



FREP Partial Cut Timber Protocol

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INTRODUCTION

This field protocol is set up to provide guidance on how to collect information and answer each of the questions provided on the field cards found in Appendix IV. Each question has one or several indicator statements that help answer the question. For each indicator statement guidance is provided on how to obtain information to either agree or disagree with the statement. The answer to the main question will depend upon agreement or not with the indicator statements.

PRIORITY FREP EVALUATION QUESTION – RELATING TO PARTIAL CUTTING

In order to determine the impact of FRPA on species and genetic diversity, forest productivity (merchantable timber volume, value, and availability), and forest health, Phase 1 of a two-phase program will establish benchmarks of current standards and practices established under the Forest Practices Code of British Columbia Act (the Code) for comparison. Sufficient data is available on species, species mix, genetic worth, stocking standards, and forest health conditions from October, 1987 to December, 2003 to facilitate the establishment of key benchmarks.

INTENT OF THE FREP PARTIAL CUTTING TIMBER ASSESSMENT

This information will not be published or distributed widely without providing adequate context using information provided by District, Region, and Licensee staff regarding: amount or area impacted; types of areas impacted; and potential implications for meeting provincial timber objectives over a management unit.

- More direction to follow with consultation with MFR regarding output and analysis.
- An outstanding question, outside the realm of this first approximation, is the context issue, whether other options would better suit the timber value from a watershed or landscape scale. This issue requires further attention once field results are available.

QUESTION A IS GROWING SPACE WELL-OCCUPIED BY HIGH VALUE, UNIMPEDED CROP TREES OF AN ECOLOGICALLY SUITABLE SPECIES, SUITABLE MINIMUM SIZE, WITH NO OBVIOUS RISK OF LOSS OVER THE ROTATION?

INDICATOR STATEMENT

¹ The growing space is well-occupied by well-spaced, unimpeded, suit-able crop trees of ecologically suitable species.

Note: A consideration of poor trees, trees at risk (riskers), and impeded trees are all incorporated into this indicator as they assist in answering the general question.

ASSESSMENT METHOD

Using a combination of prism sweep (Layer1 trees) and a 3.99 m fixed radius plot (Layers 2-4 trees), assess by counting:

Overstory Trees with a Prism Sweep – the number of “IN” Layer 1 (17.5 cm dbh +) trees (while recording the BAF of the prism) for:

- Ecologically suitable species (as per regional guidance documents).
- Trees with suitable crop (C) 1 quality.
- Trees with poor quality characteristics (see definition of poor - P).
- Crop or Poor trees that are also “riskers” in that they will likely die over the short term (20-40 years).

Understory Trees with a Fixed Radius Plot - Using a 1/200th hectare plot (3.99 m radius) – tally well-spaced, unimpeded suitable understory crop trees Layer 1 (12.5 to 17.5 cm dbh) and Layer 2-4 regeneration:

- Well-spaced with a minimum inter-tree spacing of 2.0 m.
- Suitable crop trees – meeting minimum acceptability criteria normally used for silvicultural surveys.
- Unimpeded by vegetation (herbaceous or shrubs) or overstory trees (see explanation of impeded²).
- With a minimum Layer 4 height of 15 cm.
- Also - Ingress (trees less than 15 cm tall) of high value species will be tallied up to a maximum of 10 per plot.

Tally combinations of understory unimpeded (ecologically suited) well-spaced trees of a minimum size along with a tally of overstory stems within Layer 1 – providing a basal area value for the plot. Refer to “Data Collection” section (that follows) for more details on procedures, information to be recorded, field forms, and data summary.

To assess understory growth - at each plot determine the average height for the leading well-spaced suitable crop species. Several average understory trees may be sampled during the assessment to determine age, unless that can be determined from planting history data in RESULTS.

Note: The understory growth indicator is under consideration, other information may account for the answers this indicator would provide. Stocking is measured using a modification of the DFP approach.

DEVIATION FROM POTENTIAL (DFP)

This protocol borrows strongly from the Deviation from Potential method of stocking assessment. The approach integrates overstory and understory site occupancy to provide a “deviation” from the full growth potential if the site were fully stocked (based on TASS³ model runs). Table 1 indicates the proportion of increase that is available for added stocking, the cell with zero RBA and no understory is 1 or 100% deviation from full growth potential.

THRESHOLDS FOR STANDS < 60 CM AVERAGE DBH

– USE TABLE 1

Yes If the average DFP is stocked – S (DFP ≤ 0.15) AND ≥ 60% of plots are stocked (S) or partially stocked (P).

