FREP
FOREST AND RANGE EVALUATION PROGRAM
Scientifically Valid Evaluations of Forest Practices under the *Forest and Range Practices Act*

Protocol for Stand-level Biodiversity Monitoring

Steps for field data collection and administration

For the most current version of this document, please consult the FREP web site Indicators-SLBD-Protocol-2008.pdf

For other FREP information, please go to http://www.for.gov.bc.ca/hfp/frep/

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BRITISH COLUMBIA
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Resource Stewardship Monitoring

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Thanks to the district and regional staff who participated in the pilot testing of the stand-level biodiversity monitoring indicators and protocol and provided their valuable suggestions for improvements. Thanks also to the staff now taking this protocol and making it an operational reality. Looking to update the form D (which includes the Wildlife Tree Classes) and CWD.

FREP Background

The *Forest and Range Practices Act* (FRPA) introduces the transition to a results-based forest practices framework in British Columbia. Under this new approach to forest management, the forest industry is responsible for developing results and strategies, or using specified defaults, for the sustainable management of the 11 resource values (subject areas) identified under FRPA. The role of government is to ensure compliance with approved results and strategies, and other practice requirements, and evaluate the effectiveness of forest and range practices in achieving government's objectives for FRPA's resource values.

Resource stewardship monitoring (RSM) is a key component of the provincial Forest and Range Evaluation Program (FREP).

Resource stewardship monitoring will help identify implementation issues regarding forest policies, practices, legislation, and Forest Stewardship Plan results and strategies. As a result, RSM will be a fundamental component for implementing continuous improvement of forest management in British Columbia.

FREP has been established as a multi-agency program to evaluate whether practices under FRPA are meeting not only the intent of current FRPA objectives, but also to determine whether the practices and the legislation are meeting government's broader intent for the sustainable use of resources.

FREP is a long-term commitment designed to:

- assess the effectiveness of FRPA and its regulations in achieving stewardship objectives
- determine if forest and range policies and practices are achieving government's objectives, with a priority on environmental parameters, and consideration for social and economic parameters, where appropriate
- identify issues regarding the implementation of forest policies, practices, and legislation as they affect achieving stewardship objectives
- implement continuous improvement of forest management in British Columbia.

In order to accomplish these objectives, FREP will:

- develop specific monitoring and evaluation questions to be addressed
- document the status and/or trends of resource values over time through the use of detailed protocols
- identify causal factors where the status or trend is found to be undesirable
- determine whether resource values are being managed in a sustainable manner through proven or alternative forest practices
- communicate the results of evaluations
- recommend changes to forest and range policies and legislation, where required.

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Document Purpose

The following protocol was created to provide background information and instructions for data collection for stand-level biodiversity resource stewardship monitoring under FREP.

Goal of Stand-level Biodiversity Monitoring

The goal of stand-level biodiversity monitoring is to determine if the present policy of retaining wildlife tree patches and riparian reserves is achieving the desired levels and types of structures to maintain species diversity. More specifically, this monitoring protocol is designed to answer the following question:

> *"Is stand-level retention providing the range of habitat with the structural attributes understood as necessary for maintaining the species dependent on wildlife trees and CWD?"*

Objectives of the Monitoring Process

The objectives of the monitoring process are to:

- fairly quantify levels of stand structure attributes by BEC unit
- compare these data with known historical levels to determine what if any structures are lacking or significantly below expected quantities
- place the information into a landscape-level context to determine the significance of results.

Principles of Site Selection

A number of statistical design principles were used to develop site selection protocols for RSM. These principles ensure that the data collected and analyzed can be used at multiple scales (district, region, and province) with statistical validity and credibility.

This protocol is for provincial RSM. Districts may choose to sample from an alternate population than described here and apply a different site selection criteria. Please discuss any alternate sampling schemes with the Resource Value Team Leader. Such alternate blocks must be analyzed separately from the standard list, and are considered targeted sampling.

The sampling population is the entire population of potential sites that could be sampled for a given resource value. To ensure the results are objective and defensible, all sites sampled under RSM will be selected using random sampling.

The number of sites sampled may vary depending on available resources (largely staff time and access dollars). Very large, very steep or rough terrain, or very diverse blocks will take longer to sample. Problems in accessing sites will likely mean more expensive travel options. A rough goal for the number of sites sampled per forest district is 15. This goal can be decreased, particularly if some of the sample blocks are "big blocks," greater than 100 hectares.

For additional information on the site selection process, refer to *Protocol for 2006 Resource Stewardship Monitoring* at http://www.for.gov.bc.ca/hfp/frep/7_rsm.html.

Site Selection Criteria for Stand-level Biodiversity

For stand-level biodiversity, each participating district is provided with a random list of 200 sites generated from the population of cutblocks that meet the selection criteria in Forest Tenure Administration (FTA). The list is located on the Forest Practices Branch FTP server at ftp/hfp/gov_internal/!publish/Forest and Range Evaluation Program/Resource Stewardship Monitoring/2007 RSM/District random list.

From the list of 200 sites, each district will begin at the top of the list and select up to 15 sample sites, working down in sequential order. Site selection criteria include:

- cutblocks with a harvest completion date between January 1, 2002 and December 31, 2006.
- cutblocks greater than 2.0 ha in size.

If a district completes sampling of their sites and wants to sample additional blocks, the next sites should continue to be selected sequentially from the random list.

Sites should only be removed from the list for very specific reasons, which must be recorded. If a site clearly does not belong to the population, it can be deleted. Do not sample blocks that show up on the list but were sampled in previous years. Questions regarding whether a site is in or out of the defined population should be referred to the Resource Value Team (RVT). For example, a site may be deleted from the population if active nearby harvesting or other activities in the block make it too dangerous to sample. If there are other reasons for considering deleting a site, these should be discussed with the RVT.

Allocate sufficient time to sample all blocks chosen to do in the year. These blocks may be sampled in any order. However, be careful not to miss blocks. **Blocks must be sampled even if there are no wildlife tree patches noted on the site plan.** Often, there is retention that is not noted on the SP and, even if that is not the case, zero retention is part of the population. **Blocks must also be sampled even if there are no streams on the block.**

Indicators

The indicators used to assess stand-level biodiversity include:

- tree species and size (height and diameter)
- WT classes 1 and 2 (live trees), and 3+ (standing dead trees)
- invasive plants
- amount and type (size, species and decay class) of coarse woody debris (CWD)
- amount of windthrow
- harvesting constraints and ecological attributes used to anchor retention.

Getting Started: Required Equipment and Information

Both office and field procedures are provided in this document. What follows are the required plans, maps, and equipment that will be used to collect the information in an effective and efficient fashion.

For each randomly selected block, you will require:

- a site plan map, silviculture prescription map, or post-harvest map of the site showing retention areas, standard units (SUs), and BEC information. The map should be of suitable quality to be used in the field and preferably waterproof.
- a site plan or silviculture prescription (optional).
- air photos/orthophoto (optional).

For field sampling, you will need:

- prisms appropriate for local conditions – suggested range of prisms 4 BAF to 10 BAF (to bring in, on average for a stratum, about 6 trees in a sweep)

  Note: Use only one prism BAF per reserve stratum (e.g., BAF 6).
- compass
- diameter tape
- diameter stick (optional) – with centimetres marked off
- 30-m tape
- clinometer
- calculator
- laser range finder (optional – but highly recommended) or instrument such as the Vertex
- flagging tape and marking pen
- tree marking spray paint for marking trees and CWD
- GPS
- increment borer (optional)

- binoculars (optional)
- camera
- clipboard or field binder to hold field forms
- field forms (FS 1244-A1, A2, B1, B2, C1, C2, D1, D2) and a copy of this protocol.

General Office Procedures

1. Select cutblocks sequentially from the random list provided.
2. For each cutblock, collect the post-harvest map and access information, and if available, the orthophotos, aerial photos, and site plan (or silviculture prescription).
3. Identify the patch retention strata and determine if the harvest area requires stratification. Remember that EACH retention patch is a separate stratum.
4. Prior to heading into the field, randomly choose plot locations and mark them on the map. The suggested technique is to place an appropriate scale dot grid over the site map.
   a. *Patch:* Randomly pick one plot per hectare of reserve patch and mark the plot location(s). Record the distance and bearing from an obvious feature (e.g., SW corner of the group, or where a particular creek enters the block) to be used to locate the plots in the field.
   b. *Harvest area:* Randomly locate three plots in the harvest area (may be dispersed retention or clearcut). Harvest area plots are established to assess dispersed retention and coarse woody debris. If the harvest area has clearcut and areas having different levels of dispersed retention, try to randomly divide these 3 harvest area plots amongst the treatments. Very large cutblocks (>100 harvest area) will require more harvest area plots (e.g., 5 plots per 100 ha), as described in Appendix 1. If possible increase the number of plots in harvest areas with high levels of dispersed retention to allow for better estimates of the tree indicators.
5. Fill in the opening identification section of Form C (Section 11) and the header information for the anticipated number of plot cards (Form A) and stratum summary cards (Form B) as necessary for the particular block. Number all plots consecutively, regardless of stratum, starting with 1 for each new block. The important thing is not to duplicate plot numbers in a cutblock.
6. Fill in a Stratum Summary card (Form B – or Section 16 on Form C) for each stratum even if there is no intent of establishing a plot in the field. This will ensure basic information, such as reserve size and type, will be included in the analysis for every reserve and allows for the correct calculation of percent area retention.

Definition of the Term Stratum/Strata (pl)

Stratum: *One of a number of layers, levels, or divisions in an organized system* (Source: www.dictionary.com)

In order to facilitate efficient sampling of the cutblock, it will need to be divided into a number of strata. The strata will include each of the reserves and the harvest area. Example 1 shows that a 32-ha cutblock with two 1-ha wildlife tree (WT) patches and one riparian reserve area would have four strata. Each reserve area and the harvest area (no retention) would be considered individual strata.

Example 1. Potential stratum ID and type – 32 hectare cutblock

Description	Stratum ID	Stratum type	Plot type
Edge patch	WTP1	PW	BAF 6
Internal patch	WTP2	PW	BAF 6
20-m reserve along S3 stream	WTP3	PR	10-m radius
Negligible retention	NAR	CC	30-m radius

Example 2 shows that a 70-ha cutblock with two 4-ha wildlife tree (WT) patches, 10 ha of uniform dispersed retention (approximately 10 stems per ha), and another 15 ha of dispersed retention at 75 stems per ha can be stratified into five sample strata: two strata in the WT patches, two strata in each of the different dispersed retention areas and one in the clearcut. Stratification of the net area to be reforested (NAR) (i.e., the harvest area) allows for a different plot type (e.g., BAF, fixed-area radius or fixed area) to be used between the strata in order to get a "reasonable" number of sample trees. Plot type (e.g., some BAF or fixed-area radius) *must* be consistent within a single stratum. Ideally, these strata would be designed prior to going into the field, which may be possible if good post-harvest aerial photography is available. If this is not possible, the assessors may have to define the area in the field, being careful to clearly mark the stratum on the map (Figure 1) and include the stratum area on the Stratum Summary card (Form B).

Example 2. Potential stratum ID and type – 70 hectare cutblock

Description	Stratum ID	Stratum type	Plot type
Edge patch – rocky outcrop, few trees	WTP1	PW	BAF 4
Internal patch	WTP2	PW	BAF 8
Heavy retention	NAR1	DW	BAF 4
Sparse seed tree	NAR2	DW	Full count
Clearcut	NAR3	CC	30-m radius

Standard Unit Treatment Summary			
	SU1	SU2	Total
Reserve			19.2
NAR*	45	11.2	56.2
Gross			75.4
External reserve			5.0
Override (adjusted gross)			80.4

* NAR refers to Net Area to be Reforested

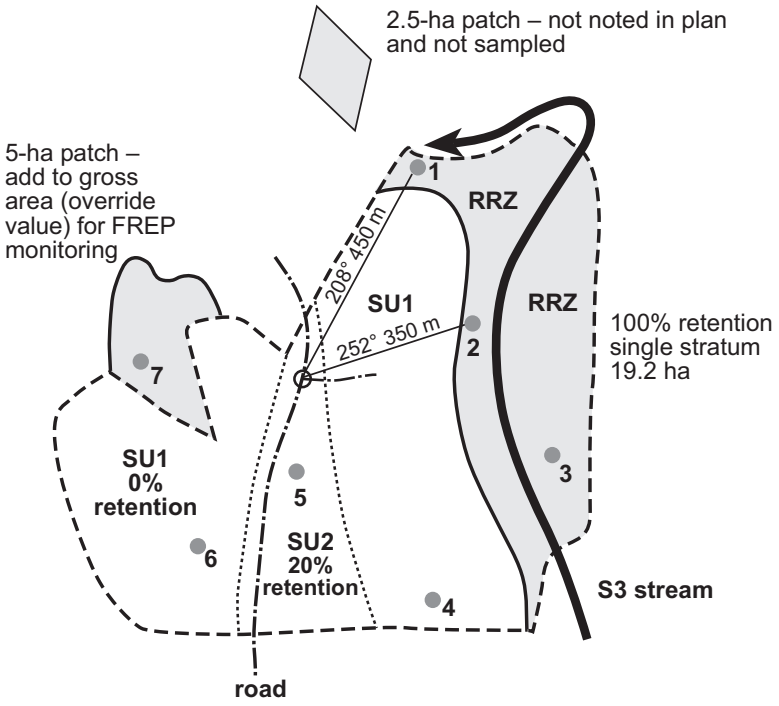


Figure 1. Example map showing strata definition.

Suggested Number of Plots in Post-harvest Cutblock

The number of plots to establish is based on the retention strategy and the cutblock size. You should establish 1 plot per ha of patch retention, up to a maximum of 5 plots per patch and at least 3 plots within the harvest area.

Time and stand structure variability need to be considered. If the retention is homogeneous, it may be acceptable to reduce the number of plots where time is limited.

