

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 http://www.for.gov.bc.ca/hfp/frep/3_indicators.html

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

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BRITISH
COLUMBIA

Ministry of Forests
Ministry of Water, Land and Air Protection
Ministry of Sustainable Resource Management



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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 FRPA Resource 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 the FRPA Resource Evaluation Program.

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

- 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 resource stewardship monitoring. These principles ensure that the data collected and analyzed can be used at multiple scales (district, region and province) with statistical validity and credibility.

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 resource stewardship monitoring will be selected using random sampling.

The number of sites sampled can vary depending on available resources, variability across the population, or the anticipation of problem sites. For 2005, the number of sites sampled per forest district is set at 15, although a district may choose to sample more sites.

For additional information on the site selection process, refer to *Protocol for 2005 Resource Stewardship Monitoring* at: (http://www.for.gov.bc.ca/hfp/frep/7_rsm.html).

Site Selection Criteria for Stand-level Biodiversity for 2005

For stand-level biodiversity, each participating district will be provided with a population list of 200 sites randomly generated from the Forest Tenure Administration (FTA). The list is located on the Forest Practices Branch FTP server at: ([ftp/hfp/mof_internal/publish/resourcestewardshipmonitoring](ftp://hfp/mof_internal/publish/resourcestewardshipmonitoring)).

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

- Cutblocks limited to those harvested under the Forest Practices Code based on silviculture prescriptions (SPs) approved after June 15, 1997 to ensure that SPs were prepared and forest practices were conducted under full knowledge of Code regulations and the principles and objectives of biodiversity management guidelines.
- Cutblocks limited to those harvested no later than the end of 2003 to ensure all reserves were exposed to at least two years of post-harvest environmental conditions (e.g., storms)
- Cutblocks must be greater than 2.0 hectares in size (cutblocks less than two hectares in size harvested under mountain pine beetle salvage will be monitored separately).

If the site meets the above criteria and contains a stream, it can also be assessed for riparian-fish at the same time.

If a district completes sampling the first 15 blocks from the list and wishes to collect additional data, 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. Questions regarding whether a site is in or out of the defined population should be referred to the Resource Value Team (RVT). One reason a site may be deleted from the population is 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.

Indicators

The indicators used to assess stand-level biodiversity include:

- tree species and size (height and diameter)
- wildlife tree class 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 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).

For field sampling, you will need:

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

Note: You will use only one prism of a chosen BAF per reserve (e.g., BAF 6).

- compass
- diameter tape
- diameter stick (optional) – with centimetres marked off
- 30-metre tape
- clinometer
- calculator
- laser range finder (optional – but highly recommended)
- flagging tape and marking pen
- GPS
- increment borer (optional)
- binoculars (optional)
- digital camera
- clipboard or field binder to hold field forms
- field forms (FS 1237-A1, A2, B1, B2, C1, C2, D1, D2) and a copy of this protocol.

General Office Procedures

1. Determine the “population” and select random samples as per Sampling Design section.
2. 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. Randomly pick one dot 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.
3. Similarly, locate three plots in the areas of dispersed retention and/or harvest areas. Harvest area plots are established to assess any dispersed retention and coarse woody debris.
4. Fill in as much of Form C (Section 11) on a cutblock field card and the anticipated number of plot cards and reserve summary cards as necessary for the particular block. Number all plots consecutively, starting with 1 for each new block.
5. Fill in a reserve summary card for each patch reserve 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.

Filling in the Field Forms

This section will lead you through the process of filling out stand-level biodiversity resource stewardship monitoring forms (A, B and C).

Section

Instructions/Descriptions

Plot Information

Form A – Side 1



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FRPA Resource
Evaluation Program

**Stand-level Biodiversity
Resource Stewardship Monitoring**

Plot Information – Form A Side 1

1 Plot Identification

Date _____ Assessed by _____

Opening Number _____

Licence # _____ CP # _____ Block _____

Plot # _____ Reserve ID _____

Reserve Type _____ UTM or lat/long _____

2 Plot Information (trees)

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

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1 Plot Identification

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

Assessed by – name(s) of assessors.

Opening # – opening number from RESULTS.

Licence # – Licence number from RESULTS or post-harvest map.

CP # – CP number from RESULTS or post-harvest map.

Block # – block number from RESULTS or post-harvest map.

Plot # – unique plot identification number.

Reserve ID – unique plot ID number (generally from post-harvest map).

Reserve Type – reserve code from Form B – Side 2.