Yes + where the average DFP ≥ 0.05 AND ≥ 80% of plots are S.

Perhaps (or somewhat) where DFP average is in the partially stocked class – P (DFP 0.15 – 0.40) AND more than 50% of the plots are in the S or P classes.

No Where none of the above are achieved

Ingress input Change No to Perhaps if the average ingress of high value seedlings is ≥ 500.

Poor Overstory Modifier (-) • For “Yes” or “Perhaps” scenarios - Add a minus sign (-) to either condition if the average basal area of poor trees is > 20 m²/ha and understory stocking is required to achieve the stocking class. A “Yes -” or “Perhaps -” will indicate that growth of understory trees may be significantly impacted by poor trees in the overstory.

• For “No” scenarios - Add a minus sign (-) if the average basal area of poor trees is > 20 m²/ha. This situation indicates that not only is growing space not adequately stocked with suitable trees, but it is dominated by poor trees.

1 Refer to “Data Collection” section that follows.

“Are partial cutting forest practices sustainable as measured by maintenance of forest productivity?”

Are regeneration opportunities under partial cutting being maintained or diminished?”

BLOCK SELECTION CRITERIA

This section is to be completed by MFR in fiscal 2008-2009. Use of a statistician is recommended.

Possible approach – create a listing of potential blocks using a RESULTS query where strata have Layer 1 stems in the inventory label. Alternative methods include use of silvicultural systems other than Clearcut and Clearcut with reserves. Additionally blocks or strata with multistoried stocking standards or identified as intermediate cuts could form candidate stands. Sample blocks should then be chosen randomly. Blocks should be at least five years old since harvest to allow for some ingress to occur. In some cases waiting for the full 7 year regeneration delay may be warranted.

STRATIFICATION

The sampling procedure and assessment will be most effective where stratification is used to target assessment on relatively uniform areas of residual stand structure. Since considerable partial-cutting has been conducted in the last few years focused on the removal of individual species (e.g., PI in response to Mountain Pine Beetle infestations), residual basal area may be distributed throughout a cutblock in diverse manner. For that reason, stratification will help reduce the number of plots required, and better characterize the actual situation on a given block.

USE THE FOLLOWING STRATIFICATION CLASSES

Because the real driver will be the occupation of growing space with the combination of regeneration and overstory trees of species of interest, suggested categories are as follows:

- A - Unharvested
 - Sample unharvested areas where patches were left and are not mapped, and therefore are part of the NAR, they should be assessed as a separate stratum. Do not sample mapped areas of unharvested timber.
- B - High retention of dispersed overstory.
 - In most cases there will not be a regeneration objective (these may be categorized in the RESULTS database as an Intermediate Cut, Commercial Thin, or Salvage). Note: this may not always be the case – Silvicultural systems can be misclassified and these may be called “Single-tree Selection”, “Irregular Shelterwood”, “Clearcut with reserves” (dispersed) retention system or another type of system.
 - These stands often will have some clumpiness and variability, even when timber is intended to be relatively uniform in distribution. L1 – has the potential to be 20 m²/ha or more on average (Note: this does not have to be exact – if it is close use this class).
 - A regeneration objective may be relevant (as in a regeneration entry for a partial cut silvicultural system).
 - Layer 1 overstory appears to be less than 20 m²/ha, but has the potential to be > 10 m²/ha on average. Might be relatively uniform or have a high degree of clumpiness and variability (numerous gaps evident).
 - A regeneration objective is obviously relevant.
 - Layer 1 overstory is obviously << 10 m² on average.
- C - Significant overstory, but not high retention.
 - A regeneration objective may be relevant (as in a regeneration entry for a partial cut silvicultural system).
 - Layer 1 overstory appears to be less than 20 m²/ha, but has the potential to be > 10 m²/ha on average. Might be relatively uniform or have a high degree of clumpiness and variability (numerous gaps evident).
 - A regeneration objective is obviously relevant.
 - Layer 1 overstory is obviously << 10 m² on average.
- D - Insignificant overstory

Where discreet manageable strata can easily be defined based on the criteria above, they may be sampled separately. Where a diversity of strata are mixed on a cutblock as smaller units, or less discreet units, in a large mosaic, the stratum that each sample plot falls in will be recorded such that a proportion of the block can then be reported in the various condition categories in the final documentation.

To assist with stratification, consult recent air photos, spot-5 imagery, orthophotos or other images that have a reliable scale to aid in stratification.

NOTE: This protocol is designed for stratification classes A - C using the DFP approach, for # D simply use the most recent silviculture survey data for stocking. The intent

OTHER QUESTIONS WITH NO THRESHOLDS OF PERFORMANCE.

