

# **Single Entry Dispersed Retention Stocking Standard Framework Implementation Guide**

Silviculture Working Group,  
Coast Region FRPA Implementation Team

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## **Acknowledgements**

This implementation guide is a collaborative work prepared by members of the Silviculture Working Group (SWG), and stocking standard survey specialists.

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# Preface

In November 2009 the Coast FRPA Implementation Team (CRIT) silviculture working group released the discussion paper entitled “Single Entry Dispersed Retention Stocking Standard Framework”. This discussion paper presented a stocking standard framework to replace the multi-storied stocking standard, which was being applied, often incorrectly, on the coast.

This proposed stocking standard framework is intended for stands being managed under a silvicultural system with only a single entry planned partial cut harvest entry, where retained stems contribute towards achieving the stocking obligation. For the purposes of this stocking standard framework additional stand harvest entries are not required to meet the target stand structural objectives.

As a follow up to the release of the this discussion paper the CRIT silviculture working group developed and delivered two field based workshops, one on the north coast held in Prince Rupert and one on northern Vancouver Island held in Port McNeill. As a result of participant feedback from these field based workshops this Implementation Guide was developed to help guide forest practitioners in implementation the Single Entry Dispersed Retention Stocking Standard (SEDRSS) Framework operationally. This implementation guide is intended to compliment and support the framework described within the discussion paper.

# SEDRSS Implementation Guide

## Single Entry Dispersed Retention Stocking Standard (SEDRSS) Survey – Coastal

### 1.0 Single Entry Dispersed Retention System Suitability

This proposed stocking standard framework is meant for stands managed with a Single Entry Dispersed Retention Silvicultural System - defined as a partial cut harvest entry where retained overstorey stems contribute towards a regen and free growing obligation. This stocking standard is meant to replace the multi-storied stocking standard, referenced in the Ministry of Forests and Range (MFR) publication titled: Reference Guide to Forest Development Plan Stocking Standards. It is therefore assumed that future stand entries are not required to meet prescribed long term stand structural objectives. The intent of this standard and subsequent survey methodologies **are for guidance purposes and represent suggested best management practices.**

#### SEDRSS Suitable Stand Criteria:

1. **Dispersed Retention Residual Basal Area (RBA) ranging from 5 to 39 m<sup>2</sup>/ha** (Note this range is a guideline and is subject to modification for specific situations) and,
2. **Stands that meet the specific Situations and Circumstances - Section 2.0 below** (SEDRSS is not intended for a broad application across managed landscapes but rather is intended to be a tool to address specific management concerns within a local management unit)

#### Stratification Criteria for Stand Unsuitable for SEDRSS

1. **Areas  $\geq 1.0$  ha. with  $< 5\text{m}^2/\text{ha}$  of Dispersed Retention** (*Open stands, clearcuts or stands with low levels of dispersed retention*): Remove from the SU and treat with an Even-aged Stocking Standard;
2. **Areas  $\geq 1.0$  ha with  $\geq 40\text{m}^2/\text{ha}$  of Dispersed Retention** (*full stocking of ecologically suitable species with no openings  $> 0.1$  ha. in size*): Defined as an **Intermediate cut** (with no regeneration obligations) requiring a separate stocking standard;
3. **Areas  $\geq 0.25$  ha Uncut:** (*large areas of reserved stems where no harvested or disturbance has occurred*): Remove from SU and map as a **Grouped Retention SU**, classify as **Group Reserve**, removed from NAR and report in RESULTS;
4. **Areas  $\geq 1.0$  ha. Broadleaf leading:** SEDRSS is designed for conifer management only.

### 2.0 Situations and Circumstances for SEDRSS

The stocking standard provides the linkage from stand level to forest level management. This type of standard is generally **only applicable** where retention of dispersed stems is required to achieve FRPA management objectives (non- timber). The Forest Stewardship Plan (FSP) **must** specify the situations and circumstances where the stocking standard will be applied.

### 3.0 SEDRSS Regen and Free Growing Obligation Criteria

The following table matrix identifies the application of each obligation criteria relative to the SEDRSS standard (for both SEDRSS methodology options):

Layer	COMMON Criteria (REGEN & FG)			REGEN Criteria	FREE GROWING (FG) Criteria			
	Spp <sup>(1)</sup>	MITD	BA & Density (SEDRSS Tabular only)	REGEN Delay (Max Years)	FG Declaration Date (Min Yrs)	Comp. Brush Factor <sup>(4)</sup>	Min Ht <sup>(5)</sup>	Damage Criteria
<b>Residual Overstorey Layer 1</b>  ≥ 12.5cm DBH	As per FSP or SEDRSS Tabular	0 meters	BA as per SEDRSS Tabular	As per FSP or SEDRSS Tabular	2 <sup>(3)</sup>	N/A	N/A	As per SEDRSS Damage Criteria for Layer 1
<b>Understorey (Advanced or Artificially Established) Layers 2, 3 &amp; 4</b>  < 12.5cm DBH	As per FSP or SEDRSS Tabular	<b>From Layer 1:</b> Dripline <sup>(2)</sup>  <b>Between Layers 2, 3 &amp; 4:</b> 2.0 meters or as per FSP	Minimum Stocking as per SEDRSS Tabular			As per FSP	As per FSP or SEDRSS Tabular	As per SEDRSS Damage Criteria for Layers 2, 3 & 4

Footnotes:

- 1) Preferred and Acceptable species by site series presently identified in the MFR publication titled: *Reference Guide to FDP Stocking Standards*, are recommended to be listed in the standard for the regeneration component. The recommended best practice is to identify a minimum of the preferred species in the silviculture label for the understorey. However, individual FSP authors may prefer to use the guidance in the above mentioned document as a good starting point for identifying one list of ecologically suitable species, and a species composition range for retained layer 1 trees that is based on the pre-harvest conditions. New emerging information, especially as it relates to shade tolerance, contained within published literature, research or data regarding species acceptability should also be considered.
- 2) The Dripline is defined as “the vertical boundary of the outside of the outer live foliage of the overstorey tree”. An understorey tree is considered outside the Dripline if “the main stem pith of the understorey stem is outside of the Dripline as defined

- above*". Overstorey stems (regardless if counted as a crop tree) inside and *outside* of survey plots are used to determine the Dripline.
- 3) Declaration of the Free Growing Obligation is recommended to be two years or greater after the completion of harvest. Although the date specified under *Forest Planning and Practices Regulation* (FPPR) 44 (1) (b) for which a person who has an obligation to establish a free growing stand must meet the applicable stocking standards and free growing criteria is no more than 20 years from the commencement date, for SEDRSS after two years the stand could be considered having met the Free Growing Criteria if the overstorey trees and understorey of advanced regeneration meet the minimum criteria set out in the standard. This is considered as sufficient time for wind throw to be expressed in the residual stand. However, two years post harvest will often be insufficient to allow for expression of added growth or release.
  - 4) As required by legislation, a free growing stand must not be impeded by competing plants, shrubs or other trees. It is considered a best management practice to include C/B % as part of the standard to address this requirement (This refers to the minimum Conifer to Brush Ratio for an understorey crop tree to be considered as Free Growing). However, individual FSP authors may prefer to use another methodology to determine if a free growing stand is not impeded by competing plants, shrubs or other trees.
  - 5) Acceptable guidance is to list the minimum heights as 75% of the heights listed in the MFR publication titled: *Reference Guide to FDP Stocking Standards* for each species on a given site series unless certified under FPPR 22.1. There may be situations where this reduced minimum height has not been achieved, but the understorey stems meet all other criteria. In this situation a forest professional can use Forest Planning and Practices Regulation (FPPR) section 97.1 to indicate the obligation has been met and provide a rationale that indicates the crop trees are well established, free from vegetative competition and are not expected to be impacted by a forest health agent.