UTM or Lat/Long – record one of UTM or Lat/Long for plot centre.

2 Plot Information (trees)

Fill in **one** of:

BAF – record basal area factor.

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

Full count – record area (ha) to which full count applies.

3 Stand Table

Tree # – number each tree in plot.

Spp. – record species using codes on Reference Form – Side 2 (FS 1237-D2).

WT Class – record wildlife tree class using codes on Reference Form – Side 1 (FS 1237-D1).

DBH (cm) – diameter in cm +/- 10%.

HT (m) – height in metres +/- 10%.

Comments – record comments on individuals trees or plot.

Section

Instructions/Descriptions

Plot Information

Form A – Side 2



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**Stand-level Biodiversity
Resource Stewardship Monitoring**

Plot Information – Form A Side 2

4 Plot Information (CWD)					
Coarse Woody Debris (30 m transect)					No CWD in transect ☐
Log #	Spp.	Decay Class	Dia. (cm)	Length (m)	Comments

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4 Plot Information (CWD)

Coarse Woody Debris (30 m transect)

No CWD in transect – tick box if no CWD found on transect; if CWD found, record in table provided.

Log # - number each piece of CWD on transect that is >7.5 cm diameter and CWD class 1-4 (see Reference Form - Side 2 (FS 1237-D2)).

Spp. – record species using codes on Reference Form – Side 2 (FS 1237-D2). If species unknown, record X.

Decay Class – record CWD decay class using codes on Reference Form – Side 1 (FS 1237-D1) for CWD classes 1–4.

Dia. (cm) – diameter in cm +/- 10%.

Length (m) – length in metres +/- 10%.

Comments – record comments on individual CWD or transect .

Section

Instructions/Descriptions

Reserve Summary
Form B – Side 1



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FRPA Resource
Evaluation Program

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

5 Patch/Dispersed Reserve Summary Location			
Date _____	Assessed by _____		
Opening # _____			
Licence # _____	CP # _____	Block _____	
Reserve ID _____	Reserve type _____		
# of plots in reserve _____	Mapped Reserve size (ha) _____		
BEC subzone variant and site series _____			
6 Patch/Dispersed Reserve Summary			
Reserve locations and size consistent with map? Yes ☐ No ☐ Not mapped ☐ If 'no' or 'not mapped', actual size (ha) _____			
Tick one of: Harvest area with no retention ☐ Harvest area with dispersed retention ☐ Patch reserve ☐			
Age of trees in reserve: Old growth ☐ Second growth ☐ Estimated age _____			
Reserve location/pattern: Patch – Internal to block ☐ Edge of block ☐ External/not touching block ☐ N/A ☐ Dispersed – Clumped ☐ Evenly distributed ☐ N/A ☐			
% of total trees in reserve windthrown: < 5 ☐ 5–15 ☐ 16–30 ☐ >30 ☐			
Distribution of windthrow: Edge only ☐ Edge and internal ☐ N/A ☐			
Windthrow treatment in reserve: Feathering ☐ Topping ☐ None ☐ Other ☐			
Distance from reserve to nearest patch reserve _____ m			
7 Reserve Constraints	% of reserve	Ecological Anchors	count
Wetland		Bear den	
Recreation feature		Hibernaculum	
Non (or low) merch timber		Vet tree	
RRZ		Mineral lick	
Non-commercial brush		Large stick nest	
Rock outcrop		Karst feature	
RMZ		Largest trees for site	
Sensitive terrain or soil		CWD heavy natural concentration	
Ungulate wintering area		Active wildlife trails	
WHA		Cavity nest	
OGMA		Large hollow tree	
Other: _____		Active WLT/CWD feeding	
		Uncommon tree species	
		Large witches broom	
		Other: _____	
None	☐	None	☐
Comments:			

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5 Patch and/or Dispersed Reserve
Summary Location

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

Assessed by – name(s) of assessors.

Opening number – opening number from RESULTS.

Licence # – Licence number from RESULTS or post-harvest map.

CP # – CP number from RESULTS or post-harvest map.

Block # – block number from RESULTS or post-harvest map.

Reserve ID – unique plot ID number (generally from post-harvest map).

Reserve Type – reserve code as recorded on Form A – Side 1.

of plots in reserve – record the number of plots established in the reserve/strata.

Mapped reserve size – record reserve size from RESULTS or harvest map.

BEC subzone variant and site series – record as per site map.