Questions A – C covered above and the associated indicators focus in on the key concerns for provincial timber objectives, which can be assessed at a stand or cutblock level. There are other questions that, while they are important to the provincial timber objectives, they are either of less importance to the provincial timber objectives or, representative, reliable or feasible indicators (and thresholds) are not possible at this time. For many of these questions it is felt that it is inappropriate to assess the impact at the stand level as it can only be considered at a coarser scale, or there is too much uncertainty associated with the impacts that potential indicators may have on provincial timber objectives at the stand level.

For these questions, general questions were designed that should be considered at each sample point and throughout the cutblock as it is being sampled. While this information will be gathered at the block level for these questions, indicators with clear thresholds have not been designed. The resulting information for each cutblock may at some point be considered at a coarser scale (TSA level, TFL level, Landscape Unit level or Watershed level) where impacts and trends may be more appropriately assessed.

LIST OF OTHER QUESTIONS

- Was a significant dispersed salvage opportunity potentially missed?**
Assessment Method – Sum of the Crop Riskers and WINDTHROW basal area (average m²/ha) of LAYER 1 stems of high value species from the assessment tally forms.
Note: This is a complex indicator and may or may not be a major driver for meeting the provincial timber objectives. Where forest health concerns for bark beetles are associated with blowdown, this may be a major concern. With no forest health concerns, the amount of blowdown, and the species, size and quality of dead and down of the timber will all impact contributions to provincial timber objectives. Since a threshold could be complex, and it is not felt that this situation occurs often, the question is deemed to be minor with no thresholds provided.
- Was a significant concentrated salvage opportunity potentially missed?**
Assessment Method – Based on observations of the block as a whole, estimate the area in which the concentrated blowdown is found, and then estimating the proportion of the basal area in the blowdown. The area is then reduced by the proportion of the basal area. See: Data Collection section for more details.
Notes: See notes for #2.
- What is the general perceived risk of further losses throughout the rotation from forest health concerns?**
Assessment Method – Answer this question for the block as: low, moderate or high while recording the associated forest health risk.
Note: Stands may look healthy and vigorous now, and yet have a high risk of potential losses from forest health factors further along in the rotation. In some cases these losses might constitute a minor growth loss, and in other cases the impact may be large. Yet, at this time, predictive abilities of FREP assessors can be highly variable, based on local knowledge of forest health factors and their perceptions of future risks under various conditions. For this reason, consistency of assessment cannot be assured and a reliable indicator is not available. However, rough trends in the observations recorded may be useful for those considering risks, or perceptions of risk at a coarser scale. Forest health staff may wish to use this category to help identify training needs or to confirm issues.
- Is general species diversity in the stand changing due to management and potentially altering ecological resilience?**
Assessment Method – Answer this question for the block with an estimate of: increased diversity, no change, minor decrease, or major decrease.
Note: The concept of maintaining a diverse mix of species in ecosystems is widely accepted as a way to manage both potential economic and ecological risks over time by promoting resilience. While a notable goal, it is not easily integrated with the other indicators of performance toward the provincial timber goals at the stand level, because performance (good, bad or neutral) depends on many other considerations. For example, where a mixed-species stand is in imminent danger of significant losses due to mountain pine beetle, removing the lodgepole pine and reducing species diversity may be the desired management option. For this reason, these data may be helpful when viewed at a coarser scale with numerous cutblocks (while considering other ecological and species information), but should not be considered as a performance indicator at the stand level.

is to summarize results by category. Category delineation will be revisited upon the results of the first year’s data collection. Category A is included as patches of unharvested may be found in blocks with patchy distribution and will affect the timber goal.

QUESTIONS, INDICATORS AND THRESHOLDS FOR DATA COLLECTION

STRUCTURE OF THIS SECTION

Indicators are linked to the Provincial Timber Objectives through the monitoring questions that are of interest for the timber objectives. An overview of the approach for assessment is given as well as thresholds, and notes:

- Question – Each key question is provided
- Indicator Statement – Each indicator statement is listed
- Assessment Method – Provides guidance on data collection and ranking
- Threshold – Explains thresholds
- Note – Is used to provide additional background information
- Guidance – Words or phrases in bold italics are done so to draw attention to significant information

MAJOR QUESTIONS, ASSOCIATED INDICATORS AND THRESHOLDS

These questions focus on the areas of management performance that are considered to contribute the greatest to the provincial timber objectives, and can reasonably be assessed with representative, reliable, and feasible indicators with thresholds of performance. The presence or potential presence of situations of concern, and excellent performance will be examined over a population of similar cutblocks within a geographic area to explore trends.

