



Multiple Resource Value Assessment (MRVA)

Mackenzie Natural Resource District

January 2014

FOREWORD

Forest management in British Columbia is governed by a hierarchy of legislation, plans and resource management objectives. For example, federal and provincial acts and regulations, Land Use and forest stewardship plans, and protected areas and reserves collectively contribute to achieving balanced environmental, social and economic objectives. Sustainable forest management is key to achieving this balance and a central component of forest management certification programs. The purpose of Multiple Resource Value Assessment (MRVA) reports is to provide resource professionals and decision makers with information about the environmental component of this 'balance' so that they can assess the consistency of actual outcomes with their expectations.

The *Forest and Range Practices Act (FRPA)* lists eleven resource values essential to sustainable forest management in the province; biodiversity, cultural heritage, fish/riparian and watershed, forage and associated plant communities, recreation, resource features, soils, timber, visual quality, water, and wildlife. The MRVA report is a summary of the available field-based assessments of the conditions of these values. Field assessments are generally conducted on or near recently harvested cut blocks and therefore are only evaluating the impact of industrial activity and not the condition of the value overall (e.g., they don't take into account protected areas and reserves). Most of the information is focused on the ecological state of the values and provides useful information to resource managers and professionals on the outcomes of their plans and practices. This information is also valuable for communicating resource management outcomes to stakeholders, First Nations and the public, and as a foundation for refining government's expectations for sustainable resource management in specific areas of the province.

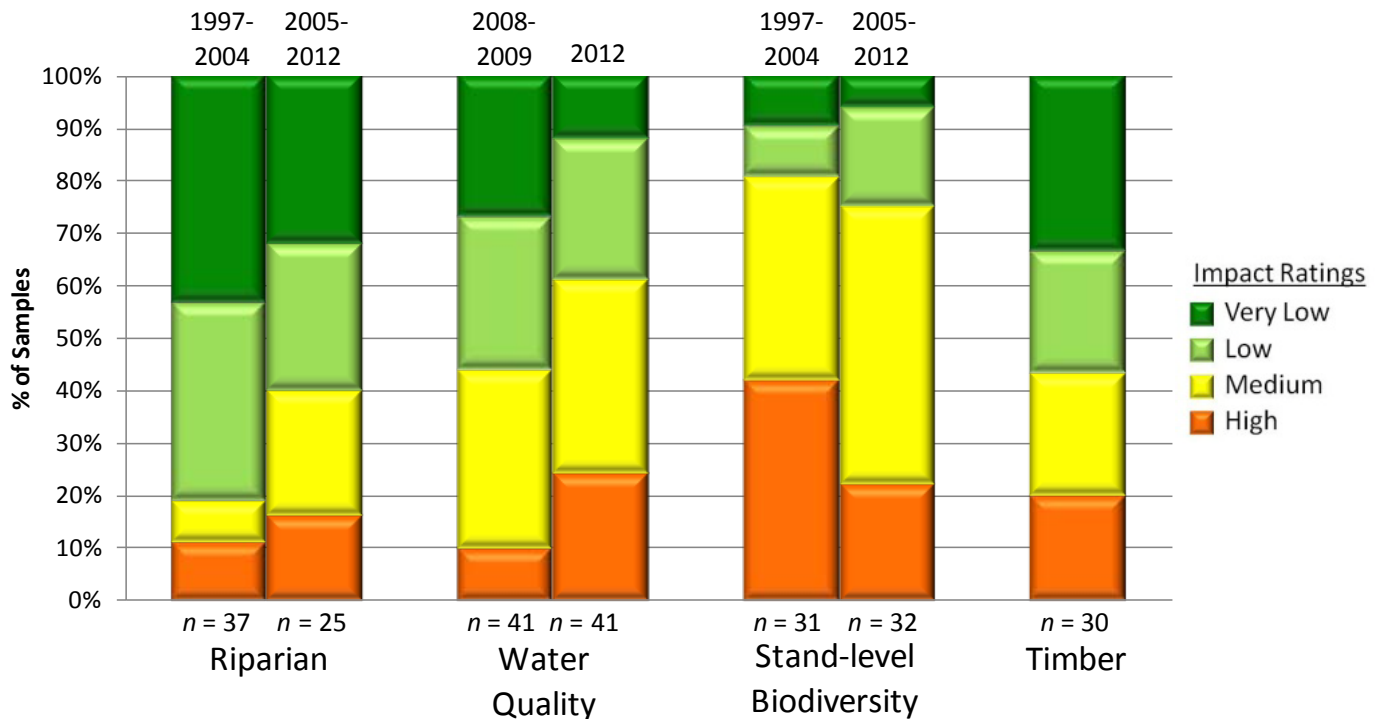
I encourage readers to review the full report and direct any questions or comments to the appropriate district office.