If multiple strata are designated in the harvest area to allow for different plot types, it is not necessary to establish three plots in each harvest area strata. However, areas of high density dispersed retention will benefit from additional harvest area plots to better estimate the tree indicators.

The following table outlines the intensity of sampling for six different scenarios that will ensure we meet the objectives of stand-level biodiversity monitoring.

Description of retention	# of plots in cutblock	Discussion
60-ha homogenous cutblock. No trees >12.5 cm DBH retained.	• 3 randomly located plots in the harvest area.	Since the harvest area is homogenous, 3 plots should be sufficient. How do you tell if it's homogeneous? A visual overview and knowledge of harvest methods.
40-ha cutblock with evenly distributed dispersed retention (approximately 6 trees per ha), no patch retention	• 3 randomly located fixed-area plots in the dispersed area.	Full count would take too much time for limited benefit. Three fixed-area plots should adequately characterize relatively uniform retention.
60-ha mixed wood cutblock with variable density dispersed retention and no patch retention. No easily defined strata.	• 3 randomly located CWD transects. Establish a full count area that is easily defined (so area can be estimated).	Conducting a full count for the entire harvest area would not be practical. Fixed-area plots would be too large to be practical. Establishing one smaller full count area with an easily defined area will allow extrapolation to the entire harvest area.
25-ha cutblock with a 1.3-ha WTP	• 1 randomly located plot in patch retention. • 3 randomly located plots in harvest area.	This conforms with the one plot per ha in patch.
158-ha Mountain Pine Beetle cutblock with 35 ha of retention. Two 14-ha patches with riparian influence and 12 smaller internal patches	• 6 randomly located plots in the harvest area. • 8 randomly located plots in the riparian influence retention. • 6 randomly located plots in the smaller patches.	Relatively uniform pine stand allows for a reduced number of plots, according to the "Big Block" sampling procedure (Appendix 1). Establish 8 plots total in the two 14-ha WTPs. Randomly select 6 of the smaller patches to sample. Ensure reserve summaries are done for all of the patches. In the harvest area, establish 6 plots randomly in the 123 ha of harvest area.
36-ha cutblock with one 2.6-ha WTP and 7 ha of RRZ. Harvest area has evenly distributed (50 stems per ha) dispersed retention.	• 3 randomly located plots in WTP and 5 randomly located plots in RRZ. • 3 randomly located plots in dispersed retention.	Conforms to the strategy. Dispersed retention plots will likely be fixed area (possible prism plot depending on tree size).

Navigating to Plots

Once the required plots have been located on the field map, navigating to the plots requires planning for efficiency and safety. The following guiding principles should guide plot establishment.

- Safety is paramount; if your plot(s) cannot be safely accessed (e.g., steep cliffs, deep-water barriers, extensive windthrow), randomly select an alternative plot from the office exercise.
- Plot locations are horizontal distances, so try to correct for slope distances when working on steep terrain (i.e., slopes >40%).
- Traversing to plots can be done using GPS hand-helds (e.g., Garmin GPS 60), compass and hip-chain, compass and rangefinder, or compass and pacing (see Appendix 2 for use of GPS to navigate).

General Procedures for Establishing Plots

In general, to establish plots:

- Use flagging tape to establish plot centres and the CWD transect segments.
- Record plot #, date of assessment, and identify as RSM plot on flagging tape.
- Measure at least one height and diameter per plot to calibrate; likewise measure one length and diameter per 30-m CWD line transect. Record measured trees and CWD to one decimal place. Estimates should be recorded without a decimal.
- Use only one measurement type and plot size (i.e., prism, fixed area, or full count) per stratum (see section on stratification).

Prism Plots

- Prism sweeps should be done in patch areas or areas of dense dispersed retention.
- Target is an average of 6–10 trees per plot. In a stratum with variable stocking, some plots will have few (or no) trees, others will have many trees. Try for a BAF that *averages* about 6–10 trees per plot.
- Standardize the way in which prism sweeps are done. Paint or mark the first tree measured and sweep your prism clockwise.
- For prism plots, use the same BAF within a stratum (reserve).

Prism plots on the stratum edge

Where a plot is situated within the fringe areas of a stratum, move the plot centre into the stratum. The fringe width of a stratum depends on the selected prism BAF and the largest diameter tree in the plot. The following procedure can be used.

Determine whether the plot is an edge plot by calculating the plot's limiting distance (LD) based on the largest tree in your prism sweep and the plot radius factor (see Table 1).

For example:

- prism BAF = 4 (has a plot radius factor of 0.25)
- DBH of largest tree = 45 cm
- LD = PRF × DBH = 0.25 × 45 = 11.25 m.

Shift the plot perpendicular from the edge so that the plot centre is now 11.25 m from the stratum edge.

Table 1. Table showing plot radius factors PRF = $\frac{1}{2\sqrt{BAF}}$

BAF	PRF	BAF	PRF
1	.500	11	.151
2	.354	12	.144
3	.289	13	.139
4	.250	14	.134
5	.224	15	.129
6	.204	16	.125
7	.189		
8	.177	18	.118
9	.167		
10	.158	20	.112

Full prism plot cannot fit in narrow stratum

A very narrow stratum, such as a riparian reserve zone, may not be wide enough to allow for a complete prism plot, even if it is moved to the centre of the stratum. In that case, follow the MFR *Cruise Manual* procedure for establishing a border plot (http://www.for.gov.bc.ca/hva/manuals/cruising/pdf/CH3.pdf).

> *Plots which are located on or adjacent to timber type lines or harvesting boundaries inside the sample area, are split through the plot centre parallel to the type line. The trees inside the sample area are recorded and the plot recorded as a "B" for border or half plot. Each tree captured by the prism sweep will be tallied twice.*

Borderline trees for prism plots

Use the following procedure for determining if borderline BAF trees are in/out of plot:

- For prism plots, measure borderline trees to determine if they are indeed IN or OUT. The formula is: *LD = PRF*DBH.*

  For example, when using a prism with a BAF of 4, the PRF is 0.25. If you have measured a 30-cm tree, it must be within 7.5 m from the plot centre to be IN (0.25*30 = 7.5). If the distance to the pith of the tree is >7.5 m (at 1.3 m DBH), it is OUT.

Fixed-area Plots

- For strata with very low retention levels (e.g., 15 trees/ha), conduct a fixed-area plot.
- For fixed-area plots, a 30-m radius is recommended. When adjusting this radius to try to achieve about 6–10 trees per plot, go up or down in 5-m increments to a maximum of 50 m and a minimum of 15 m.
- Use the same plot radius for all plots within a given stratum (reserve).
- Paint or mark the first tree measured and sweep your fixed-area plot in a clockwise fashion.
- If a plot lands on the border of the stratum, move the plot so that it is fully within the stratum. Moving a fixed-area plot is done by relocating the plot centre in a perpendicular direction from the stratum edge so that the plot centre is now 1 plot radius distance from the edge.

Full Count Area

Entire area of stratum

This method is suitable in a stratum with an extremely low density of trees (e.g., less than 30 sample trees total).

The stratum area will typically be the full area of NAR, or the full area of one or more treatment units which make up the stratum. If more than 20 or 30 trees are likely to be counted, consider another method to get a smaller tree count.

Subset of stratum area

You may do a full count of a representative subset of the total stratum area. Choose an easily recognizable area in which you can obtain a full count of all trees and an area estimate. **Only one full count area is allowed per stratum and the tree tally is recorded as if it is one plot.** If possible, put all the tree data onto the stand table of the first plot card (Form A) in that stratum. You will still require plots to tally CWD. Whenever the full count area is smaller than the total stratum area, the data will be extrapolated to the full stratum. Be sure to show this subset area on the field map.

Stumps and Stubs

Stems are generally to be tallied in a plot if they are taller than 1.3 m (breast height) and with a DBH greater than 12.5 cm. Stubs and high stumps could fall into that size category. High stumps from first pass logging or winter logging may add some biodiversity value to a block. However, this value is usually minimal compared to full size trees, and thus are NOT tallied. Stubs are purposefully made at time of harvest to enhance biodiversity. Stubs may have marginal value as habitat if they already have heartrot established. If stubs occur in regular prism or fixed-area plots, tally them with a comment noting they are a stub. However, don't bother doing a full count of stubs – that time would be better spent doing another retention plot, or getting home earlier.

In summary:

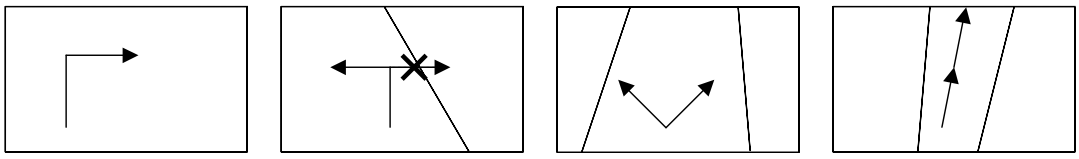
- Do not tally high stumps.
- Tally stubs found in prism or fixed-area plots – do not do a full count of stubs.

CWD Transects

Data collected for CWD include species, diameter, length, and decay class. Only diameter is used in the line transect equation to calculate volume. Length is collected as a qualitative indicator for CWD – long pieces are generally better for habitat and decay slower. Knowing the species and decay class of the wood helps in an assessment of diversity of CWD, and overall decay rates.

- A CWD line transect is established from each plot centre.
- Establish the first 15-m leg and record the bearing.

  General rule for direction (to avoid bias):
  - First choice is to continue the bearing from last plot or point of commencement.
  - If the transect extends out of the stratum, add 90°. If that still takes you outside the stratum, go to options 3 or 4 shown in the Figure 2.
- The second leg is at a 90° angle additive from the first bearing, as long as that keeps you within the same stratum. If not, subtract 90°. The purpose of the 90° angle is to avoid bias in sampling. For example, CWD resulting from yarding or from windthrow can be oriented predominantly in one direction. A transect along that orientation may pick up very little CWD, but by having half of the transect at a right angle, the probability of this type of error is reduced.
- Flag the end of each of the two 15-m transects. Consider painting the CWD pieces at the point where they are crossed by your transect, especially when there are a lot of pieces (it helps to ensure you have tallied all pieces).
- If the transect extends outside of a stratum, this leg of the transect must be repositioned so that it is fully within the stratum. If both of the perpendicular directions extend outside the stratum, try establishing both transects perpendicular from the plot centre. And if this does not work, make a single 30-m transect. Record your results on the field card including how you established the anomalies.



1. Normal CWD line transect – continue direction from previous plot or initial WP then turn 90°.
2. Turn transect opposite direction to remain in stratum.
3. Establish both legs from plot centre if necessary to fit in stratum.
4. In a very narrow stratum, establish both legs in line.

*Figure 2. **Locate CWD transect within the stratum.***

CWD and piles

If your random transect location ends up on a pile, it should be tallied unless it will be removed or burned. Safety is paramount, so do not climb over piles that are at risk of shifting. Estimate the data for all logs falling under your line transect. In the case of large piles, make a trade-off against time on the block and data collected. For large, fairly uniform piles (where time is limited), it is acceptable to measure a portion (e.g., 50%) of the line transect that is on the pile, and pro-rate the data (i.e., double the data if only 50% of the line was measured).

For large piles where it isn't possible to safely and accurately determine sizes, it may be quickest to keep a running tally of logs in various species groups/diameter classes and length classes. Often wood in such piles is consistently decay class 1. This can then be summarized onto Form A Side 2. The following is an example of a pile summary:

Diameter classes	<2 m length			2–6 m length			7–11 m length		
	Cw	Fd	Dr	Cw	Fd	Dr	Cw	Fd	Dr
12–20 cm						///			///
20–30 cm				////			//	###	
30–40 cm		### /							

Log #	Spp.	Decay class	Dia. (cm)	Length (m)	Comments
1–6	Fd	1	35	1	Start of pile
7–10	Cw	1	25	4	
11–13	Dr	1	16	4	
14–15	Cw	1	25	9	
16–20	Fd	1	25	9	
21–23	Dr	1	16	9	End of pile
24	Fd	2	22.5	4.3	Start of Leg #2
25	Dr	2	17	3	

Block Stratification

Plots are located randomly within each stratum and only a single sampling technique (i.e., prism, fixed-area plot size, full count area entire stratum, full count area subset of stratum) can be used within a single stratum. Therefore, it is important to first understand what constitutes a stratum. Here are a few points to keep in mind when considering the patch retention mapped for a cutblock:

- All patch retention internal to the harvest boundary is considered part of the cutblock.
- Patch retention external but contiguous, or external and non-contiguous, with the harvest boundary is considered part of the cutblock *if* it is acknowledged as such on the SP or post-harvest map. If it is not acknowledged as associated with the cutblock, do not sample it, as it may be retention related to adjacent or future cutblocks.
- Patch retention may be considered part of the cutblock, but the patch area is not included in the gross area indicated on the SP map. If this is the case, the patch area needs to be added into the gross area noted on Form C, Section 11 and this total is recorded as the "override" area (the adjusted gross area).
- Even if a road splits up an area of retention, it is considered one retention patch (one stratum ID and one summary). Sample it as such.
- If the SP map shows two patches which are contiguous (e.g., a WTP immediately alongside a RRZ), consider these as one stratum (a single patch). This ensures that the correct patch size (i.e., sum of area for contiguous patches) is recorded on the stratum summary. If the two areas within the single patch are very distinct timber types, and this is not reflected in the plot data, please comment on this in the stratum summary (Form B).

The variability in dispersed retention can cause problems when choosing the type of plot to establish for the tree count. For example, a 30-m fixed-radius plot in one area of the dispersed retention may pull in a reasonable tree count (6–20) while the same 30-m plot elsewhere may end up with a very high tree count. If possible, pre-stratify the dispersed retention area using aerial photos to identify significant variation in tree density. If that isn't possible, stratify areas of dispersed retention in the field (do not do this for patch retention) in order to utilize an appropriate (efficient) tree count methodology. Remember, each time you switch plot types you must stratify the dispersed area and attribute a size for the stratum, as well as to complete a Form B. In this way, the appropriate weighting can be applied during data analysis.

