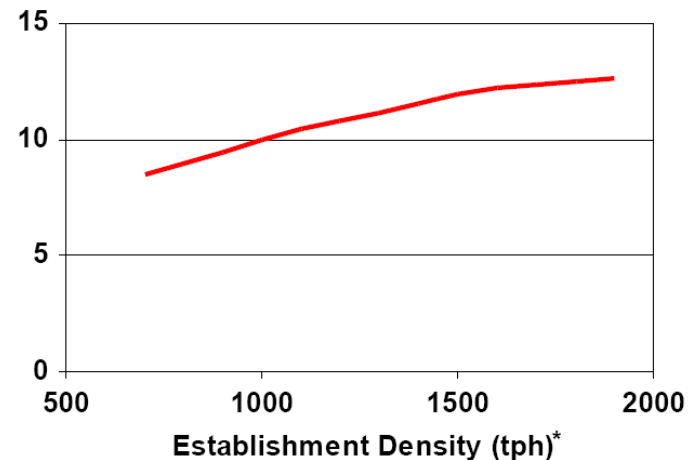
While volume may remain similar total trees can impact piece size



Stocking / Density Impacts: Volume vs. Piece Size



Stocking / Density Impacts: Piece Size



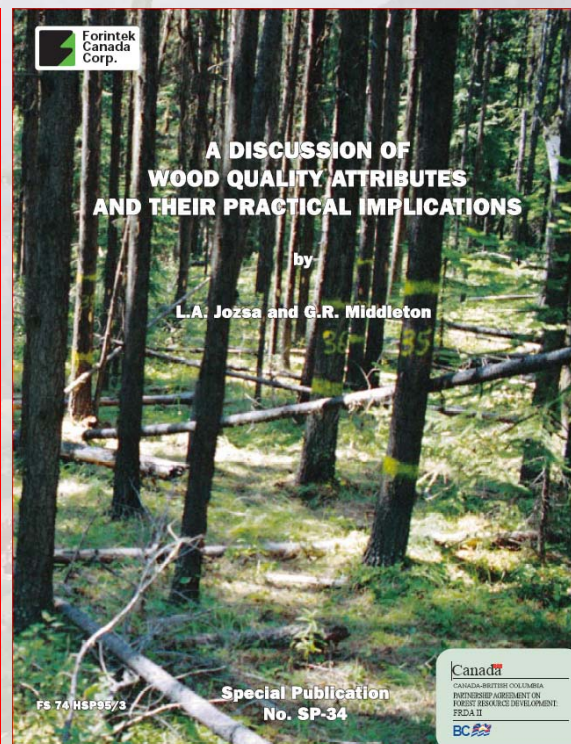
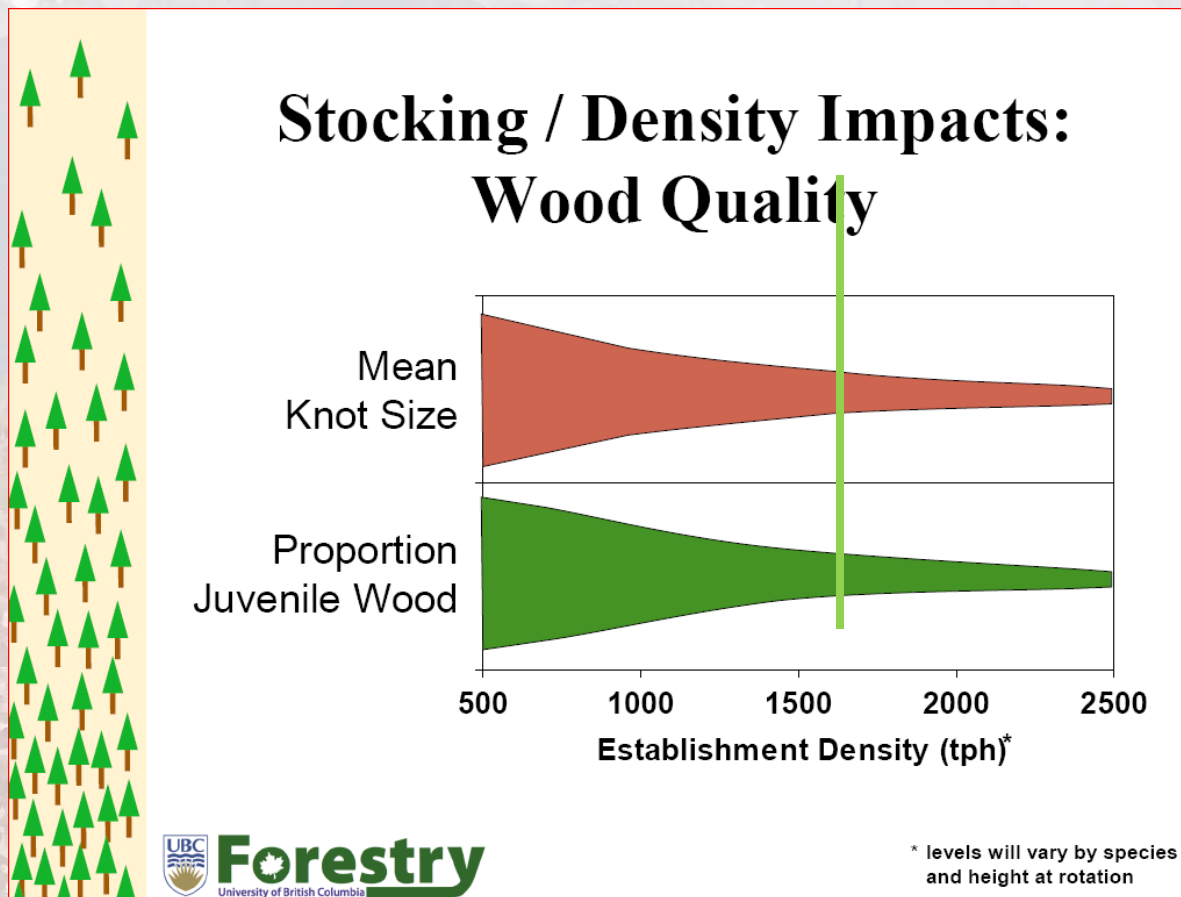
From B. Larson and C. Farnden - Forrex Webinar Dec 2, 2010