### 3.1 SEDRSS Damage Criteria

All stems considered to be crop trees in both SEDRSS Methodologies, must meet or exceed the following damage criteria for both Layer 1 stems and Layers 2, 3, and 4 stems (separate damage criteria tables have been developed for each stand structure component).

## FG DAMAGE CRITERIA FOR SINGLE ENTRY DISPERSED RETENTION STOCKING STANDARD (SEDRSS) MANAGED STANDS IN COASTAL B.C.

Note: this table overrides all other damage criteria for SEDRSS managed stands

TABLE A- Layer 1 -  $\geq 12.5$  cm DBH. SEDRSS damage criteria

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:		Possible damage agents & codes	Comments
		Hw, Ba, Bg, Bl, Cy, Fdc, Ss, Pw, PI	Cw		
Stem	Wound	<ul style="list-style-type: none"> <li>Wound girdles <math>&gt;33\%</math> stem circumference, or</li> <li>One wound <math>&gt;400</math> cm<sup>2</sup> on stem, or</li> <li>Wound on major root within 1 m of stem, or</li> <li>Tree has <b>gouge</b> in stem.</li> </ul>	<ul style="list-style-type: none"> <li>No criteria</li> </ul>	fire NB, windthrow NW, sunscald NZ, logging TL, mechanical TT.	A <b>wound</b> is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable.
Stem	Decay	<ul style="list-style-type: none"> <li>Any pathological indicator(s) are present. This may include <b>conk</b>, <b>blind conk</b>, <b>frost crack</b>, or <b>rotten branches</b>.</li> </ul>	<ul style="list-style-type: none"> <li>No criteria</li> </ul>	various decay fungi DD.	
Stem	Bark Mining	<ul style="list-style-type: none"> <li>Any of the following signs are visible: pitch tubes, boring dust, exit holes on bark surface, galleries under the bark.</li> </ul>	<ul style="list-style-type: none"> <li>No criteria</li> </ul>	Douglas-fir beetle IBD, Ips pini IBI, Pityogenes & Pityophthorus IBP	Note: pitch tubes can be associated with trees that have successfully repelled bark beetles, bark must be removed above pitch tube to confirm successful attack (successful galleries will be filled with frass and not pitch, contain adult beetles and/or larval galleries).  Stressed trees are susceptible to secondary bark and twig beetles.
Stem	Deformation (including crook, fork and dead or broken top)	<ul style="list-style-type: none"> <li>A <b>crook</b> displaces the portion of the stem above the defect by <math>&gt;50\%</math> from the line of growth formed by the stem below the point of defect in the bottom 2/3rds of the stem only.</li> <li>A <b>fork</b> occurs above stump height in the bottom 2/3rds of the stem only.</li> <li>A <b>dead</b> or <b>broken top</b> extends more than 20% of the stem length or the live crown is removed.</li> </ul>	<ul style="list-style-type: none"> <li>No criteria</li> <li>A <b>dead tree</b> with no live foliage</li> <li><math>&lt; 2/3</math>rds of the stem unable to produce <math>&gt; 50\%</math> merchantable volume.</li> </ul>	frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TT, Dwarf mistletoes (see below).	<b>Note:</b> Field guidance procedures for the estimation of merchantable Cw volume are identified in <b>Appendix 1.</b>

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:		Possible damage agents & codes	Comments
		Hw, Ba, Bg, Bl, Cy, Fdc, Ss, Pw, PI	Cw		
Stem	Dwarf Mistletoe Infection	<ul style="list-style-type: none"> <li>Hawksworth rating &gt;3, or severe stem infections (major swelling or deformity) present.</li> </ul>	<ul style="list-style-type: none"> <li>No criteria</li> </ul>	hemlock dwarf mistletoe DMH	The Hawksworth rating system is described in the FPC <i>Dwarf Mistletoe Management Guidebook</i> (or refer to Appendix AA of this document) For SEDRSS, this rating system will only apply to the tree/plot assessment level, and not at the stand level.
Foliage	Defoliation	<p><b>For defoliating insects:</b></p> <ul style="list-style-type: none"> <li>&gt; 80% of foliage has been removed, lost or damaged due to insect defoliation.</li> </ul> <p><b>For foliar diseases:</b></p> <ul style="list-style-type: none"> <li>&gt; 50% of foliage has been removed, lost or damaged</li> </ul>	<ul style="list-style-type: none"> <li>No criteria</li> </ul>	defoliators ID, foliage diseases DF	
Foliage	Live Crown Vigour	<ul style="list-style-type: none"> <li>Stems &lt; 17.5 cm dbh - &lt; 30% live crown due to poor vigour.</li> <li>Stems ≥ 17.5 cm dbh - &lt; 20% live crown due to poor vigour.</li> </ul>	<ul style="list-style-type: none"> <li>A dead tree with no live foliage</li> </ul>		Percent live crown is the length of continuous green foliage on a tree expressed as a percentage of its total height.

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:				Possible damage agents & codes	Comments																											
		Hw, Ba, Bg, Bl, Cy, Fdc, Ss, Pw, PI		Cw																														
Roots	Root Disease	<ul style="list-style-type: none"> <li>Sign(s) or definitive combinations of symptoms of root disease are observed</li> </ul>	<ul style="list-style-type: none"> <li>For Cw, there is no criterion for net down calculation - considered not susceptible or low susceptibility.</li> </ul>			armillaria root disease DRA, laminated root rot DRL, annosus root disease DRN.	<p><b>Signs</b> are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. <b>Symptoms</b> include foliar thinning or chlorosis, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. Symptoms alone are not usually sufficient to identify root disease. Both signs and symptoms may be detected from old stumps, root balls, or other post-harvest remains.</p>																											
		<ul style="list-style-type: none"> <li>Infected conifer or stump found in plot. See <b>Table Y</b> for well-spaced tree net down calculation by layer.</li> </ul>						<p><b>Example:</b> How to apply net down for root disease.</p> <p>If root disease-infected trees are found in the plot:</p> <ol style="list-style-type: none"> <li>Determine the number of healthy, well-spaced trees in each layer using the prescribed minimum inter-tree distance (MITD) (e. g., 3 layer 1, 3 layer 3 and 4 layer 4 = 10 healthy, well-spaced) ignoring the M-value;</li> <li>Count the number of infected trees (e. g., 1 layer 1 tree and 1 layer 3 tree);</li> <li>Working from the uppermost layer down, apply the multiplier in Table Y to each lower layer. Subtract the resultant from each layer in turn, for susceptible species only (e. g., if all trees are susceptible, 1 infected layer 1 tree removes 1 healthy, well-spaced layer 1 tree plus 3 layer 3 trees plus 4 layer 4 trees). Note the effects are cumulative, not exclusive and lower layers do not affect higher layers;</li> </ol> <p>Calculate the remaining healthy, well-spaced trees once all removals due to infected trees are completed (e. g. 10 – 8 = 2). The result is the maximum number of free growing trees tallied for the plot.</p>																										
		<p><b>TABLE Y.</b> Deductions from numbers of acceptable well-spaced uninfected stems for trees infected by root disease in layered stands.</p> <table border="1"> <thead> <tr> <th rowspan="2">Tree layer with infected tree(s) or stumps</th> <th colspan="4">Multiplier used to determine number of acceptable trees to be deducted from:</th> </tr> <tr> <th>Layer 1</th> <th>Layer 2</th> <th>Layer 3</th> <th>Layer 4</th> </tr> </thead> <tbody> <tr> <td>Layer 1</td> <td>Deduct BA of infected layer 1 from Crop BA</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Layer 2</td> <td></td> <td>2</td> <td>2</td> <td>3</td> </tr> <tr> <td>Layer 3</td> <td></td> <td></td> <td>2</td> <td>2</td> </tr> <tr> <td>Layer 4</td> <td></td> <td></td> <td></td> <td>2</td> </tr> </tbody> </table>				Tree layer with infected tree(s) or stumps	Multiplier used to determine number of acceptable trees to be deducted from:				Layer 1	Layer 2	Layer 3	Layer 4	Layer 1	Deduct BA of infected layer 1 from Crop BA	2	3	4	Layer 2		2	2	3	Layer 3			2	2	Layer 4				2
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Layer 4				2																														

