FREP

ADM RESOURCE STEWARDSHIP REPORT

July 2012

FOREST AND RANGE EVALUATION PROGRAM

ASSISTANT DEPUTY MINISTER RESOURCE STEWARDSHIP REPORT: RESULTS AND RECOMMENDATIONS OF THE FOREST AND RANGE EVALUATION PROGRAM

Old forest, Spiller Inlet
Photo credit: Lloyd Davies

FREP
Forest & Range Evaluation Program

BRITISH COLUMBIA

Sustainability of Forest and Range Resources Through Science and Stewardship

MESSAGE FROM THE ADM RESOURCE STEWARDSHIP

British Columbia's results-based resource management framework (the *Forest and Range Practices Act*) is built on a foundation of professional reliance and effectiveness evaluation of resource practices, policies, and legislation. Under the professional reliance model, resource professionals must understand both the legal and non-statutory realm when providing informed and objective advice to their employer or client on how to manage forestry operations. The Forest and Range Evaluation Program provides science-based monitoring findings and identifies opportunities for ongoing improvement. It is incumbent on resource professionals to consider these findings, along with other information in their practice, and then make professional recommendations and decisions that strike a balance between environmental, social, and economic values.

Tom Ethier
Assistant Deputy Minister
Resource Stewardship Division
Ministry of Forests, Lands and Natural Resource Operations

MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS
FOREST AND RANGE EVALUATION PROGRAM

ASSISTANT DEPUTY MINISTER RESOURCE STEWARDSHIP REPORT: RESULTS AND RECOMMENDATIONS OF THE FOREST AND RANGE EVALUATION PROGRAM

July 2012

FREP monitoring identifies resource practices that have proven effective in sustainably managing forest and range resource values and highlights opportunities for continued improvement.

The FREP Mission:
To be a world leader in resource stewardship monitoring and effectiveness evaluations; communicating science-based information to enhance the knowledge of resource professionals and inform balanced decision-making and continuous improvement of British Columbia's forest and range practices, policies and legislation. *http://www.for.gov.bc.ca/hfp/frep/index.htm*

FREP
Forest&Range
EvaluationProgram

BRITISH COLUMBIA

TABLE OF CONTENTS

FIGURES AND TABLES

INTRODUCTION

This report summarizes the key findings identified through the Forest and Range Evaluation Program (FREP) and provides recommendations to improve on-the-ground resource management practices and decision making. Its purpose is to encourage dialogue and inform balanced decision making among those who manage British Columbia's natural resource values on behalf of the public. By providing science-based monitoring and evaluation information to resource management professionals and decision makers, FREP supports professional reliance and the ongoing improvement of land and resource stewardship.

As a partnership between the Ministry of Forests, Lands and Natural Resource Operations and the Ministry of Environment, FREP meets the commitment of government to:

1. Assess the effectiveness of forest and range legislation in achieving stewardship objectives;
2. Determine whether forest and range practices are achieving government's objectives, with a focus on ecological function and social values;

Old-growth cedar in a wildlife tree patch
Photo credit: Paul Barolet

3. Identify forest and range resource value status and trends; and
4. Identify opportunities for continued improvement of British Columbia's forest and range practices, policies, and legislation.

Specific evaluation questions have been developed for each of the 11 *Forest and Range Practices Act* (*FRPA*) resource values (see: http://www.for.gov.bc.ca/hfp/frep/about/questions.htm). These questions frame the context for FREP monitoring indicators and procedures. To date, FREP monitoring has identified resource practices that have proven effective in sustainably managing forest and range resource values and has thus informed policy development, timber supply reviews, licensee certification requirements, on-the-ground practices, and cumulative effects assessments (see http://www.for.gov.bc.ca/hfp/frep/publications/extension_notes.htm#e26).

Table 1 lists the current FREP monitoring status of the 11 *FRPA* resource values. Figure 1 illustrates the spatial distribution of FREP resource stewardship monitoring completed to the end of the 2011 field season.

BIODIVERSITY (STAND-LEVEL)

The FREP evaluation question for the biodiversity resource value is: *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 coarse woody debris?*

To date, biodiversity monitoring has focussed on key stand-level indicators of habitat necessary to sustain almost 70 wildlife species depending on wildlife trees. Table 2 summarizes how some indicator averages have shifted over three harvest time frames. These time frames correspond roughly to the changing legislative framework:[1] *Forest Practices Code of British Columbia Act* (*FPC*), 1997–2003; *FPC* to *FRPA* transition, 2004–2006; and *FRPA* influence, 2007–2010. Results for four biogeoclimatic ecosystem classification subzones are discussed as representative examples.

1 Although the effective date of the *Forest and Range Practices Act* was January 31, 2004, forest development plans under the previous *Forest Practices Code of British Columbia Act* were being created until December 31, 2005, and could extend until March 31, 2007. Cutting permits originating from these plans could also extend beyond March 31, 2007. Therefore, harvesting undertaken from 2004 through 2006 is considered transitional. Harvesting undertaken from 2007 to 2010 is influenced primarily by the more recent regulatory environment of the *Forest and Range Practices Act* and, as such, the related evaluation results should be considered preliminary and interpreted with caution.

Table 1. ***The status of Forest and Range Practices Act resource value monitoring under FREP***

