Coast Area Forest Stewardship Plan Result or Strategy Effectiveness Analysis
Coast Area Forest Stewardship Section

Introduction
This paper analyses available data to help forest practitioners and decision makers assess the effectiveness of Forest Stewardship Plan (FSP) results or strategies. The goal is to provide information to help facilitate meaningful discussion in support of the FSP approval or extension process.

Background
The renewal or extension of a Forest Stewardship Plan provides an opportunity to review the effectiveness of results or strategies included in the original FSP. This review is supported by information derived from a variety of sources. The Forest and Range Evaluation Program (FREP) is an important source of information for this purpose. This paper links FREP resource value data and results to common FSP results or strategies used on the coast. The goal is to determine how effective a particular result or strategy is in managing the resource value(s). Understanding the effectiveness of a specific result or strategy will facilitate meaningful discussion between planners, reviewers, licensees and decision makers during FSP extension, replacement and/or amendment processes.

Analysis Process
The analysis process involves the "mining" of FREP monitoring data and results to;

- Identify resource values where FREP monitoring data is available
- Identify common FSP result or strategy types for a given resource value
- Build a population of resource value monitoring data
- Analyse the stratified data by result or strategy type to determine resource value monitoring result and performance indicator attributes.
- Summarize analysis results in report
- Review results of analysis with FREP resource value team contact

A full explanation of the analysis process is provided in Appendix A of this report.

Challenges
The analysis approach used in this proposal accepts the FREP protocol results at face value and makes no attempt to interpret FREP results. This interpretation challenge influences the acceptance of proposed report output by all stakeholders and therefore the utility of using the outputs in conversations between Ministry and forest tenure holder staff.

Analysis Results
Currently, available FREP data and results allow us to assess the utility of FSP results or strategy for two different resource values, i.e. riparian management areas and stand level biodiversity. The analysis results are based on a small sample size so observations are purposefully limited. No statistical analysis was completed as part of this exercise. The goal is to use additional FREP monitoring data to build a more robust sample size using this analysis and reporting format in the future.

Caution: The reader is reminded to use caution when interpreting the results. FREP data does not allow us to confirm if or to what extent each of these result or strategy types was actually

utilized within the population of cutblocks analysed, i.e. we can't define to what extent the flexibility provisions built into a results or strategy was implemented. Also, the results of this analysis should not be used to interpret consistency of a particular result or strategy with any objective set by government.

Section 1 - Stand Level Biodiversity

This analysis compares FREP's retention quality ranking indicator result and data between FSP's using Forest and Range Practices Act (FRPA) default practice requirements[1] versus FSP results or strategies.

i. Default practice requirement (Default), i.e. Forest Planning and Practices Regulation (FPPR) section 66 and 67. The FSP submission undertakes to comply or adopts specified FPPR "default" practice requirements as a result or strategy (see FPPR sections 12.1(4)). Cutblocks identified as FRPA s. 196 cutblocks in a FSP are included in this population.
ii. Flexible stand level biodiversity commitment (Flexible) that authorizes the holder of the FSP to vary stand retention levels and/or modify a wildlife tree retention area (WTRA).
iii. Stand level biodiversity result or strategy that was approved consistent with specified higher level plan (HLP) legal objectives, e.g. Land Use Orders.

1(a) Data Population

The data used in this analysis included (see Appendix A for details about data population selection process);

- representation from all districts within the South Coast and West Coast Ministry of Forests, Lands and Natural Resource Operations
- cutblocks harvested from 2006 through 2012
- cutblocks surveyed by FREP from 2008 through 2013

1(b) Result or Strategy Type Observations

The population of cutblocks used in this analysis is broken down by result or strategy type listed in Table 1.