Note: This stratification of dispersed retention areas is intended to encourage efficient tree count methodology. It is not intended to force 3 plots within each dispersed stratum. The same "rule of thumb" for plot numbers in the harvest area applies regardless of the number of stratum in harvest/dispersed areas (i.e., minimum 3 plots in the harvest area (this may be increased if high density of dispersed retention), increasing to 5 plots per 100 ha for larger cutblocks).

Logic for Use of Section 16: When is it acceptable to not sample a patch?

There are cases – one of them being a multitude of very small variable retention patches made up of essentially the same timber type – where it is not likely worth the time to plot each one of a number of similar patches. However, it is always necessary to confirm the existence and approximate size of each patch. Hence Section 16, which is essentially an abbreviated version of the stratum summary (Form B). The purpose of Section 16 is to save on using multitudes of stratum summary pages. The ecological anchors listed in Section 16 are limited to those that you might see when observing the patch from a distance (i.e., those that could stand out from the canopy). It is your choice whether to use Form B (and note "zero" plots in stratum) or Section 16 of Form C.

It is acceptable to not sample a patch when your other observations tell you it is homogeneous with what you've already seen, and time is a critical factor. However, if there are patches in existence on a block, always establish *at least* one patch plot. A block containing retention patches may be rejected for data analysis if there are no patch plots established (no information for development of tree indicators). Where access is an issue (e.g., long or difficult access), a level of professional judgement needs to be made regarding the number and choice of strata sampled versus the time and cost of returning for a second field day. A stratum summary must be done for each patch stratum regardless of whether they are sampled. ***Do not* use Section 16 for a dispersed stratum.**

Stratum ID: Why we need to standardize

The format for stratum ID has been standardized at a maximum of five characters – zero to three alphabetical characters followed by zero to two numeric characters with no spaces between (e.g., WTP1, RMZ2, VR, VR1, NAR, SU1). Since it is essential to have identical identification linking all plots in a stratum, this standardized approach will help to stifle creativity and improve the odds of the same identification being moved forward on all plot cards and onto the stratum summary. Each stratum in a cutblock must have a unique identifier using this standardized approach.

Stratum Type: What is it anyway?

The allowable coding ID for stratum type is shown on Form B, Section 8.
It is a two-letter code.

- **CC** stratum type = clearcut – a stratum with no trees >12.5 cm DBH in any of the plots (regardless of tree species or merchantability) and, in the assessor's opinion, the total of the dispersed trees in the stratum equate to a patch smaller than 0.1 ha (see Appendix 3).

Retention Areas

First letter

First letter designations for retention areas are:

- **P** = patch reserves – no harvesting in the stratum (other than removal of trees from patch likely done for safety reasons).
- **D** = dispersed retention reserves – harvest occurred in the stratum and there are trees larger than 12.5 cm dbh.

Second letter

Second letter designations are:

- **T** = temporary, if there is a plan to harvest the retention prior to rotation end. Retained dispersed trees in a commercial thinning operation are considered temporary.
- **R** = riparian, a rotational reserve if there are any riparian (either RRZ or RMA) in the stratum.
- **W** = wildlife tree, a rotational reserve if the SP or SP map note a wildlife or biodiversity purpose for the retained trees.
- **O** = other.
- **U** = unidentified.

Required Accuracy

Field assessors should measure one (or more if you are not comfortable estimating) tree diameter and height per plot to calibrate yourself. These measured trees should be recorded to one decimal place of accuracy. The remainder of the trees in a plot can be estimated. Estimated trees should be recorded with no decimal place. The amount of measurement that is required can be monitored by occasionally checking your own estimates. Estimates should be within 10% of actual size.

Acceptance of estimated data is appropriate for RSM monitoring as the data will be lumped into diameter and height classes. During the pilot testing of this procedure, an attempt was made to have tree data collected categorically. We found that, in order to place trees in the appropriate categories, field assessors needed to estimate height and diameter. It was felt that since that work was being done anyway, the complete data should be collected. Furthermore, if different diameter or length or height limits are required, the data can be re-analyzed.

Innovative Practices

Innovative – ahead of the times… something new or unusual.
(Source: www.dictionary.com)

This section of the field forms is intended to record new or unusual practices that, in the opinion of the evaluator, would be beneficial to biodiversity. As a result of the evaluators collecting this information, it will be possible to identify new or unusual practices that are being implemented in various areas of the province. This may lead to more specific evaluations of a particular practice to determine effectiveness and ultimately to extend this information to practitioners.

Reserve Constraints

A constraint percentage is determined for every stratum other than the CC (clearcut) stratum type. This information is used in the provincial analysis to assess the component of retention that either:

- is being maintained to fulfill an additional purpose other than WT retention (e.g., RRZ, RMZ, Visuals, Recreation Feature), or
- had a very low likelihood of providing an economic harvest opportunity (e.g., rock, non-commercial, sensitive terrain).

In essence, what percentage of the area would have been retained regardless of WT retention? An ungulate winter range or wildlife habitat areas should only be noted as a constraint if the block overlaps the designated UWR or WHA, harvesting is permitted and retention requirements are specified in the SP or UWR/WHA order. A spatially designated old growth management area is not likely going to be a component of a cutblock. However, if this does occur – the percent constraint is likely 100 (assuming no harvesting is allowed in the OGMA).

Ecological Anchors

The provincial guidance given for choice of wildlife tree retention is to first look for important features to protect such as high value wildlife trees (e.g., veteran tree or tree containing cavity nest, hollow stem, stick nest, large witches broom, bear den, active feeding on the tree), or features such as a mineral lick or hibernaculum. A hibernaculum would be an important feature – this is primarily a den (e.g., hollow tree or cave) where bats may overwinter. The presence of bat guano and the smell should be your clues to such a hibernaculum. Other hibernacula are possible for ground dwelling creatures (e.g., snakes), but since these are much harder to spot – unless they are a component of a WHA and noted as such in a silviculture prescription – it is not expected that you will be finding and noting them. Presence of these types of ecological anchors on a site may indicate a choice on the part of the licensee to protect such high value attributes.

The provincial guidance goes on to say that if no important features require protection

through wildlife tree retention, then look to retain an area with trees that will likely attain high value wildlife tree status. If you determine that there are trees being retained equivalent in size to the dominant trees pre-harvest, then we might assume that this guidance is being considered (i.e., largest tree for the site).

It is understood that you will not be walking through 100% of every stratum. However, take some time to visually assess each stratum as you walk by or through it. An unsampled stratum should also be scanned with binoculars to detect the presence of ecological anchors.

Evaluator Opinion

This section is meant to provide a check against the data collected. It is not the conclusion for the cutblock. During the design of this routine assessment, it was recognized that the assessor's opinions of how well they feel the cutblock retained stand structures and representative stand conditions could provide valuable feedback to the assessment model. If, for example, the assessment model consistently places cutblocks in the high risk category when the assessors feel they are well done, the assessor's rationale may provide insight into data that should have been collected or a way in which the data might be interpreted differently.

Assessors should ask the questions:

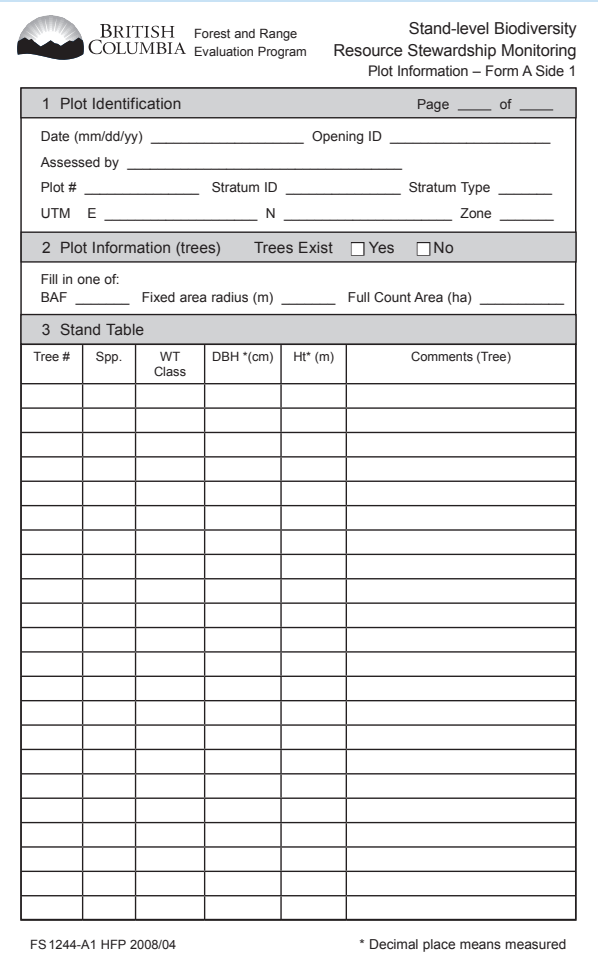
- How well did this cutblock do at retaining the types of stand structural attributes that existed prior to harvest?
- How well does the retention represent the stand conditions present in the area?
- Is the retention distributed in a way that will be beneficial to biodiversity?

Filling in the Field Forms

This section will lead you through the process of filling out stand-level biodiversity RSM forms (FS 1244 A, B, and C). Sample completed forms are provided in Appendix 4.

Section	Instructions/Descriptions

Plot Information Form A Side 1



BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Plot Information – Form A Side 1

1 Plot Identification Page ____ of ____

Date (mm/dd/yy) _____ Opening ID _____

Assessed by _____

Plot # _____ Stratum ID _____ Stratum Type _____

UTM E _____ N _____ Zone _____

2 Plot Information (trees) Trees Exist ☐ Yes ☐ No

Fill in one of:
BAF _____ Fixed area radius (m) _____ Full Count Area (ha) _____

3 Stand Table

Tree #	Spp.	WT Class	DBH *(cm)	Ht* (m)	Comments (Tree)

FS 1244-A1 HFP 2008/04 * Decimal place means measured

1 Plot Identification

Page ___ of ___ – fill in if multiple pages are used for a single plot (e.g., page 1 of 3).

Date – date of assessment (month/day/year).

Opening ID – numeric identification from the RESULTS database.

Assessed by – names or initials of assessors.

Plot # – unique plot identification number (start at 1 for each new cutblock ; no alphabet and no repeat numbers).

Stratum ID – unique ID code (maximum of 5 digits – zero to three letters followed by zero to two numbers, with no spaces).

Stratum Type – reserve code from Form B Side 2.

UTM – for plot centre. (If no signal, note that fact, but make sure the plot is accurately mapped and labelled, in case of future site visits.)

2 Plot Information (trees)

Trees Exist – tick "Yes" or "No."

Fill in one of:

BAF – record basal area factor of prism.

Fixed area radius – record radius in metres (15–50 m, recommended 30 m).

Full count – record area (ha) to which full count applies (note if the full count area is smaller than stratum area, the data will be extrapolated to the entire stratum area). Only one full count area allowed per stratum.

3 Stand Table

Tree # – number each tree in plot (with diameter >12.5 cm and height >1.3 m).

Spp. – record tree species using codes on Reference Form – Side 2 (FS 1244-D2). Record to species (e.g., Py).

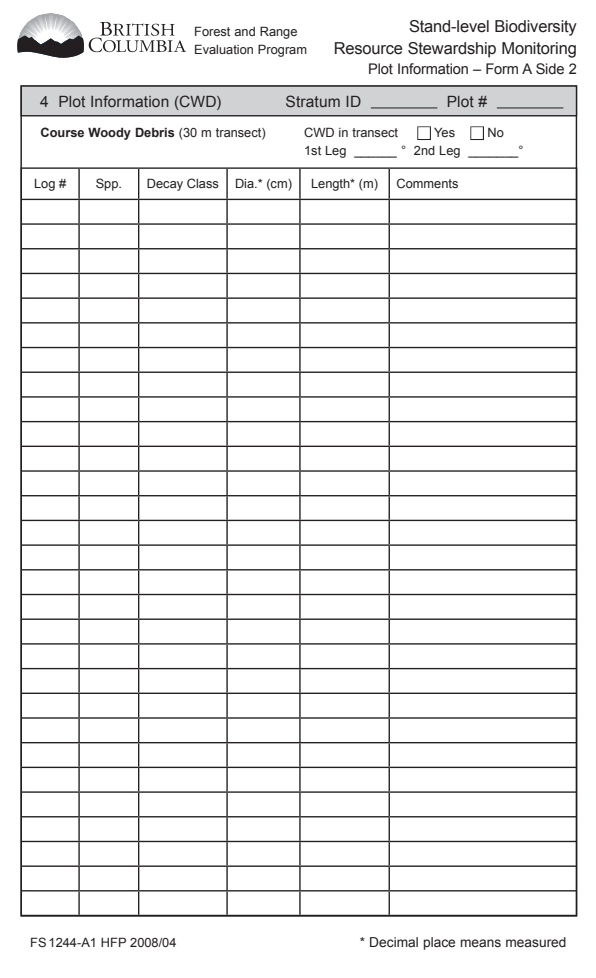
WT Class – record wildlife tree class using codes on Reference Form – Side 1 (FS 1244-D1).

DBH (cm) – diameter at breast height in cm; include a decimal place if measured.

HT (m) – height in metres; include a decimal place if measured.

Comments – record comments on individual trees. Any general comments on plot can be included on the strata summary (Form B Side 1).

Section	Instructions/Descriptions
Plot Information Form A Side 2	**4 Plot Information (CWD)**



BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Plot Information – Form A Side 2

4 Plot Information (CWD) Stratum ID _____ Plot # _____

Course Woody Debris (30 m transect) CWD in transect ☐ Yes ☐ No
1st Leg _____ ° 2nd Leg _____ °

Log #	Spp.	Decay Class	Dia.* (cm)	Length* (m)	Comments

FS 1244-A1 HFP 2008/04 * Decimal place means measured

Transfer *Stratum ID* and *Plot #* from front of card, in case cards are photocopied or dropped.

CWD in transect – tick "Yes" or "No."