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Note relationship to knot size and Juvenile wood at target stocking



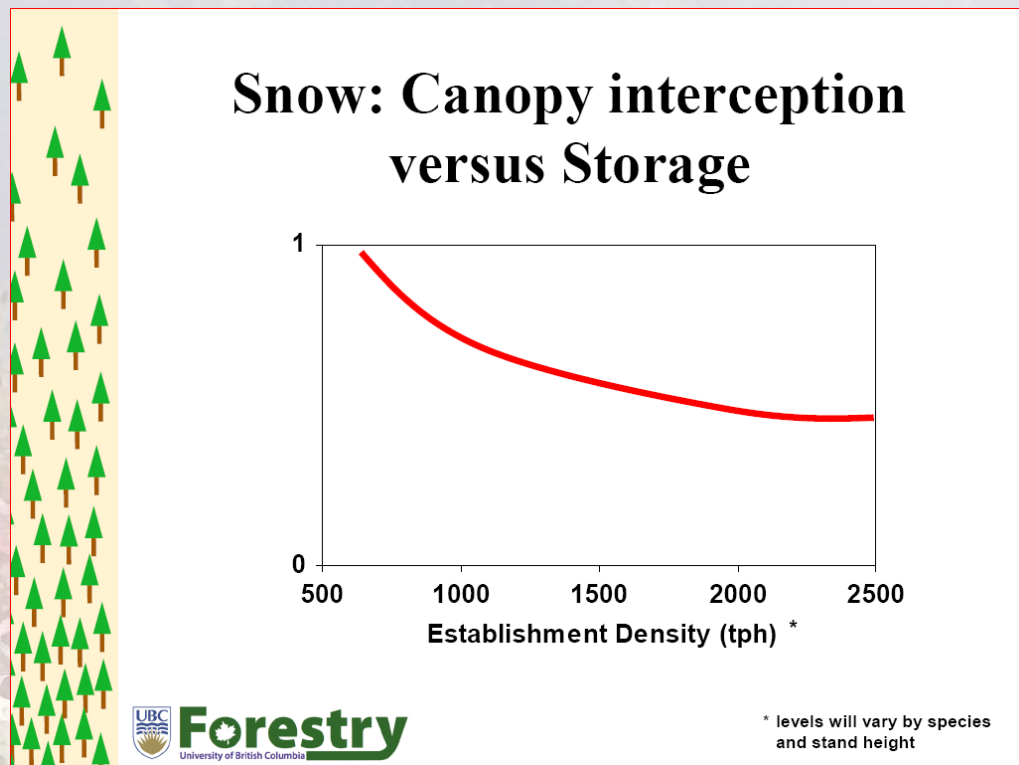
From B. Larson and C. Farnden - Forrex Webinar Dec 2, 2010



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Note density impacts what you are trying to achieve – plan and implement accordingly!



From B. Larson and C. Farnden - Forrex Webinar Dec 2, 2010



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Silviculture Survey Procedures Manual

**-Regen Delay, Stocking and Free Growing Surveys -
plus Alternative Survey Methodologies -**



April 1, 2010

It is recommended that those creating or reviewing stocking standards be familiar with the Survey Procedures Manual.

http://www.for.gov.bc.ca/hfp/silviculture/Surveys/SilvicultureSurveyProceduresManual_April_1_2010.pdf

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Why again use the MITD and M?

The MITD and use of M reduces the effect of gaps in the spatial distribution.

Caps the total numbers counted to avoid over compensation (to address statistical variation).

They define WS and FG density.

AND they help maintain the Public's risk at a reasonable level

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

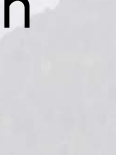
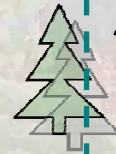
What if we don't use the M-value?
(And average density is at MSS=700)



200 fgph



72%



2000 fgph



The proportion of area that can be
Under stocked

Stocking Standards

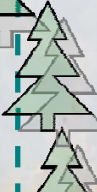
Maintains or enhances economically valuable commercial timber supply

What about if we use the M-value
with an average density is at $MSS=700$?



200 fgph

**Reduced
to 50%**



2000 fgph



The proportion of area that can
be under stocked



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

So why we don't just average over the SU?

The percentage provides an indication of the area that can be understocked in conjunction with the stocked density (top line) when averaged over the SU

Understocked Density (fgph)	Density (ws/h) in Stocked Areas				
	800	1000	1200	1600	2000
0	12.5%	30 %	42 %	56 %	65 %
200	17 %	38 %	50 %	64 %	72 %
400	25 %	50 %	62 %	75 %	81 %
600	50 %	75 %	83 %	90 %	93 %
650	67 %	86 %	91 %	95 %	96 %

See CF letter on the subject

<http://www.for.gov.bc.ca/hfp/silviculture/FSP%20stocking%20standards%20based%20on%20tree%20density%20averaged%20over%20the%20standards%20unit.pdf>