Table 1. Stand Level Biodiversity result or strategy types

Result or Strategy Type/Name	Cutblock population (% of total)	Result or Strategy Description
1) Default	60 (46%)	Commitment to conduct forest operations consistent with FPPR s. 66, 67 stand-level biodiversity practice requirements
2) Flexible	23 (18%)	Flexibility to utilize alternate stand-level retention level and/or to allow for harvesting in a WTRA.
3) HLP	47 (36%)	Commitment to address one or more Higher Level Plan (HLP) stand-level retention objective(s)
Total	130 (100%)	

[1] Forest Planning and Practices Regulation section 12.1

1(c) Stand Level Biodiversity Analysis Results

1(c)(i) Stand Retention Quality Ranking

The stand level retention quality ranking and average stand level retention for the three different result or strategy types is presented in Table 1.

Table 1. WTRA Retention Quality Ranking Results with area weighted % retention

Result or Strategy Type/Name		sample size *n*	Retention quality ranking[2] (number of cutblocks per quality ranking and area weighted % retention[3])								
			Good		Fair		Borderline		Poor		no rank[4]
			% of n[3]	% ret.	*% of n*[3]	% ret.	*% of n*[3]	% ret.	*% of n*[3]	% ret.	*# of blocks*
1	Default	60	11%	26%	38%	14%	34%	17%	17%	11%	7
2	Flexible	23	0		29%	21%	52%	16%	19%	7%	2
3	HLP	47	13%	28%	26%	17%	41%	27%	18%	10%	1

1(c)(ii) Stand Level Biodiversity Retention Quality Ranking Indicators

The WTRA Retention Quality Ranking results are derived from analysis and interpretation of a number of different quantifiable stand level biodiversity performance indicators[5]. To help understand what drives the retention quality ranking, Table 3(a) and 3(b) summarizes FREP monitoring results for a number of these indicators in relation to the three results or strategy types listed above.

Note : Performance indicators related to CWD and invasive plants were not included in Table 3 because they are not a required element of stand level biodiversity results or strategies.

[2] Retention quality ranking is a merged indicator based on the following attributes; dispersed retention, ecological anchors, large patches, location of patches, density of large snags and big trees, and, number of live tree species

[3] *n* for this calculation does not count the numbers of cutblocks that could not be ranked (see note 4 below).

[4] Retention quality ranking is not possible for blocks with either insufficient timber cruise baseline data for the BEC subzone (e.g. CDF) or if no plot data was acquired when patch retention exists, normally due to safety concerns

[5] *Protocol for* Stand-level Biodiversity Monitoring - Steps for field data collection and administration Version 5.0, April, 2009
http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/indicators/Indicators-SLBD-Protocol-2009.pdf

Table 3(a) Stand level biodiversity performance indicators for retention levels, ecological anchors, veteran trees, patch size and number of trees species.

Result or Strategy Type (*n*)	**% Area Retained**			**Ecological Anchors**	**Veteran trees in at least one sampled stratum**	**Number of patch strata > 2ha (excluding PT)**	**Number of tree species (excluding "Unknown" species) sampled in all strata (excluding PT, DT) (compared to baseline)[6]**
(# of cutblocks)	Average Total retention %	Average Patch Retention %	Average Dispersed Retention %	Average (no./ha)	% of cutblocks	% of cutblocks	average # per cutblock
Type 1 (53)	16.4	15.4	0.9	4	47	47	3.0 (low)
Type 2 (21)	17.0	16.9	0.1	6	76	62	2.8 (very low)
Type 3 (46)	23.3	19.8	3.4	3	54	54	3.2 (low)

Table 3(b) Stand level biodiversity performance indicators for wildlife trees, larger trees, windthrow and retention patch location.

Result or Strategy Type (*n*)	**Large snag (Class 3+ wildlife trees with height >= 10m and dbh >= 30cm) based on BAE areas: patch and dispersed strata (excluding PT, DT) (compared to baseline)**	**Total Large Trees retained in BAE areas: patch and dispersed strata (excluding PT, DT) (compared to baseline)**	**Windthrown trees (%) – area average of reserve values (mid-point of range) – excluding clearcuts**	**Retention patch location in relation to harvest boundary (% of patches)**		
(# of cutblocks	Average sph	dbh >= 70cm (average sph)	Average % per cutblock	Internal	On edged	External
Type 1 (53)	20 (low)	32 (low)	7.1	43	53	4
Type 2 (21)	36 (low)	27 (low)	5.3	48	49	3
Type 3 (46)	23 (similar)	20 (low)	8.0	37	62	1

1(c)(iii) Stand Level Biodiversity Discussion Points

Based on the results listed above, the following questions are provided with the intent of facilitating additional discussion related to stand level biodiversity management;

- Why is use of default practice requirement for stand level biodiversity objectives so popular?
- What circumstances and how often are result or strategy flexibility provisions being utilized by the holder of the FSP and what are the results?