6 Patch and/or Dispersed Reserve Summary

Reserve location and size consistent with map? – tick one of the boxes indicating yes, no or not mapped. If not consistent, or not mapped, record the estimated size in hectares.

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.

Age of trees in reserve – tick appropriate box indicating if old growth or second growth is retained in the reserve. Use pre-harvest inventory label, local knowledge or bore the tree. Use the age class for old growth by BEC unit. For example, 9 (> 250) for NDTs 1, 2 and 4, age class 8 or more (> 140) for NDT3 (age class 5+ > 100 for the BWBS) as per the *Biodiversity Guidebook* (1995). Confirm approximate age through field verification – occasional coring of trees, or counting the rings on stumps.

Section	Instructions/Descriptions																																																																				
Reserve Summary Form B – Side 1 (cont.)	<p><i>Reserve location/pattern:</i> – tick the appropriate box identifying the location of the reserve or dispersed area.</p> <p><i>% of total trees in reserve windthrown</i> – tick off box closest to the estimated windthrow level. Tick box indicating the distribution pattern of windthrow and the box identifying any observed or known windthrow management treatments. Where distribution of windthrow is only internal, scratch out “edge” and tick box.</p> <p><i>Distance from this reserve to next nearest patch reserve</i> – record the distance to the closest reserve area. This can be a WTP, riparian reserve or area such as an OGMA. Do not record the distance to forest edge unless this area is known to be a “permanent” reserve area. Use a range finder, or measure from the map to the nearest 10 metres.</p>																																																																				
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Section

Instructions/Descriptions

Reserve Codes/Plot Guidance Form B – Side 2

Reserve Codes and Plot Guidance

This form provides reference material for:

- reserve codes
- plot establishment
- CWD transects.



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

8 Reserve 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 other than purpose fo 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 other than purpose of 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).
DU	Dispersed unidentified	Not mapped and no indication on map regarding purpose of dispersed and trees are not in a RMA.

9 Guidance for plot establishment (trees)

- For strata with very low retention levels, do a full count (e.g., < 15 trees/strata).
- 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 strata.

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.

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Section	Instructions/Descriptions																						
Block Information Form C – Side 1	11 Opening Identification The header information can be filled in at the office with information from the map and post-harvest map or RESULTS. <i>Opening #</i> – from RESULTS. <i>Licence #</i> – from RESULTS or post-harvest map. <i>CP #</i> – from RESULTS or post-harvest map. <i>Block #</i> – from RESULTS or post-harvest map. <i>Licensee</i> – from RESULTS or post-harvest map. <i>District</i> – enter name of district. <i>Year of Harvest</i> – enter year of harvest from RESULTS (if doing a pre-harvest block – note that here). <i>Location Descriptor</i> – general description of location (e.g., Fury Creek). <i>Net Area to be Reforested (NAR) (ha)</i> – enter the total net area to be reforested (the total hectares actually receiving reforestation treatment). <i>Gross area</i> – equivalent to “total area under prescription” (i.e., inclusive of all reserves associated with the cutblock). <i>% NP unnat (non-productive un-natural)</i> – enter percentage of cutblock area in permanent roads and landings. This percentage is normally noted on the map. <i>Landscape Unit</i> – name of Landscape Unit. <i># of patch reserves in block</i> – record the number of patch reserves identified on site map or in RESULTS. <i># of patch reserves sampled</i> – record the number of reserves that were sampled. Note: Whether or not a reserve has been sampled, please fill out Form B – Side 1, section A.																						
 BRITISH COLUMBIA FRPA Resource Evaluation Program Stand-level Biodiversity Resource Stewardship Monitoring Block Information – Form C Side 1																							
11 Opening Identification Opening # _____ Licence # _____ CP# _____ Block _____ Licensee: _____ District: _____ Year of Harvest: _____ Location Description: _____ Net Area to be Reforested (ha): _____ Gross area (ha) _____ % NP unnat _____ Landscape Unit: _____ # of patch reserves in block _____ # of patch reserves sampled _____																							
12 Photo Section <table border="1"> <thead> <tr> <th>Photo #</th> <th>Comments/location</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Photo #	Comments/location																					
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12 Photo Section

Record photo numbers and other information that will help you identify where photos were taken once back in the office.

13 Quality Control Self Assessment

This section is a self assessment of the data you have collected in order to:

- ensure calibrated data precision and accuracy
- ensure data consistency and eliminate data blanks and/or missing information.