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

MULTIPLE RESOURCE VALUE ASSESSMENTS—IN BRIEF

Multiple resource value assessments show the results of stand and landscape-level monitoring carried out under the Forest and Range Evaluation Program (FREP). This report summarizes results for riparian, water quality (sediment), biodiversity and timber (stand development) monitoring conducted in the Mackenzie Natural Resource District and includes a district manager commentary of key strengths and weaknesses. Through MRVA reports, decision makers communicate expectations for sustainable resource management of public resources and identify opportunities for continued improvement.

Figure 1: Mackenzie Natural Resource District site-level resource development impact ratings by resource value with trend (Riparian, stand-level biodiversity trend by harvest year/era. Water quality trends by evaluation year. Timber samples are all post-free growing.)



Important Context for Understanding this Assessment

The extraction and development of natural resources, along with natural factors (e.g., insects, wind, floods), influence and impact ecological condition. The goal of effectiveness evaluations is to assess these impacts on the state of public natural resource values (status, trends, and causal factors); such evaluations *do not assess compliance with legal requirements*. These evaluations help resource managers:

- assess whether the impacts of resource development result in sustainable resource management
- provide transparency and accountability for the management of public resources
- support the decision-making balance between environmental, social, and economic factors
- inform the ongoing improvement of resource management practices, policies, and legislation.

The resource development impact ratings contained in this report are based on assessments conducted within the areas where resource extraction takes place and do not reflect the ecological contributions of parks, protected areas, or other conservancy areas.

Although this report focuses on forestry-related activities, FREP monitoring protocols have also been applied to other resource sector activities, including mining (roads) and linear developments (hydro and pipelines). Procedures are being adapted to expand monitoring into these resource sectors over time.

INTRODUCTION

The development of the *Forest and Range Practices Act (FRPA)* had several key objectives, including:

- simplifying the forest management legal framework
- reducing operational costs to both industry and government
- allowing “freedom to manage”
- maintaining the high environmental standards of the *Forest Practices Code of British Columbia Act (FPC)*.

As part of the results-based *FRPA* framework, the provincial government committed to conducting effectiveness evaluations and publically reporting the monitoring results. The science-based information provided by these evaluations will be used to determine whether *FRPA* is achieving the government’s objectives of maintaining high environmental standards and ensuring sustainable management of public resources. If those objectives are not being met the monitoring results will be used to help inform the necessary adjustments to practices, policies, and legislation. Government is delivering its effectiveness evaluation commitment through the Forest and Range Evaluation Program (FREP; for details, see <http://www.for.gov.bc.ca/hfp/frep/>). The 11 *FRPA* resource values monitored under FREP include: biodiversity, cultural heritage, fish/ riparian & watershed, forage and associated plant communities, recreation, resource features, soils, timber, visual quality, water and wildlife.

Multiple Resource Value Assessments (MRVAs) reflect the results of stand- and landscape-level monitoring carried out under FREP. The program’s stand-level monitoring is generally conducted on forestry cutblocks, resource roads, or other areas of industrial activity. As such, these evaluations provide a stewardship assessment of resource development practices. Landscape-level monitoring of biodiversity, visual quality, and wildlife resource values is more broadly an assessment of the overall landscape. Reports on MRVAs are designed to inform decision making related to on-the-ground management practices, statutory decision-maker approvals, and data for the assessment of cumulative effects.

This report summarizes FREP monitoring results for the Mackenzie Natural Resource District. MRVA reports clarify resource stewardship expectations, and promote the open and transparent discussion needed to achieve short- and long-term sustainable resource management in British Columbia.

MRVA reports are intended for those interested in the status and trends of resource values at the timber supply area (TSA) or natural resource district scale, such as natural resource managers and professionals, government decision makers, and First Nations. These reports are also useful in communicating resource management outcomes to the public.

Government managers and decision makers are encouraged to consider this information when:

- discussing district or TSA-level resource stewardship with staff, licenced stakeholders, tenure holders and First Nations
- clarifying expectations for sustainable resource management of public land
- integrating social and economic considerations into balanced decision making
- reviewing and approving forest stewardship plans
- developing silviculture strategies for TSAs
- assessing Timber Supply Reviews and their supporting rationale
- informing decision making at multiple scales.