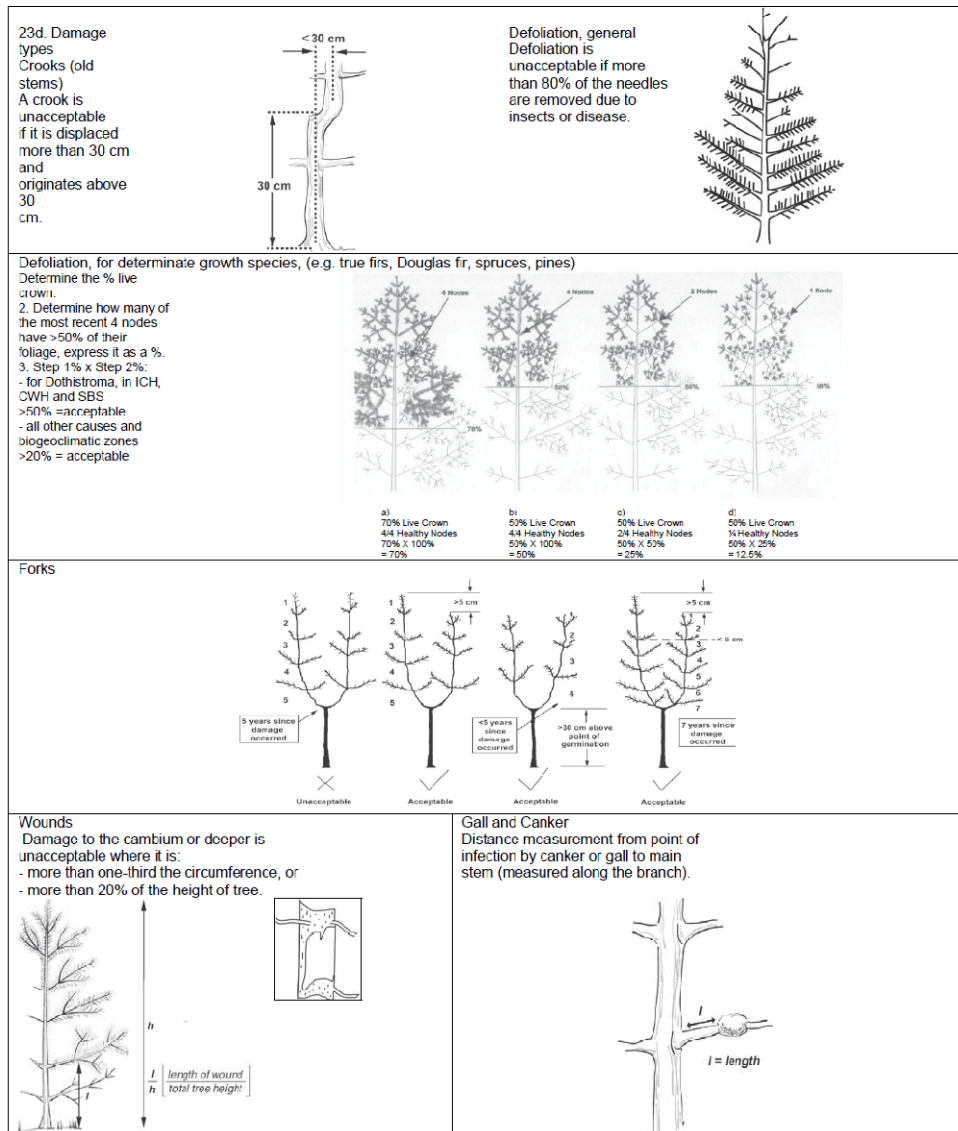
**TABLE B- Layers 2, 3 & 4 - < 12.5 cm DBH. SEDRSS damage criteria**

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host Species	Possible damage agents & codes	Comments
Stem	Wound	<ul style="list-style-type: none"> <li>Wound girdles &gt;25% stem circumference, or</li> <li>One wound &gt;10% the length of stem</li> </ul>	All	fire NB, windthrow NW, sunscald NZ, logging TL, mechanical TT.	A <b>wound</b> is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable.
Stem	Decay	<ul style="list-style-type: none"> <li>Any pathological indicator(s) are present. This may include <b>conk, blind conk, frost crack, or rotten branches.</b></li> </ul>	All	various decay fungi DD.	
Stem	Bark Mining	<ul style="list-style-type: none"> <li>Any of the following signs are visible: pitch tubes, boring dust, exit holes on bark surface, galleries under the bark.</li> </ul>	All	Douglas-fir beetle IBD, Ips pini IBI, Pityogenes & Pityophthorus IBP	<p>Note: pitch tubes can be associated with trees that have successfully repelled bark beetles, bark must be removed above pitch tube to confirm successful attack (successful galleries will be filled with frass and not pitch, contain adult beetles and/or larval galleries).</p> <p>Stressed trees are susceptible to secondary bark and twig beetles.</p>
Stem	Deformation (including crook, fork and dead or broken top)	<ul style="list-style-type: none"> <li>The pith is horizontally displaced more than 30 cm from the point of defect and originates above 30 cm from the point of germination</li> </ul>	All	defoliators ID, white pine (spruce) weevil IWS, lodgepole pine terminal weevil IWP,	
		<ul style="list-style-type: none"> <li>The tree leader has been killed three or more times in the last 5 years (weevil only)</li> </ul>	Ss	cattle AC, deer AD, elk AE, moose AM, frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TT, Dwarf mistletoes (see below).	This criterion applies only for terminal weevil damage.
		<ul style="list-style-type: none"> <li>The tree has two or more leaders with no dominance expressed after five years growth and the fork originates above 30 cm from the point of germination.</li> <li>The tree has a dead or broken top at a point that is &gt; 3cm in diameter.</li> <li>The tree has a flat top (umbrella like) form and no distinct leader.</li> </ul>	All		Leader dominance occurs when the tallest leader is at least 5 cm taller than the second tallest leader. See Appendix AA on Damage Types.
Stem	Lean and Sweep	<ul style="list-style-type: none"> <li>The tree leans &gt;30<sup>0</sup> from the vertical with or without growth correction.</li> </ul>	All	Flooding NF, snow NY, slides NS, wind NW, mechanical TM	