Please review the questions before and after data collection.

Section

Instructions/Descriptions

Block Summary Form C – Side 2



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

14 Innovative Practices

Were any innovative and/or unique forest practices used on this block (e.g. wildlife tree creation, re-distribution of CWD, small piles of CWD for habitat, etc.)? Please describe.

15 Invasive Plants

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

Species Code / Distribution Code

Comments:

16 Professional Opinion/Comments

In your professional opinion, 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 for opinion and general comments:

14 Innovative Practices

Were any innovative and/or unique forest practices used on this block (e.g., wildlife tree creation, redistribution of CWD, small piles for CWD habitat etc.)? Please note and describe any practices other than variations in levels of retention that can impact stand-level biodiversity.

15 Invasive Plants

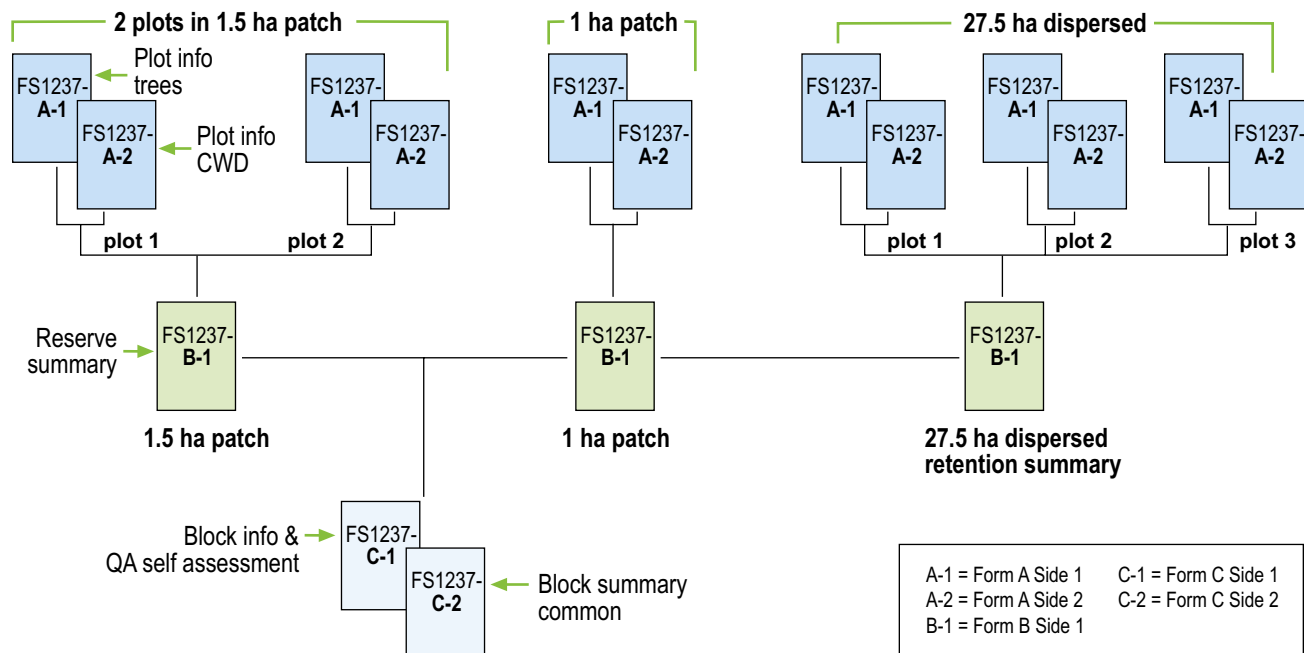
Tick one of the boxes to indicate the presence or absence of invasive plants. If you do not know, tick "don't know." Record species and distribution code (e.g., CT/10) from Reference Form, Sides 1 and 2.

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.