1st Leg and *2nd Leg* (a transect "leg" is 15 m) – record compass bearing of the transect. This is to help relocate transect for mentoring or auditing.

Log # – number each piece of CWD on transect that is >7.5 cm diameter and CWD classes 1–4; see Reference Form – Side 2 (FS 1244-D2)

Spp. – record CWD species using codes on Reference Form – Side 2 (FS 1244-D2). Record to species if known, if not to genus or unknown (e.g., in order of preference Hw, H, Xc or Xd, X).

Decay Class – record CWD decay class using codes on Reference Form – Side 1 (FS 1244-D1) for CWD classes 1–4.

Dia. (cm) – diameter in cm where transect instersects log; record decimal place if measured.

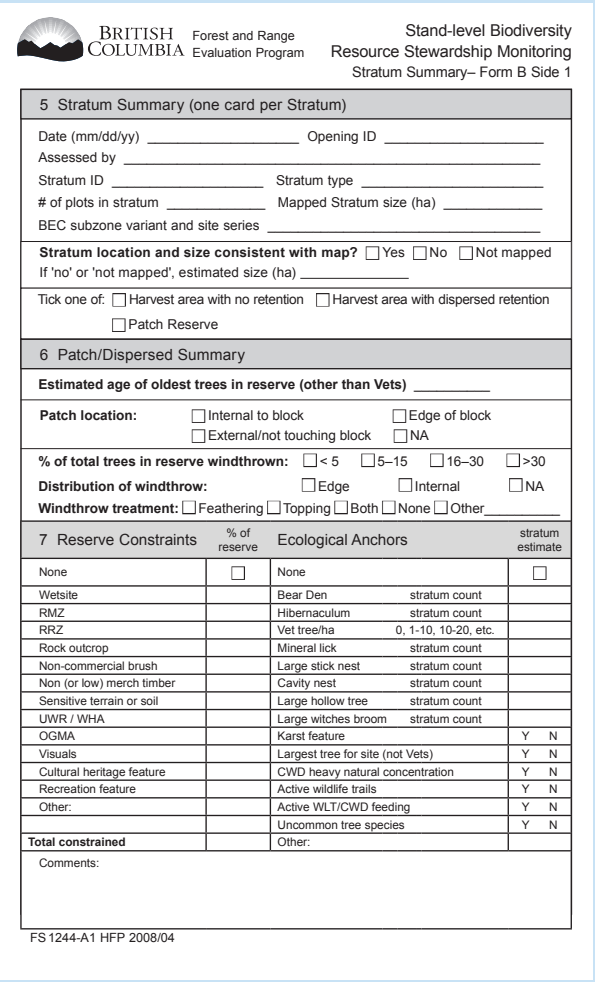
Length (m) – length in metres; record decimal place if measured.

Comments – record any comments on individual piece of CWD. General comments on plot should be recorded on the stratum summary Form B Side 1.

For guidance on measuring CWD, refer to Appendix 5.

Section	Instructions/Descriptions

Stratum Summary
Form B Side 1



BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Stratum Summary– Form B Side 1

5 Stratum Summary (one card per Stratum)

Date (mm/dd/yy) _____ Opening ID _____
Assessed by _____
Stratum ID _____ Stratum type _____
# of plots in stratum _____ Mapped Stratum size (ha) _____
BEC subzone variant and site series _____

Stratum location and size consistent with map? ☐ Yes ☐ No ☐ Not mapped
If 'no' or 'not mapped', estimated size (ha) _____

Tick one of: ☐ Harvest area with no retention ☐ Harvest area with dispersed retention
☐ Patch Reserve

6 Patch/Dispersed Summary

Estimated age of oldest trees in reserve (other than Vets) _____

Patch location: ☐ Internal to block ☐ Edge of block ☐ External/not touching block ☐ NA

% of total trees in reserve windthrown: ☐ < 5 ☐ 5–15 ☐ 16–30 ☐ >30

Distribution of windthrow: ☐ Edge ☐ Internal ☐ NA

Windthrow treatment: ☐ Feathering ☐ Topping ☐ Both ☐ None ☐ Other_____

7 Reserve Constraints	% of reserve	Ecological Anchors		stratum estimate
None	☐	None		☐
Wetsite		Bear Den	stratum count	
RMZ		Hibernaculum	stratum count	
RRZ		Vet tree/ha	0, 1-10, 10-20, etc.	
Rock outcrop		Mineral lick	stratum count	
Non-commercial brush		Large stick nest	stratum count	
Non (or low) merch timber		Cavity nest	stratum count	
Sensitive terrain or soil		Large hollow tree	stratum count	
UWR / WHA		Large witches broom	stratum count	
OGMA		Karst feature		Y N
Visuals		Largest tree for site (not Vets)		Y N
Cultural heritage feature		CWD heavy natural concentration		Y N
Recreation feature		Active wildlife trails		Y N
Other:		Active WLT/CWD feeding		Y N
		Uncommon tree species		Y N
Total constrained		Other:		

Comments:

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5 Stratum Summary

Date – date of assessment (month/day/year).

Opening ID – numeric identification from the RESULTS database.

Assessed by – names or initials of assessors.

Stratum ID – unique plot ID number; must be **identical** to stratum ID used for plots within the strata (maximum 3 letters plus 2 numbers).

Stratum Type – as recorded on Form A Side 1.

# of plots in stratum – record the number of plots established in the stratum.

Mapped stratum size – record stratum size from RESULTS or harvest map; note that all non-contiguous patch retention is a separate stratum.

BEC subzone variant and site series – record as per site map; please change if reserve is obviously a different variant or site series from the harvest area.

Stratum location and size consistent with map? – tick either yes, no, or not mapped. If not consistent, or not mapped, record the estimated size in hectares. Harvest areas are considered as mapped by SU designation.

Tick one of:

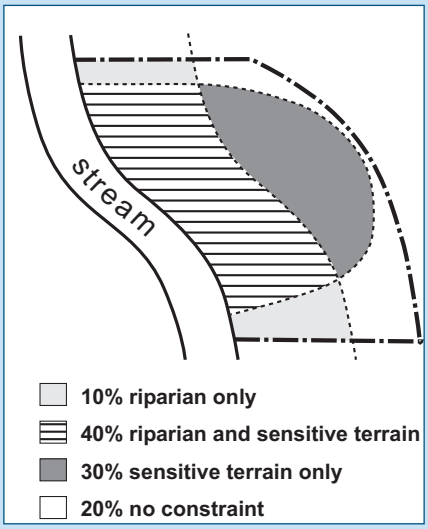
Harvest area with no retention – tick this box if harvested area contains no trees >12.5 cm dbh.

Harvest area with dispersed retention – tick this box if harvested area contains dispersed retention >12.5 cm dbh.

Patch reserve – tick this box if the area is a designated patch reserve.

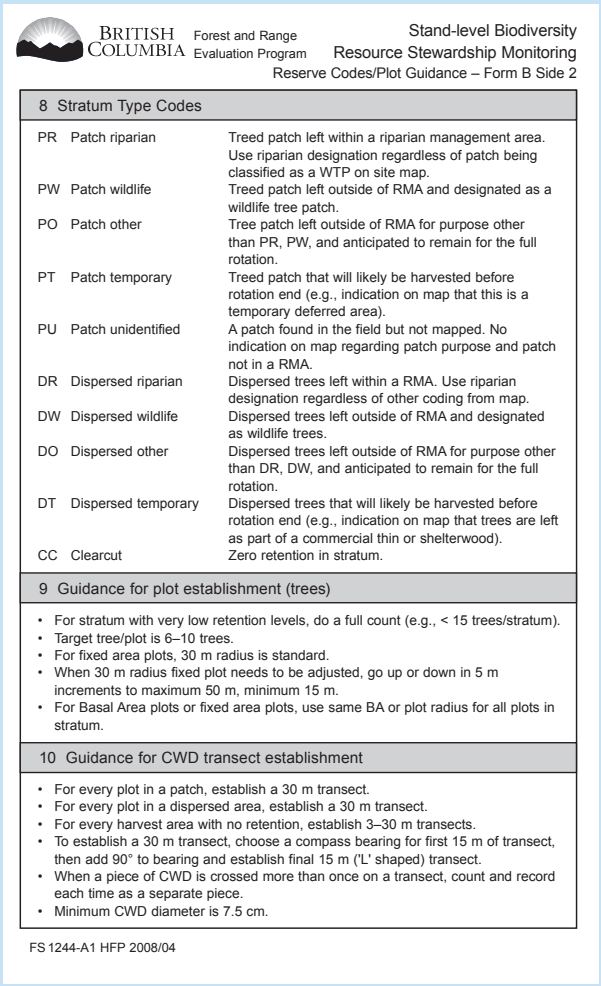
Only Section 5 is filled out for a clearcut (CC) stratum.

Section	Instructions/Descriptions
Stratum Summary Form B Side 1 (cont.)	**6 Patch/Dispersed Summary** *Estimated age of oldest trees in reserve (other than Vets)* – use pre-harvest inventory label, local knowledge, or bore the tree. Confirm approximate age through field verification – occasional coring of trees, or counting the rings on stumps. *Patch location* – tick the appropriate box identifying the location of the reserve or dispersed area. If any part of the patch touches the external harvest boundary, it should be considered on the edge of block. *% of total trees in reserve windthrown* – tick the box closest to the estimated windthrow level. Tick one or two boxes indicating the distribution pattern of windthrow. Identify any observed or known windthrow management treatments. Collect this data for both patch and dispersed retention. Estimate the windthrow impacts based on the number of stems affected (dominant and codominant). Basically, we want to know if windthrow is impacting the features retained for biodiversity: whether lots of blocks are affected; whether the windthrow impacts are edge, or internal, or throughout. Overall, what % of retained trees was affected by wind. **7 Reserve Constraints and Ecological Anchors** *Reserve constraints* – the amount of area contributing to an alternate requirement or if it is inoperable. Record the % of the reserve that is affected by the identified constraint. This may add up to >100% (e.g., 50% riparian + 70% sensitive terrain), as constraints can overlap. In this example, if 80% of the riparian is also sensitive terrain (4/5 overlap so 10% of the area is constrained by riparian alone, 40% by riparian and sensitive terrain, and 30% sensitive terrain alone), there is a total constraint of 80%. The "total" must be the total proportion of the stratum that is constrained (e.g., 80%) NOT the sum of all constraints. *Ecological anchors* – for a "stratum count" – record the number of times you observed the indicator in the stratum. For vet trees, give an estimate of category for stems per ha of the stratum. Several indicators are just presence or absence (i.e., circle Y [Yes] if at least one instance of the indicator or N [No] if you do not see any incidences). An example of "other" ecological anchors could be an artificially modified tree (e.g., nest platform, nest box). Check the "none" box if there are no anchors.



Section	Instructions/Descriptions

Reserve Codes/Plot Guidance Form B Side 2



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Stand-level Biodiversity
Resource Stewardship Monitoring
Reserve Codes/Plot Guidance – Form B Side 2

8 Stratum Type Codes

PR	Patch riparian	Treed patch left within a riparian management area. Use riparian designation regardless of patch being classified as a WTP on site map.
PW	Patch wildlife	Treed patch left outside of RMA and designated as a wildlife tree patch.
PO	Patch other	Tree patch left outside of RMA for purpose other than PR, PW, and anticipated to remain for the full rotation.
PT	Patch temporary	Treed patch that will likely be harvested before rotation end (e.g., indication on map that this is a temporary deferred area).
PU	Patch unidentified	A patch found in the field but not mapped. No indication on map regarding patch purpose and patch not in a RMA.
DR	Dispersed riparian	Dispersed trees left within a RMA. Use riparian designation regardless of other coding from map.
DW	Dispersed wildlife	Dispersed trees left outside of RMA and designated as wildlife trees.
DO	Dispersed other	Dispersed trees left outside of RMA for purpose other than DR, DW, and anticipated to remain for the full rotation.
DT	Dispersed temporary	Dispersed trees that will likely be harvested before rotation end (e.g., indication on map that trees are left as part of a commercial thin or shelterwood).
CC	Clearcut	Zero retention in stratum.

9 Guidance for plot establishment (trees)

- For stratum with very low retention levels, do a full count (e.g., < 15 trees/stratum).
- Target tree/plot is 6–10 trees.
- For fixed area plots, 30 m radius is standard.
- When 30 m radius fixed plot needs to be adjusted, go up or down in 5 m increments to maximum 50 m, minimum 15 m.
- For Basal Area plots or fixed area plots, use same BA or plot radius for all plots in stratum.

10 Guidance for CWD transect establishment

- For every plot in a patch, establish a 30 m transect.
- For every plot in a dispersed area, establish a 30 m transect.
- For every harvest area with no retention, establish 3–30 m transects.
- To establish a 30 m transect, choose a compass bearing for first 15 m of transect, then add 90° to bearing and establish final 15 m ('L' shaped) transect.
- When a piece of CWD is crossed more than once on a transect, count and record each time as a separate piece.
- Minimum CWD diameter is 7.5 cm.