FRPA **resource value and team lead(s)**	**Monitoring status**
Biodiversity Nancy Densmore Nancy.Densmore@gov.bc.ca Richard Thompson Richard.Thompson@gov.bc.ca	• 1868 cutblocks assessed and reported (stand level) (2006–2011) • Province-wide implementation of stand-level biodiversity assessments • Landscape-level indicators under development and pilot testing
Cultural Heritage Steve Lehnert Steve.Lehnert@gov.bc.ca Peter Bradford Peter.Bradford@gov.bc.ca Kathleen Hebb Kathleen.Hebb@gov.bc.ca	• 107 cutblocks and 215 individual cultural features assessed and reported (2009–2011) • Implementation based on district priorities
Fish/Riparian Peter Tschaplinski Peter.Tschaplinski@gov.bc.ca	• 1668 stream reaches assessed and reported (2006–2011) • Province-wide implementation
Forage (range) Doug Fraser Doug.Fraser@gov.bc.ca Francis Njenga Francis.Njenga@gov.bc.ca	• More than 800 range assessments (including upland areas, wetlands, and streams) (2006–2011) • Range reference area assessments (reporting in 2012) • Implementation based on district priorities
Recreation Bill Marshall Bill.Marshall@gov.bc.ca	• 120 recreation sites evaluated and reported (2006) • Inactive for last several years – new assessment question and tools to be developed in 2012
Resource Features Christina Mardell Christina.A.Mardell@gov.bc.ca	• Karst monitoring protocol in pilot testing, Vancouver Island
Soils Stephane Dubé Stephane.Dube@gov.bc.ca Shannon Berch Shannon.Berch@gov.bc.ca Chuck Bulmer Chuck.Bumber@gov.bc.ca	• 150 cutblocks assessed and reported (2008–2010) • Implementation based on district priorities
Timber Frank Barber Frank.Barber@gov.bc.ca (Timber lead) Stefan Zeglen Stefan.Zeglen@gov.bc.ca (SDM lead)	• 323 post–free-growing cutblocks assessed (2009–2011) • Implemented in approximately one-third of districts
Visual Quality Jacques Marc Jacques.Marc@gov.bc.ca	• 249 landforms assessed and reported (2007–2011) • Implemented in approximately one-half of districts
Water Quality Dave Maloney Dave.Maloney@gov.bc.ca	• 3423 stream crossings (sediment) and 466 range (2008–2011) assessments completed and reported
Wildlife Kathy Paige Kathy.Paige@gov.bc.ca Laura Darling Laura.Darling@gov.bc.ca	• Development and testing of individual wildlife indicators and protocols under way for several species, including mountain goat, badger, tailed frog, northern goshawk, and mountain caribou

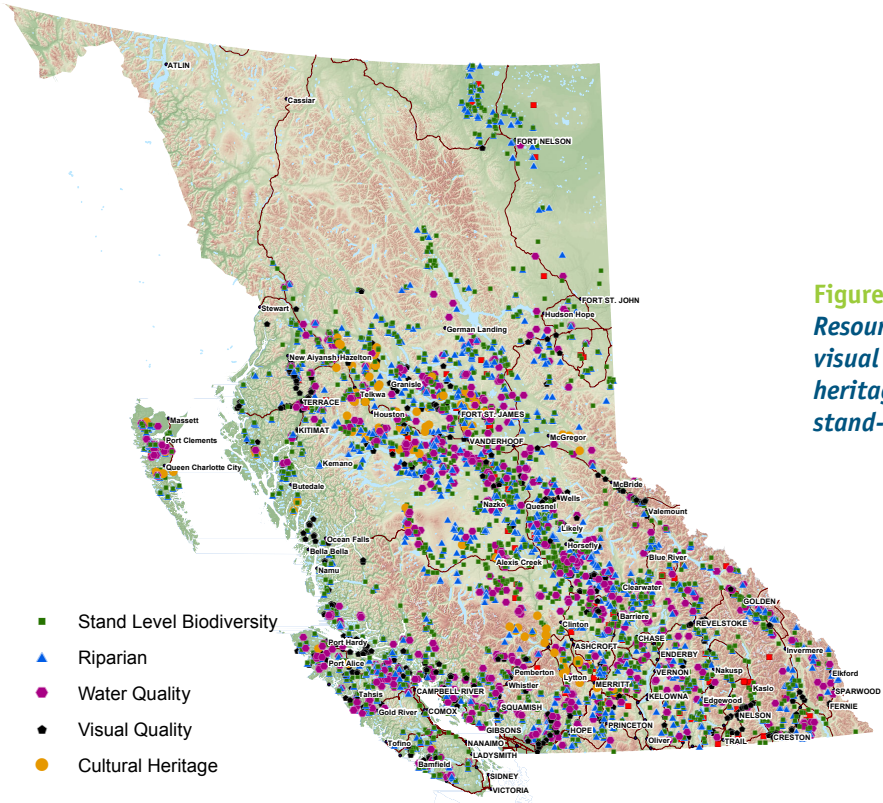

Figure 1. ***Sample locations for FREP Resource Stewardship Monitoring of the visual quality, water quality, cultural heritage resources, fish/riparian, and stand-level biodiversity resource values.***

Boreal White and Black Spruce moist warm (BWBSmw) subzone: Retention quality has generally improved in the harvested cutblocks. Although the density of large diameter trees has decreased overall from the *FPC* years, the average density during *FRPA* years is above average baseline levels. Average cutblock size has increased over time; however, the percent retention has not increased accordingly (see section 64, Forest Planning and Practices Regulation). The low sample size for this subzone in the 2007–2010 harvest years provides only an indication of potential results.

Coastal Western Hemlock very wet maritime (CWHvm) subzone: Harvested cutblocks show increased average overall levels of retention from *FPC* to *FRPA* years; however, in recent years, more cutblocks are found with zero or minimal retention. The quality of overall retention (density of large snags and large trees, plus number of live trees retained) has stayed fairly constant, but is lower than desirable compared to baseline levels. Large increases have occurred in coarse woody debris volume, density, and size.

Interior Douglas-fir dry cool (IDFdk) subzone: Harvested cutblocks show a decrease in average retention, although this subzone still has the highest *FRPA*-years' average of the four discussed. Quality of retained trees appears to be decreasing, with lower densities of large snags, large trees, and numbers of tree species, although the low sample size for this subzone in the 2007–2010 harvest years provides only an indication of potential results.

Sub-Boreal Spruce moist cold (SBSmc) subzone: Mountain pine beetle has heavily impacted this part of the province. Monitoring shows an increase in the numbers of cutblocks containing retention, which is critical for stand-level biodiversity. Density of large trees retained (40 cm breast height diameter) has decreased from *FPC* to *FRPA* years, and a slight decrease was also evident in both the volume of coarse woody debris and the density of big pieces.

Recommendations for Continued Improvement of Stand-level Biodiversity Management

The following recommendations centre on four example biogeoclimatic subzones, and are based on practices associated with the most successful stand-level biodiversity management outcomes. These areas have large sample sizes and represent different geographic areas of the province.

- Boreal White and Black Spruce moist warm (BWBSmw) subzone: Designing cutblocks so that the structural characteristics resemble the natural disturbance regime. Higher retention levels on larger cutblocks (i.e., > 60 ha) are generally required to do this.