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

MITD and Projected Volume Losses

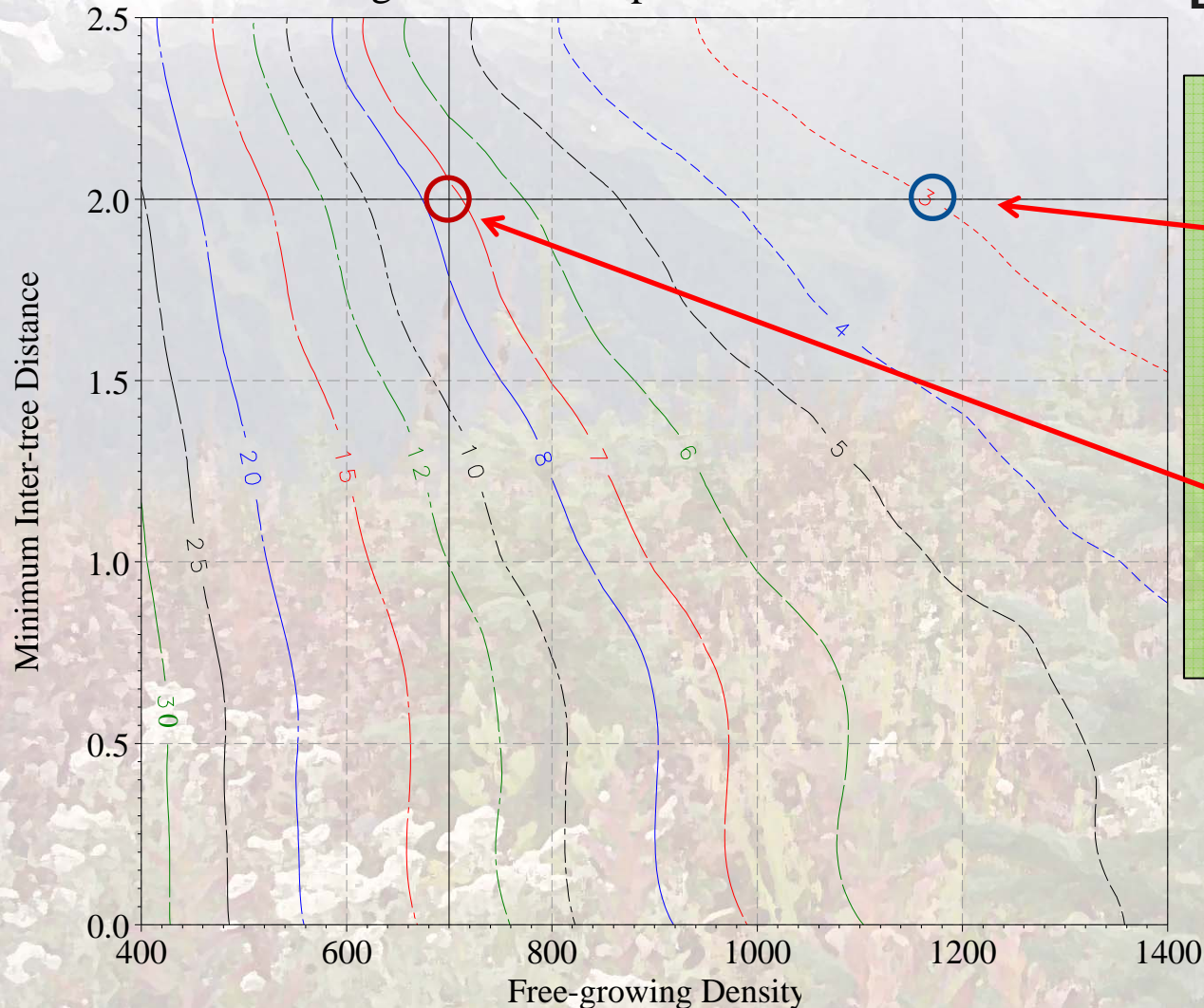
- Remember that there are many assumptions in all of the graphs in this presentation.
- Remember to look more at the TRENDS or patterns than the specific values – these are more likely to remain the same under a different set of assumptions than would the specific values presented.

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Lodgepole Pine at Site Index of 23
Using the Natural Spatial Distribution