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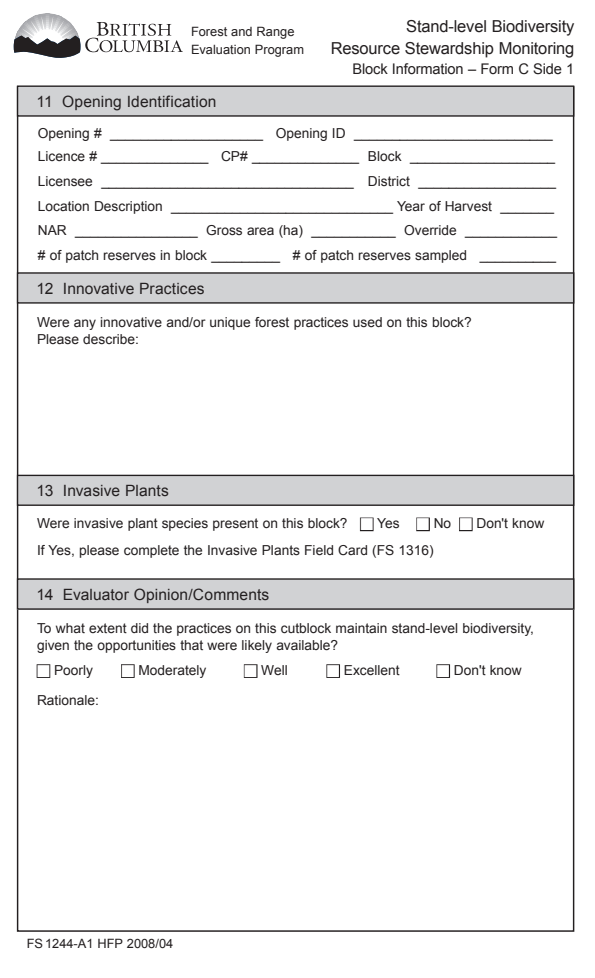
Reserve Codes and Plot Guidance

This form provides reference material for:

- reserve codes
- plot establishment
- CWD transects.

Section	Instructions/Descriptions

Block Information Form C Side 1



BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Block Information – Form C Side 1

11 Opening Identification

Opening # _____ Opening ID _____
Licence # _____ CP# _____ Block _____
Licensee _____ District _____
Location Description _____ Year of Harvest _____
NAR _____ Gross area (ha) _____ Override _____
# of patch reserves in block _____ # of patch reserves sampled _____

12 Innovative Practices

Were any innovative and/or unique forest practices used on this block?
Please describe:

13 Invasive Plants

Were invasive plant species present on this block? ☐ Yes ☐ No ☐ Don't know
If Yes, please complete the Invasive Plants Field Card (FS 1316)

14 Evaluator Opinion/Comments

To what extent did the practices on this cutblock maintain stand-level biodiversity, given the opportunities that were likely available?
☐ Poorly ☐ Moderately ☐ Well ☐ Excellent ☐ Don't know
Rationale:

FS 1244-A1 HFP 2008/04

11 Opening Identification

This section header contains complete identification for the block. Information can be filled in at the office with data from the post-harvest map, SP, or RESULTS.

Opening # – from RESULTS.

Opening ID – from RESULTS.

Licence # – from RESULTS or post-harvest map.

CP # – from RESULTS or post-harvest map.

Block # – from RESULTS or post-harvest map.

Licensee – from RESULTS or post-harvest map.

District – enter name or 3-letter code.

Location Descriptor – general description of location (e.g., Fury Creek).

Year of Harvest – enter year of harvest completion (disturbance end date) from RESULTS (if doing a pre-harvest block, note that here).

Net Area to be Reforested (ha) – enter the total net area to be reforested (the total hectares actually receiving reforestation treatment). From RESULTS.

Gross area – equivalent to "total area under prescription" (i.e., inclusive of harvest area and all reserves associated with the cutblock). From RESULTS.

Override – to attribute reserves associated with cutblock but not included in gross area. Sum gross plus reserves as the "override" area (the corrected gross area).

# of patch reserves in block – record the number of patch reserves (multiple patch areas that are contiguous [i.e., touching] are counted as a single patch) identified on site map or in RESULTS.

# of patch reserves sampled – record the number of reserves that were sampled.

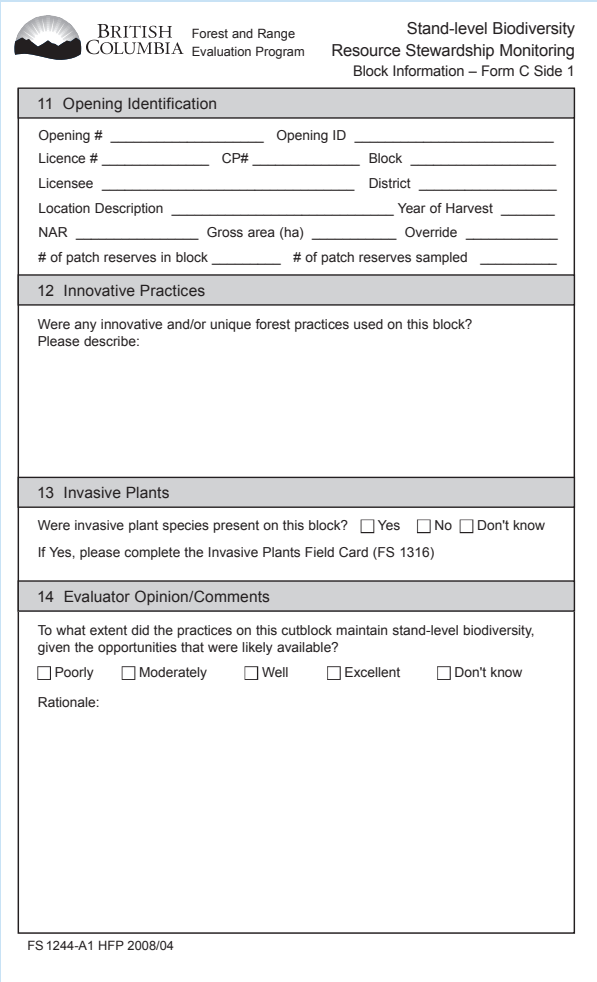
Note: Whether or not a patch reserve has been sampled, please fill out either Form B Side 1, Section A or use Form C Side 2, section 16, but NOT both.

12 Innovative Practices

Were any innovative and/or unique forest practices used on this block? Please note and describe any practices other than variations in levels of retention that can impact stand-level biodiversity. Innovative may include treatments not commonly used in the district but that have been implemented with the intent of managing for biodiversity.

Section	Instructions/Descriptions

Block Information
Form C Side 1 (cont.)



BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Block Information – Form C Side 1

11 Opening Identification

Opening # _____ Opening ID _____
Licence # _____ CP# _____ Block _____
Licensee _____ District _____
Location Description _____ Year of Harvest _____
NAR _____ Gross area (ha) _____ Override _____
# of patch reserves in block _____ # of patch reserves sampled _____

12 Innovative Practices

Were any innovative and/or unique forest practices used on this block?
Please describe:

13 Invasive Plants

Were invasive plant species present on this block? ☐ Yes ☐ No ☐ Don't know
If Yes, please complete the Invasive Plants Field Card (FS 1316)

14 Evaluator Opinion/Comments

To what extent did the practices on this cutblock maintain stand-level biodiversity, given the opportunities that were likely available?
☐ Poorly ☐ Moderately ☐ Well ☐ Excellent ☐ Don't know
Rationale:

FS 1244-A1 HFP 2008/04

13 Invasive Plants

Tick one of the boxes to indicate the presence or absence of invasive plants. If you do not know, tick "don't know." Record distribution code (e.g., CT/5) from Reference Form, Sides 1 and 2. Species codes will be provided separately.

Invasive plants are not plot-based information; simply look for invasive plants during and between plots, while driving the road system, etc.

Record any comments you may have concerning invasive plants.

14 Evaluator Opinion/Comments

To what extent did the practices on this block maintain stand-level biodiversity, given the opportunities that were likely available – tick one of poorly, moderately, well, excellent or don't know.

This is a subjective ranking of the cutblock, which will be used as a check against the objective data collected. A question you should ask yourself is "did they do as well as they could have considering the forest they began with?" Note general comments as well as anything unusual about the cutblock in the comments section. Please provide a rationale for your professional opinion. Some points to consider:

Species mix is different from pre-harvest (e.g., Pw left in Fd-dominated stand):

- often considered good as it provides greater species diversity and a possible seed source of a rust-resistant tree
- mistletoe-laden hemlock left in a stand dominated by Fd with planned natural regeneration may be seen as a negative, as Hw would impact negatively on the next crop and does not provide the same long-term standing potential as the Fdc
- mistletoe in mature trees can provide excellent nesting habitat.

Height is different from pre-harvest:

- shorter than pre-harvest trees may be better if taller trees are susceptible to windthrow.
- if trying for longer term inputs of CWD, a few younger patches may be considered good.
- short, stunted, unhealthy trees may be considered poor, as they will not age well and may not create desired WT characteristics.

Amount of standing retention:

- high levels of retention with good ecological anchors is good.
- high levels of retention with no ecological anchors is not necessarily good.

Amount of CWD:

- long (>10 m) logs in decay classes 1, 2, and 3 in the harvested area is good.

Section	Instructions/Descriptions
Block Information **Form C Side 2**	**15 Photo Notes** Record photo numbers and other information that will help you identify where photos were taken. **16 Stratum Summary When No Plots Established** This section provides minimum information for patch retention strata that are not sampled. It is your choice to use this section or Form B Side 1. Do NOT use this section for tallying strata already summarized on a Form B. **17 Quality Check** Please take the time to work through this calculation. There should be Stratum Summaries (either Form B Side 1, or Section 16 of Form C) that add up to entire patch, dispersed and CC areas. Gross area (or "override" area) is therefore that sum plus NP area plus other areas (e.g., NCCBr or Im). If it doesn't add up, check whether the SP may not have added some reserves associated with the cutblock into gross area.

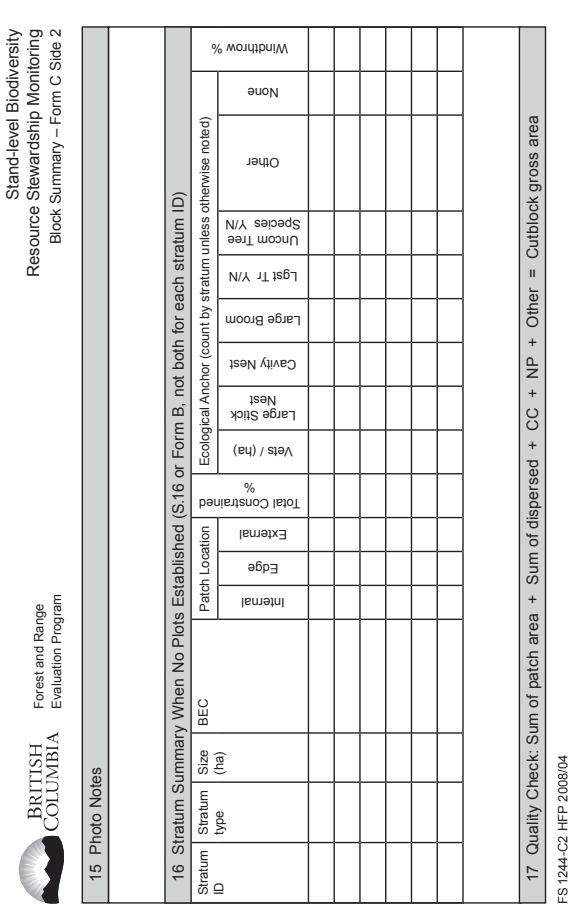


Figure 3 shows field cards required to fully sample a 30-ha cutblock with two wildlife tree patches (WTPs) and dispersed retention.

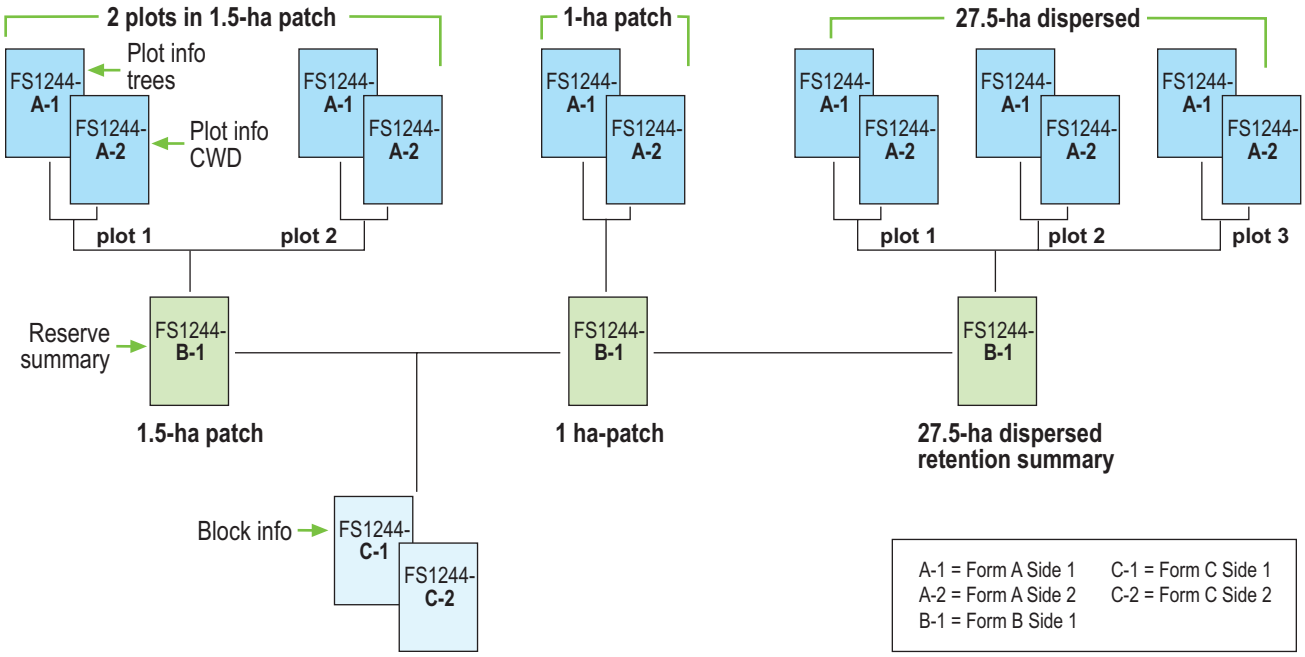


Figure 3. Field cards used to complete sampling of 30-ha cutblock. This cutblock contains two WTPs and dispersed retention.

Wildlife Tree Classes

Wildlife tree classes are shown in Figure 4 and Appendix 6.