Table 2. *Stand-level biodiversity indicators by biogeoclimatic ecosystem classification subzone and harvest year*

Subzone[a]	No. of blocks	Retention (%)			Average gross cutblock size (ha)			Cutblocks with > 0.5% retention (%)			Density of large snags per hectare of retention		
		1997–2003	2004–2006	2007–2010	1997–2003	2004–2006	2007–2010	1997–2003	2004–2006	2007–2010	1997–2003	2004–2006	2007–2010
BWBSmw	91	10.5	9.9	9.3	43	84	70	76	100	86	7	13	13
CWHvm	185	15.8	20.1	21.1	27	27	19	95	97	84	29	20	34
IDFdk	101	29.5	23.0	21.3	29	36	19	94	91	93	9	10	2
SBSmc	102	15.7	16.9	13.8	40	32	43	78	86	95	20	41	30

Subzone	No. of blocks	Large diameter breast height trees per hectare[b]			No. of live tree species retained per cutblock			Coarse woody debris volume per hectare in harvest area			Coarse woody debris big pieces per hectare in harvest area (length and diameter)		
		1997–2003	2004–2006	2007–2010[c]	1997–2003	2004–2006	2007–2010[c]	1997–2003	2004–2006	2007–2010[c]	1997–2003	2004–2006	2007–2010[c]
BWBSmw	91	14	6	10 (120%)	2.9	2.8	3.6 (92%)	100	105	136 (113%)	13	12	22 (45%)
CWHvm	185	37	35	35 (66%)	2.6	3.0	2.7 (71%)	419	512	569 (134%)	26	41	62 (95%)
IDFdk	101	20	17	15 (53%)	2.7	3.0	1.5 (52%)	58	73	60 (75%)	7	8	5 (18%)
SBSmc	102	33	22	15 (64%)	2.4	2.6	2.6 (84%)	101	90	87 (64%)	13	9	8 (14%)

a Representative subzones are as follows: BWBSmw – Boreal White and Black Spruce moist warm; CWHvm – Coastal Western Hemlock very wet maritime; IDFdk – Interior Douglas-fir dry cool; SBSmc – Sub-Boreal Spruce moist cold.

b Diameter at breast height of a large tree differs by subzone: IDFdk and SBSmc = 40 cm; BWBSmw = 50 cm; and CWHvm = 70 cm.

c Percentage of average baseline cruise data shown for *FRPA* years.

- Coastal Western Hemlock very wet maritime (CWHvm) subzone: Maintaining retention on every cutblock and ensuring big trees for the site are left within wildlife tree patches.
- Interior Douglas-fir dry cool (IDFdk) subzone: Retaining a full diversity of tree species in future reserves, with large trees and large snags for current and future wildlife trees.
- Sub-Boreal Spruce moist cold (SBSmc) subzone: Retaining large trees for the site as the current and future high-value wildlife trees.

CULTURAL HERITAGE RESOURCES

The FREP evaluation question for the cultural heritage resources value is: *Are cultural heritage resources being protected and conserved for First Nations cultural and traditional activities as a result of forest practices?*

In total, FREP monitoring has assessed 107 cutblocks, containing 215 individual cultural features and 55 composite cultural features (two or more feature types managed in the same way, such as culturally modified trees along a cultural trail; see Figure 2). Individual cultural heritage resource features include archaeological sites, other cultural features that are the focus of traditional use, such as post–1846 cultural trails and culturally modified trees (individual trees and stands), and important wildlife areas, such as dens and birthing areas.

At a cutblock level, 52% of sites were assessed as "very well" or "well" managed, 29% were "moderately" managed, and 17% were either "poorly" or "very poorly" managed. The most commonly used management strategies identified were feature or site avoidance (conserving features in reserve/modifying block boundaries), stumping of some or all culturally modified trees above cultural markings or scars (especially common on dead pine), and retaining features without a buffer. Where features were damaged, common causes included harvesting and road-building activities (e.g., removing culturally modified trees or sections of trail, and cross-trail yarding with trail-bed damage or trail-blocking debris), windthrow, and silviculture activities such as site preparation or planting. Figure 2 shows monitoring results for individual cultural heritage resource features.

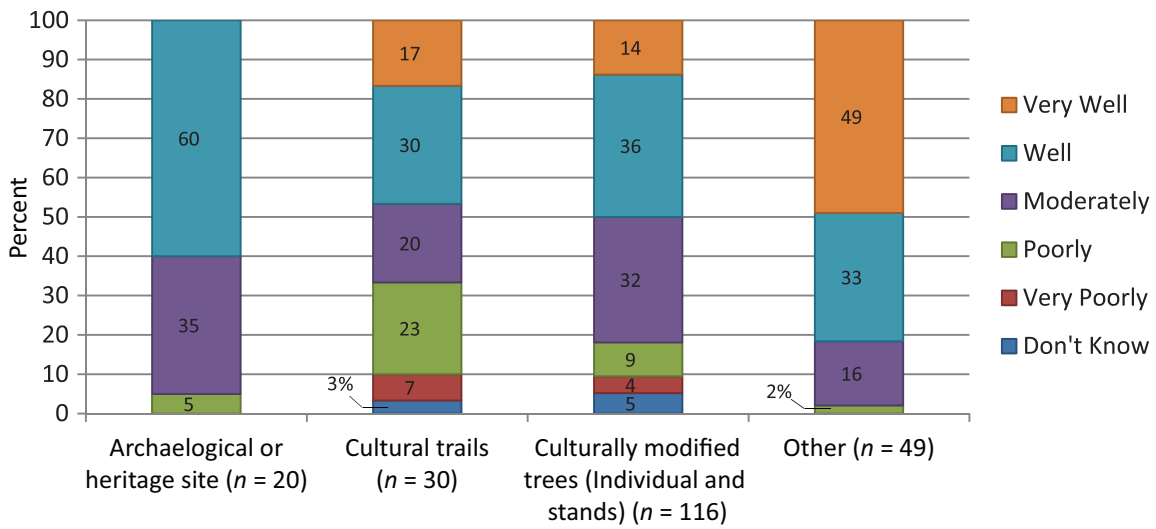

Figure 2. ***Cultural heritage resource monitoring results showing extent to which (%) practices on individual features maintained resource values.***

Recommendations for Continued Improvement of Cultural Heritage Resource Management

The following recommendations are based on practices associated with the most successful cultural heritage resource management outcomes and from opportunities for improvement identified by those completing individual site or feature assessments. In general, the most successful outcomes are associated with direct communication with First Nations and careful pre-harvest planning.