MITD and Lines of
Projected Volume
Losses

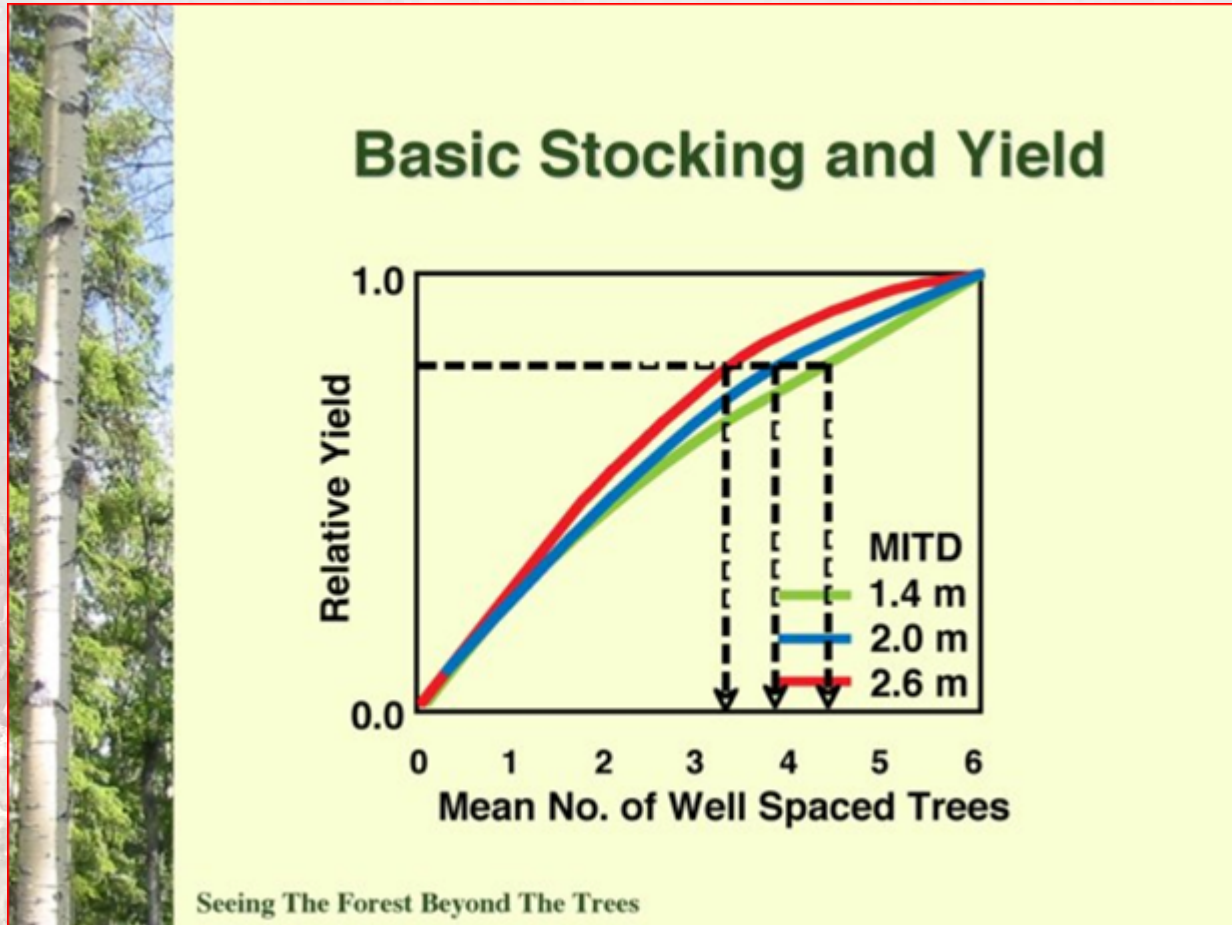


- At MITD of 2.0 m we see ~ 3% volume loss at 1200 fg/ha
- But at 700 we have >7% volume loss

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

MITD and Projected Volume Losses



This indicates a MSS of 700 at 2.6 m spacing provides similar yield to a MSS of 900 for MITD of 1.4m spacing

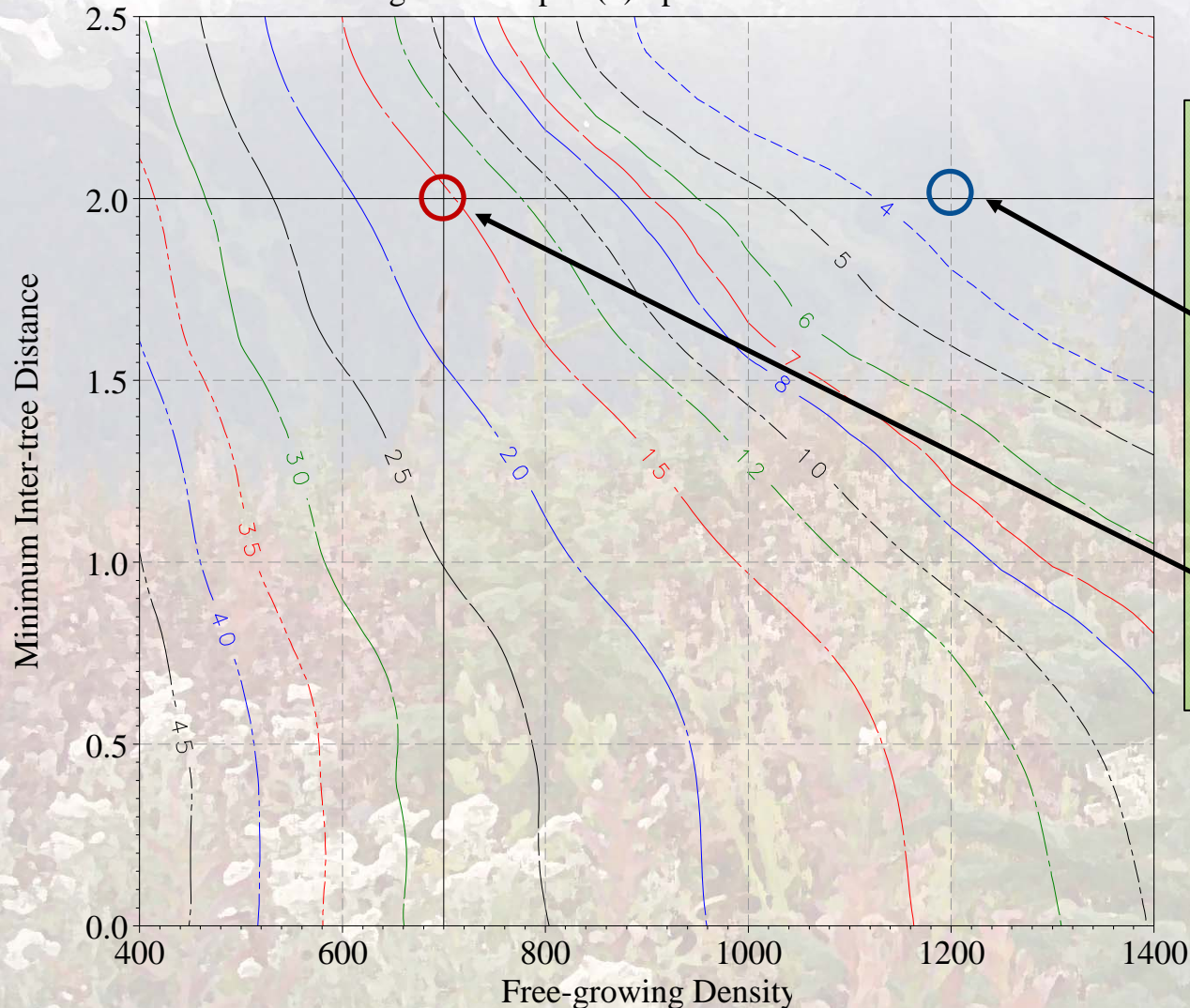
Thus with a lower MITD should there be a higher MSS?