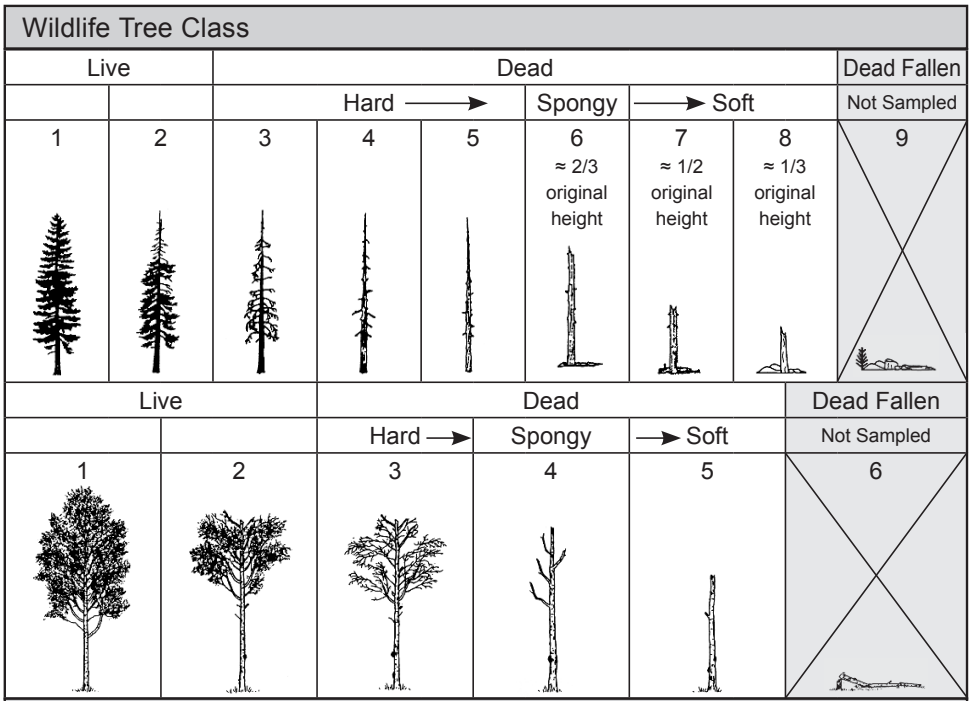


Figure 4. Wildlife tree classes for conifers and hardwoods.

Species codes are found in Appendix 7. Use standard species coding – tree species list provided on summary field card. For invasive plants, use the species codes identified on reference card (Form D Side 2).

CWD Decay Classes

For a more detailed description of CWD line transect methodology, see Appendix 7 and visit the following web site: http://ilmbwww.gov.bc.ca/risc/pubs/teecolo/fmdte/cwd.htm#sampling%20Methods.

The following are CWD decay classes (Figure 5 and Appendix 6). Decay class 5 is not tallied since it is subsurface and therefore too difficult to accurately identify for the purposes of this assessment.

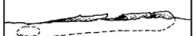
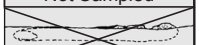
CWD Decay Class				
				Not Sampled 
Log class 1	**Log class 2**	**Log class 3**	**Log class 4**	**Log class 5**
Hard	Sap rot (but still hard)	Advanced decay (spongy)	Extensive decay (crumbles/mushy)	Many small pieces, soft
Bark firm	Loose bark	Bark trace/absent	Bark absent	Bark absent
Elevated	Sagging	Sagging to settled on ground	Fully settled on ground	Partly sunken in ground
Hard branches with twigs	Soft branches	Branches stubs/ absent	No branches	No branches
Supports person	May not support person	Breaks easy	Shape collapses when stepped on	Collapsed oval
No invading roots	No invading roots	Roots in sapwood	Roots in heartwood	Roots in heartwood

Figure 5. CWD decay classes.

Completed Plot Cards and Field Map

Prior to entering data in the information management system or sending cards to the Branch, please check them over. Refer to Appendix 8 for tips on what to look for when checking cards.

Keep a copy of all plot cards and maps. *Please* ensure location of completed plots are marked and labeled on the map.

Mail original plot cards with the associated site map and site plan, if available, to:

Forest Practices Branch
Attn: Nancy Densmore
PO Box 9513 Stn Prov Gov't
8th Floor, 727 Fisgard Street
Victoria, BC V8W 9C2

Help

If you require assistance on the use of the stand-level biodiversity RSM forms and/or protocol, please contact one of the following:

Nancy Densmore (250) 356-5890 or Nancy.Densmore@gov.bc.ca
Richard Thompson (250) 356-5467 or Richard.Thompson@gov.bc.ca
Dean McGeough (250) 642-2666 or DeanMcG@shaw.ca
Kevin Kilpatrick (250) 356-9306 or Kevin.Kilpatrick@gov.bc.ca

Appendix 1. Big block sampling

Purpose

Design a sampling scheme for blocks larger than 100 hectares that limits the numbers of plots established – but still captures the general variability of retention on the block – and confirms the size, type and existence of every separate retention patch.

Methodology for Determining Number of Plots and Plot Location

Patch Retention

Make at least three lists (i.e., stratification by like features):

1. all retention polygons that are riparian or wetland
2. all non-riparian retention polygons
3. all retention polygons that are temporary or immature.

Note: The purpose of the first two lists is to lump reasonably similar timber types. This would generally be a mapping exercise, but use better information (such as aerial photos) if available to identify similar timber types. If time allows and you determine there is sufficient variability to warrant it – you may decide to create an additional list of polygons to sample from. For example, subdivide the list of non-riparian polygons into large and small patches.

For the riparian/wetland:

- sum up the area in each list
- number of plots to sample is one per hectare for first five hectares and one per 10 hectares after that (round up) to a maximum of 15 plots
- locate the plots within the polygons on each list by using a grid overlay to determine potential plots and randomly select from these potential plots
- it is not necessary to force a potential plot into each polygon on the list – as long as the overlay of a dot grid (or other such method), captures an equal or greater number of potential plots than your number of sample plots
- each contiguous stratum (stand alone patch) still requires a Form B (or section 16 if no plots established)

For the non-riparian patches:

- same as riparian/wetland

For the temporary or immature polygons:

- don't establish plots (unless for some reason you've got extra time on block)
- fill out Form B or section 16 for each non-contiguous polygon

Harvest Area

Number of plots: 3 plots for first 60 ha, plus one plot per 20 ha after that to a maximum of 15 plots.

Maximum Number of Plots for a Large Block

Maximum plots is likely 45 (30 patch plots if two lists of similar timber types to be sampled and, 15 harvest area plots).

Appendix 2. Using the GPS unit

The GPS hand-held unit is a great tool when there is adequate satellite reception. When you have open canopies, open ground, and good satellite reception, the following process works for field-locating your plots.

Find a central access point in the cutblock that has a mapped control (e.g., a road junction). Confirm that this location is positionally true by taking 2 or 3 range finder shots to identifiable reference points (e.g., another road junction, creek crossing, visible F/C, corners of WTR, etc.) and confirm that the junction is relatively correct. If it is not, find an alternate access point.

Using the GPS, establish the access point to be a "WAY POINT" (WP). Locating plots using a GPS hand-held can be accomplished using steps 1–7.

For those using the Garmin GPS 60 hand-held unit, the following steps are used.

STEP 1: Turn on the unit. Hold the GPS unit upright (the antenna will get better reception). Let the unit acquire satellites and wait until the location co-ordinates are <±10 m (top of screen).

STEP 2a: Press "mark," then toggle left to select "Avg;" press "enter" and wait until the "estimated accuracy" is below 10 m or there are 100 measurement counts.

STEP 2b: Press "enter" to save this location as a WP location. Record this WP number (seen at the top of the screen) on your map access point location.

STEP 3a: Using a scale, draw radial transects for the WP to each of the mapped plots. Measure the distance from the WP to the plot and record this distance for each transect. Be sure to verify the map scale.

STEP 3b: Using a protractor or your compass, determine the compass bearing from the plot to the WP, and record this for each transect (see Figure 1). Now you are ready to go to the plots. You can "project WPs" for each of your plots, or work "backwards" from your initial WP as described below.

STEP 4: Orient yourself towards the plot you seek and begin your hike to the plot. Press "find," select "waypoint" with toggle, press "enter," and now select the applicable WP using the toggle; press "enter." Select "go to," press "enter." The GPS unit will now guide your position relative to the WP.

STEP 5: Head towards a plot and track your progress on the GPS screen – the bearing and distance readings should equal the mapped transect information for the plot. Hold the GPS unit upright in order to get better reception. You have arrived at the plot the moment the bearing and distance equal the plot's position from the WP.

CAUTION: Be sure to watch your footing and be aware of your surroundings as you walk and monitor the GPS screen.

STEP 6: At the plot, tie flagging tape to a stick to mark the plot centre. Tie a length of flagging tape to a secure branch above 1.3 m (this helps in relocating the plot). Remember to record RSM plot details on the flagging tape.

STEP 7: Determine the UTM co-ordinates for this plot:

- Select "mark."
- Select "Avg," then press "enter."
- Wait until "estimated accuracy" is below 10 m or 100 measurement counts.
- Record the UTM co-ordinates displayed.
- You can select "quit" to avoid creating a WP for this plot; or select "enter" to create a WP for this plot (in case you need/want to find this plot again).

Once you have finished the plot work, use your GPS to find the next plot by repeating steps 4–7.

At the end of the day, return to your access point (where you parked your vehicle) by using step 4 to return to the WP. The Garmin GPS 60 has a compass that will guide your return route to the WP.

Appendix 3. When is a clearcut stratum actually dispersed?

Issue: Each stratum is given a designation as either; patch (P) retention, dispersed (D) retention or clearcut (CC). When should a few trees in a harvest area change the designation from CC to D?

Background: The data will be entered into the FREP Information Management System. A current requirement of this system is that if a single tree shows up in any of the stand tables for a harvested stratum the designation of that stratum must be "dispersed."

However, if trees exist only outside of plots (i.e., no trees recorded in stand tables for the stratum), and, in the consideration of the assessor those trees are of little biodiversity value, then the harvest stratum can be designated as "clearcut." The logic behind stating trees have "little" or "some" biodiversity value is if all the retained trees within the harvest stratum could add up to equal or greater than 0.1 ha of basal area equivalent area (i.e. if all the dispersed trees were squished together they would make up a patch of at least 0.1 ha) then we should call the stratum "dispersed." Smaller amounts of trees would have negligible impact on the percent area retained indicator.

Discussion: Basal area equivalency can be done by:

1. estimating the total basal area left in the dispersed stratum
2. estimating the average basal area/hectare that was present on the block pre-harvest
3. dividing the total basal area in dispersed stratum by the average pre-harvest BA/ha to get the equivalent hectares.

The following table gives an example of the number of total trees (of differing diameters) that are required (compared to two different average BA/ha) to make up equivalent to a 0.1 patch.

		# of trees equivalent to a 0.1 ha patch	
DBH	BA/tree	Interior 30 m^2/ha	Coast 50 m^2/ha
12.5	0.01	245	408
15	0.02	170	283
20	0.03	95	159
30	0.07	42	71
40	0.13	24	40

Conclusion: The total number of dispersed trees retained in the harvest area that are required to add up to atleast equivalent of 0.1 ha of patch retention is dependent on:

- the average basal area/hectare of a fully stocked stand
- the total (i.e. – NOT m^2/ha , but TOTAL m^2 in the stratum) basal area of the retained trees.

Appendix 4. Sample completed forms

Plot Information – Form A Side 1

BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Plot Information – Form A Side 1

1 Plot Identification Page ____ of ____

Date (mm/dd/yy) 10/12/07 Opening ID 103807
Assessed by IB/WB
Plot # 1 Stratum ID WTP2 Stratum Type PW
UTM E 658171 N 5999213 Zone 9

2 Plot Information (trees) Trees Exist ☑ Yes ☐ No

Fill in one of:
BAF 6 Fixed area radius (m) _____ Full Count Area (ha) _____

3 Stand Table

Tree #	Spp.	WT Class	DBH *(cm)	Ht* (m)	Comments (Tree)
1	Pli	1	35.9	29.7	
2	Pli	1	38	27	
3	Pli	1	35	29	
4	Pli	3	41	28	
5	Pli	3	38	32	cavity nest @ 18 m
6	Pli	1	40	34	
7	Pli	2	44	30	MPB scaling
8	Pli	1	44	36	
9	Sx	1	21	13	

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* Decimal place means measured

Plot Information – Form A Side 2

BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Plot Information – Form A Side 2

4 Plot Information (CWD) Stratum ID WTP2 Plot # 1

Course Woody Debris (30 m transect) CWD in transect ☑ Yes ☐ No
1st Leg 300° 2nd Leg 30°

Log #	Spp.	Decay Class	Dia.* (cm)	Length* (m)	Comments
1	X	3	13	3	
2	Pli	1	9.8	15.6	
3	Pli	4	16	6	
4	Pli	2	16	8	end leg 1
5	Pli	2	15	9	
6	Xh	3	8	3	

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* Decimal place means measured

Stratum Summary - Form B Side 1

BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Stratum Summary– Form B Side 1

5 Stratum Summary (one card per Stratum)

Date (mm/dd/yy) 10/12/07 Opening ID 103807
Assessed by IB/WB
Stratum ID WTP2 Stratum type PR
# of plots in stratum 3 Mapped Stratum size (ha) 3.1
BEC subzone variant and site series SBS mc2 01

Stratum location and size consistent with map? ☑ Yes ☐ No ☐ Not mapped
If 'no' or 'not mapped', estimated size (ha) _____

Tick one of: ☐ Harvest area with no retention ☐ Harvest area with dispersed retention
☑ Patch Reserve

6 Patch/Dispersed Summary

Estimated age of oldest trees in reserve (other than Vets) 120

Patch location: ☐ Internal to block ☑ Edge of block
☐ External/not touching block ☐ NA

% of total trees in reserve windthrown: ☐ < 5 ☑ 5–15 ☐ 16–30 ☐ >30

Distribution of windthrow: ☑ Edge ☑ Internal ☐ NA

Windthrow treatment: ☐ Feathering ☐ Topping ☑ Both ☐ None ☐ Other _____

7 Reserve Constraints	% of reserve	Ecological Anchors		stratum estimate
None	☐	None		☐
Wetsite		Bear Den	stratum count	
RMZ	10	Hibernaculum	stratum count	
RRZ		Vet tree/ha	0, 1-10, 10-20, etc.	
Rock outcrop		Mineral lick	stratum count	
Non-commercial brush	15	Large stick nest	stratum count	1
Non (or low) merch timber		Cavity nest	stratum count	
Sensitive terrain or soil		Large hollow tree	stratum count	
UWR / WHA		Large witches broom	stratum count	
OGMA		Karst feature		Y N
Visuals		Largest tree for site (not Vets)		Y N
Cultural heritage feature		CWD heavy natural concentration		Y N
Recreation feature		Active wildlife trails		Y N
Other:		Active WLT/CWD feeding		(Y) N
		Uncommon tree species		Y N
Total constrained	15	Other:		

Comments:

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Block Information – Form C Side 1

BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Block Information – Form C Side 1

11 Opening Identification

Opening # 93 L 018 112 Opening ID 103807
Licence # A16828 CP# 473 Block PARRSX10
Licensee Canfor District DND
Location Description 24 Km Parrott West Year of Harvest 2001
NAR 47.7 Gross area (ha) 67.6 Override
# of patch reserves in block 6 # of patch reserves sampled 4

12 Innovative Practices

Were any innovative and/or unique forest practices used on this block?
Please describe:

No

13 Invasive Plants

Were invasive plant species present on this block? ☑ Yes ☐ No ☐ Don't know

If Yes, please complete the Invasive Plants Field Card (FS 1316)

14 Evaluator Opinion/Comments

To what extent did the practices on this cutblock maintain stand-level biodiversity, given the opportunities that were likely available?