Natural resource professionals are encouraged to consider this information, along with other FREP information such as reports, extension notes, protocols, and monitoring data to:

- maintain current knowledge of the resources they manage
- inform professional recommendations and decisions, particularly when balancing environmental, social, and economic values
- enhance resource management, consultation, and treaty rights discussions between First Nations, government, and licensees.

Published FREP reports and extension notes contain detailed findings for each resource value. These documents are available on the FREP website at:

<http://www.for.gov.bc.ca/hfp/frep/publications/reports.htm>. Licensees can request data collected on their operating areas. FREP staff will assist licensees with the analysis of their data and the preparation of licensee-specific MRVA reports.

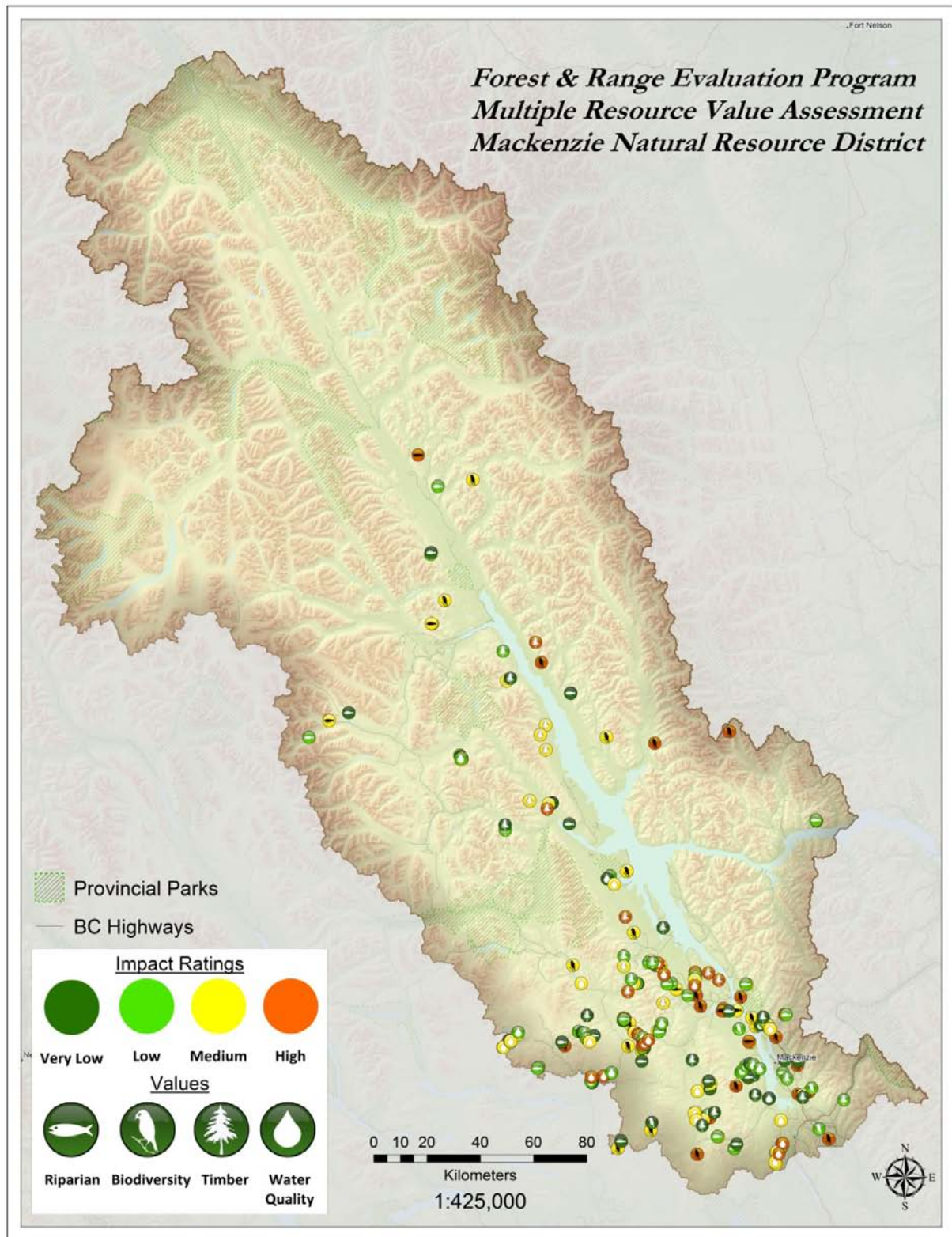
Although this MRVA report documents monitoring results at the district or TSA level, the MRVA concept is scalable. Reports for individual licensees, treaty settlement areas, or landscape units can be produced when sufficient monitoring data is available. Reports can also be prepared at the regional or provincial levels. This report provides site-level resource value assessments and trends through comparisons of cutblocks harvested before 2005 with those harvested in 2005 or later (where data is sufficient). FREP's site assessment monitoring results on each resource value are categorized by impact (very low, low, medium, or high). This classification reflects how well site-level practices achieve government's overall goal of sustainable resource management. Site-level practices that result in "very low" or "low" impact are consistent with sustainable management objectives. Practices resulting in "high" impact are seen as inconsistent with government's sustainability objectives. For a description of the MRVA methodology see Appendix 1.