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host Species	Possible damage agents & codes	Comments
Stem	Infection (includes cankers and galls)	<ul style="list-style-type: none"> <li>Any infection occurs on the stem.</li> </ul>	All	white pine blister rust DSB, atopellis canker DSA, Dwarf mistletoes (see below).	<b>Note:</b> Wounds caused by rodent feeding around rust cankers should have stem rust recorded as the causal agent.
Branch	Infection (cankers)	<ul style="list-style-type: none"> <li>An infection occurs on a live branch less than 60 cm from the stem.</li> </ul>	Pw, Pl, Py	white pine blister rust DSB, comandra blister rust DSC, stalactiform blister rust DSS.	
Branch	Galls	<ul style="list-style-type: none"> <li>A gall rust infection occurs on a live branch less than 5 cm from the stem.</li> </ul>	Pl, Py	western gall rust DSG.	
Foliage	Defoliation	<ul style="list-style-type: none"> <li>&gt;60% tree foliage has been removed by hemlock looper</li> </ul>	Hw	Hemlock looper IDL	
		<ul style="list-style-type: none"> <li>&gt; 80% of foliage has been removed, lost or damaged due to insect defoliation.</li> </ul>	All other	defoliators ID	
		<ul style="list-style-type: none"> <li>&gt; 50% of foliage has been removed, lost or damaged due to foliar disease.</li> </ul>	All	foliage diseases DF	
Foliage	Live Crown Vigour	<ul style="list-style-type: none"> <li>&lt;30% live crown present due to poor vigour.</li> </ul>			Percent live crown is the length of continuous green foliage on a tree expressed as a percentage of its total height.
Stem or Branch	Adelgid Gouting	<ul style="list-style-type: none"> <li>Any adelgid <b>gouting</b> occurs on a stem or branch.</li> </ul>	Ba, Bg, Bl	balsam woolly adelgid IAB.	<b>Gouting</b> is defined as excessive swelling on a branch or shoot caused by balsam woolly adelgid, and is often accompanied by misshapen needles and buds. It is most common on branch tips and at nodes near the ends of branches. Consult a recent distribution map to identify the geographic extent of this pest.
Stem or Branch	Dwarf Mistletoe Infection	<ul style="list-style-type: none"> <li>Any infection occurs on the stem or a live branch, or</li> <li>A susceptible tree is located within 10 m of the bole of a higher layer tree that is infected with dwarf mistletoe.</li> </ul>	Hw	hemlock dwarf mistletoe DMH	<b>Note:</b> To confirm infection, the surveyor must observe mistletoe aerial shoots or basal cups on regeneration or on live or dead fallen brooms.

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host Species	Possible damage agents & codes	Comments
Roots	Root Disease	<ul style="list-style-type: none"> <li>Sign(s) or definitive combinations of symptoms of root disease are observed</li> </ul>	All	armillaria root disease DRA, laminated root rot DRL, annosus root disease DRN.	<p><b>Signs</b> are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. <b>Symptoms</b> include foliar thinning or chlorosis, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. Symptoms alone are not usually sufficient to identify root disease. Both signs and symptoms may be detected from old stumps, root balls, or other post-harvest remains.</p>
		<ul style="list-style-type: none"> <li>Infected conifer or stump found in plot. See <b>Table Y</b> for well-spaced tree net down calculation by layer.</li> </ul>	All	armillaria root disease DRA.	<p><b>Example:</b> How to apply net down for root disease. If root disease-infected trees are found in the plot:</p> <ol style="list-style-type: none"> <li>Determine the number of healthy, well-spaced trees in each layer using the prescribed minimum inter-tree distance (MITD) (e. g., 3 layer 1, 3 layer 3 and 4 layer 4 = 10 healthy, well-spaced) ignoring the M-value;</li> <li>Count the number of infected trees (e. g., 1 layer 1 tree and 1 layer 3 tree);</li> <li>Working from the uppermost layer down, apply the multiplier in Table Y to each lower layer. Subtract the resultant from each layer in turn, for susceptible species only (e. g., if all trees are susceptible, 1 infected layer 1 tree removes 1 healthy, well-spaced layer 1 tree plus 3 layer 3 trees plus 4 layer 4 trees). Note the effects are cumulative, not exclusive and lower layers do not affect higher layers;</li> </ol> <p>Calculate the remaining healthy, well-spaced trees once all removals due to infected trees are completed (e. g. 10 – 8 = 2). The result is the maximum number of free growing trees tallied for the plot.</p>
		<ul style="list-style-type: none"> <li>Infected conifer or stump found in plot. See <b>Table Y</b> for well-spaced tree net down calculation by layer.</li> </ul>	Fd, Ba, Bg	laminated root rot DRL.	<p><b>Note:</b> Bl, Cw, Pl, Pw, and broadleaf species are considered <b>not susceptible</b> for survey purposes only</p>
		<ul style="list-style-type: none"> <li>Infected conifer or stump found in plot. See <b>Table Y</b> for well-spaced tree net down calculation by layer.</li> </ul>	Ba, Hw, Ss	annosus root rot DRN.	<p><b>Note:</b> Bg, Bl, Cw, Cy, Fd, Hm, Pl, Pw, and broadleaf species are considered <b>not susceptible</b> for survey purposes only.</p>

## Appendix AA Damage Types



### Instructions

- Step 1** Divide live crown into thirds.
- Step 2** Rate each third separately. Each third should be given a rating of 0, 1, or 2 as described below:
- (0) no visible infections
  - (1) light infection (1/2 or less of total number of branches in the third infected)
  - (2) heavy infection (more than 1/2 total number of branches in the third infected).
- Step 3** Add ratings of thirds to obtain rating for total tree.

### Example



- If this third has no visible infections, its rating is (0).
- If this third is lightly infected, its rating is (1).
- If this third is heavily infected, its rating is (2).
- The tree in this example gets a rating of: 0 + 1 + 2 = 3.

Figure 4. The Hawksworth six-class dwarf mistletoe rating system.

## 4.0 SEDRSS Methodologies – Two Options: 1) SEDRSS DFP or 2) SEDRSS Tabular

### 4.1 Background - DFP Concept – *(Note: This section is only for Silv. Survey manual)*

The Deviation From Potential (DFP) method of stocking assessment recognizes two stand components: overstorey trees - those trees greater than a designated DBH (e.g., 12.5cm) - and understorey trees, those less than the designated diameter. The DFP method focuses on the future yield from the understorey component. The underlying concept is that understorey yield varies based on understorey density and the amount of overstorey.

To calibrate the concept, Martin et al (2005)<sup>1</sup> used TIPSY and TASS to relate understorey density to future yield. Without an overstorey, as understorey density increases, future yield increase rapidly and then level off. Predictions from TASS and other published research on the growth impact of retained overstorey were used to relate overstorey basal area to understorey yield reduction. With increased overstorey basal area, understorey yield potential decreases.

The DFP combines the two relationships providing future understorey yield over a range of understorey density and overstorey basal area. Since the DFP is constructed from these fundamental relationships, it provides a solid biological basis for stocking assessments and standards.

Deviation From Potential ranges from 0 to 1. A DFP of 0 at a sample point indicates that the sample point is fully stocked - that is there is no additional space available for added stocking at that point. At the other end of the spectrum a DFP of 1 (or 100%) indicates the point has no stocking and has a 100% deviation from the potential.

This concept is a significant departure from historic forest stocking evaluation processes. Two implementation protocols are presented for SEDRSS to aid in clarifying the concept. Evaluation and survey approaches are presented based on either 1) the **DFP** model or 2) the **Tabular** integrated approach. These alternative approaches are presented to show how the stocking standard could be developed for an FSP submission.

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<sup>1</sup> Martin, P.J., Bancroft, B., Day, K., and Peel, K. 2005. A new basis for understorey stocking standards for partially harvested stands in the British Columbia Interior. West. J. Appl. For. 20(1): 5–12.

## 4.2 Common Methodologies for Options 1) and 2)

### 4.2.1 Survey Design

- **Pre-stratification:** Identify the areas suitable for SEDRSS as per the criteria listed in Section 1.0
- **Plots:** Establish 1 plot per ha within SU (stratum) or a minimum of 5 plots per SU (stratum).
- **Plot Size:** To tally understorey stems use a 3.99m. or 5.64m. radius plot depending on stand condition. Use the same plot size throughout the entire SU.
- **Prism size:** Choose a prism that captures a minimum of 4 trees per plot from the pre-harvest condition (in cut areas this would be a combination of standing trees and stumps).