Section	Instructions/Descriptions
Block Summary Form C – Side 2 (cont.)	16 Professional Opinion/Comments <i>In your professional opinion, to what extent did the practices on this block maintain stand-level biodiversity, given the likely opportunities that were available – tick one of: poorly, moderately, well, excellent or don't know.</i> 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: <ul style="list-style-type: none"> Species mix is different from pre-harvest (e.g., Pw left in Fd dominated stand) – this is often considered good as it provides greater species diversity and a possible seed source of a rust resistant tree. However, mistletoe-laden hemlock left in a stand dominated by Fd and the block being left for naturals 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 (e.g., shorter than pre-harvest trees may be better if taller trees are susceptible to blow down). However, there may be a need for longer term inputs of CWD where a few younger patches are considered good; in other cases shorter stunted unhealthy trees may be considered bad, as they will not age well and will not create desired characteristics. Amount of standing retention – high levels of retention with good ecological anchors is a good thing; high levels of retention with no ecological anchors is not necessarily good. Amount of CWD – presence of long (> 12 m) logs in decay class 1, 2 and 3 in the harvested area is good.
 BRITISH COLUMBIA FRPA Resource Evaluation Program	
Stand-level Biodiversity Resource Stewardship Monitoring Block Summary – Form C Side 2	
14 Innovative Practices Were any innovative and/or unique forest practices used on this block (e.g. wildlife tree creation, re-distribution of CWD, small piles of CWD for habitat, etc.)? Please describe.	
15 Invasive Plants Were invasive plant species present on this block? Yes ☐ No ☐ Don't know ☐ Species Code / Distribution Code _____ Comments: _____ _____ _____	
16 Professional Opinion/Comments In your professional opinion, 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 for opinion and general comments:	

Figure 1 shows field cards required to fully sample a 30-hectare cutblock with two wildlife tree patches and dispersed retention.



Suggested Number of Plots in Post-harvest Cutblock

The number of plots to establish is based on the stand conditions for the block in question. In general, this is one plot per hectare, up to a maximum of 5 plots per patch, with a higher density of plots where variability is higher. The following table outlines the intensity of sampling for four different scenarios.

Description of retention	# of plots in cutblock
No trees > 12.5 dbh retained in cutblock	3 plots in harvest area
Evenly distributed dispersed retention only	3 plots dispersed area
< 2 ha patch retention	1–2 plots in patch retention 3 plots in harvest area
> 3 ha patch retention plus evenly distributed dispersed retention	3–5 plots in patch retention 3 plots in dispersed retention

General Procedures for Establishing Plots

- Establish plot centres with flagging tape.
- Record plot #, date of assessment, and identify as RSM plot on flagging tape.
- For strata with very low retention levels, conduct a fixed-area plot (e.g., 15 trees/strata).
- Target is 6–10 trees/plot.
- For fixed-area plots, a 30-m radius is recommended. When adjusting this radius to try and achieve the target number of trees, go up or down in 5-m increments to a maximum of 50 m and a minimum of 15 m.
- For basal area and fixed-area plots, use the same BA or plot radius for all plots within a given strata (reserve).
- If doing a full count of all trees in a specified area, note the area. For dispersed retention, this will typically be the full area of NAR, or the full area of one or more standard units.
- It is recommended that the total number of trees sampled on any one cutblock be approximately 30; where very low levels of retention occur, 30 trees may not be practical.
- Prism sweeps should be done in patch areas or areas of dense dispersed retention.

Borderline Trees

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: $LD = \frac{0.5}{\sqrt{BAF}} DBH$

For example, if when using a prism with a BAF of 4, the PRF is $0.5/2 = 0.25$.

If you have measured a 30-cm tree, it must be within 7.5 m from the plot centre to be in ($0.25 \times 30 = 7.5$). If the distance to the pith of the tree is > 7.5 m (at 1.3 m DBH), it is out.

Wildlife Tree Classes

(Species codes are found in Appendix 2)

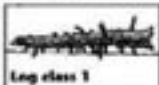
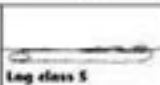
Wildlife Tree Class								
Live		Dead						Dead Fallen
		Hard			Spongy	Soft		
1	2	3	4	5	6 ≈ 2/3 original height	7 ≈ 1/2 original height	8 ≈ 1/3 original height	9
								
Live			Dead				Dead Fallen	
1	2	3	4	5	6			
								

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, visit the following web site: <http://srmwww.gov.bc.ca/risc/pubs/teecolo/fmdte/cwd.htm#sampling%20Methods>.

The following are CWD decay classes. 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					
	I	II	III	IV	V
Characteristics of fallen Douglas-fir*					
Bark	intact	intact	trace	absent	absent
Twigs	present	absent	absent	absent	absent
Texture	intact	intact to partly soft	hard, large pieces	small, soft block pieces	soft and powdery
Shape	round	round	round	round to oval	oval
Colour of wood	original colour	original colour	original colour to faded	light brown to reddish brown	red brown to dark brown
Portion of tree on ground	tree elevated on support points	tree elevated on support points but sagging slightly	tree sagging near ground	all of tree on ground	all of tree on ground
Invading roots	none	none	in sapwood	in heartwood	in heartwood

* Characteristics of other tree species may differ. Five other species use texture, shape, and invading roots to determine decay class.