MACKENZIE NATURAL RESOURCE DISTRICT – ENVIRONMENTAL AND STEWARDSHIP CONTEXT

This report covers the Mackenzie Natural Resource District (figure 2). It is located in the northeast interior of British Columbia and is the fourth largest district covering approximately 6.41 million hectares. Forestry and the public sector are the major employment sectors, with agriculture, construction and mining also contributing to the local economy. The district is one of two in the Omineca Region and is the most forest dependent area in the province. There are several provincial parks in the district including Dune Za Keyih Provincial Park, Kwadacha Wilderness Provincial Park, and Finlay Russel Provincial Park. The forests and waterways of the TSA are home to more than 250 species of wildlife, including mule and whitetail deer, grizzly and black bears, moose, woodland caribou, wolves, coyotes, Stone sheep, elk and mountain goats. Furbearers include marten, lynx, beaver, otter and fisher. The traditional territories of the Kwadacha and the Tsay Keh Dene First Nations are almost entirely located within the district, including their main communities of Fort Ware and Tsay Keh, respectively. The traditional territories of the McLeod Lake, Takla Lake, Nak'azdli, West Moberly and Halfway River First Nations are primarily located outside the district, but portions of their traditional territories overlap with the district. In addition, small portions of the district near Thutade Lake are asserted to be within the traditional territories of the Gitksan and the Tahltan.

The district manufacturing facilities are located in the south end of the district resulting in long hauling distances over gravel roads. Lodgepole pine is the most dominant tree species in the district much of which has been killed by the recent Mountain Pine Beetle epidemic. Timber harvesting has increased and has targeted the dead pine stands over the last few years. With the increased harvesting, coordination is necessary between licence holders to ensure retention of stewardship values on the landscape. The district values to highlight include old-growth management areas, ungulate habitats, grizzly bear habitat, river and stream systems with bull trout and grayling populations, and raptor nesting sites.