### 4.2.2 RESULTS Entry

The *RESULTS Information Submission Specifications* document has a recent supplement document (dated July 28, 2010) called - *Procedures for Submitting Forest Cover to RESULTS for Openings with Treed Retention*. This document clearly provides the content requirements for reporting SU's with Dispersed and Grouped Tree Retention.

Basically, the reporting of Polygon, Inventory and Silviculture components are the same as reporting an even-aged clear cut stand with < 5m<sup>2</sup> of RBA, *except* for the following additional information:

1. Polygon Component
  - a. Reserve Type: Enter **Dispersed**.
  - b. Reserve Objective: Enter **TIM** (for timber objective, for the retained stems are contributing to the stocking and the next harvest).
  - c. Tree Cover Pattern: Enter the **Tree Cover Pattern Number** for the pattern observed and recorded on the field card that best represented the pattern of the layer 1 residuals.
2. Inventory Component
  - a. Layer: **Two layers** would normally be reported – one for the Residual Layer 1 stems and one for the Regen Layer, as explained in the data summary section below.
  - b. Basal Area: Enter the **Total BA m<sup>2</sup>/ha.** value (including crop and non-crop stems) for the Residual Layer – *but not just the Crop BA*.
3. Silviculture Component
  - a. Layer: As for the Inventory Component, **two layers** would normally be reported – one for the Residual Layer 1 stems and one for the Regen Layer, as explained in the data summary section below.

- b. Well-spaced or Free Growing: Enter the mean WS or FG/ ha. value from the summary data (Whichever is being reported).
  - c. Free Growing: Enter the mean FG / ha. value from the summary data.
  - d. Basal Area: enter the **Crop BA m<sup>2</sup>/ha.** value for the Residual Layer – *not the total BA as for the Inventory Label.*
4. Add Comments regarding SEDRSS use
- a. In the comments field next to a milestone declaration, include a comment on the SEDRSS methodology used. Specifically for the SEDRSS DFP method, include the mean DFP value and the % stocking classes.

### 4.3 Option 1) SEDRSS DFP - Survey Sampling Procedures

This approach uses the DFP table (developed for the interior by Martin 2005) solely as the basis for the stocking decision. The resultant DFP derived from the Dispersed Retention BA and present understorey stocking levels at each plot produces an averaged DFP value for the SU, which must meet a standards threshold value. In addition three other thresholds must be met by the SU in order to achieve the obligation (a threshold percent of the plots in each stocking class of the DFP table must be met - refer to the decision table below).

#### Field Survey

- **Measurements:** Determine the Dispersed Retention BA per plot and assess regen stocking using criteria for WS stems from the stocking standard. Use the overstorey crop trees BA only, and tally non crop BA separately. The non crop tally may be used to identify the need for additional harvesting if non crop trees are found to be fully occupying the site. In some cases the stand may have been dominated by trees of non crop status and this should be identified prior to assessment to address what should be tallied.
  - **Plot card data field modifications (use of modified FS 658 – Example shown in Figure - *without the WS and FG M values*):**
  - **Data Collection procedures (using the modified FS 658 above):**
    - Set up the card similar as one would while collecting data for a multi-storey or a layered even-aged survey (i.e. one row for each layer 1 and then another line for understorey /regen – layers 2, 3 and 4 combined)
  - **Tally of Residual Overstorey Layer 1**
    1. Start with tallies for **Residual Layer 1** in the first row:
      - a. **Layer 1** = all stems >12.5 cm. DBH
      - b. **TT** and **TC**;
      - c. **Number of Crop stems by species** (all stems are recorded, for there is no MITD)

- d. in GI column record **Total # in sweep** regardless if crop or non-crop stem;
  - e. in the plantable/in column record **Crop #in sweep**;
  - f. in the preparable column record **Crop BA** (crop # in sweep x BAF)
  - g. Record the DFP for that plot using the DFP table below (a copy of this table is required to be included in the surveyors note book or loaded in their handheld program).
2. Record Tree Cover Pattern during the full survey data collection. **Estimate** the overall Tree Cover Pattern for the SU being surveyed, based on the diagram in Section 9.3.4.1 of the Silviculture Survey Manual. Write the corresponding Tree Cover Pattern number in the comments section of the FS 658.
- **Tally of Regeneration Understorey Layers 2, 3 and 4**
    1. Tally the remaining **Regeneration Layers 2, 3 and 4** in one row below layer 1's row (no nesting of Layers, but use drip line MITD from **ALL layer 1 stems regardless if Crop or Non-Crop trees or inside or outside of the plot (influence layer 1 trees are considered)** – and use MITD from the FSP for all other trees between layers 2, 3 and 4):
      - a. **TT** and **TC** for regeneration layer;
      - b. **Number of WS stems by species** in the preferred and acceptable species columns relative to MITD criteria;
      - c. In the total W column total **all WS per Regeneration Layer for all species**;
      - d. In the total FG column total **all FG per Regeneration Layer for all species**;
    2. Tally **Plantable Spots, Preparable Spots and Competing Vegetation** as regular surveys for Regeneration Layer row and tally **Forest Health Agents** as regular surveys for Regeneration Layer.
  - **Record Inventory Label Data**
  - An **Inventory Label** is recorded every 1<sup>st</sup> and 4<sup>th</sup> plot as regular surveys for each layer. This can be located at the bottom of the FS 658 comprised of a line per layer 1 and a line for the regen layer. If the leading species changes per layer, additional leading species can be listed in the additional inventory table to the right.

### Data Summary

The field survey results are tallied and the following thresholds are calculated:

1. **The average DFP value** from all individual plots.
2. **The percent of the total plots established per stocking class** from the plot data and a value generated for each class – stocked; partial stocked; and open.

3. **Inventory and Silviculture Labels** will be generated for **Layers 1** and a combined second layer – **Layer 2, 3, and 4 combined** – but reported as one layer (whichever is most dominant – i.e. if the majority of stems in the Regeneration Layer are layer 3, identify this layer with the prefix L3. The Inventory Label will be generated from the data collected in the field every 1<sup>st</sup> and 4<sup>th</sup> plot for total species %, crown closure and from the mean TT summary for all layers. The Silviculture Label will be generated from the tally totals for WS and FG values and species percentages.

**Stocking Decision**

The SU is found to have met its **Regen Obligation or Free Growing Obligation** if the following table’s criteria have been met.

