
Rocky Mountain Forest District Partial Cutting Stocking Standards

Version 2.0

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1. Preamble

This document outlines a set of standards and an approach for assessing regeneration and free-growing success for even-aged silviculture systems using partial cutting. These standards and approach are intended for stands being managed under a system with only a single planned partial cut harvest entry; retained stems contribute towards the stocking obligation.

Introduction of these standards serves to restrict the use of uneven-aged (multi-layered) stocking standards to areas prescribed for true single tree selection systems (multiple harvest entries).

The Partial Cutting Stocking standards described here are available for use on blocks partially harvested prior to the present date. The standards are to be used for those blocks harvested within the time era when harvesting was recommended or even restricted to a partial cut entry (eg. pine-only removal or for a non-timber objective).

It is acknowledged that the residual structures that would be expected using this approach for stocking assessment are below stocking levels and growth rates that would promote optimal timber production. It is noted that these structures will result in growth and yield losses relative to timber supply review (TSR) expectations, when they are retained for extended periods (Przeczek, 2002).

Subsequently, in the future, it is expected that residual basal areas will be less than 5 m²/ha or greater than 20 m²/ha following the initial harvest entry in most cases. The exceptional cases for which residual structures between 5 and 20 m²/ha are applicable to these procedures are outlined in the Situations and Circumstances.

The following standards are an approximation and are to be reviewed periodically and revised as more experience is gained and better information becomes available.

2. Application of Partial Cutting Stocking Standards

2.1 Stands with < 5 m²/ha Basal Area

Even-aged stocking standards apply to stands with an average basal area retention of less than 5 m²/ha.

2.2 Stands with > 20 m²/ha Basal Area Retention

Stands with an average basal area retention of greater than 20 m²/ha are eligible for classification as an intermediate cut silviculture system. As per standard stratification requirements legislated under the FPPR s. 86(6) and outlined in the RESULTS Information Submission Specifications (Oct. 2008), areas greater than 1 ha that are below 20 m²/ha must be identified, surveyed and managed as a separate stratum. Acceptable layer 1 trees need to comply with the attributes described for the long term retention in Table 4 of the Tree Wounding and Decay Guidebook. There is no initial silviculture obligation associated with intermediate cut silviculture systems; stands need to remain in a stable condition for two years before free growing can be declared. Loss of basal area during the two-year period may move these areas into the condition described in section 2.3 below.

2.3 Stands between 5 and 20 m²/ha Basal Area

The following approach to defining and assessing stocking success in partial cut standards units apply to even-aged silvicultural systems that have retained between 5 and 20 m²/ha of residual basal area. The potential growth losses that result from retaining such structures can be significant and should be considered in the next TSR.

Recommended stocking decisions are based on management objectives that are focussed toward the production of sawlog timber. Bancroft *et. al.* (2003) and Martin (2004) have completed the initial work associated with the “Deviation From Potential” approach to assessing stocking in complex partially cut stand structures; their work has been incorporated into this approach for the Rocky Mountain Forest District (RMFD).

2.3.1 Situations and circumstances

These structures will exist primarily in previously harvested blocks (blocks harvested prior to 2009). Use of the approach for blocks harvested in the future is restricted to the situations and circumstances defined below.

For areas that do not contribute to long term timber supply, (i.e. riparian reserve zones, environmentally sensitive areas, wildlife habitat areas, and wildlife tree patches) or areas where the contribution to timber supply is significantly reduced to account for non-timber values (i.e. riparian management zones with retention requirements, visually sensitive areas, and old growth management areas), stands may be managed between 5m²/ha and 20 m²/ha basal area to the extent necessary to meet the management objective while being mindful of the timber supply implications.

On rare occasions when blocks with primarily timber objectives are partially harvested, it is expected that this will be part of a silviculture system and the blocks will have another harvest entry within a 20-30 year timeframe (or less).

3. Assessment Procedures for Partial Cutting Stocking Standards

The Deviation from Potential (DFP) assessment methodology will form the basis for determining acceptable stocking status. Plot assessments will be conducted as per standard even-aged regeneration and free-growing assessments (i.e., stratification, sampling design/intensity, minimum strata size) with the following changes:

3.1 Layer 1 stems (≥ 12.5 cm dbh)

Tally stems by species and diameter class (5 or 10 cm classes are appropriate) using an appropriate prism. Initial indications suggest that a 3 - 5 BAF prism will provide reasonable data for most sites. Tally acceptable layer 1 stems because the DFP stocking decision requires all layer 1 stems to be of acceptable quality (refer to “Free growing damage criteria for multi-layered stands in B.C.”). Tally moribund trees as a separate class but do not include them in basal area summaries for the stand.

All locally commercial layer 1 stems that meet acceptable quality criteria are considered to be preferred species.

3.2 Layers 2, 3, 4

Tally only those well spaced understory stems that are unimpeded (i.e., outside of the drip-line of overstory trees), and at free growing are unimpeded by vegetation.