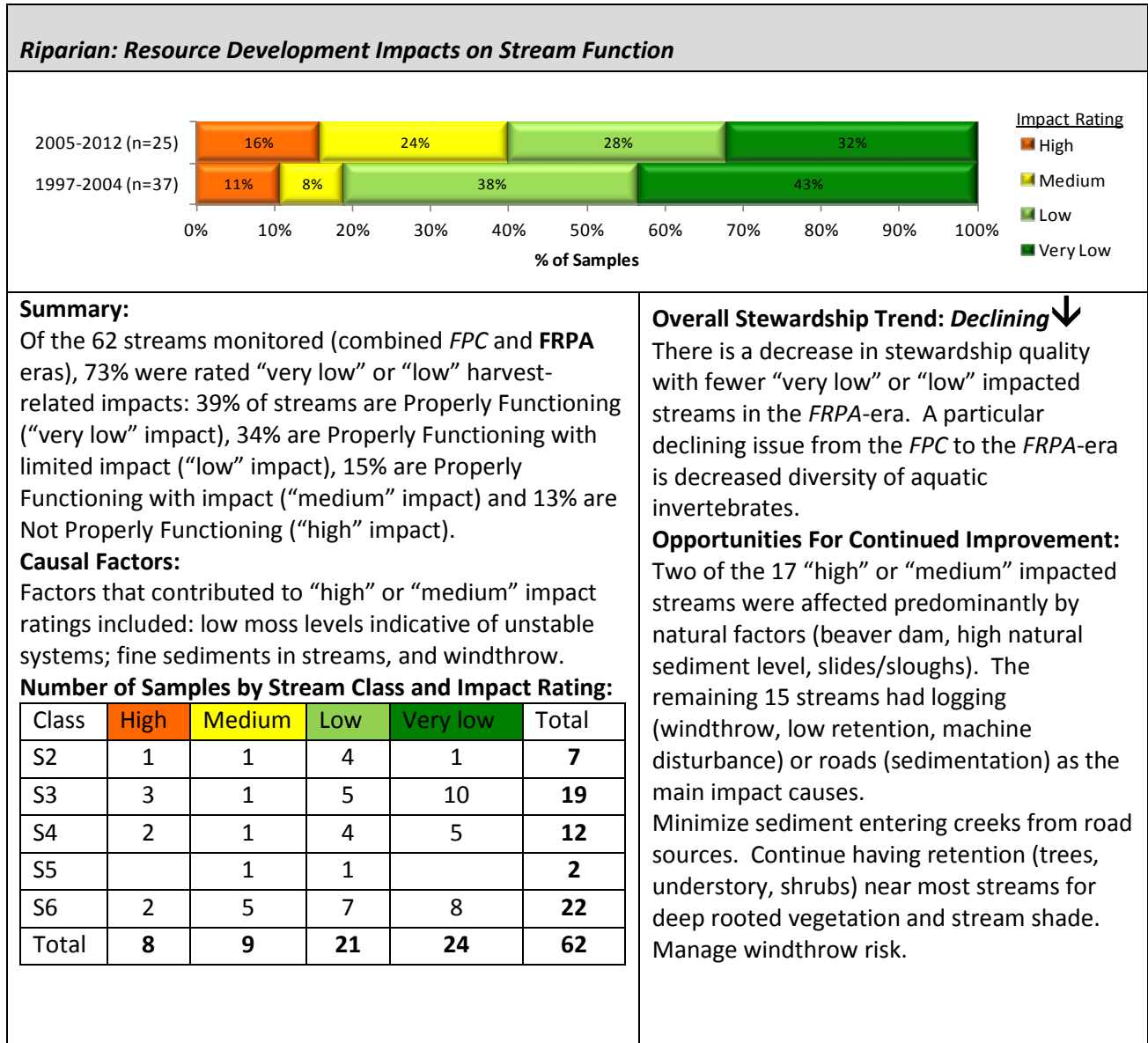
Figure 2: Mackenzie Natural Resource District, showing FREP sample locations and results (see <http://www.for.gov.bc.ca/hfp/frep/publications/mrva.htm> for a high-resolution version of this map).



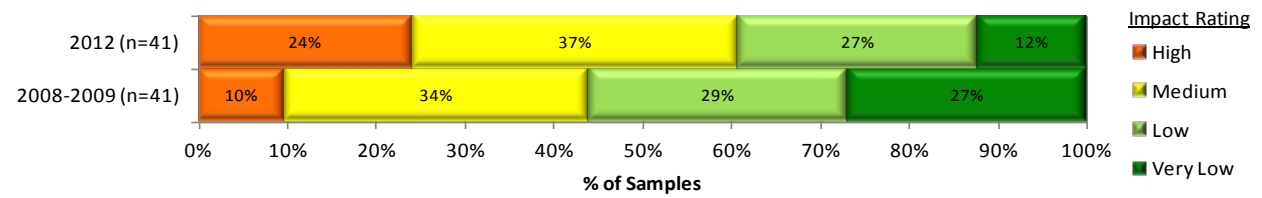
KEY RESULTS BY RESOURCE VALUE AND OPPORTUNITIES FOR CONTINUED IMPROVEMENT

Table 1 shows the resource values assessed for the Mackenzie Natural Resource District and includes a summary of key findings, causal factors, trends, and opportunities for continued improvement. Data are presented for *FPC*-era samples at sites harvested before 2005 and *FRPA*-era samples at sites harvested in 2005 or later. This approximates the *Forest and Range Practices Act* (*FRPA*) era, and allows for a comparison between earlier and later stewardship practices. The impact rating indicates the effect of resource development on the resource value, from “very low” to “high” impact.

Table 1: Resource development impact rating, key findings, and opportunities for improvement by resource value for the Mackenzie Natural Resource District.



Water Quality (fine sediment): Resource Development Impacts on Water Quality



Summary:

Of the 82 road segments assessed from 2008 to 2012, 48% were rated as “very low” or “low” road-related impact. Site assessments show the range for potential sediment generation as 20% “very low” (“very low” impact), 28% “low” (“low” impact), 35% “moderate” (“medium” impact), 13% “high” and 4% “very high” (“high” impact).