- Understanding local First Nations perspectives and expectations through direct contact and information sharing.
- Knowing, understanding, and using readily available cultural heritage resource information, recommendations, and (or) requirements (e.g., Preliminary Field Reconnaissance Reports, Archaeological Impact Assessments, Site Plans).
- Locating, assessing, and determining the most appropriate management of features before harvesting.
- Avoiding cultural heritage resource features by excluding them from the harvest areas and (or) providing higher levels of post-harvest retention (buffers) to protect features where necessary.
- Falling and yarding trees away from cultural features and (or) buffers, keeping accumulations of slash and (or) burn piles away from features to help ensure long-term feature integrity.
- Ensuring adequate communication with people conducting post-harvest activities, such as pile burning (avoid burning near features), site preparation (avoid features and damage to tree roots buffering features), and planting (not planting on features such as trails).

FISH / RIPARIAN

The FREP evaluation question for the fish/riparian resource value is: *Are riparian forestry and range practices effective in maintaining the structural integrity and functions of stream ecosystems and other aquatic resource features over both the short and long terms?*

The top five sources of riparian-related forest management impacts are:

1. Generation and transport of road-related fine sediments (found at stream crossings)
2. Windthrow (source of streambank and streambed disturbance and sedimentation)

Small stream
Photo credit: Don Coombes

3. Falling and yarding trees across small streams (source of logging debris accumulations in the channel, streambank and streambed disturbance, and sedimentation)
4. Low retention (loss of source of large woody debris, nutrients, organic materials, and shade)
5. Machine disturbance during harvesting (source of sedimentation)

From 2006 to 2011, 1668 streams were assessed for post-harvest condition or "health" with an indicator-based protocol that included assessments of fine sediment accumulation, streambed and streambank disturbance, riparian area disturbance, and riparian area retention.

Outcomes for class S4 and S5 streams influenced by *FRPA*-related practices both show increases in the number of sites in the not properly functioning condition and the properly functioning condition with impacts (Figure 3). Outcomes for class S6 streams remained approximately the same for all three FREP monitoring time frames (*FPC*, *FPC–FRPA* transition, and *FRPA*). The percentage of all stream reaches in one of the three properly functioning conditions also varied minimally among the three time frames—that is, 88% for the *FPC* years, 89% for *FPC–FRPA* transition years, and 87% for the *FRPA*-influenced era. Table 3 shows the percentage of streams with outcomes equivalent to a not properly functioning condition as assessed in these three time frames and compared to data from 1994 and 1998.

A key indicator of riparian health is the amount of road-related sediment found at stream crossings. Although an improvement is evident from the *FPC* through *FRPA* years in the management of road-related fine sediments, this indicator remains a concern. During the *FPC* years, 83% of S6 streams were of particular concern regarding fine sediment; this has decreased to 60% of the sampled S6 streams during the *FRPA* years.

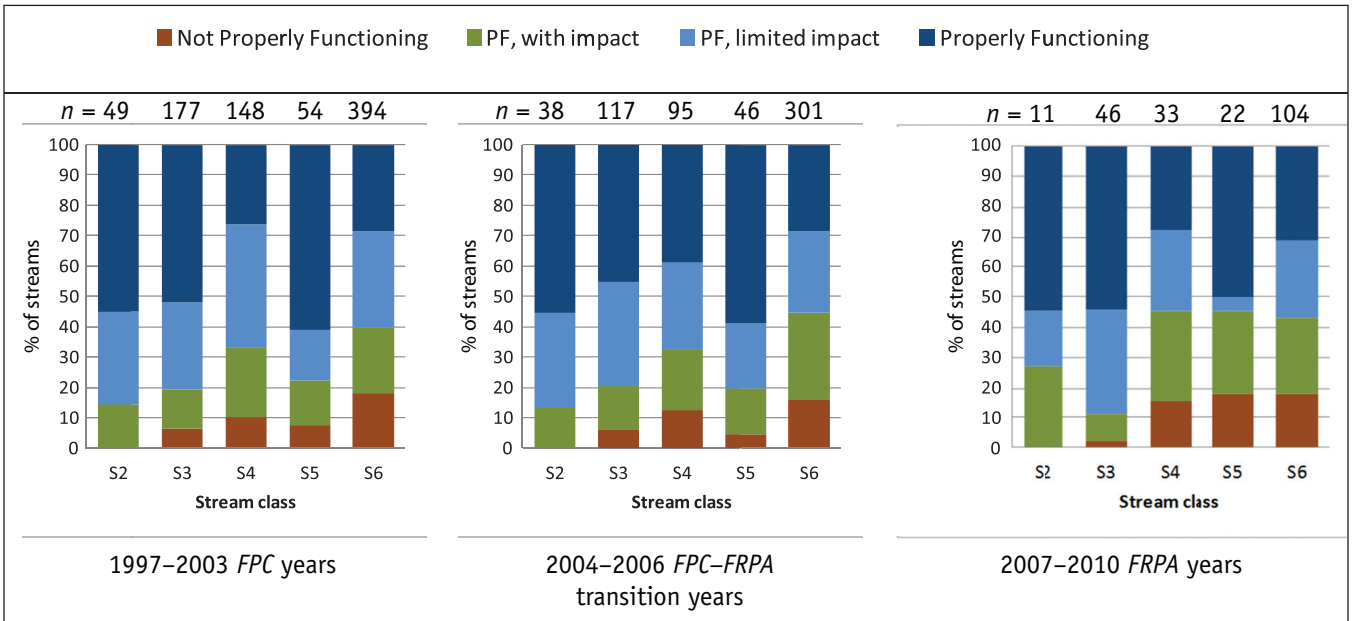

Figure 3. ***Fish/riparian monitoring results showing percentage of streams by functioning condition and stream class in three harvest time frames: FPC (1997–2003), FPC–FRPA transition (2004–2005), and FRPA influence (2007–2010).*** **(See footnote 1 on page 1.)**

Table 3. *Percentage of streams with outcomes equivalent to not properly functioning condition as assessed in five time frames*

Riparian class	Pre-*FPC* (Tripp 1994)[a]	Forest Practices Board (1998) assessment[b]	FREP Assessment (1997–2003)	FREP Assessment (2004–2006)	FREP Assessment (2007–2010)
S1	5	0	0	0	No samples
S2	20	1	0	0	0
S3	41	4	6	6	2
S4	60	9	10	13	15
S5	45	3	7	4	18
S6	76	20	18	16	18

a Tripp, D. 1994. The use and effectiveness of the coastal fisheries forestry guidelines in selected forest districts of coastal British Columbia. B.C. Ministry of Forests, Integrated Resources Branch, Victoria, B.C.

b Forest Practices Board. 1998. Forest planning and practices in coastal areas with streams. Victoria, B.C. Technical Report.