[6] A "very low" or "low" comparison to baseline indicates the range of values found from the FREP sampled retention is skewed to the lower part of the range as found in the baseline (timber cruise data from the same BEC subzone variant). A "similar" comparison indicates that the range of retention values fairly closely maintains the full baseline range.

- How are the following performance indicator values being considered as part of stand level retention decision making process;
    - Retention amount (hectares retained)
    - Retention patch size and location
    - Tree species selection (number retained)
    - Large snags (number, size and wildlife tree class retained)
    - Large tree (number and size retained)
- Is there potential to reduce stand level retention amount in result or strategy type 3 areas by designing retention areas to meet more than one resource value objective?

Section 2 - Riparian Management Areas

This analysis compares FREP's stream function results and data between FSP's using Forest and Range Practices Act (FRPA) default practice requirements versus two different result or strategy approaches as follows;

i. Default practice requirement (Default), i.e. Forest Planning and Practices Regulation (FPPR) section 47 to 53. Cutblocks identified as FRPA s. 196 cutblocks in a FSP are included in this population.
   Note: unless exempt, the holder of a FSP must still write a result or strategy addressing riparian management zone tree retention (see FPPR s. 12(3)).
ii. Flexible riparian management area commitment (Flexible) that authorizes the holder of the FSP to vary from the FPPR section 47 to 53 practice requirements, based on specified situations or circumstances, e.g. varying the riparian reserve zone (RRZ) or riparian management zone (RMZ) width and/or modify the RMA.
iii. Riparian management area result or strategy that was approved consistent with specified higher level plan (HLP) legal objectives, e.g. Central and North Coast Order[7].

2(a) Data Population

The data used in this analysis included (see Appendix A for details about data population selection process);

- representation from all districts within the South Coast and West Coast Ministry of Forests, Lands and Natural Resource Operations regions as well as stream reaches surveyed within the North Coast District (now the Coast Mountain District).
- includes cutblocks harvested from 2006 through 2012
- includes cutblocks surveyed by FREP from 2009 through 2013

[7] http://archive.ilmb.gov.bc.ca/slrp/lrmp/nanaimo/cencoast/docs/CNC_consolidated_order.pdf

2(b) Result or Strategy Type Observations

The population of cutblocks used in this analysis is broken down by result or strategy type listed in Table 4.

Table 4. Riparian Management Area result or strategy type observations

Result or Strategy Type/Name	Cutblock population (% of total)	Result or Strategy Description
1) Default	60 (49%)	Commitment to conduct forest operations consistent with FPPR s. 47-53 stand-level biodiversity practice requirements
2) Flexible	59 (48%)	Flexibility to vary the RMA widths and/or activities that can occur in the RRZ
3) HLP	2 (2%)	Commitment to address one or more Higher Level Plan (HLP) stand-level retention objective(s)
Total	121 (100%)	

Note: as full implementation of new and updated HLP's progress, we expect to see a significant increase in the number of HLP result or strategy types in coming years.

2(c) Analysis Results

2(c)(i)Stream riparian function results.

The riparian management area stream function result for two[8] different result or strategy types is presented in Table 5.

Table 5. Stream Function Results by Result or Strategy Type

Result or Strategy Type		*n*	Stream reach functioning condition (% and number of stream reaches per stream function condition)			
			Properly Functioning	Properly Functioning, limited impact	Properly Functioning, impacted	Not Properly Functioning
1	Default PR	60	29% (17)	25% (15)	23% (14)	23% (14)
2	Flexible RMA R/S	59	44% (26)	27% (16)	19% (11)	10% (6)

2(c)(ii) Riparian management area stream function indicators

To assess the functioning condition of each reach, the FREP protocol asks 15 questions (representing 15 indicators) about the characteristics of healthy streams and their riparian habitats. The relative health or "functioning condition" of the stream and its adjacent riparian area is based on the total number of "No" answers to these questions. To help understand what drives stream function results listed above, Tables 6(a) and 6(b) below provides the stream function indicator result, by result or strategy type, for the 15 questions.