Completed Plot Cards

Keep a copy of all plot cards and maps. 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

Data Management Procedures

Stand-level biodiversity resource stewardship monitoring data analysis procedures will be posted on the FREP web site by July 1, 2005.

Help

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

Nancy Densmore (250) 356-5890 or Nancy.Densmore@gems2.gov.bc.ca

Richard Thompson (250) 356-5467 or Richard.Thompson@gov.bc.ca

Peter Bradford (250) 365-2134 or Peter.Bradford@gems1.gov.bc.ca

Plot Information - Form A Side 1

[illegible]

Plot Information - Form A Side 2



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Plot Information - Form A Side 2

4 Plot Information (CWD)					
Coarse Woody Debris (30 m transect)					No CWD in transect ☐
Log #	Spp.	Decay Class	Dia. (cm)	Length (m)	Comments
1	Pli	3	20	12	→ broken top from tree outside of plot
2	Fdi	4	30	3	

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Reserve Summary - Form B Side 1



FRPA Resource
Evaluation Program

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

5 Patch/Dispersed Reserve Summary Location			
Date <u>2005/08/17</u>		Assessed by <u>L.P. / K.A.</u>	
Opening # <u>93B013.048</u>			
Licence # <u>A20019</u>	CP # <u>753</u>	Block <u>15</u>	
Reserve ID <u>WTP 1</u>	Reserve type <u>PW</u>		
# of plots in reserve <u>1</u>	Mapped Reserve size (ha) <u>1.0</u>		
BEC subzone variant and site series <u>IDF dk4 / 01</u>			
6 Patch/Dispersed Reserve Summary			
Reserve locations and size consistent with map? Yes ☒ No ☐ Not mapped ☐ If 'no' or 'not mapped', actual size (ha) _____			
Tick one of: Harvest area with no retention ☐ Harvest area with dispersed retention ☐ Patch reserve ☒			
Age of trees in reserve: Old growth ☒ Second growth ☐ Estimated age _____			
Reserve location/pattern: Patch – Internal to block ☒ Edge of block ☐ External/not touching block ☐ N/A ☐ Dispersed – Clumped ☐ Evenly distributed ☐ N/A ☐			
% of total trees in reserve windthrown: < 5 ☒ 5–15 ☐ 16–30 ☐ >30 ☐ Distribution of windthrow: Edge only ☒ Edge and internal ☐ N/A ☐ Windthrow treatment in reserve: Feathering ☐ Topping ☐ None ☒ Other ☐			
Distance from reserve to nearest patch reserve _____ <u>120</u> m			
7 Reserve Constraints		Ecological Anchors	
% of reserve			count
	Wetland	Bear den	
	Recreation feature	Hibernaculum	
	Non (or low) merch timber	Vet tree	2
	RRZ	Mineral lick	
	Non-commercial brush	Large stick nest	
10	Rock outcrop	Karst feature	
	RMZ	Largest trees for site	1
	Sensitive terrain or soil	CWD heavy natural concentration	
100	Unquale wintering area	Active wildlife trails	
	WHA	Cavity nest	
	OGMA	Large hollow tree	
	Other: _____	Active WLT/CWD feeding	1
		Uncommon tree species	
		Large witches broom	
		Other: _____	
	None ☐	None ☐	
Comments: <div style="text-align: center; padding: 10px;"><i>observed deer in patch</i></div>			

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Block Information - Form C Side 1



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Evaluation Program

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

11 Opening Identification	
Opening #	<u>93B 013 048</u>
Licence #	<u>A20019</u> CP# <u>753</u> Block <u>15</u>
Licensee:	<u>Riverside F.P.</u>
District:	<u>DCH</u> Year of Harvest: <u>1997</u>
Location Description:	<u>Mt. Alexis</u>
Net Area to be Reforested (ha):	<u>55.9</u> Gross area (ha) <u>65.3</u>
% NP unnat	Landscape Unit: <u>Alexis</u>
# of patch reserves in block	<u>2</u> # of patch reserves sampled <u>2</u>
12 Photo Section	
Photo #	Comments/location
1	Block overview from road Jct. (SE)
2	Plot Ctr. WTP 1 looking north
3	" " WTP 2 " " (plot 3)
13 Quality Control Self Assessment	
Question 1 Have you gone through all the questions/fields and entered a value or "N/A" and other acknowledgements (such as "X" or "—") to indicate the fields or questions have been assessed? Please leave no blanks. Yes ☒	
Question 2 Did you calibrate your visual estimates (e.g., height, diameter) with actual measurement on each site? Both "precision" and "accuracy" are critical. Yes ☒	
Question 3 Did you complete all field data on the forms before leaving the site? This helps ensure accurate data recording. Yes ☒	
Question 4 Did you look for invasive plants, innovative forest practices and ecological anchors when travelling between plots? Yes ☒	
Accuracy – Height and diameter estimates should be within $\pm 10\%$.	