Causal Factors:

See opportunities for improvement for “high” or “medium” impacted road segments. Some opportunities will apply to ongoing maintenance issues, while others mainly apply to new road construction.

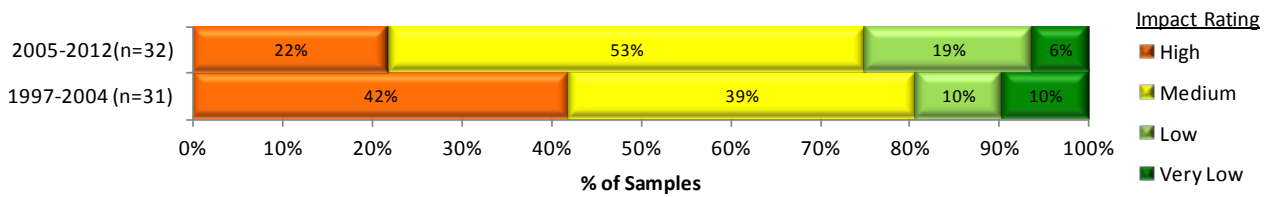
Overall Stewardship Trend: Declining ↓

Trending for water quality is based on survey years, to capture impact of road traffic and maintenance. There is higher percentage of “high” or “medium” impacted road segments in the 2012 sample year and fewer “very low”, compared to the 2008 and 2009 sample years.

Opportunities For Improvement:

The most frequent suggested maintenance issues are: increase the number of strategically placed culverts; and, use cross ditches and kickouts.

Stand-level Biodiversity: Resource Development Impacts on Stand-Level Biodiversity



Summary:

Of 63 cutblocks sampled (combined *FPC* and *FRPA* eras), 22% of sites were rated as “very low” or “low” harvest-related impact. Considering total retention, retention quality, and coarse woody debris quantity and quality, 8% sites are rated as “very low” impact on biodiversity, 14% as “low”, 46% as “medium” and 32% as “high”. An additional 12 blocks were sampled and assessed for individual indicators but were not ranked due to insufficient baseline (11 from the *FPC*-era).

Causal Factors:

83% of all blocks had more than 3.5% tree retention, increasing to 94% in the *FRPA*-era. The *BWBSdk* subzone was most likely to have very low retention compared to *ESSFmv*, *SBSmk* and *SBSwk*. Large snag retention is lower than expected compared to baseline. Big diameter tree density (≥ 40 cm dbh for the majority) is close to expected. The number of tree species retained improved in *FRPA*-era, but can improve further.

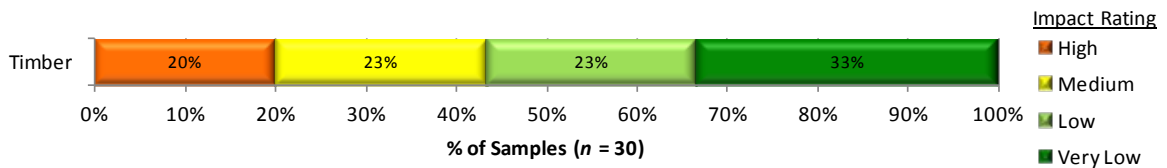
Overall Stewardship Trend: Improving ↑

Retention increased from an average 5.3% in the *FPC*- to 14.2% in the *FRPA*-era. Much of this increase is due to fewer blocks with very low amounts of retention in *FRPA*-era. Retention quality also increased in *FRPA*-era, with best quality found in the *ESSFmv* blocks.

Opportunities For Continued Improvement:

Continue trend to leave at least low levels of retention on every cutblock. Improve retention quality by leaving higher densities of large snags and big diameter trees and the full spectrum of tree species. Leave higher densities of big coarse woody debris pieces.

Timber: Resource Development Impacts on overall health and productivity of managed 20-40 year stands



Summary:

Of the 30 polygons sampled (2012) the weighted average well spaced density over the three biogeoclimatic ecosystem classification (BEC) zones (ESSF, SBS, BWBS) achieved 74% of target stocking standard (TSS).

Percent of target stocking standard by BEC

BEC	ESSF	SBS	BWBS	Average
TSS	80%	71%	78%	74%

56% of the polygons were rated “very low” or “low” impact to health and stocking; 23% “medium” and 20% “high” impact.