[8] There are too few results to include HLP result or strategy type in this population.

Table 6(a). Percentage of No Answers to FREP Stream Function Questions (Q1 to Q9)

Result or Strategy Type	*n*	Q1 -Is the channel bed undisturbed?	Q2-Are the channel banks intact?	Q3-Are channel LWD processes intact?	Q4-Is the channel morphology intact?	Q5-Are all aspects of the aquatic habitat sufficiently connected to allow for normal, unimpeded movements of fish, organic debris, and sediments?	Q6-Does the stream support a good diversity of fish cover attributes?	Q7-Does the amount of moss present on the substrates indicate a stable and productive system?	Q8-Has the introduction of fine sediments been minimized?	Q9-Does the stream support a diversity of aquatic invertebrates?
Default	60	18% (11/60)	38% (23/60)	50% (30/60)	0% (0/15)	65% (39/60)	24% (5/21)	40% (24/60)	42% (25/60)	15% (8/54)
Flexible	59	19% (11/59)	17% (10/59)	39% (23/59)	22% (5/23)	61% (36/59)	31% (5/16)	24% (14/59)	27% (16/59)	25% (13/52)

Table 6(b). Percentage of No Answers to FREP Stream Function Questions (Q10 to Q15)

Result or Strategy Type	*n*	Q10-Has the vegetation retained in the RMA been sufficiently protected from windthrow?	Q11-Has the amount of bare erodible ground or soil disturbance in the riparian area been minimized?	Q12-Has sufficient vegetation been retained to maintain an adequate root network or LWD supply?	Q13-Has sufficient vegetation been retained to provide shade and reduce bank microclimate change?	Q14-Have the number of disturbance-increaser plants, noxious weeds and/or invasive plant species present been limited to a satisfactory level?	Q15-Is the riparian vegetation within the first 10 m from the edge of the stream generally characteristic of what the healthy unmanaged riparian plant community would normally be along the reach?
Default	60	16% (9/58)	30% (18/60)	45% (27/60)	27% (16/60)	0% (0/60)	53% (32/60)
Flexible	59	12% (7/57)	17% (10/59)The	29% (17/59)	19% (11/59)	0% (0/59)	37% (22/59)

2(c)(iii) Riparian management zone retention results

Under the FPPR, a FSP must specify a result or strategy that addresses retention of trees in a riparian management zone. This analysis reviewed the FREP stream function result for two different result or strategy approaches commonly used to address this requirement;

A. Establish a minimum RMZ treed retention width or basal area percentage by stream class (Minimum RMZ) or
B. Implement a process to determine tree retention level on site specific basis and conduct harvest operations consistent with the result of this process (RMA Assessment).

Table 7 identifies RMZ retention levels results associated with each of these approaches.

Table 7 Riparian Management Zone Retention Level Results

RMZ Result or Strategy Type	n	Riparian Management Zone Retention (average treed width of RMZ in meters)				
		S2 RMZ 20m	S3 RMZ 20m	S4 RMZ 30m	S5 RMZ 30m	S6 RMZ 20m
Minimum RMZ	10	20 (1)	15.5 (4)	-	30 (1)	5.3 (4)
RMA Assessment	109	16.5 (9)	12.9 (14)	15.7 (8)	22.5 (25)	5.3 (53)

2(d) Riparian Management Area Discussion Points

The following questions are provided to facilitate additional discussion related to stream reach functioning condition and riparian management area retention level decisions at the local level (i.e. district, management unit, FSP);

- How often are result or strategy type 2 flexibility provisions (authority to vary RMA widths and modify the RMA) being utilized by the holder of the FSP and what are the results?
- Is use of default result or strategy type too limiting in application to make RMA management decisions tailored to local conditions?
- How are the following factors driving RMA management decisions?
    - Aquatic habitat connection
    - Riparian vegetation
    - Channel LWD processes
    - Sediment
- Is there a standardized process for assessing RMZ retention levels?