☐ Poorly ☑ Moderately ☐ Well ☐ Excellent ☐ Don't know

Rationale:

Good amount, plus number of patches – primarily the wet areas. S3 reserve mostly dead or windthrown.

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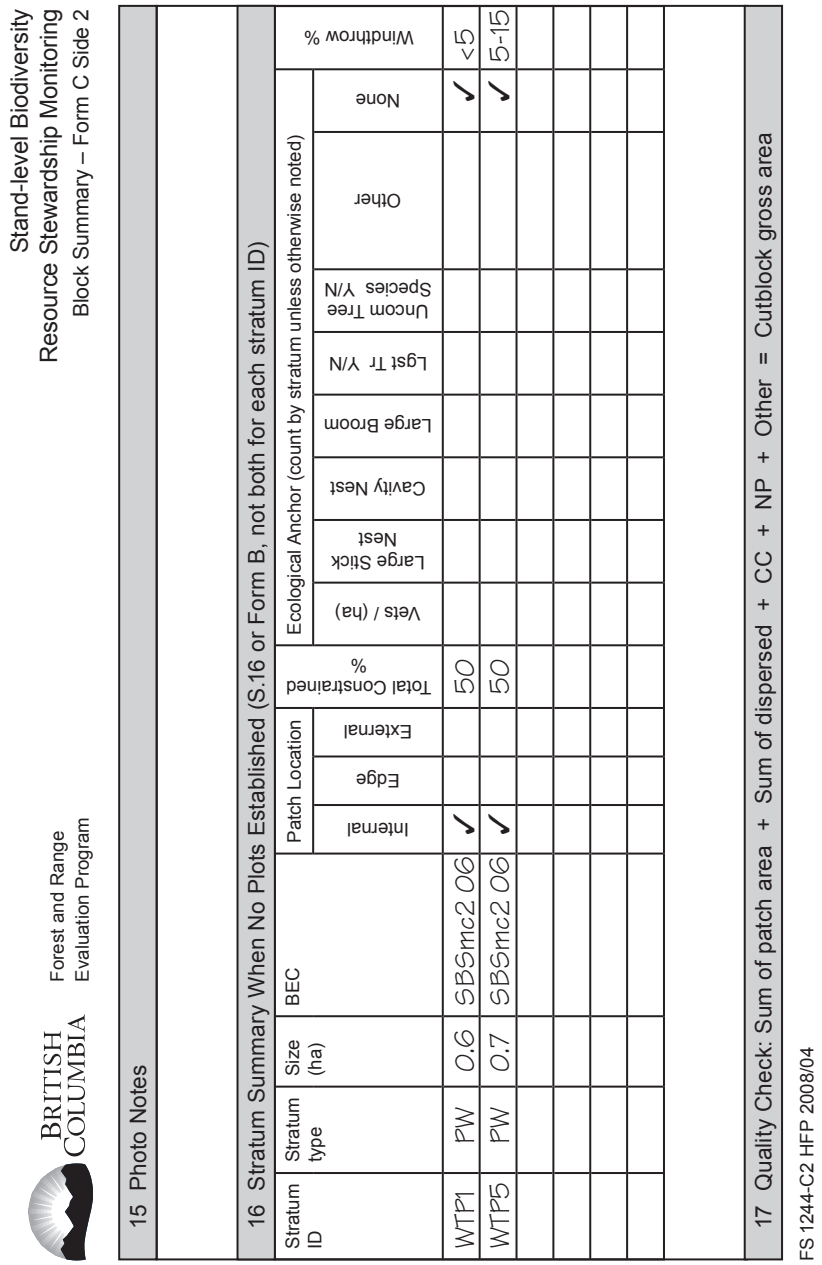
Block Information - Form C Side 2



Stand-level Biodiversity
Resource Stewardship Monitoring
Block Summary – Form C Side 2

BRITISH COLUMBIA
Forest and Range Evaluation Program

15 Photo Notes

16 Stratum Summary When No Plots Established (S.16 or Form B, not both for each stratum ID)

Stratum ID	Stratum type	Size (ha)	BEC	Patch Location			Total Constrained %	Ecological Anchor (count by stratum unless otherwise noted)								Windthrow %
				Internal	Edge	External		Vets / (ha)	Large Stick Nest	Cavity Nest	Large Broom	Lgst Tr Y/N	Uncom Tree Species Y/N	Other	None	
WTP1	PW	0.6	SBSmc2 06	✓			50								✓	<5
WTP5	PW	0.7	SBSmc2 06	✓			50								✓	5-15

17 Quality Check: Sum of patch area + Sum of dispersed + CC + NP + Other = Cutblock gross area

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Appendix 5. CWD measurements

To assist with the fieldwork for the *Protocol for Stand-level Biodiversity*, the following information is provided following the summer 2005 field training sessions.

Field procedures for measuring CWD were adapted from the CWD field procedures, as found at http://ilmbwww.gov.bc.ca/risc/pubs/teecolo/fmdte/cwd.htm#coarse.

Excerpts are included here to clarify and guide protocol fieldwork.

CWD Defined

Coarse woody debris is dead woody material, in various stages of decomposition, located above the soil, larger than 7.5 cm in diameter (or equivalent cross-section) at the crossing point, which is not self-supporting. Trees and stumps (intact in ground) are considered self-supporting, and therefore are NOT considered CWD.

Pieces of CWD may be suspended on nearby live or dead trees, other pieces of CWD, stumps, or other terrain features. There is NO minimum length for CWD.

Coarse woody debris includes:

- downed horizontal or suspended (not self-supporting) dead tree boles with or without roots attached
- fallen trees which still have green foliage if they no longer have roots attached (no living cambium) to the ground to keep them alive
- woody pieces greater than 7.5 cm at the point where the sampling line crosses the piece
- uprooted (not self-supporting) stumps greater than 7.5 cm in diameter at the crossing point and any of their exposed dead roots greater than 7.5 cm in diameter at the crossing point;
- fallen broken tree tops which may be horizontal or leaning, or large fallen branches
- recently cut logs.

Coarse woody debris does not include:

- dead branches still connected to standing trees
- self-supporting (not overturned) stumps
- exposed roots of self-supporting trees or stumps
- material that is buried beneath organic or mineral soil layers, or has decomposed enough to be part of the forest floor
- live or dead trees (still rooted) which are self-supporting.

Rules for Sampling Coarse Woody Debris

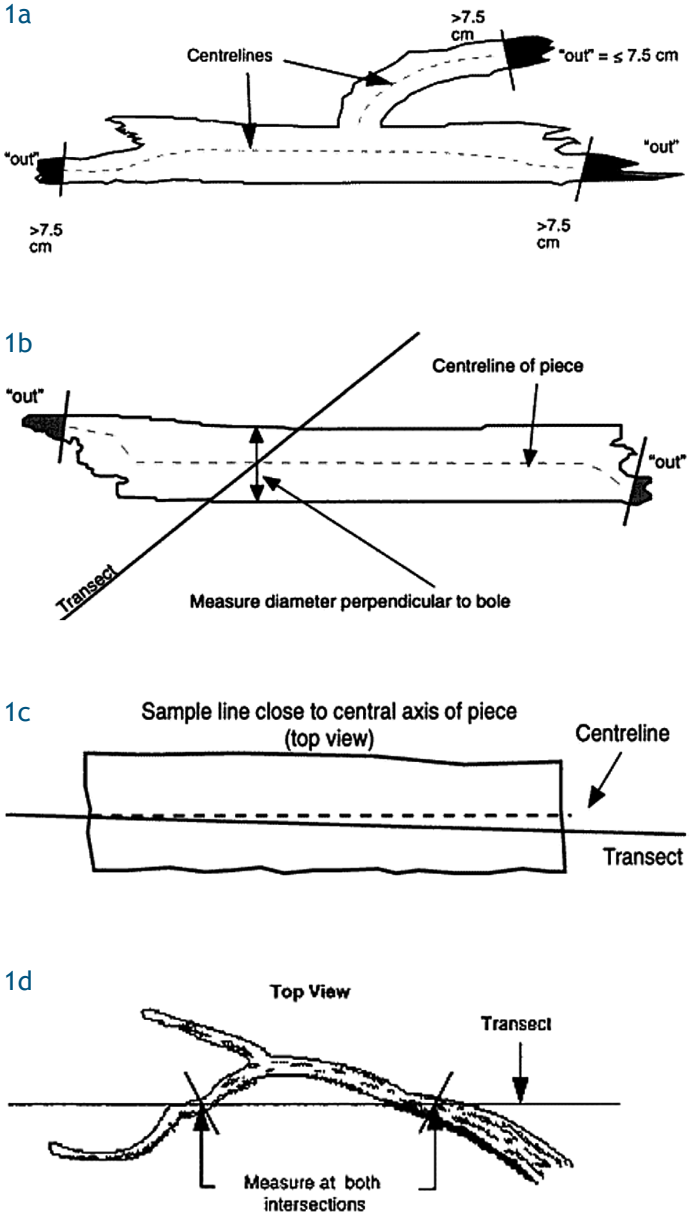


Figure A4-1. Rules for sampling CWD.

- Coarse woody debris must be greater than 7.5 cm in diameter (or equivalent) at the line intersect point (see Figure A4-1a). There is NO minimum length.
- The transect must cross the central axis of the piece (see 1b).
- If the transect coincides closely with the centreline, make the best decision as to whether the line crosses the centreline and where (see 1c).
- If the transect intersects a curved or angular piece more than once, measure each intersection as a separate observation (see 1d).
- If a log has split open, but is still partially held together, record the diameter as if the piece were whole. If a stem has shattered into a number of distinct, unconnected pieces, record each piece that is greater than 7.5 cm in diameter at the point of sampling.
- Do not tally undisturbed stumps. Tally uprooted stumps and their exposed dead roots if they meet the other criteria.

- Tally only the CWD that lies above the soil (see Figure A4-2). A piece is no longer above the soil when it is entirely buried beneath a layer of surface organic matter (forest floor) and/or mineral soil. Estimate an "equivalent" diameter for the remaining portion of logs where part of the wood has decayed and become part of the soil layer.

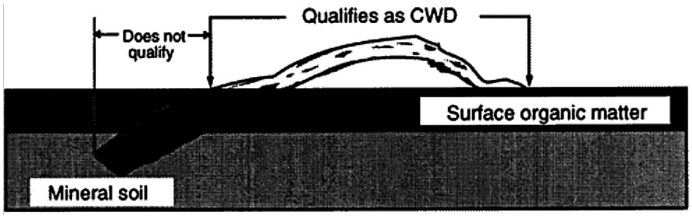


Figure A4-2. Tally only CWD that lies above the soil.

CWD Length

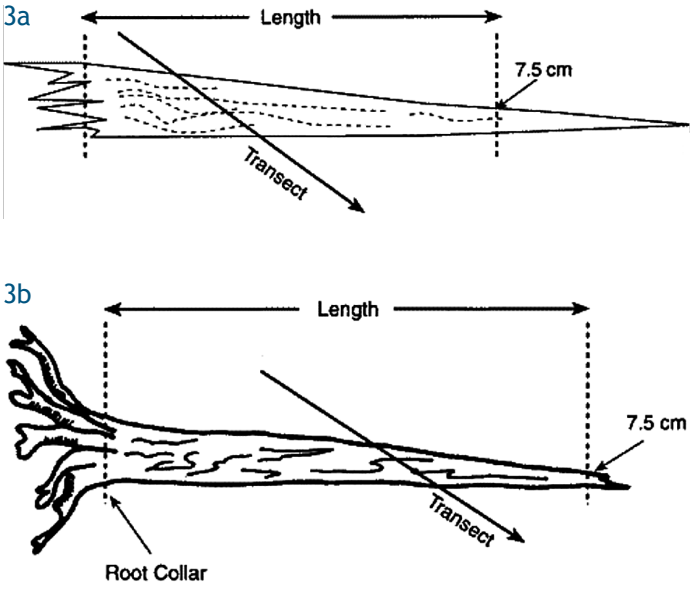


Figure A4-3. Rules for measuring length of CWD.

Record the length of each piece to the nearest 0.1 m (see Figure A4-3a).

- If a log has broken lengthwise but is still partially held together, record the equivalent length as if the piece were whole.
- If the end(s) of the piece are broken, visually fold in the broken sections to compensate for the missing parts.
- Piece length is from the largest end down to the 7.5-cm diameter limit.