On average, a substantial amount of riparian retention (buffers) is being left on all stream classes (Table 4). FREP monitoring results show that stream sites with the higher functioning outcomes (67% of assessed samples in the properly functioning condition and the properly functioning condition with limited impacts) are more likely to have a riparian buffer at least 10 m wide. These buffers provide shade for temperature regulation, nutrients, a source of large woody debris, and a harvest- and machine-free zone to reduce the potential for soil, streambed, and streambank disturbances and fine sediment input to the aquatic environment. By comparison, stream sites with the two lowest functioning outcomes (28% of the assessed samples that were in the properly functioning condition with impacts and the not properly functioning condition) had substantially lower levels of streamside tree retention. For class S4, S5, and S6 streams combined, those in properly functioning condition had (on average) an 8 m wide treed buffer within the first 10 m from the streambank (all retention strategies combined including, full partial, and no tree retention). Those in properly functioning condition with limited impacts had (on average) a 5 m wide treed buffer, whereas sites in properly functioning condition with impacts and not properly functioning condition had treed buffers equivalent to 3 m and 2 m wide, respectively.

Table 4. *Average width of treed buffer by stream class (including full retention, partial retention, and no retention sites)*

Stream class	Average width of treed buffer in first 10 m	Average width (meters) of treed buffer in Riparian Management Area
S1	10	66
S2	9	42
S3	9	30
S4	7	17
S5	7	19
S6	4	7

Recommendations for Continued Improvement of Fish/Riparian Resource Management

The following recommendations are based on practices associated with the most successful fish/riparian resource management outcomes. In general, the two biggest factors that will enhance riparian outcomes in British Columbia are: (1) providing a 10 m wide buffer on S4, S5, and S6 streams; and (2) limiting the fine sediment input that results from riparian practices and at road crossings.

- Placing 10 m wide riparian buffers on all S4 streams and perennial S5 and S6 streams that deliver water, alluvial sediments, organic materials, nutrients, invertebrates and (or) large woody debris downstream to fish-bearing areas and (or) drinking water sources will significantly improve outcomes on small streams. This can be done without increasing the current overall levels of riparian retention across the landscape.
- Retaining, at a minimum, all non-merchantable trees and smaller vegetation and as many other windfirm trees as possible within the first 10 m on intermittent and ephemeral S5 and S6 streams that are directly connected to fish-bearing areas and (or) drinking water sources.
- Following well-established best management practices concerning fine sediment delivery to streams and stream crossings. These documents are excellent sources of

information: *Forest Road Engineering Guidebook*; *Erosion and Sediment Control Practices for Forest Roads and Stream Crossings*; and the *Fish-stream Crossing Guidebook*. [Publication details appear at the end of this report.]

FORAGE (RANGE)

The FREP evaluation questions for the forage (range) resource value are: *What impact are range practices having on the desired plant succession?* and *What impact are range practices having on the water cycle/hydrologic function?*

During the 2011 field season, range staff evaluated uplands, wetlands, and stream reaches found on *Range Act* tenure areas grazed by cattle, domestic horses, feral horses, and wild ungulates in 10 districts. Evaluations were carried out based on district priorities and risk level. Staff also conducted several stream or water quality evaluations and a forage analysis. Table 5 summarizes the 2011 FREP monitoring results, which are very similar to those of 2010.

Table 5. ***Range and forage monitoring results showing number of samples by range type and level of functionality***

	Level of functionality			
Range type	**Non-functioning to high risk**	**Moderately at risk**	**Slightly at risk to properly functioning condition**	**Total samples**
Uplands	5	20	124	149
Wetlands	4	5	17	26
Streams	0	2	21	23

Range and forage evaluations were conducted in areas of primary range, often with high use levels and a long history of grazing. Sites identified as slightly at risk to properly functioning condition are considered healthy and to be meeting site potential. Sites identified as moderately at risk bear close attention as these sites may be improving or declining in health. Sites in the non-functioning to high risk category generally need management action as these sites are not achieving their potential. Ongoing monitoring will help to identify trends and whether management practices are leading to improvements in rangeland health.

Recommendations for Continued Improvement of Forage (Range) Resource Management

The following recommendations are based on practices associated with the most successful forage (range) management outcomes.

- Preserving natural range barriers (vegetation and downed woody debris) to help limit livestock access to streams, wetlands, and lakes. Removal of natural range barriers during timber harvesting and road building can create new livestock access to streams, wetlands, and lakes and result in trampling damage. Co-ordinating timber harvesting, road building, and range use can help ensure that natural range barriers in riparian areas remain effective.
- Following well-established best management practices, including:
  - Building planned rest into the annual grazing plan for bunchgrass range (e.g., rest-rotation grazing systems rest one-quarter of pastures from livestock use each year).
  - Adjusting grazing use levels and stocking rates according to seral stage and rangeland health. Ideally, early-seral range should be used lightly (17–25% of annual forage production), whereas healthy mid- and late-seral range is best used moderately (30–40% of annual production).
  - Allowing dormant season (winter grazing) on low-elevation bunchgrass range is beneficial to grass plants and biological soil crusts.

RECREATION

The current FREP evaluation question for recreation is: *Are recreation sites providing healthy and safe recreation experiences?*

In 2011, no FREP activity was undertaken for the recreation resource value. In 2012, a new monitoring question and methodology will be developed to evaluate the condition of recreation trails in British Columbia and identify opportunities for improvement.

RESOURCE FEATURES

The FREP evaluation question for resource features is: *Are current forest practices adequately protecting and maintaining the integrity of karst features?*

In 2011, field staff continued the pilot testing of field assessment procedures that will determine the impacts of resource management on karst features, such as sink holes, cave entrances, and sinking streams. Karst assessment field procedures will be completed in 2012.