Preferred and acceptable species are the same as RMFD even-aged stocking standards for layers 2-4.

At free growing the minimum height is 1.0 m or the minimum free growing height as per species and site series as per the even-aged stocking standards for RMFD.

3.3 Data Compilation

Compare the basal area (m²) of overstory (OS) layer 1 trees and “unimpeded” well-spaced sph for each plot to Table 1 and record the corresponding DFP value.

The mean DFP and the proportion (%) of stocked, partially stocked and open plots¹ as defined by the relative position on Table 1, will be calculated for each stratum.

Table 1. Deviation from potential (DFP) stocking by understory tree density and overstory basal area.

OS Basal Area (m2/ha)	Well-spaced trees in plot								
	0	1	2	3	4	5	6	7	8
0	1.00	0.76	0.52	0.34	0.22	0.13	0.07	0.03	0.0
1	0.98	0.74	0.51	0.34	0.21	0.13	0.07	0.03	0.0
2	0.96	0.73	0.50	0.33	0.21	0.13	0.07	0.03	0.0
3	0.93	0.71	0.49	0.32	0.20	0.12	0.07	0.03	0.0
4	0.90	0.68	0.47	0.31	0.20	0.12	0.06	0.03	0.0
5	0.86	0.65	0.45	0.30	0.19	0.11	0.06	0.02	0.0
6	0.82	0.62	0.43	0.28	0.18	0.11	0.06	0.02	0.0
7	0.77	0.58	0.40	0.27	0.17	0.10	0.05	0.02	0.0
8	0.72	0.55	0.38	0.25	0.16	0.09	0.05	0.02	0.0
9	0.67	0.51	0.35	0.23	0.15	0.09	0.05	0.02	0.0
10	0.62	0.47	0.32	0.21	0.14	0.08	0.04	0.02	0.0
11	0.57	0.43	0.30	0.20	0.12	0.07	0.04	0.02	0.0
12	0.52	0.39	0.27	0.18	0.11	0.07	0.04	0.01	0.0
13	0.47	0.35	0.24	0.16	0.10	0.06	0.03	0.01	0.0
14	0.42	0.32	0.22	0.15	0.09	0.05	0.03	0.01	0.0
15	0.38	0.28	0.20	0.13	0.08	0.05	0.03	0.01	0.0
16	0.33	0.25	0.17	0.11	0.07	0.04	0.02	0.01	0.0
17	0.29	0.22	0.15	0.10	0.06	0.04	0.02	0.01	0.0
18	0.26	0.19	0.13	0.09	0.06	0.03	0.02	0.01	0.0
19	0.22	0.17	0.12	0.08	0.05	0.03	0.02	0.01	0.0
20	0.19	0.14	0.10	0.07	0.04	0.02	0.01	0.01	0.0
21	0.16	0.12	0.08	0.06	0.04	0.02	0.01	0.00	0.0
22	0.13	0.10	0.07	0.05	0.03	0.02	0.01	0.00	0.0
23	0.11	0.08	0.06	0.04	0.02	0.01	0.01	0.00	0.0
24	0.09	0.07	0.05	0.03	0.02	0.01	0.01	0.00	0.0
25	0.07	0.05	0.04	0.02	0.02	0.01	0.00	0.00	0.0
26	0.05	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.0
27	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.0
28	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.0
29	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.0
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Colour

Stocking Class

Growth Potential Opportunity

Open

High potential for additional volume growth

≥ 41% Additional stocking is required

Partially Stocked

Moderate potential for additional volume production through additional stocking

21 – 40% Assess options, additional stocking may be required

Stocked

Low potential for additional growth through additional stocking

≤ 20% No further treatments required

¹ NOTE: the % of plots calculation is a surrogate for the % of area. If the proportion or distribution of plots does not reflect the area for each DFP stocking class the calculation will be incorrect and another approach to estimating proportional area will have to be documented and applied.

3.4 Timing of Assessment

Time frames for the assessment will default to even-aged regeneration delay and free growing delay periods.