Measurement of stems from attached roots:

- For main boles with exposed roots, piece length is measured only down to the root collar (see 3b).
- If a root mass is transected, piece length for individual roots (larger than the minimum diameter) is measured only up to the root collar (see 3c).

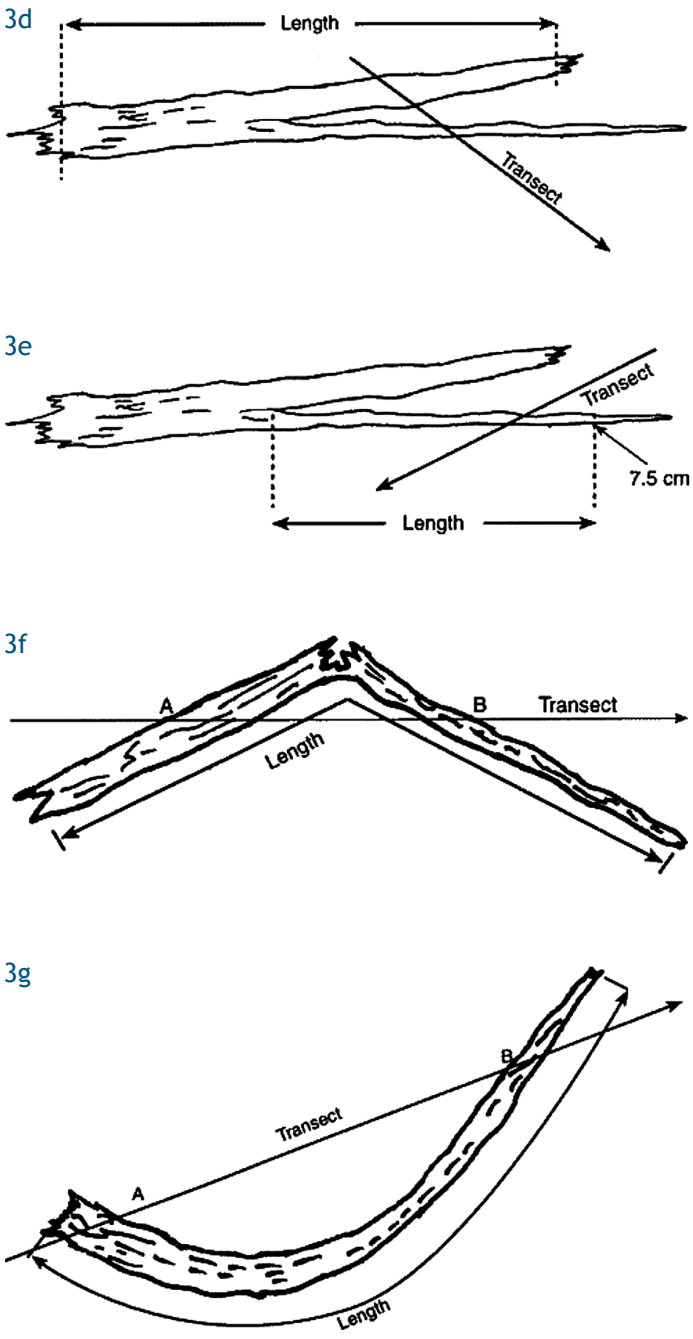


Figure A4-3. Rules for measuring length of CWD (cont.).

Measurement of forked stems

- Where one of the forks transected is determined (by largest diameter) to be a continuation of the main bole then the length will be measured to the ends of the main piece (see 3d).
- The piece length of the smaller stem(s) (smaller diameter) will be measured only to the junction with the main bole (see 3e).
- For forks of near equal stature, make a determination as above and measure accordingly.

Measurement of pieces that are crossed more than once on the transect:

- Pieces broken but still physically attached are measured as one piece at each transect point. The length measurement is taken along the central axis of the piece (see 3f).
- The full piece length of curved/crooked pieces is measured at both crossings (see 3g).
- In the same manner as above, record the full piece length twice where the same piece is crossed by two transects at right angles to each other.

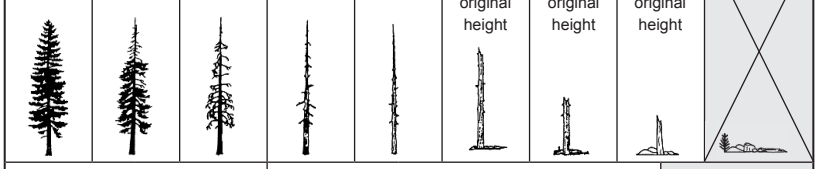
Appendix 6. Reference — Form D Side 1

BRITISH COLUMBIA Forest and Range Evaluation Program

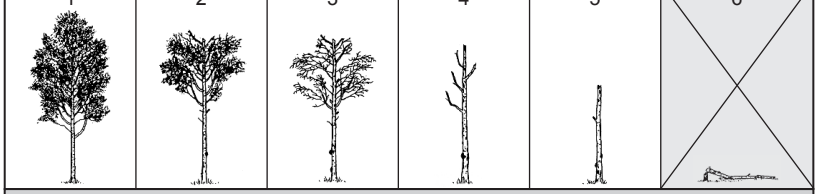
Stand-level Biodiversity
Resource Stewardship Monitoring
Reference – Form D Side 1

Wildlife Tree Class

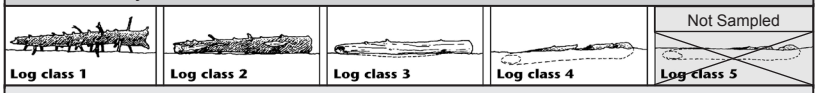
Live		Dead						Dead Fallen
		Hard →			Spongy	→ Soft		Not Sampled
1	2	3	4	5	6 ≈ 2/3 original height	7 ≈ 1/2 original height	8 ≈ 1/3 original height	9



Live		Dead			Dead Fallen
		Hard →	Spongy	→ Soft	Not Sampled
1	2	3	4	5	6



CWD Decay Class



Log class 1	Log class 2	Log class 3	Log class 4	Log class 5 (Not Sampled)
Hard	Sap rot (but still hard)	Advanced decay (spongy)	Extensive decay (crumbles/mushy)	Many small pieces, soft
Bark firm	Loose bark	Bark trace/absent	Bark absent	Bark absent
Elevated	Sagging	Sagging to settled on ground	Fully settled on ground	Partly sunken in ground
Hard branches with twigs	Soft branches	Branches stubs/ absent	No branches	No branches
Supports person	May not support person	Breaks easy	Shape collapses when stepped on	Collapsed oval
No invading roots	No invading roots	Roots in sapwood	Roots in heartwood	Roots in heartwood

Plot Radius Factor

$$PRF = \frac{1}{2\sqrt{BAF}}$$

BAF	PRF	BAF	PRF	BAF	PRF	BAF	PRF
1	.500	6	.204	11	.151	16	.125
2	.354	7	.189	12	.144		
3	.289	8	.177	13	.139	18	.118
4	.250	9	.167	14	.134		
5	.224	10	.158	15	.129	20	.112

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Appendix 7. Reference — Form D Side 2

BRITISH COLUMBIA Forest and Range Evaluation Program

Stand-level Biodiversity
Resource Stewardship Monitoring
Reference – Form D Side 2

British Columbia Tree Code List

NATIVE CONIFERS

Cedar	**Thuja**	**C**
western redcedar	*T. plicata*	Cw
Cypress	Chamaecyparis	Y
yellow-cedar	*C. nootkatensis*	Yc
Douglas-fir	**Pseudotsuga**	**F**
Douglas-fir	*P. menziesii*	Fd
coastal Douglas-fir	*P. menziesii* var. *menziesii*	Fdc
interior Douglas-fir	*P. menziesii* var. *glauca*	Fdi
Fir (Balsam)	**Abies**	**B**
amabilis fir	*A. amabilis*	Ba
grand fir	*A. grandis*	Bg
subalpine fir	*A. lasiocarpa*	Bl
Hemlock	**Tsuga**	**H**
mountain hemlock	*T. mertensiana*	Hm
western hemlock	*T. heterophylla*	Hw
mountain x western hemlock hybrid	*T. mertensiana* x *heterophylla*	Hxm
Juniper	**Juniperus**	**J**
Rocky Mtn. juniper	*J. scopulorum*	Jr
Larch	**Larix**	**L**
alpine larch	*L. lyallii*	La
tamarack	*L. laricina*	Lt
western larch	*L. occidentalis*	Lw
Pine	**Pinus**	**P**
jack pine	*P. banksiana*	Pj
limber pine	*P. flexilis*	Pf
lodgepole pine	*P. contorta*	Pl
lodgepole pine	*P. contorta* var. *latifolia*	Pli
lodgepole x jack pine hybrid	*P.* x *murraybanksiana*	Pxj
ponderosa pine	*P. ponderosa*	Py
shore pine	*P. contorta* var. *contorta*	Plc
western white pine	*P. monticola*	Pw
whitebark pine	*P. albicaulis*	Pa
Spruce	**Picea**	**S**
black spruce	*P. mariana*	Sb
Engelmann spruce	*P. engelmannii*	Se
Sitka spruce	*P. sitchensis*	Ss
white spruce	*P. glauca*	Sw
spruce hybrid	*Picea cross*	Sx
Engelmann x white	*P. engelmannii* x *glauca*	Sxw
Sitka x white	*P.* x *lutzii*	Sxl
Sitka x unknown hybrid	*P. sitchensis* x ?	Sxs
Yew	**Taxus**	**T**
western yew	*T. brevifolia*	Tw

NATIVE HARDWOODS

Alder	**Alnus**	**D**
red alder	*A. rubra*	Dr
Apple	**Malus**	**U**
Pacific crab apple	*M. fusca*	Up
Arbutus	**Arbutus**	**R**
Arbutus	*A. menziesii*	Ra
Aspen, Cottonwood, or Poplar	**Populus**	**A**
poplar	*P. balsamifera*	Ac
balsam poplar	*P. b.* ssp. *balsamifera*	Acb
black cottonwood	*P. b.* ssp. *trichocarpa*	Act
hybrid poplars	*P.* spp.	Ax
trembling aspen	*P. tremuloides*	At
Birch	**Betula**	**E**
Alaska paper birch	*B. neoalaskana*	Ea
Alaska x paper birch hybrid	*B.* x *winteri*	Exp
paper birch	*B. papyrifera*	Ep
water birch	*B. occidentalis*	Ew
Cascara	**Rhamnus**	**K**
cascara	*R. purshiana*	Kc
Cherry	**Prunus**	**V**
bitter cherry	*P. emarginata*	Vb
choke cherry	*P. virginiana*	Vv
pin cherry	*P. pensylvanica*	Vp
Dogwood	**Cornus**	**G**
Pacific dogwood	*C. nuttallii*	Gp
Maple	**Acer**	**M**
bigleaf maple	*A. macrophyllum*	Mb
vine maple	*A. circinatum*	Mv
Oak	**Quercus**	**Q**
Garry oak	*Q. garryana*	Qg
Willow	**Salix**	**W**
Bebb's willow	*S. bebbiana*	Wb
Pacific willow	*S. lucida*	Wp
peachleaf willow	*S. amygdaloides*	Wa
pussy willow	*S. discolor*	Wd
Scouler's willow	*S. scouleriana*	Ws
Sitka willow	*S. sitchensis*	Wt
UNKNOWNS		
Unknown		X
Unknown conifer		Xc
Unknown hardwood		Xh
OTHERS		
Other tree, not on list		Z
Other conifer		Zc
Other hardwood		Zh

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Appendix 8. Data cleaning of field cards — Stand-level biodiversity

Suggested Methodology

- Order your cards to make it easier to review, Form C, then each Form B with related plot cards.
- Check RESULTS for the opening ID. See if NAR and Gross areas agree (cards to RESULTS), if they don't then investigate. Generally accept the RESULTS NAR if only a few hectares different and tweak the cards as necessary (i.e., make sure the sum of harvest strata area equals NAR). If Gross area is different determine if it is due to external retention that was not included in gross area for RESULTS. That is a legitimate change – which should show up as an "override" area.
- Confirm all retention acknowledged in the SP or RESULTS is accounted for on cards (check Forest Cover in RESULTS screen – MAT/NAT usually means a reserve). If some retention seems to be missing then look for evidence of their existence in photos. If you have confirmation of their existence – and they are not a big component of the retention – then add them in as unsampled strata (using known info such as area, location of retention).
- Confirm that separate (non-contiguous) patches are not lumped together on one Form B. If they are, they need to be separated.
- Check the list of strata that are unsampled. None of them should be a dispersed stratum. Make sure there is no duplication between section 16 and Form B's.
- Confirm all stratum ID meets the rules (maximum of three letters followed by maximum of two numbers). If a stratum is entire area of NAR – it should have stratum ID of "NAR."
- Confirm all stratum ID are consistent (i.e., identical) between Form B and the related plot cards.
- Confirm all plot type (i.e., PW, DW, etc) are identical between Form B and the related plot cards. Pay closest attention to make sure all retention strata are correctly differentiated between rotation length strata and temporary strata. Temporary strata are those we have evidence that harvesting will occur before a full rotation is over. Retention left after a partial cut silvicultural system (e.g., commercial thinning or shelterwood) will be considered temporary unless there is a statement that contradicts that in the SP.
- Add up all the stratum areas to make sure they don't exceed gross (or override area).
- Review every card for complete information.
- Review plot cards for correct species codes and any anomalies in tree size.
- Make sure the same BAF or fixed area is used on all plots in single stratum.
- If a full count area – all stand table trees show up on first plot. The CWD data should be on separate plots.

When you've finished checking cards:

- re-order the plots for data entry (Form C, all Form B's, all Form A's).
- Headquarters only – document major changes for that opening ID (with rationale), note any communication with the district. Keep an electronic copy as a district file and put a paper copy in the folder.
- Headquarters only – sign your name on the folder for data validation.