**Table DFP Regen and FG Obligation Criteria**

<b>DFP Threshold Value</b>	<b>Obligation Standard</b>
Average DFP	0.2 or less
Proportion of plots in “stocked” class (below green on DFP table below)	≥ 60% and
Proportion of plots in “partial stocked” class (yellow)	≤ 40% and
Proportion of plots in “open” class (above red on DFP table)	≤ 20%

**Table DFP Table - Basal Area and WS/ha. Table for use with  $SI_{50} < 30$  m.**

BA of Overstorey crop trees $\geq 12.5$ cm dbh	Understorey density – well spaced sph.								
	0	200	400	600	800	1000	1200	1400	1600
0	1.00	0.76	0.52	0.34	0.22	0.13	0.07	0.03	0.00
1	0.98	0.74	0.51	0.34	0.21	0.13	0.07	0.03	0.00
2	0.96	0.73	0.50	0.33	0.21	0.13	0.07	0.03	0.00
3	0.93	0.71	0.49	0.32	0.20	0.12	0.07	0.03	0.00
4	0.90	0.68	0.47	0.31	0.20	0.12	0.06	0.03	0.00
5	0.86	0.65	0.45	0.30	0.19	0.11	0.06	0.02	0.00
6	0.82	0.62	0.43	0.28	0.18	0.11	0.06	0.02	0.00
7	0.77	0.58	0.40	0.27	0.17	0.10	0.05	0.02	0.00
8	0.72	0.55	0.38	0.25	0.16	0.09	0.05	0.02	0.00
9	0.67	0.51	0.35	0.23	0.15	0.09	0.05	0.02	0.00
10	0.62	0.47	0.32	0.21	0.14	0.08	0.04	0.02	0.00
11	0.57	0.43	0.30	0.20	0.12	0.07	0.04	0.02	0.00
12	0.52	0.39	0.27	0.18	0.11	0.07	0.04	0.01	0.00
13	0.47	0.35	0.24	0.16	0.10	0.06	0.03	0.01	0.00
14	0.42	0.32	0.22	0.15	0.09	0.05	0.03	0.01	0.00
15	0.38	0.28	0.20	0.13	0.08	0.05	0.03	0.01	0.00
16	0.33	0.25	0.17	0.11	0.07	0.04	0.02	0.01	0.00
17	0.29	0.22	0.15	0.10	0.06	0.04	0.02	0.01	0.00
18	0.26	0.19	0.13	0.09	0.06	0.03	0.02	0.01	0.00
19	0.22	0.17	0.12	0.08	0.05	0.03	0.02	0.01	0.00
20	0.19	0.14	0.10	0.07	0.04	0.02	0.01	0.01	0.00
21	0.16	0.12	0.08	0.06	0.04	0.02	0.01	0.00	0.00
22	0.13	0.10	0.07	0.05	0.03	0.02	0.01	0.00	0.00
23	0.11	0.08	0.06	0.04	0.02	0.01	0.01	0.00	0.00
24	0.09	0.07	0.05	0.03	0.02	0.01	0.01	0.00	0.00
25	0.07	0.05	0.04	0.02	0.02	0.01	0.00	0.00	0.00
26	0.05	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00
27	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00
28	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
29	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
30 <sub>(1)</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1) Note that the DFP table has only been listed to 30 m<sup>2</sup>/ha. This is due to the original development of the values for primarily interior sites. Projections of the table up to 40 m<sup>2</sup> have been interpolated for Option 2. Further development and production of a complete table to 40 m<sup>2</sup> is planned, but not funded at this time.

#### 4.4 Option 2) SEDRSS Tabular - Survey Sampling Procedures

This approach integrates the overstorey and understorey aspects of the DFP approach and presents them in a tabular format. The DFP Table has been consolidated by grouping basal area (BA) and listing the density groups into a table (an example is shown below in Table ). The tabular format is designed to match as close as possible, the current stocking standard tables found in the MFR publication titled: Reference Guide to FDP Stocking Standards – at the following link:

[http://www.for.gov.bc.ca/ftp/hfp/external!/publish/Stocking%20Standards%20for%20FDPs/Reference\\_Guide.xls](http://www.for.gov.bc.ca/ftp/hfp/external!/publish/Stocking%20Standards%20for%20FDPs/Reference_Guide.xls)

Target and minimum Well Spaced (WS) density standards are listed for each BA grouping in the table. These values were derived from the original DFP table and correspond to the open and stocked threshold lines used in the DFP approach above. The primary difference in using this Tabular approach versus the DFP approach above is the concept of a maximum (**M value**) for BA and for target WS stems. For example if the maximum overstorey BA is set at 40 m<sup>2</sup>/ha, a plot with more than 40 m<sup>2</sup>/ha, the value would be capped at 40 m<sup>2</sup>/ha with the understorey contributing “0” WS. Correspondingly, the WS density has an **M** value depending on the BA grouping.

The intention is for FSP licensees to develop stocking standard tables **specific** to their coastal BEC Subzones and site series (or grouping of site series) for Single Entry Dispersed Retention management regimes.

**Table Example SEDRSS Tabular Method for CWHvh1 01**

		Regeneration Guide								Free Growing Guide		
		Species	Site Occupancy						Regen Delay (max yrs)	MITD		
BGCU	Layer		Moderate Dispersed Retention				High Dispersed Retention				Species	Height (m)
			BA(m <sup>2</sup> /ha)	BA(m <sup>2</sup> /ha)	BA(m <sup>2</sup> /ha)	BA(m <sup>2</sup> /ha)	BA(m <sup>2</sup> /ha)	BA(m <sup>2</sup> /ha)				
			WS/ha <sub>(2)</sub>	WS/ha	WS/ha	WS/ha	WS/ha	WS/ha				
			TSS	TSS	TSS	TSS	TSS	TSS				
			MSS	MSS	MSS	MSS	MSS	MSS				
CWHvh1 01	Residual Layer (L1) (≥12.5dbh) (m <sup>2</sup> /ha)	Cw, Hw, Cy, Pl	0-4	5-10	11-15	16-20	21-25	26-39	3	N/A	N/A	
	Regen Layer (L2-L4)Sph	Cw, Hw, Cy, Pl	900 500	700 300	550 250	400 200	300 100	200 75	3	L1 Drip line or 2.0 m (L2-L4)	Cw,Yc,Pl Hw	1.5 2.0

## Field Survey



- **Measurements:** Determine BA per plot and assess regen stocking using the obligation criteria for WS and/or FG stems from stocking standard (Insure to reference all possible BA range columns regardless of the level of dispersed retention – for all ranges can be present within any Stratum being sampled – but overall the resultant average BA for the Stratum will be within one level of dispersed retention – Moderate or High).
  - **Plot card data field modifications (use of modified FS 658 – Example shown in Figure ):**
    1. Within Column Heading Boxes across the top of the data entry section, modify: Count Conifer column to **TSS**; Count Height to **MSS**
  - **Data Collection procedures (using the modified FS 658 above):**
    2. Set up the card similar as one would while collecting data for a multi-storey or a layered even-aged survey (i.e. one row for each layer 1 and then another line for understorey /regen – layers 2, 3 and 4 combined)
  - **Tally of Residual Overstorey Layer 1**
    3. Start with tallies for **Residual Layer 1** in the first row:
      - a. **Layer 1** = all stems >12.5 cm. DBH
      - b. **TT** and **TC**;
      - c. **Number of Crop stems by species** (all stems are recorded, for there is no MITD)
      - d. in GI column record **Total # in sweep** regardless if crop or non-crop stem;
      - e. in the plantable/in column record **Crop # in sweep**;
      - f. in the preparable column record **Crop BA** (crop # in sweep x BAF)
    4. Using Crop BA determined above and the DFP tabular table, enter the **TSS M value and MSS M value** for the plot in the columns as modified above (example: If using a 5.64 m radius plot [1/100 ha.], and the BA is 20 m<sup>2</sup>, then the **TSS** is 400 or **4 M** value and **MSS** is 200 or **2** stems per plot). Note: Cap determination of BA at **40 m<sup>2</sup>** when entering plot data – i.e. if 50m<sup>2</sup> recorded in plot, 40 m<sup>2</sup> is entered.
    5. Record Tree Cover Pattern during the full survey data collection. **Estimate** the overall Tree Cover Pattern for the SU being surveyed, based on the diagram in Section 9.3.4.1 of the Silviculture Survey Manual. Write the corresponding Tree Cover Pattern number in the comments section of the FS 658.
  - **Tally of Regeneration Understorey Layers 2, 3 and 4**
    6. Tally the remaining **Regeneration Layers 2, 3 and 4** in one row below layer 1's row (no nesting of Layers, but use drip line MITD from **ALL layer 1 stems regardless if Crop or Non-Crop trees or inside or outside of the plot - influence**

**layer 1 trees are considered** – and use the MITD from the table or FSP for all other trees between layers 2, 3 and 4):

- a. **TT and TC** for regeneration layer;
  - b. **Number of WS stems by species** in the preferred and acceptable species columns relative to MITD criteria;
  - c. In the total W column total **all WS per Regeneration Layer for all species**, if the sum exceeds the M value for that plot, enter the **M value**;
  - d. In the total FG column total **all FG per Regeneration Layer for all species**, if the sum exceeds the M value for that plot, enter the **M value**;
7. Tally **Plantable Spots, Preparable Spots and Competing Vegetation** as regular surveys for Regeneration Layer row and tally **Forest Health Agents** as regular surveys for Regeneration Layer.

o **Record Inventory Label Data**

1. An **Inventory Label** is recorded every 1<sup>st</sup> and 4<sup>th</sup> plot as regular surveys for each layer. This can be located at the bottom of the FS 658 comprised of a line per layer 1 and a line for the regen layer. If the leading species changes per layer, additional leading species can be listed in the additional inventory table to the right.