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

MITD and Lines of Projected Volume Losses

Lodgepole Pine at Site Index of 23
Using the Clumped (3) Spatial Distribution



Clumped Distribution

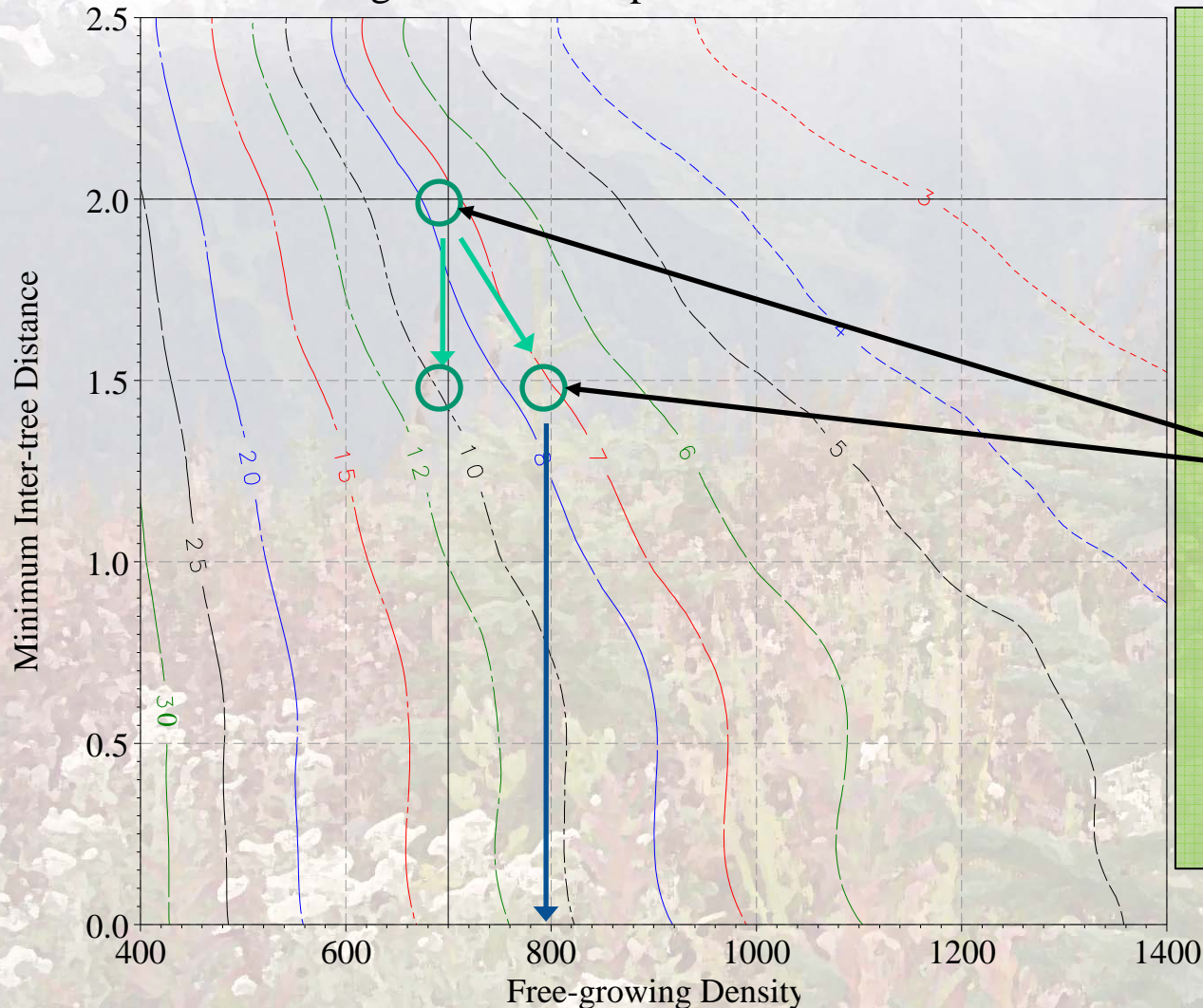
- At MITD of 2.0 m we see ~ 3 - 4% volume loss at 1200 fpgh
But at 700 we have ~ 15-16 % volume loss over full occupancy

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

What if we reduce the MITD?

Lodgepole Pine at Site Index of 23
Using the Natural Spatial Distribution



Natural distribution

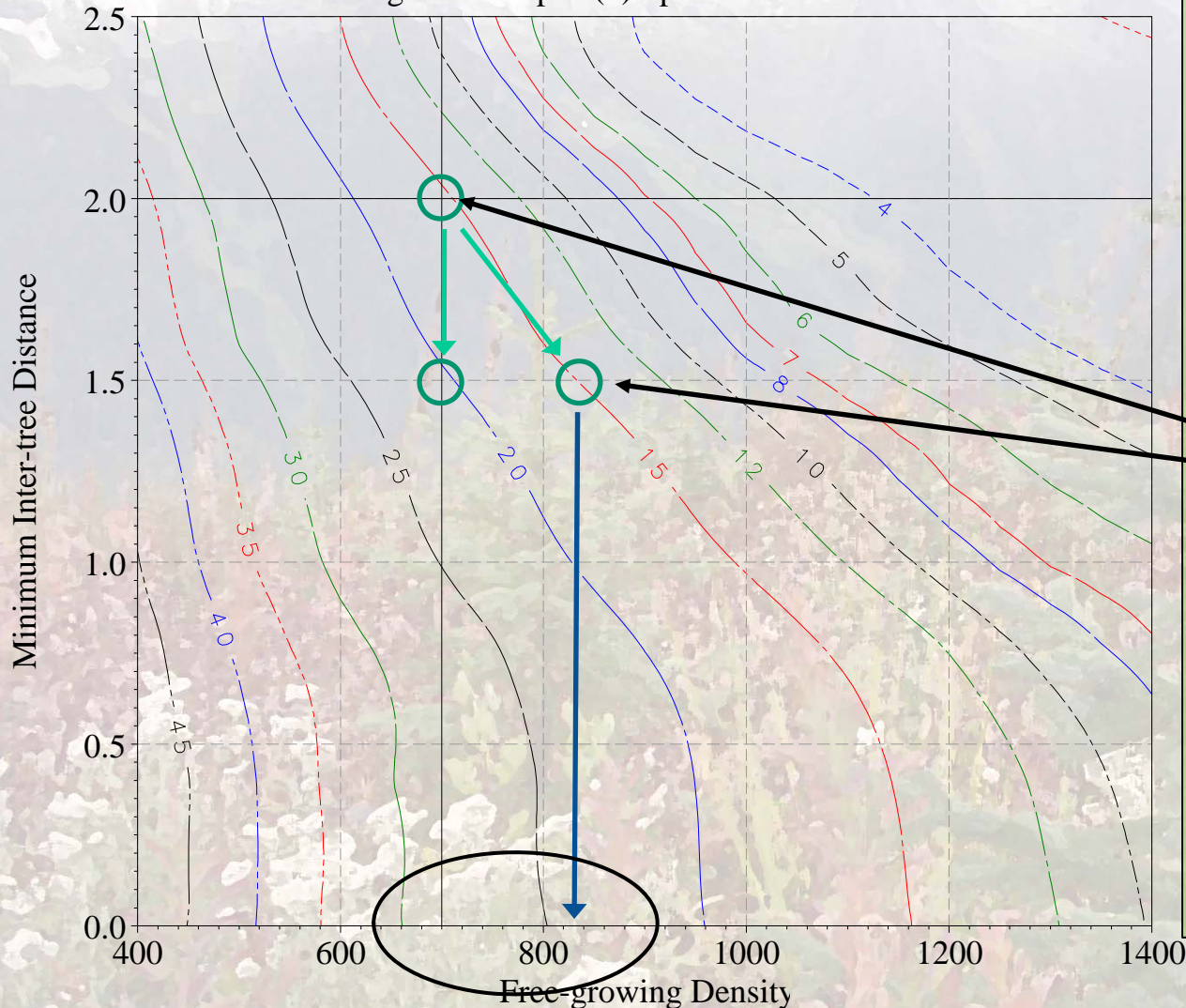
- Reducing the MITD increases the volume loss.
- Increasing the MSS from 700 to 800 compensates for this.