SOILS

The FREP evaluation question for the soils resource value is: *Are forest practices successful in preventing levels of site disturbance that are detrimental to soil productivity and hydrologic function?*

In 2011, a report was produced describing how current forest practices protected productivity and natural drainage of soils during a 5-year period (2005–2009). The combined approach of field-based evaluations by staff and expert high-resolution image interpretation showed that soil productivity and hydrologic function are being protected on the majority of cutblocks assessed across the province; soil conservation objectives were not achieved on approximately 18% of cutblocks sampled during the study (140 cutblocks in 28 forest districts). Soil conservation problems identified were related to: (1) disturbance in the roadside work areas and the net area to be reforested; (2) drainage, access construction, and erosion; and (3) low retention of mature trees for soil organism inoculum and coarse woody debris levels.

Recommendations for Continued Improvement of Soils Management

The following recommendations are based on practices associated with the most successful soils resource management outcomes.

- Reducing soil disturbance through improved planning of designated skid trail locations and (or) patterns.
- Reducing soil disturbance by considering the importance of soil organism inoculum in the location of single tree and patch retention.
- Promoting greater soil conservation awareness through communication of soil conservation principles to operators, particularly regarding the importance of minimizing compaction in roadside work areas, timing of operations on sensitive soils, maintaining natural drainage systems and patterns, and avoiding concentration of skid roads in harvest areas.
- Following well-established best management practices concerning soil compaction and conservation. These documents are excellent sources of information: *Preventing Soil Compaction and Rutting in the Boreal Forest of Western Canada: A Practical Guide to Operating Timber-harvesting Equipment*; and *Best Management Practices for Soil Conservation in Mountain Pine Beetle Salvage Operation*. [Publication details appear at the end of this report.]

TIMBER

The FREP evaluation question for the timber resource value is: *What are the changes (since declaration of free growing) to forest health and productivity (stand density and species composition, pest incidence, and site index) in 15–40-year-old second-growth stands?*

Second-growth forest
Photo credit: Paul Barolet

In the original intensive FREP studies, timber value monitoring primarily assessed the condition of 15–40-year-old, post–free-growing managed stands to determine whether they are on track to produce a healthy merchantable forest. Of the 266 stands examined across five timber supply areas, the majority have undergone a loss of free-growing density in the decade or so since free-growing declaration. Total stand density in the Coastal Western Hemlock and Sub-Boreal Spruce biogeoclimatic zones increased as a result of high levels of natural ingress. Total stand density in the Interior Cedar–Hemlock, Interior Douglas-fir, Montane Spruce, and Engelmann Spruce–Subalpine Fir zones are experiencing a net decrease as a result of natural mortality induced by pests or vegetation competition.

Four of the five timber supply areas examined experienced a change in leading inventory species in about 20% of stands with the exception of the lodgepole pine-dominated Lakes Timber Supply Area, where the leading species did not change. Changes to leading species were the result of ingress of natural regeneration and specific forest health issues.

The most common forest health agents found were: hard pine rusts, deformities and abiotic damage, vegetation competition, mammal damage, and root disease. Most of these cause tree mortality or reduce tree value and vigour by causing permanent deformity.

For the 323 stand development monitoring blocks sampled between 2009 and 2011, data quality control and analysis are currently under way. A detailed report will be available this fall. A preliminary data summary from 265 stands shows that:

- Pine is the leading species in 180 of 265 stands (68%) assessed to date, followed by spruce in 45 of 265 stands (17%), and Douglas-fir in 21 of 265 stands (8%).
- Hard pine stem rusts were the most frequently recorded damaging agent on pine. Vegetation competition from conifers and hardwoods ranked second, resulting in natural mortality in layer three trees (> 1.3 m tall and < 7.5 cm dbh) continues to reduce total stand density.

Recommendations for Continued Improvement of Timber (Managed Stand) Resource Management

The following recommendations are based on intensive timber value monitoring and stand development monitoring studies.

- Using the most current stand development monitoring data to help inform the development, review, and approval of forest stewardship plan stocking standards. Lodgepole pine should be the primary focus of this work in the near future.
- Planting species mixes at densities that consider climate change adaptation and account for local forest health and site conditions, and their anticipated long-term impacts. Careful consideration of site-specific tree species selection, species mixes, and densities, including existing stocking standards, will improve the chances of having healthy merchantable forests in a changing climate (see "Resources" section).

VISUAL QUALITY

The FREP evaluation questions for the visual quality resource value are: *How well are we managing and conserving views in designated scenic areas?* and *Are established Visual Quality Objectives being achieved?*

FREP visual quality monitoring began in 2006. Samples were randomly selected and only included cutblocks that fell within scenic areas with legally established Visual Quality Objectives (VQO). The initial aim was to collect enough samples to determine baseline performance for visual quality management under the *FPC*, thus establishing the benchmark against which to measure *FRPA* success. FREP Extension Note No. 13, released in 2010, summarized 3 years of sampling under the *FPC*.

Visual sampling of *FRPA*-influenced openings began in 2009. To date, 221 assessments have been completed, with a projected goal of 400 samples. A preliminary analysis shows no improvement in the management of

Enterprise Creek Hillside: Harvest achieved a partial retention visual quality objective with 56% volume removal
Photo credit: Ministry of Forests, Lands and Natural Resource Operations

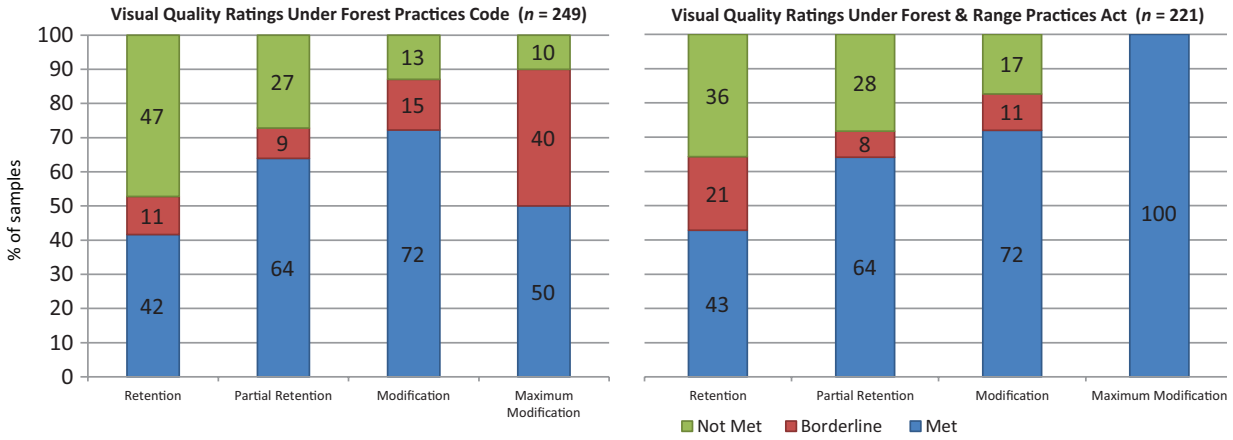

Figure 4. ***Visual quality monitoring results showing the extent to which Visual Quality Objectives have been met under FPC and FRPA.***