The thresholds allow for verification of the indicator statement in the context of the stratum and cutblock being sampled. The indicator makes a positive statement that, if true, would satisfy the criteria to positively address the management question. The threshold values allow the indicator to be verified positively (yes – as expected), negatively (no – a situation of concern), or in some cases questionably (perhaps -possibly a situation of concern). For several indicators performance that goes beyond expectations in a positive manner is indicated as “yes+”.

EVOLUTION OF THE ROUTINE ASSESSMENT METHOD

A preliminary assessment method was presented in the field on August 9th. At each field session, participants had the opportunity to provide feedback and suggestions. After each session a revised version of the assessment methods and protocol were created to reflect their comments. In that way each new group had the most up to date version to work from. The following provides a brief chronology of the changes made to the original version and why.

Question A – site occupancy. The DFP procedure is the basis for the assessment with some modifications. Tree class categories evolved through feedback. The original categories were Good Fair and Poor along with Dead and Dead merchantable to C= crop, CR=Crop-risker P= poor, PR= poor risker, St= stump. These categories are then used to inform the DFP process (Crop only) and whether a tree is considered as impeding understory growth over the long term (non riskers). If there are enough poor trees above a threshold it is identified as specific category.

The criteria used to separate trees into the various categories borrows from the Cruising manual and Wounding and Decay Guidebook. Suggestions on use of the Vegetation Inventory categories were suggested and contemplated, yet not used as they were seen as too detailed for the use of the data. If added categories were included in the protocol, to provide more detailed information on pathology and vigour, Vegetation Inventory categories would be useful. Application of specific information for what would become the “poor” and “riskier” categories, and how to address “dead” trees evolved from discussions mostly with UBC and MFR staff at the Williams Lake session. These categories evolved even further at the Tofino session, where old growth cedar can have many characteristics that would indicate a “riskier” with other species, and yet the cedar may persist for centuries.

Species information was originally collected by species. Input from Kootenay staff, where up to 19 species grow, suggested the simpler, High Value, Ecologically Suited and Directed Species Categories. The species in each category are listed for each site on the top of each form.

Thresholds for site occupancy had two significant additions from feedback. The first was to add in a Yes+ category to account for performance that goes beyond expectations in a positive fashion, a modification that evolved out of discussions with UBC Williams Lake staff. Additionally, a poor overstory modifier (-) was added after the Coastal session to account for the situation where the site is either stocked in the understory or not but in either case there is a high proportion of poor quality overstory basal area left on site.

Information on relative understory growth was added after the first session to try and capture whether understory trees were growing or simply in a holding pattern.

Layout of the form evolved as well to allow for logical placing of summary data as well as reflecting the new categories. The final summary forms were designed to be sequential and self-guiding (would not have to refer back too often to the protocol).

Changes relating to Question B were made in each session. Each iteration reflected subtleties in choosing thresholds that made sense. The indicator has both an overstory and understory threshold, depending on the retained structure.

The question and indicator statement for Question C were modified from the earlier versions for clarity and simplicity.

STEPS THAT REMAIN TO BE WORKED ON

Block selection methodology. This is an area that needs input from a statistician and MFR staff.

Additional guidance on stratification is required. Presently there is the ability to present the information by cover categories. These categories should be used in pilot testing to determine their suitability. As well additional categories contemplated for use in RESULTS to describe dispersed retention may replace these categories if agreed upon.

For Appendix one it should be decided if it would be useful to have more information from the cruising manual. It has numerous photos and other information on decay. If so the sections from the Appendix can be pdfed and added in.

Putting the Protocol to the test in the field. This may require some mentoring or training to get people who decide to try the protocol sufficiently comfortable with it to provide reliable information and feedback.

QUESTION B IS THE STAND MAINTAINING OR INCREASING IN VALUE DUE TO THE SPECIES COMPOSITION?

INDICATOR STATEMENT

2. In stands with a significant amount of basal area in crop⁴ trees with suitable vigor and quality – the OVERSTORY is well occupied by suitable crop trees of high value species⁵.

Note: This indicator is intended to be directed at stands with most of the stocking in overstory Layer 1 trees. For all intents and purposes, the “value” of the stand for timber is related to the potential for another harvesting entry from the overstory timber at some point within the next 5 to 40 years.

ASSESSMENT METHOD

Overstory Trees with a Prism Sweep – while recording the number of “IN” Layer 1 (17.5 cm dbh +) trees for indicator 1, also distinguish the:

- The proportion of crop and poor trees that are of a high value species.
- Stumps (estimated to represent preharvest “IN” trees). The proportion of stumps of high value species will be determined as much as practicable. Note: all stumps are assumed to be crop trees if they were living at the time of harvest.