A draft Stand Development Monitoring TSA Data Summary Report was produced for the Mackenzie TSA. The mean age of all the stands was 23.8 years. The four leading stand damaging agents were: tree competition (VT); western gall rust (DSG); snow press (NY), and moose browse (AM).

Agent	VT	DSG	NY	AM
300 plots	109/300	89/300	52/300	38/300

The average total stems/ha (all BECs) at declaration was 3583 and 3880 at the time of stand development monitoring. Well spaced at declaration was 1101 and 915 at the time of stand development monitoring. There was no change in leading species found between declaration and the time of stand development monitoring in 15 (88%) of the 17 polygons sampled. All the “medium” or “high” impact rated polygons were a result of a combination of low total and/or well spaced stems/ha. It is not known if spacing was the cause of these stands low total stems/ha.

Causal Factors:

The major contributing factor to the “medium” and “high” impact rated polygons was a combination of relatively low total and well spaced stems/ha. If these low densities are attributed to spacing their productivity would be re-evaluated.

Overall Stewardship Trend:

No trend can be established at this time

Opportunities For Improvement:

A closer investigation is needed of the “medium” and “high” impacted stands to see if they were spaced. A complete set of declaration and stand development monitoring data would provide a clearer picture of the polygons sampled.

NOTE: Completing the Stand Development Monitoring Polygon Cover sheet will provide a clearer picture why some stands have such low stocking

Soils: Resource Development Impacts on Soil Productivity and Hydrologic Function

There are currently only four soils samples in the Mackenzie Natural Resource District. Analysis will be completed in subsequent years when more samples are available.

Landscape-level Biodiversity: Is the forested matrix at the landscape-level providing the range of habitat understood as necessary for maintaining ecosystem function and old and mature forest dependant species?

This protocol is in development. The three primary landscape-level biodiversity indicators are: (1) site index by leading species (ecosystem representativeness); (2) percent of TSA by age class (young, mid-, mature, and old forest); and (3) percent interior habitat of old forest. Each indicator is categorized by percent in non-commercial land base, timber harvesting land base, and protected areas. Data for these indicators is derived from Hectares BC and other spatial databases.

RESOURCE VALUE STEWARDSHIP RESULTS COMPARISON

Table 2 provides ratings of stewardship effectiveness at varying scales. Effectiveness is determined by the percentage of samples with a “very low” or “low” resource development impact rating. Appendix 2 shows stewardship effectiveness results by resource value for the North, South and Coast Areas and the province as a whole.

Table 2: Stewardship effectiveness within the Omineca Region as determined by resource development impact rating (ID = Insufficient Data; sample sizes in brackets).

Resource Value	Effectiveness of Practices in Achieving Resource Stewardship Objectives: % very low and low impact resource development impact ratings (sample size in brackets)					
	Omineca Region Comparison					Omineca Region ^a
	Mackenzie District	Prince George District	Vanderhoof District	Fort St. James District	Robson Valley TSA	
Riparian – all data	73% (62)	74% (54)	70% (74)	64% (83)	57% (14)	69% (287)
FRPA-era data	60% (25)	ID (11)	74% (35)	72% (29)	ID (12)	70% (112)
FPC-era data	81% (37)	71% (42)	67% (39)	59% (54)	ID (2)	68% (174)
Water quality – all data	48% (82)	25% (48)	69% (127)	64% (133)	52% (58)	56% (448)
2010–2012 samples	39%(41)	19% (21)	74%(57)	41% (44)	41% (27)	48% (190)
2008–2009 samples	56% (41)	30% (27)	64%(70)	75% (89)	61% (31)	63% (258)
Stand-level biodiversity –all data	22% (63)	59% (49)	8% (65)	71% (93)	ID (32)^b	43% (283)
FRPA-era data	25% (32)	64% (14)	5% (22)	88% (33)		46% (108)
FPC-era data	20% (31)	57% (35)	9% (43)	62% (60)		41% (175)
Timber (stand development monitoring)	56% (30)	64% (14)	73% (30)	73% (26)	ID (0)	67% (100)

^a Includes the Prince George, Mackenzie, Fort St. James and Vanderhoof Natural Resource Districts.

^b There is insufficient baseline for ESSFmm and ICHmm so ranking is not possible at this time for Robson Valley.

DISTRICT MANAGER COMMENTARY¹

Sustainable forest management relies on a dynamic process based on continued learning and improvement. It aims to ensure forests maintain their biodiversity, productivity and regenerating capacity; while providing beneficial ecological, social and economic conditions now and for future generations.