 BRITISH COLUMBIA The Best Place on Earth		Ministry of Forests and Range		 SILVICULTURE SURVEY PLOT CARD		SURVEYOR NAME(S) & REGISTRATION NO(S)				SURVEY DATE 2010   07   10			PAGE OF											
MAPSHEET / OPENING NO.		LICENCE NO.		CUTTING PERMIT		BLOCK		STANDARDS UNIT		STRATUM														
POINT OF COMMENCEMENT 5.64 meter radius Plot												BAF = 10												
BEARING & DISTANCE	PLOT NO.	STRATUM	LAYER	TOTAL TREES	TOTAL CON.	COUNT CON.	COUNT HEIGHT (cm)	<input type="checkbox"/> WELL-SPACED <input checked="" type="checkbox"/> FREE-GROWING				TOTAL TOTAL (W) (FG)	AGE	TOTAL HEIGHT (m)	GI SAMPLE & DATA SPP.	PLANTABLE NUMBER Yr	PREPARABLE	COMPETING VEGETATION			FOREST HEALTH			
								PREFERRED AND ACCEPTABLE SPECIES										T	C	BA	DFP	POST CODE	TREE SPECIES AFFECTED	
								P	P	P	A												LIVE TREES	DEAD TREES
Cw	Hw	Cy	Pl																					
	1	A	1	5	2								2	2	20			0.10						
						TSS	MSS																	
			RG	6	6		4			M	2	100	10		0	0		gash	20	0.5	DMH	1Hw		
	2	A	1	2	2								2	1	10			0.62						
						7	3																	
			RG	2	2					1	0	40	1		2	0		gash	40	0.5				

Notes:											
Plot 1											
SV & Ldg. Layer Spp.	Cw	2 <sup>nd</sup> Spp. Hw	Minor Spp.	C Cr	Strat. Layer Spp.	Ldg. Spp. Hw	2 <sup>nd</sup> Spp. Cw	Minor Spp.	Cr Cl		
% Age Ht(m)	% Age Ht(m)	% % % %	% % % %	% %	% Age Ht(m)	% Age Ht(m)	% % % %	% % % %	% %		
1	7	200 25	3 40 25		20	2	8 100 10	2 100 10		10	

FS 658 2008/3/16 Well spaced/free growing age and height sample data is recorded for the representative well spaced/free growing tree within plots. (approx. 1 per 4 plots, min. 3 per stratum), then mathematically averaged. Inventory label data is collected periodically, (approx. 1 per 4 plots, min. 3 per stratum), from visual observations throughout the stratum, then 'roughly averaged' to represent the stratum.

**Figure : Example Field Card for DFP tabular Sampling Procedure** Page 23 of 29

## **Data Summary**

The field survey results are tallied and the mean calculated using the following test steps:

1. **The Type of Retention System** would be predetermined from the SP (Moderate, High or Very High Intermediate Cut) and verified in the field (i.e. determine which BEC, situation and circumstance and corresponding table that applies to this SU).
2. **The average Crop BA/ha.** for the Residual Layer 1 would be determined from the plot data and the appropriate column located on the table.
3. **The mean WS or FG / ha.** is determined from the plot data. The M value for each plot sum will be used in the compilation of the tallies and the determination of the mean value, as noted above in the Field Survey section. **Note:** Statistical analysis is not applicable, due to the lower stocking values used in this methodology.
4. **Inventory and Silviculture Labels** will be generated for **Layers 1** and a combined second layer – **Layer 2, 3, and 4 combined** – but reported as one layer (whichever is most dominate – i.e. if the majority of stems in the Regeneration Layer are layer 3, identify this layer with the prefix L3. The Inventory Label will be generated from the data collected in the field every 1<sup>st</sup> and 4<sup>th</sup> plot for total species %, crown closure and from the mean TT summary for all layers. The Silviculture Label will be generated from the tally totals for WS and FG values and species percentages.

## **Stocking Decision**

The SU is found to have met its **Regen Obligation or Free Growing Obligation** if:

5. **the mean Regen or FG sph**  $\geq$  **the MSS sph**  
for the corresponding **Average Crop BA** from the table.

# Appendix 1: Field Guidance Procedures for the Estimation of Cw Merchantable Volume

## 1.0 Cw Stem Merchantability Criteria

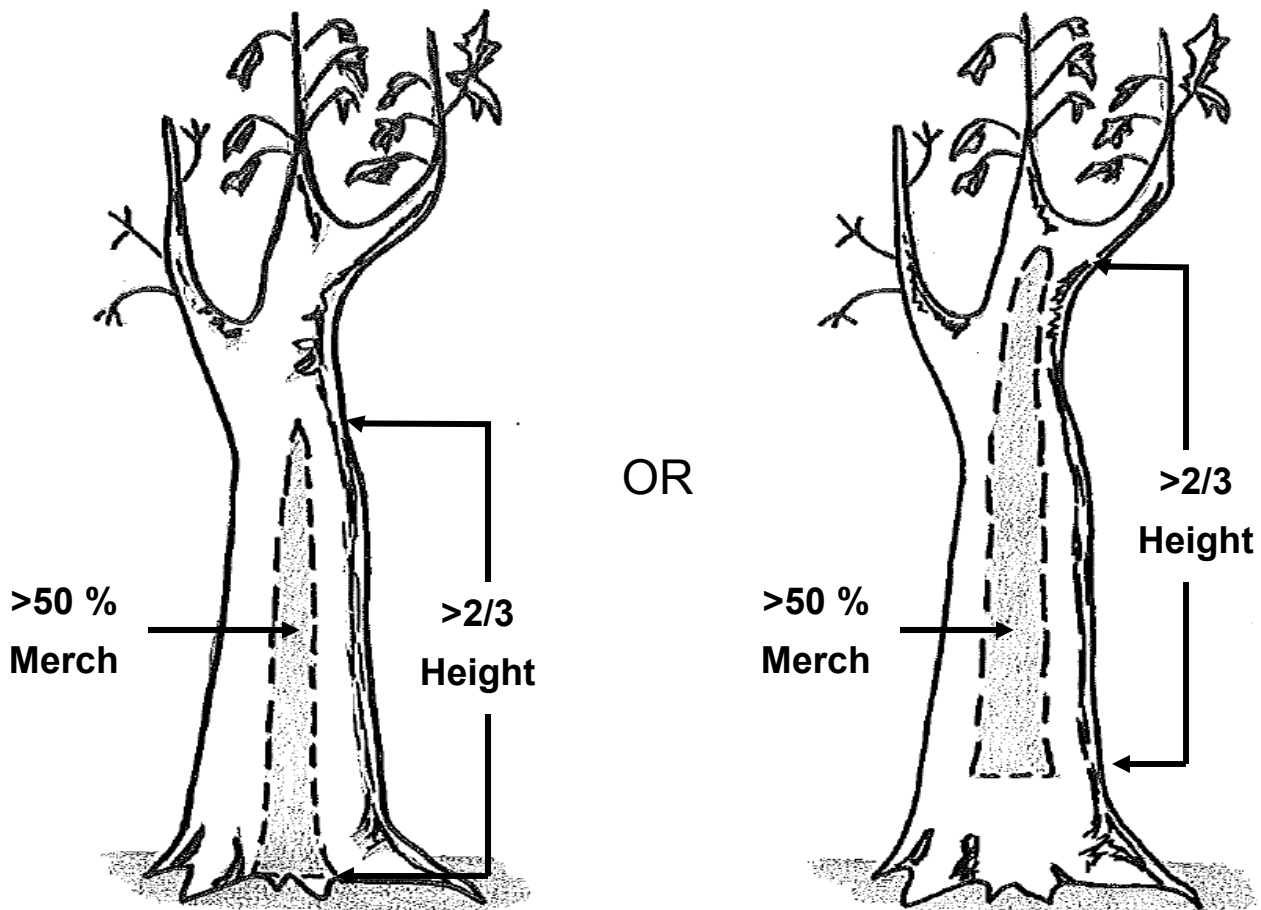
**Criteria Definition:** A Cw tree being assessed is Unacceptable as a contributing Crop Tree if –  
*< 2/3rds of the stems height is unable to produce > 50% merchantable volume*