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Block Information - Form C Side 2



FRPA Resource
Evaluation Program

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

14 Innovative Practices
<p>Were any innovative and/or unique forest practices used on this block (e.g. wildlife tree creation, re-distribution of CWD, small piles of CWD for habitat, etc.)? Please describe.</p> <p style="margin-top: 10px;">None.</p>
15 Invasive Plants
<p>Were invasive plant species present on this block? Yes ☐ No ☒ Don't know ☐</p> <p>Species Code / Distribution Code</p> <p>Comments:</p>
16 Professional Opinion/Comments
<p>In your professional opinion, to what extent did the practices on this cutblock maintain stand-level biodiversity, given the opportunities that were likely available.</p> <p>Poorly ☐ Moderately ☐ Well ☐ Excellent ☒ Don't know ☐</p> <p>Rationale for opinion and general comments:</p>
<p><i>This stand was selectively harvested.</i></p>
<p><i>The remaining stand has a mix of species and stand structure — with scattered vets throughout the block.</i></p>
<p><i>Observed two moose (cow/calf), two black bears and three white tailed deer while on block.</i></p>

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Appendix 2. Reference - Form D Side 1



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

Wildlife Tree Class								
Live		Dead						Dead Fallen
		Hard			Spongy	Soft		
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	
1	2	3	4	5	6			
CWD Decay class								
	I	II	III	IV	V			
Characteristics of fallen Douglas-fir*								
Bark	intact	intact	trace	absent	absent			
Twigs	present	absent	absent	absent	absent			
Texture	intact	intact to partly soft	hard, large pieces	small, soft block pieces	soft and powdery			
Shape	round	round	round	round to oval	oval			
Colour of wood	original colour	original colour	original colour to faded	light brown to reddish brown	red brown to dark brown			
Portion of tree on ground	tree elevated on support points	tree elevated on support points but sagging slightly	tree sagging near ground	all of tree on ground	all of tree on ground			
Invading roots	none	none	in sapwood	in heartwood	in heartwood			
* Characteristics of other tree species may differ. Five other species use texture, shape, and invading roots to determine decay class.								
Invasive Plants Distribution Code Chart								
0 no occurrence	4 several sporadically spread individuals	8 spread throughout site with some gaps						
1 rare or single occurrence	5 clustered in a few spots	9 spread densely throughout						
2 a few spread sporadically throughout	6 clustered in several spots	10 distributed on roadside only						
3 cluster in a single spot	7 spread uniformly throughout							

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Appendix 3. Reference - Form D Side 2



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

Invasive Plants Species Code Chart					
Name	Code	Name	Code	Name	Code
Annual Sowthistle	AS	Hound's Tongue	HT	Spotted Knapweed	SK
Canada Thistle	CT	Jointed Goatgrass	JG	Tansy Ragwort	TR
Crupina	C	Leafy Spurge	LS	Velvetleaf	VL
Dalmation Toadflax	DT	Perennial Sowthistle	PS	Wild Oats	WO
Diffuse Knapweed	DK	Purple Nutsedge	PN	Yellow Nutsedge	YN
Dodder	D	Rush Skeletonweed	RS	Yellow Starthistle	YS
Gorse	G	Scentless Chamomile	SC	Yellow Toadflax	YT