Summary

Analysis results provided in this report provide evidence of the relative effectiveness of different result or strategy types commonly approved in coast area forest stewardship plans. These results are meant to be used to facilitate discussion as part of the FSP approval, amendment or extension process.

Contacts

1. Chuck Rowan (Chuck.Rowan@gov.bc.ca 250 751-7096) for questions or comments regarding this note.
2. Peter Tschaplinski (Peter.Tschaplinski@gov.bc.ca 250 387-8082) for background on the FREP riparian fish monitoring program.
3. Nancy Densmore (Nancy.Densmore@gov.bc.ca 250 356-5890) for background on the FREP stands level biodiversity monitoring program.

References

Stand Level Biodiversity References

1. FREP Report #1 - Baseline Datasets for Evaluating Wildlife Tree Patches FREP http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm#rep01
2. FREP Report #15 - Sampling intensity for stand-level biodiversity surveys. http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm#rep15
3. FREP Report #17, Resource Stewardship Monitoring: Stand-level Biodiversity Analysis of 2005/2006 Field Season Data by Biogeoclimatic Zone http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm#rep17
4. FREP Report #30 - Coast Forest Region: Analysis of Stand-Level Biodiversity Sampling Results In Six Predominant Biogeoclimatic Subzones. http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm#rep30
5. Protocol for Stand-level Biodiversity Monitoring - Steps for field data collection and administration, Version 5.0, April, 2009 http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/indicators/Indicators-SLBD-Protocol-2009.pdf
6. Unpublished: Methodology for MRVA ranking.

Riparian Management Area References

Protocol for Evaluating the Condition of Streams and Riparian Management Areas *(Riparian Management Routine Effectiveness Evaluation)* Version 5.0 March, 2009 http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/indicators/Indicators-Riparian-Protocol-2009.pdf

Appendix A - Forest Stewardship Plan Result or Strategy Effectiveness Analysis Process

The steps listed below can be used to assess the effectiveness of FSP result or strategy in managing a specified resource value based on FREP monitoring data and results.

1. Identify resource values where FREP monitoring data is available
    - Locate FREP monitoring results (that are compiled and updated annually) at https://spc-flnr.gov.bc.ca/frep/FREP%20data/Forms/AllItems.aspx
    - Identify data availability among resource values list (data is not available for all resource values listed)
    - Identify candidate resource value monitoring data for analysis consideration, i.e. is there a resource value assessment result based on well defined performance indicators (the metrics)?
    - Identify which of the resource value monitoring data can be linked to FSP results or strategies (not all FREP monitoring results are tied to a FSP result or strategy).
2. Identify common FSP result or strategy types for a given resource value
    - Review FSP for each record to identify common result or strategy types within the stratified population.
    - Group each record into common result or strategy types and provide brief description of the result or strategy type.
3. Build a population of resource value monitoring data[9]
    - If not included in the data, add reference links for each record as follow;
        - Cutting Permit (CP) issuance date,
        - FSP # and FSP approval date,
        - FRPA s. 196 status,
        - higher level plan (associated with the resource value identified above) and effective date HLP incorporated into the FSP.
    - Stratify resource value monitoring data to exclude all records with CP issued prior to FSP approval date.
4. Analyse the stratified data by result or strategy type to determine resource value monitoring result and performance indicator attributes. Refer to FREP Table of Resource Value Indicators and Protocols to guide the analysis.
5. Summarize analysis results in report with suggested format for each resource value analysed;
    - Result or strategy type and description
    - Population description and observations
    - Assessment results
    - Summary of performance indicators supporting the assessment results
    - Listing of potential discussion points based on analysis results

    Note: include only the factual results.
6. Review results of analysis with FREP Resource Value Team contact and re-analyse and/or edit summary report as necessary.

[9] The data population is built on the assumption that all operations associated with the record are in compliance with FRPA legislation and FSP result or strategy commitments.