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

What if we reduce the MITD?

Lodgepole Pine at Site Index of 23
Using the Clumped (3) Spatial Distribution



Clumped Distribution

- Reducing the MITD from 2 to 1.5 m increases the volume loss.
- Increasing the MSS from 700 to 830 compensates for this.



Stocking Standards

Maintains or enhances economically valuable commercial timber supply

MITD and Projected Volume Losses

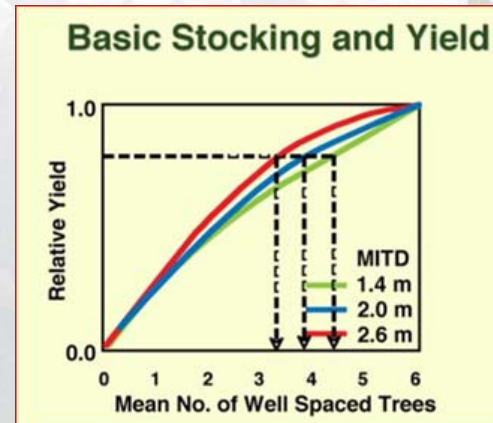
- At the target stocking of 1200 fgph with an MITD of 2.0 m, we see a similar volume loss regardless of spatial distribution.
- For the more clumpy distributions, the volume loss at 1200 remains about the same, but at the minimum stocking level the losses rise to approximately 20%.
- So what does this mean for stocking standards?
- Should we be concerned with this?
- How can it be addressed?

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Reducing the MITD

Take home message



- Changing the MITD from 2.0 m to 1.5 m to compensate for clumpy distribution without any other compensating changes can increase the projected volume losses.
- This may not be an issue in some situations or circumstances – e.g.?

Stocking Standards

Maintains or enhances economically valuable commercial timber supply

Parting thoughts on M and MITD

The MITD is an essential part of the definition of free-growing promoting full site occupancy.

The M-value helps address the issue of heterogeneous or clumpy distributions.

Stocking Standards

The Tests

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

FPPR s.26 / FRPA s.16



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Ministry of **Forests, Mines and Lands**

Forest Analysis and Inventory Branch

[What's New](#)
[Forest Analysis Projects](#)
[Forest Inventory Projects](#)

Forest Analysis and Inventory Branch provides vegetation resources inventory, resource analysis and decision support for a wide variety of clients and projects. Current key projects include:

- developing, producing and maintaining vegetation resources inventory;
- conducting timber supply reviews to support the chief forester's determination of allowable annual cuts (AACs);
- assisting with the development of plans, information and analysis to address the current mountain pine beetle epidemic;
- advising on timber supply implications of treaty negotiations and land use planning initiatives;
- supporting access to information for Forest Stewardship Planning.

What's New

- [Quesnel Timber Supply Area Rationale for Allowable Annual Cut \(AAC\) Determination](#) - January 2011
- [Prince George Timber Supply Area Rationale for Allowable Annual Cut \(AAC\) Determination](#) - January 2011

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Government

Quick access to information based on government's structure

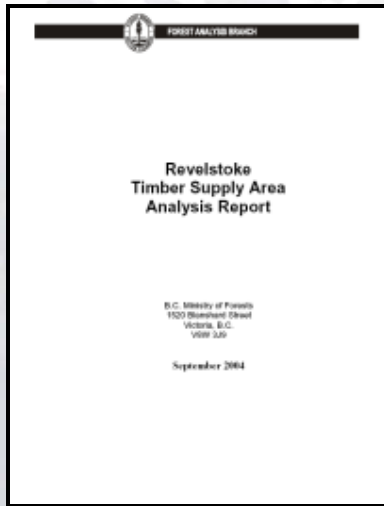
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The Tests

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

Stocking Standards

Consistent with TSR analysis and assumptions



What is meant by "Consistency with TSR"

Criteria for Evaluation:


- Species
- Density and distribution
- Regen delay

The Tests

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

Stocking Standards

Consistent with TSR analysis and assumptions



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- [Current Allowable Annual Cut \(AAC\)](#)
- [Defined Forest Area Management](#)
- [Area-Based AAC](#)
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Location of TSR documentation:

<http://www.for.gov.bc.ca/hts/analysis.htm>

Consistent with TSR analysis and assumptions

Is standard consistent with TSR analysis and assumptions.