4. Decision Rules

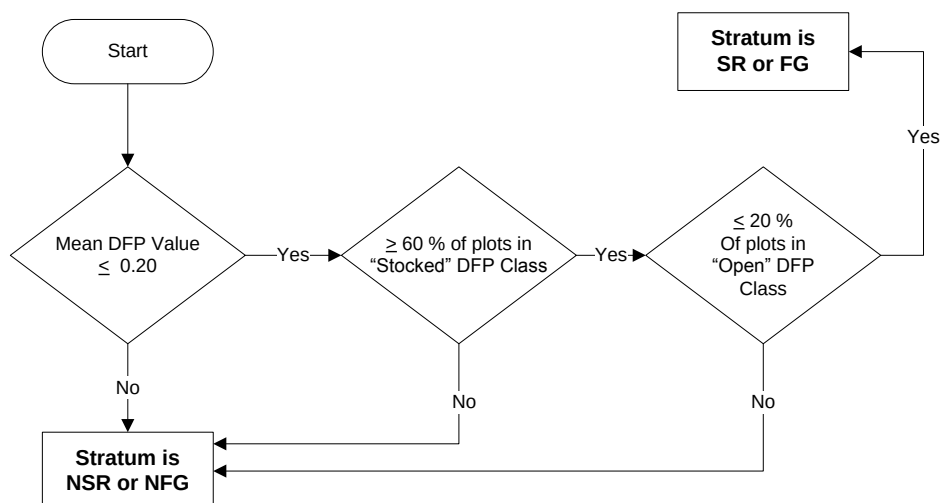
4.1 Stocking Standards

The following rules apply when assessing stands using the DFP method:

- DFP criteria
 - DFP must be ≤ 0.2 ; and
 - $\geq 60\%$ of plots must be ‘stocked’; and
 - $\leq 20\%$ of plots can be ‘open’
- Overstory (Layer 1) trees
 - No minimum inter-tree distance (MITD)
 - All live trees must meet acceptability criteria (“Free growing damage criteria for multi-layered stands in B.C.”)
- Understory Unimpeded Well-spaced (Layer 2-4) trees
 - Must be outside the dripline of Layer 1 trees; AND
 - have a MITD of 2 m; AND
 - to be free-growing, must be unimpeded by vegetation (herbaceous or shrubs overtopping the stem)²
- Preferred species
 - $> 50\%$ tallied stems in a plot

² To be unimpeded, understory trees must not be in imminent danger of mortality from understory vegetation competition or mechanical damage (e.g. snow press).

Figure 1. Stocking decision flowchart.



Notes: Many of the NSR stands will have clumped, irregular stocking patterns and the amount of overstory will limit the potential for augmenting stocking through planting. All NSR strata ≥ 1.0 ha, that are not under significant overstory influence, should be reforested.

Other NSR strata will likely require additional harvesting treatments before stocking levels can be augmented. Planting species with low or moderate shade tolerance in the shade of a significant over-story for the purpose of arbitrarily meeting these partial cut stocking standards is not acceptable.

Table 2. Summary of partial cutting stocking standards for the Rocky Mountain Forest District.

Deviation from Potential (DFP) Criteria			General Criteria	
Maximum Mean DFP	Maximum % Partially Stocked Plots	Maximum % Open Plots	Min. Intertree Distance ¹	Acceptability Criteria
0.20	40	20	Layer 1: n/a Layer 2,3 and 4: 2.0 m + outside drip line of overstory trees	Refer to "Free Growing Damage Criteria for Multi-Layered Stands in British Columbia, 2007" or as amended over time

Notes:

1. No minimum intertree distance will be applied to layer 1 stems; layer 2, 3 and 4 stems must be outside the dripline of overstory trees and a 2.0 minimum intertree distance from all other stems (layer 1-4) will apply.

4.2 Tree Acceptability Criteria

Table 3 provides a summary of the standards for tree acceptability for regeneration and free-growing assessments.

Table 3. Tree acceptability criteria for the proposed stocking assessment procedure.

Tree Acceptability Criteria	Regeneration Assessment	Free-growing Assessment
Species	All commercial layer 1 stems will be considered as preferred species. Preferred and acceptable species for the site as per current even-aged stocking standards for other layers.	All commercial layer 1 stems will be considered as preferred species. Preferred and acceptable species for the site as per current even-aged stocking standards for other layers.
MSS _p	Preferred species $\geq$ 50% of the well-spaced stocking	Preferred species $\geq$ 50% of the free-growing stocking
Health	Healthy	See: Free growing damage criteria for multi-layered stands in B.C.
Brush		Appropriate conifer/brush ratio (ETFG Guidebook, Appendix 9)
Height		1 m or the minimum free-growing height as per species & site series
Advanced Regeneration		See: Free growing damage criteria for multi-layered stands in B.C.

5. Submission Requirements

Because the data collected is not standard as per the normal RESULTS data submissions, it is expected that licensees will provide the average basal area, mean DFP value, and the proportion of plots 'stocked' and 'open' in an attachment in RESULTS when declaring a standards unit.

6. References

- Bancroft, Bryce, Ken Day, Pat Martin, Kim Peel and Ken Zielke. 2003. *Partially Cut: Occupied or Not? What are my options? – A proposed survey approach.* . Unpubl. FIA Rep. for Lignum Limited.
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- Przeczek, John E. 2002. *Partial Cutting Effects Study: Modeling with Prognosis^{BC} and TASS to Assess Partial Cutting Impacts on Yield in the Invermere T.S.A.*. Unpubl. FIA Rep. for Slocan Forest Products Ltd. and Tembec Industries Ltd. 21 pp. + append.