visual quality under *FRPA* over the *FPC*. Figure 4 compares the visual quality effectiveness monitoring results for cutblocks managed under these two legislative regimes.

FREP monitoring results indicate that although VQOs were legal objectives under the *FPC*, the rate of success for meeting those objectives fell short and performance has not improved under *FRPA*. Retention VQOs, which are reserved for the most sensitive visual landscapes and represent only 13% of the scenic areas, are achieved less than half (43%) of the time.

These results are indicative of several emerging issues related to visual quality management and the implementation of *FRPA*. For example, visual design techniques, which are key for the consistent application of VQOs, are only being applied 37% of the time. Figure 5 illustrates the results of assessing visual design of cutblocks managed for visual quality under *FRPA*. One of the most effective and basic tools for managing visual quality is the application of visual design principles. An extension note, analyzing 2012 field season data, will discuss this and other opportunities for continuous improvement.

Recommendations for Continued Improvement of Visual Quality Management

The following recommendations are based on practices associated with the most successful visual quality management outcomes.

- Retaining higher levels of designed in-block tree retention to create more natural-appearing landscapes and to help meet VQOs.
- Using partial-cutting silvicultural systems can facilitate greater overall short-term volume removal from a given landform for all visual quality classes with the exception of maximum modification. Perception studies show that generally, retention levels of more than 24% will generate a positive public response.
- Implementing visual design concepts and principles (i.e., cutblock shaping) will ensure harvested areas better blend with the natural landscape.
- Designing harvest openings on areas with VQOs using current guidelines and design tools for visual quality management.
- Following well-established best management practices concerning visual quality design principles and management. These documents are excellent sources of information: the interactive web-based Visual Landscape Design training package; and the Visual Landscape Design Training Manual. [Publication details appear at the end of this report.]

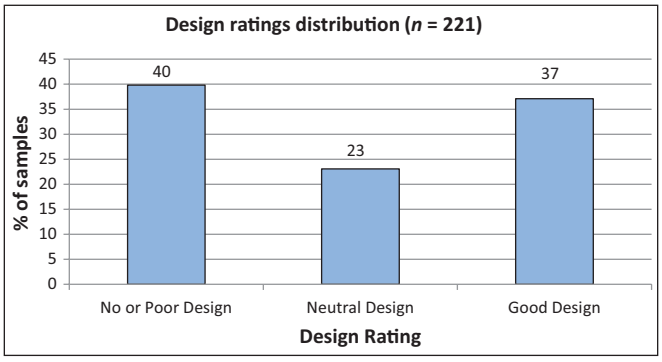

Figure 5. ***Visual quality monitoring results showing the application of visual design principles under FRPA.***

WATER QUALITY

The FREP evaluation question for the water quality resource value is: *Are forest practices effective in protecting water quality?*

Water quality data analysis is based on the year when a road system is evaluated. Fine sediment is generated from bare soil where it can be transported to connected streams, lakes, and wetlands. The amount of potential sediment generation depends on many factors, including road construction and maintenance, amount of exposed soil, and soil texture and type. Some of these factors can change over time or with specific ongoing activities (e.g., road maintenance), and therefore the evaluation year is used as the primary analysis date.

Since FREP water quality monitoring began in 2008, a total of 3423 assessments have been completed. Table 6 identifies percent scoring by sediment generation category for the 2008–2011 field seasons. Over 4 years of sampling water quality, provincial numbers indicate a positive, improving trend, as seen by increasing percentages of sites in the "very low" and "low" sediment generation categories and decreasing numbers in the "moderate," "high," and "very high" categories (Figure 6).

Table 6. ***Percentage of sites by average sediment generation potential and survey year***

		Sediment generation potential (% of sites)				
Survey year	*N* sites	Very low	Low	Moderate	High	Very high
2008	635	35	33	28	5	0
2009	1090	33	35	25	5	2
2010	941	32	39	24	4	1
2011	757	37	39	21	3	1
Total	3423	34	37	24	4	1

Stream assessment
Photo credit: Andy Waines

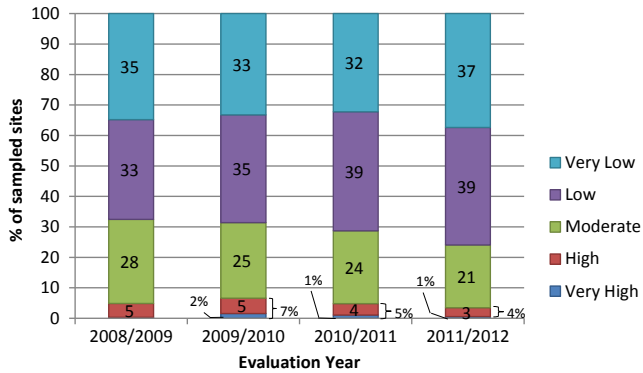

Figure 6. ***Water quality monitoring results showing sediment generation potential classes by evaluation year.***

Recommendations for Continued Improvement of Water Quality Management

The following recommendations are based on practices associated with the most successful water quality management outcomes.

- Armouring, seeding, and protecting bare soil immediately after construction or deactivation.
- Reducing water build-up and erosive potential by shunting water off roads and into the understorey, which filters suspended sediment, with the use of cross-ditches, kick-outs, shorter ditch lines, natural dips, swales, or grades.
- Avoiding long gradients approaching streams.
- Increasing the use of strategically placed culverts and road sloping for:
  - Capturing/collecting intercepted groundwater and channelling it to the other side of the road so that it can be re-absorbed into the soil. This will prevent groundwater from accumulating in the ditchline to a significant volume, which can cause erosion.
  - Collecting ditchline and road surface water and shunting it across a road (by in-sloping/out-sloping a road, and (or) with a ditch block and a culvert) where it can be absorbed/filtered into the ground to prevent it from entering a stream.