The proportion of high values stems left during harvesting will be determined as follows (W, X, Y, Z – below):

- W. Post-harvest High Value Crop – Average BA for high value C (crop) and CR (crop-risker).
- X. Post-harvest Total Basal Area - Sum of all C, CR, P, PR.
- Y. Preharvest High Value Crop Basal Area – Sum of Average BA for high value C, CR, and Sts (stumps)⁶.
- Z. Preharvest Total Basal Area – Sum of Average BA for all C, CR, P, PR and Sts.

OVERSTORY THRESHOLD

Yes if the proportion of Post Harvest High Value Crop RBA is ≥ the proportion of Preharvest High Value Crop Basal Area.

Yes + if the proportion of Post Harvest High Value Crop RBA is ≥ 120% of the proportion of Preharvest High Value Crop Basal Area.
W/X ≥ Y/Z

Perhaps if the proportion of Post Harvest High Value Crop RBA is < 100% but ≥ 50% of the proportion of Preharvest High Value Crop Basal Area.
W/X<1.0 but ≥ 0.5(Y/Z)

No if none of the above are achieved

NA where RBA is < 15 m²/ha

QUESTION C IN CUTBLOCKS WHERE HARVESTING IS DIRECTED AT A PARTICULAR SPECIES, DOES THE PROPORTION OF NON-DIRECTED SPECIES EXCEED A MINIMUM TARGET?

INDICATOR STATEMENT

4. Basal area of non-directed harvested trees does not exceed a minimum proportion of the preharvest stand.

ASSESSMENT METHOD

First – An indication is provided of whether there was harvesting “directed” at a particular species.

Overstory Trees with a Prism Sweep – while recording the number of “IN” trees Layer 1 (17.5 cm dbh +) for indicator 1, also distinguish the:

- The proportion of crop and poor trees (and stumps) that are of a directed species. Refer to the OVERSTORY TALLY of LAYER 1 stems by species in the assessment tally forms.



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Table 1. Use this table to determine stocking classes in plots with an average diameter under 60 cm¹.

Overstory basal area of good and fair vigour trees: ≥ 17.5 cm dbh (12.5 for PI) Average plot diameter under 60 (40?)cm	Understory density – well spaced sph					
	0	200	400	600	800	1000
0	1.00	0.76	0.52	0.34	0.22	0.13
5	0.86	0.65	0.45	0.30	0.19	0.11
10	0.62	0.47	0.32	0.21	0.14	0.08
15	0.38	0.28	0.20	0.13	0.08	0.05
20	0.19	0.14	0.10	0.07	0.04	0.02
25	0.07	0.05	0.04	0.02	0.02	0.01
30	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00	0.00	0.00
65+	0.00	0.00	0.00	0.00	0.00	0.00

Red = “Open” stocking class: DFP > 0.40 (40%)
Yellow = “Partially Stocked” class: DFP > 0.15 (15%) and < 0.40 (40%)
Green = “Stocked” stocking class: DFP < 0.15 (15%)

Table 2. Use this table to determine stocking classes in plots with an average diameter over 60 cm¹.

Overstory basal area of good and fair vigour trees: ≥ 17.5 cm dbh Average plot diameter under 60 (40?)cm	Understory density – well spaced sph								
	0	100	200	300	400	500	600	700	800+
0	1	1	1	1	2	3	3	3	3
5	1	1	1	1	2	3	3	3	3
10	1	1	1	1	3	3	3	3	3
15	1	1	1	2	3	3	3	3	3
20	1	1	1	2	3	3	3	3	3
25	1	1	1	2	3	3	3	3	3
30	1	1	2	3	3	3	3	3	3
35	1	2	2	3	3	3	3	3	3
40	2	2	3	3	3	3	3	3	3
45	2	3	3	3	3	3	3	3	3
60	3	3	3	3	3	3	3	3	3
65	3	3	3	3	3	3	3	3	3
65+	3	3	3	3	3	3	3	3	3

Red = “Open” stocking class: DFP to be calculated - use 1 for interim DFP number
Yellow = “Partially Stocked” class: DFP to be calculated - use 2 for interim DFP number
Green = “Stocked” stocking class: DFP to be calculated - use 3 for interim DFP number

2 TASS – Tree and Stand Simulator, <http://www.for.gov.bc.ca/hre/gymodels/TASS/>

3 The Yes+ category is provided to show active management and is meant to point out successful strategies.