**Merchantable Volume Definition:**

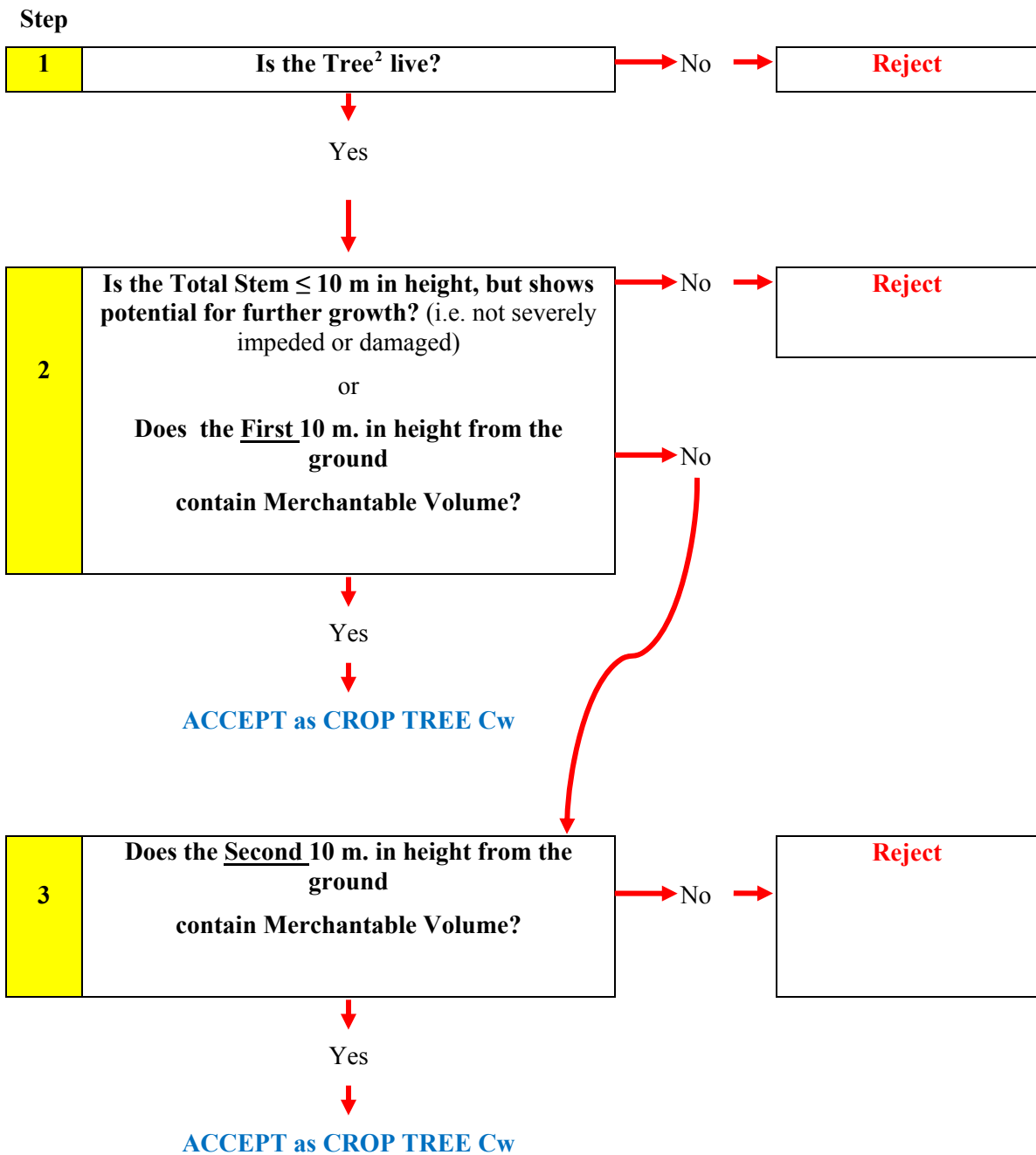
Either:

1. Utility Grade – At least a solid 8 inch shell – Shake and Shingle and /or
2. Higher Grade – Complete solid wood – Saw Logs

**Figure 1: Visual Graphic Examples of Cw Stem Merchantability Criteria**



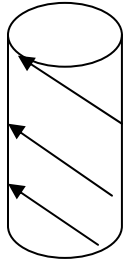
## 2.0 Suggested Assessment Key Steps



<sup>2</sup> Live tree means a tree has at least 1 live branch with green foliage.

### 3.0 Significant Visible Defect Indicators - Representing Unmerchantable Conditions

1. Significant Butt Rot as to produce a complete “see through gap” in the flared butt of a Cw – above the root collar.
2. Woodpecker Holes around the complete circumference of the first and second 10 m. length of the stem.
3. Excessive Grain Twist to the Left<sup>3</sup> for the entire first and second 10 m. length of the stem.





4. Large Branches  $\geq$  the diameter of sound bole wood around the complete circumference of the first and second 10 m. length of the stem.
5. Excessive Sun Check on “grey ghost” upper segment of dead top on a Cw – for sun checks will penetrate twice the visible distance into sound wood to create unacceptable splitting.

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<sup>3</sup> Twist to the left extends into the heartwood significantly degrading the log quality and value.

## 4.0 Example Photos of Acceptable and Unacceptable Cw Trees

### Acceptable Cw Trees

 A close-up photograph of a tree trunk showing butt rot. The bark is peeling and the wood is discolored and decayed at the base of the trunk.	<p>Acceptable Butt Rot</p> <p>Note: Butt rot does not extend completely through the tree.</p>
 A photograph of a tall, thin tree with a forked trunk. The tree is surrounded by other trees and foliage, and the trunk shows signs of decay at the base.	<p>Acceptable Forking and form</p> <p>Live tree with first 10 meters containing &gt; 50 % merchantable volume</p>



Live tree  
First 10 meter log shows contains > 50 % merchantable volume

**Unacceptable Cw trees**



Catface and live fork  
First and second 10 meters of stem contain < 50 % merchantable volume due to large catface.