- Avoiding ditch lines ending at creeks.
- Following well-established best management practices concerning fine sediment delivery to streams and stream crossings. These documents are excellent sources of information: *Forest Road Engineering Guidebook; Erosion and Sediment Control Practices for Forest Roads and Stream Crossings; and the Fish-stream Crossing Guidebook*. [Publication details appear at the end of this report.]

WILDLIFE

The FREP evaluation questions for wildlife is: *Do ungulate winter ranges and wildlife habitat areas maintain the habitats, structures and functions necessary to meet the goals of the area and is the amount, quality, and distribution of these areas contributing effectively with the surrounding land base (including protected areas and managed land base) to ensure the survival of the species now and over time?*

Under the wildlife resource value, work continues on developing conceptual models, indicators, and protocols for selected wildlife species. In 2011, conceptual models for mountain goat, and northern, boreal, and mountain caribou, were developed in support of the draft provincial Ungulate Winter Range monitoring protocol; field methods and approach were tested in one winter range. A strategic level assessment of mountain caribou use of *FRPA*-designated areas (i.e., all mountain caribou winter ranges and wildlife habitat areas) was completed and reported. Sampling design and analytical components of the tailed frog wildlife habitat area monitoring protocol were finalized in preparation for implementation; research on terrestrial habitat requirements and indicators continues. The last year of field work was completed for the grassland bird study in the Cariboo-Chilcotin, including measuring cover at nest sites, documenting nest productivity and success, and assessing cover and litter production in different grassland types exposed to different levels of grazing. Five FREP reports on these topics are currently in the development stage.

SUMMARY

As a summary of FREP monitoring results to date, this third annual program report (formerly the Chief Forester's Annual Report on FREP) provides an opportunity to communicate continuous improvement perspectives and recommendations to natural resource professionals and managers. This information is intended to support and promote the dialogue necessary to achieve short- and long-term sustainable resource management in British Columbia. Resource professionals are strongly encouraged to consider this information, along with FREP publications such as reports, extension notes, and monitoring protocols, and other relevant data in their practice, to inform their professional recommendations and decisions, particularly where these involve a balancing of environmental, social, and economic values.

To ensure the resource management community gains the maximum value from FREP, natural resource professionals are encouraged to:

1. Carefully review this report in the context of individual roles and responsibilities (you can find additional detail in FREP reports and extension notes).
2. Contact your local district FREP representatives to discuss local results and (or) see how data is collected in the field. Local data is available to individual licensees for their own analysis and interpretation.
3. Visit the FREP website http://www.for.gov.bc.ca/hfp/frep/index.htm and (or) contact any of the FREP Resource Value Team Leads (see Table 1) for detailed information on monitoring protocols, indicators, and results.
4. Contact Nancy Densmore (Nancy.Densmore@gov.bc.ca) for access to FREP data and interpretation of results.
5. Review the FREP monitoring protocols—these documents identify best available information on key attributes and indicators of forest and range resource health and sustainability.
6. Send any feedback or questions relating to this report, or FREP in general, to Peter Bradford (Peter.Bradford@gov.bc.ca or by telephone at 250-356-2134)—your ideas and suggestions for enhancing FREP communications are especially appreciated.

THANK YOU

- The Association of British Columbia Forest Professionals Stewardship Committee for their review and recommendations on a draft of this document;
- Our clients, stakeholders, and others who have suggested ongoing improvements to FREP communications;

- Resource Value Team Leads for their work in developing the FREP monitoring indicators and protocols and for the analysis of data on which this report is based; and
- Field staff that collect resource stewardship monitoring data and help champion ongoing continuous improvement of resource stewardship.

RESOURCES

FREP Extension Products

- FREP data: Contact your local district, or Nancy Densmore at Nancy.Densmore@gov.bc.ca
- FREP on the web: http://www.for.gov.bc.ca/hfp/frep/index.htm
- Reports: http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm
- Extension Notes: http://www.for.gov.bc.ca/hfp/frep/publications/extension_notes.htm
- YouTube Videos: http://www.youtube.com/user/frep101
- Posters: http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm
- Indicators, protocols, and field cards: http://www.for.gov.bc.ca/hfp/frep/indicators/table.htm
- FREP Strategic Plan (2011–2013): http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/library/FREP-Strategic-Plan-2011.pdf

Sediment Control Information

- *Forest Road Engineering Guidebook* (http://www.for.gov.bc.ca/tasb/legsregs/FPC/FPCguide/Road/FRE.pdf)
- *Erosion and Sediment Control Practices for Forest Roads and Stream Crossings* (http://www.feric.ca/en/?OBJECTID=D1719534-C09F-3A58-EAFC64F9625A170F)
- *Fish-stream Crossing Guidebook* (http://www.for.gov.bc.ca/hfp/fish/fishpassage.html)

Soil Compaction and Soil Conservation Information

- *Preventing Soil Compaction and Rutting in the Boreal Forest of Western Canada: A Practical Guide to Operating Timber-harvesting Equipment* (http://www.feric.ca/en/index.cfm?objectid=DDF72A13-E081-222F-A4DA52C482E31BA9)
- *Best Management Practices for Soil Conservation in Mountain Pine Beetle Salvage Operation* (http://www.for.gov.bc.ca/hfd/pubs/Docs/En/En91.pdf)

Visual Quality Design and Management Information

- Interactive web-based Visual Landscape Design training package (http://www.for.gov.bc.ca/hfp/training/00018/)
- *Visual Landscape Design Training Manual* (http://www.for.gov.bc.ca/HFD/pubs/docs/mr/rec023.htm)

Forest Health, Silviculture Stocking, and Tree Species Diversity Information

- Tree species monitoring reports – Provincial and TSA Summaries (https://www.for.gov.bc.ca/hfp/sof/species%20monitoring%20reports.htm)
- Guidance for assessing FSP stocking standards alignment with addressing immediate and long-term forest health issues (https://www.for.gov.bc.ca/hfp/silviculture/Guidance%20for%20assessing%20FSP%20stocking%20standards%20June%2021%202012.pdf)