- **Species?**

Regen Assumptions – Wet Belt Fd – Okanagan TSA

Regen Species	Regen Method	Regen Delay	Regen Analysis Unit	Pre-Harvest Species
Wet	Inv. Typ Groups 1-8 (F leading) 27 (Pw) 32-34 (Pv, Lw leading)			

**Regen
Species**

Code	%
Fd	50
PI	30
Sx/BI	10
Cw/Hw	10

OK...

- Assume Lw is included as Fd in TSR
- Fd and PI in standard correspond to Fd and PI in TSR.

- Assume L_w is included as F_d in TSR
- F_d and PI in standard correspond to F_d and PI in TSR.
- Unlikely that standard would result in a C_w leading stand.

Stocking Standards

Consistent with TSR analysis and assumptions

Proposed Stocking and Related Standards for Site Series 01 of the ICHmw2

Identification			Situations/Circumstances			Regeneration Standards			Free		
No.	Establishd Objective	Loc.	Phy.	Gen.	Age	Imm.	Regn.	Stand.	Free	Stand.	Free
Lic	Timber										
1											

Regeneration Standards						
Species	Stocking Standards (w/s)			Min ITD	Rgn Delay	
Pref. (P)	Acc. (A)	Trgt P&A (sph)	Min P&A (sph)	Min P (sph)	(m)	Max (yrs)
Fd	Sx	1,200	700	600	2.0	7
Lw	Bl					
Pl	Pw					
Cw						

Proposed Standard

Is standard consistent with TSR analysis and assumptions.

FPPR 26(3)(a)(ii)

- Density and Distribution?

EXAMPLE:

TSR Regen Assumptions – Wet Belt Fd – Okanagan TSA

Existing Analysis Unit	Pre-Harvest Species	Regen Species		OAF		Regen Density	
#	Code	Code	%	1	2	Initial	Post-Thin
13 Fd/Wet	Inv. Typ Groups 1-8 (F leading 27 (Pw) 32-34 (Py, Lw leading	Fd	50	33	14	1400	n/a
		Pl	30				
		Sx/Bl	10				
		Cw/Hw	10				

OK...

- Standard has a 1200 sph target with a 600 min preferred.
- Slightly below TSR total of 1400 sph.
- But – TSR OAF1 of 33 equates to modeling 1200 sph at establishment (with a more normal OAF).

Stocking Standards

Consistent with TSR analysis and assumptions

Proposed Stocking and Related Standards for Site Series 01 of the ICHmw2

No.	Estab/Standards	Location	Physical Geographic	BEC	20/25/30/35/40/45/50/55/60/65/70/75/80/85/90/95/100	Regeneration Standards					Free Growing Standards				
						Species	Stocking Standards (w/s)	Min ITF	Regn Delay	Max	LT	Min	Max	LT	Min
LC	Text	Entire	CHmw2	01	Fd	Sp	1,200	700	600	2.0	7	30	30	30	30

Proposed Standard						
Regeneration Standards						
Species	Stocking Standards (w/s)			Min ITF	Regn Delay	
Pref. (P)	Acc. (A)	Trgt P&A (sph)	Min P&A (sph)	Min P (sph)	Max (m)	Max (yrs)
Fd	Sx	1,200	700	600	2.0	7
Lw	Bl					
Pl	Pw					
Cw						

Is standard consistent with TSR analysis and assumptions.

FPPR 26(3)(a)(ii)

- Regen Delay?

EXAMPLE:

NOT OK...

- Standard of 7 years delay not close enough to the 2 year assumption.
- Standards are generally higher since TSR models actual not the standard.
- But – 3 or 4 years is more appropriate.

TSR Regen Assumptions – Wet Belt Fd – C

Existing Analysis Unit	Pre-HarvestSpecies	Regen Analysis Unit	Regen Delay	Regen Method	Regen Species		OAF		
#	Code	#	(yrs)	Type	%	Code	%	1	2
13 Fd/Wet	Inv. Type Groups 1-8 (F leading), 27 (Pw), 32-34 (Py, Lw leading)	63	2	Plant	100	Fd PI Sx/Bl Cw/Hw	50 30 10 10	33	14

TSR – Timber Supply Review

Source: Table A-17, [Okanagan Timber Supply Area Analysis Report](#), July 2000

Stocking Standards

Consistent with TSR analysis and assumptions

Proposed Stocking and Related Standards for Site Series 01 of the ICHmw2

No.	Site Series	Physical Description	BEC	202/Var. Name	Site Series	Regeneration Standards						Free Growing Standards			
						Species	Stocking Standards (w/s)			Min ITD	Regn Delay	FG Date	Height	Prepase	Post Spacing (w/s)
						Pref. (P)	Acc. (A)	Trgt P&A (sph)	Min P&A (sph)	Min P (sph)	(m)	Max (yrs)	(m)	(m)	(m)
Lc 1	Texter	Entire	ICHmw2	01	Fd	Sx		1,200	700	600	2.0	7	2.0	2.0	2.0

Proposed Standard

Regeneration Standards						
Species		Stocking Standards (w/s)			Min ITD	Regn Delay
Pref. (P)	Acc. (A)	Trgt P&A (sph)	Min P&A (sph)	Min P (sph)	(m)	Max (yrs)
Fd	Sx	1,200	700	600	2.0	7
Lw	Bl					
Pl	Pw					
Cw						

Is standard consistent with TSR analysis and assumptions.

FPPR 26(3)(a)(ii)

- Regen Delay?