British Columbia Tree Code List					
NATIVE CONIFERS			NATIVE HARDWOODS		
Cedar	Thuja	C	Alder	Alnus	D
western redcedar	<i>T. plicata</i>	Cw	red alder	<i>A. rubra</i>	Dr
Cypress	Chamaecyparis	Y	Apple	Malus	U
yellow-cedar	<i>C. nootkatensis</i>	Yc	Pacific crab apple	<i>M. fusca</i>	Up
Douglas-fir	Pseudotsuga	F	Arbutus	Arbutus	R
Douglas-fir	<i>P. menziesii</i>	Fd	Arbutus	<i>A. menziesii</i>	Ra
coastal Douglas-fir	<i>P. menziesii</i> var. <i>menziesii</i>	Fdc	Aspen, Cottonwood, Populus		A
interior Douglas-fir	<i>P. menziesii</i> var. <i>glauca</i>	Fdi	or Poplar		
Fir (Balsam)	Abies	B	poplar	<i>P. balsamifera</i>	Ac
amabilis fir	<i>A. amabilis</i>	Ba	balsam poplar	<i>P. b. ssp. balsamifera</i>	Acb
grand fir	<i>A. grandis</i>	Bg	black cottonwood	<i>P. b. ssp. trichocarpa</i>	Act
subalpine fir	<i>A. lasiocarpa</i>	Bl	hybrid poplars	<i>P. spp.</i>	Ax
Hemlock	Tsuga	H	trembling aspen	<i>P. tremuloides</i>	At
mountain hemlock	<i>T. mertensiana</i>	Hm	Birch	Betula	E
western hemlock	<i>T. heterophylla</i>	Hw	Alaska paper birch	<i>B. neoalaskana</i>	Ea
mountain x western hemlock hybrid	<i>T. mertensiana</i> x <i>heterophylla</i>	Hxm	Alaska x paper birch hybrid	<i>B. x winteri</i>	Exp
Juniper	Juniperus	J	paper birch	<i>B. papyrifera</i>	Ep
Rocky Mtn. juniper	<i>J. scopulorum</i>	Jr	water birch	<i>B. occidentalis</i>	Ew
Larch	Larix	L	Cascara	Rhamnus	K
alpine larch	<i>L. lyallii</i>	La	cascara	<i>R. purshiana</i>	Kc
tamarack	<i>L. laricina</i>	Lt	Cherry	Prunus	V
western larch	<i>L. occidentalis</i>	Lw	bitter cherry	<i>P. emarginata</i>	Vb
Pine	Pinus	P	choke cherry	<i>P. virginiana</i>	Vv
jack pine	<i>P. banksiana</i>	Pj	pin cherry	<i>P. pensylvanica</i>	Vp
limber pine	<i>P. flexilis</i>	Pf	Dogwood	Cornus	G
lodgepole pine	<i>P. contorta</i>	Pl	Pacific dogwood	<i>C. nuttallii</i>	Gp
lodgepole pine	<i>P. contorta</i> var. <i>latifolia</i>	Plj	Maple	Acer	M
lodgepole x jack pine hybrid	<i>P. x murraybanksiana</i>	Pxj	bigleaf maple	<i>A. macrophyllum</i>	Mb
ponderosa pine	<i>P. ponderosa</i>	Py	vine maple	<i>A. circinatum</i>	Mv
shore pine	<i>P. contorta</i> var. <i>contorta</i>	Plc	Oak	Quercus	Q
western white pine	<i>P. monticola</i>	Pw	Garry oak	<i>Q. garryana</i>	Qg
whitebark pine	<i>P. albicaulis</i>	Pa	Willow	Salix	W
Spruce	Picea	S	Bebb's willow	<i>S. bebbiana</i>	Wb
black spruce	<i>P. mariana</i>	Sb	Pacific willow	<i>S. lucida</i>	Wp
Engelmann spruce	<i>P. engelmannii</i>	Se	peachleaf willow	<i>S. amygdaloides</i>	Wa
Sitka spruce	<i>P. sitchensis</i>	Ss	pussy willow	<i>S. discolor</i>	Wd
white spruce	<i>P. glauca</i>	Sw	Scouler's willow	<i>S. scouleriana</i>	Ws
spruce hybrid	<i>Picea cross</i>	Sx	Sitka willow	<i>S. sitchensis</i>	Wt
Engelmann x white Sitka x white	<i>P. engelmannii</i> x <i>glauca</i>	Sxw	UNKNOWN		X
Sitka x unknown hybrid	<i>P. x lutzii</i>	Sxl	Unknown		Xc
	<i>P. sitchensis</i> x ?	Sxs	Unknown conifer		Xh
			Unknown hardwood		
Yew	Taxus	T	OTHERS		
western yew	<i>T. brevifolia</i>	Tw	Other tree, not on list		Z
			Other conifer		Zc
			Other hardwood		Zh

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