- DOESN'T COMPARE WELL WITH REFERENCE GUIDE EITHER

Regional Reference Guide

		Regeneration Standards						Free Growing Standards			
		Species		Stocking Standards (w/)			Rgn Delay	FG Assessment		Height	
BEC		Pref.	Acc.	Trgt P&A	Min P&A	Min P	Max	Earliest	Latest	Min	% tree
Z/SZ/Var.	Series	(P)	(A)	(sph)	(sph)	(sph)	(yrs)	(yrs)	(yrs)	(m)	over brush
ICHmw2	01	Fd Lw	Pl ⁵¹ Cw Pw ³¹ Sx ^{10,13}	1,200	700	600	4	9	15	Pl Pw 2.0 Lw 2.0 Fd 1.4 Othr 1.0	150

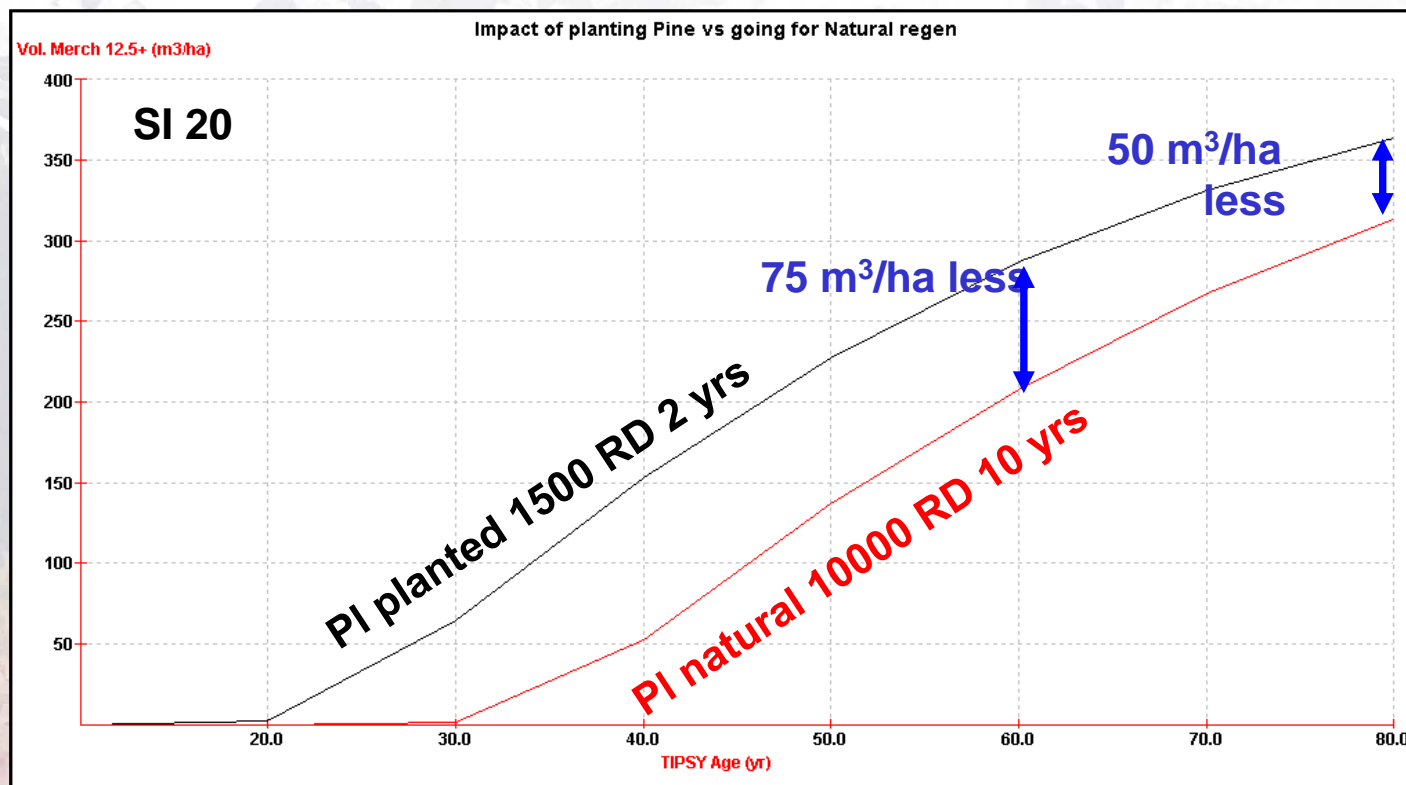
Source: [Reference Guide For Forest Development Plan Stocking Standards](#)

Species Footnotes: 10 - restricted to northerly aspects; 13 - restricted to upper elevations of biogeoclimatic unit; 31 - risk of white pine blister rust; 51 - restricted to areas with proven Pl performance.

Minimum inter-tree distances: 1.6 m - planting on hygric, sub-hydric or mechanically site prepared areas; 2.0 m - all other areas (except those areas where site factors or objectives require a different minimum inter-tree distance).

Stocking Standards

Consistent with TSR analysis and assumptions



Switching from planting pine (2yr regen delay) to natural regen (10 yr delay).

Morice TSA 2000

Discretionary approval: Impact is considerable – must be weighed against proposed benefits.

Stocking Standards

Consistent with TSR analysis and assumptions



What if it is not consistent?

DDM MAY confer with licensee and:

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

The Tests

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

Stocking Standards

Consistent with TSR analysis and assumptions

Discretionary Approval

Test 5

- **Sec 26 (5)**

PURPOSE:

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

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



Stocking Standards

Consistent with TSR analysis and assumptions

Discretionary Approval



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

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

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

Stocking Standards

Consistent with TSR analysis and assumptions

Discretionary Approval




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

Stocking Standards

The role of RESULTS

RESULTS – where stocking standards are created.

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Training & Resources – Stocking Standards Under FSP's

Provides information on searching for existing, approved stocking standards and information on generating new stocking standards, either by modifying existing stocking standards or created new stocking standards from scratch.

Type	Training	Last Updated
PDF	Participant's Guide	Jan. 4, 2006
PDF	PowerPoint Presentation	Mar. 23, 2009
LearnLinc	Stocking Standards Under FSP's #1	Dec. 15, 2004
LearnLinc	Stocking Standards Under FSP's #2	Jul. 7, 2005

Core Modules

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- **Stocking Standards Under FSP's**

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Application Link

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Access & Policy

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<http://www.for.gov.bc.ca/his/results/training/Stocking-Standards.htm>

A scenic mountain landscape with snow-capped peaks in the background and a field of colorful alpine flowers in the foreground. The text is centered over the image.

Thanks for your
attention

Questions?