In the past 10 years a large percentage of the lodgepole pine in the district has been killed by the Mountain Pine Beetle. Economic conditions have recently improved creating an increased demand for wood fibre. With this increased demand attention needs to be placed on forest and range practices and the values that are key to maintaining good forest stewardship at both the stand level and landscape level. Forest Stewardship Plans do state they will meet or exceed the key objectives of government in the *Forest and Ranges Practices Act*. The district expectations are that licensees will review the findings in this report and adjust practices to improve future results.

Riparian

The report indicates there is work to be done to recover our ratings to the *Forest Practices Code* era. Attention needs to be placed on maintaining stream shading and preventing blowdown from occurring along stream banks. For example, maintaining wind firm trees within the first 10 m of the riparian zone provides an opportunity to improve our riparian management within the district.

Water Quality

Water quality is related to the amount of sediment entering streams from roads. Again the report indicates there is work to be done to recover our ratings to the *Forest Practices Code* era. With the increased harvesting, there will not only be an increase in the number of roads but an increase in road users and shared road maintenance. Improvements can be made in the area of maintenance through strategic placement of culverts, use of cross ditches and eliminating grader berms along the road edges. I encourage licensees to continue with the grader operator education program and expect to see a significant improvement in the district's water quality results.

Stand-Level Biodiversity

Stand-level retention on the landscape is in an increasing trend compared to the *Forest Practices Code* era. The amount of retention and the retention quality has increased quite significantly. I want to see this trend maintained and continue to leave at least low levels of retention on every cutblock. Leaving higher densities of large snags, large coarse woody debris, and big diameter trees with the full spectrum of species will help contribute to the maintenance of this value.

Soils

Assessments are aimed at measuring forest practices and those that may be detrimental to productivity and hydrologic function. The current sample is too small to determine a trend. I encourage the licensees to maintain practices that are not detrimental and district staff to continue with soil monitoring so that improvements to practices today will improve timber supply in the future.

Timber Resource Value

Timber is assessed through the Stand Development Monitoring (SDM) protocol which began in 2012. With so few samples a trend has not been established. I have asked district staff to continue with SDM so that improvements to practices today will improve timber supply in the future.

¹ Commentary supplied by Mackenzie Natural Resource District Manager, David Schwarz.

Visual Quality

Visual quality was measured a few years ago and at that time licensees were meeting landscape objectives. With the increase in harvesting attention will need to be paid to this objective and value when licensees are preparing harvesting plans. I have asked district staff to continue with the visual quality protocol to ensure we are maintaining this value.

Landscape Level Stewardship within the Omineca Region

Landscape level ranking criteria are in development. As such, there is no information or reporting within this year's report. As mentioned above, with the increased harvesting, coordination is necessary with government and between licence holders to ensure identification and maintenance of key stewardship values across the landscape that result in both sustainable environment and a sustainable forest industry.

Summary

What I find encouraging is the preliminary results from this year's sampling are trending in a positive direction in all categories. Going forward district staff will continue to monitor practices and complete sufficient samples to show trends for all values. Forest professionals should review monitoring results, and use them when preparing, reviewing and implementing forest stewardship plans. Forest professionals also need to collaborate and coordinate amongst themselves and with government staff on how to best ensure landscape level stewardship across the Omineca region.

APPENDIX 1. SUMMARY DESCRIPTION OF RESOURCE DEVELOPMENT IMPACT RATING CRITERIA

Table A1.1 shows the criteria used to determine the resource development impact ratings for each resource value. Detailed rating criteria, methodology, and definition of terms used are described in the companion document *FREP Technical Note #6: Methodologies for Converting FREP Monitoring Results to Multiple Resource Value Assessment (MRVA) Resource Development Impact Ratings* (http://www.for.gov.bc.ca/ftp/HFP/external/!publish/frep/technical/FREP_Technical_Note_06.pdf). The ratings of “very low”, “low”, “medium” and “high” are “technical ratings” based on best available science.

Table A1.1: Criteria for determining resource development impact rating outcomes for each resource value.

Resource Value	FREP Evaluation Question	Indicators	Resource Development Impact Rating Criteria	Very low	Low	Medium	High
Riparian	Are riparian forestry and range practices effective in maintaining the proper functioning of riparian areas?	Fifteen key questions (e.g., intact channel banks, fine sediments, riparian vegetation)	Number of “no” answers on assessment questions of channel and riparian conditions	0–2	3–4	5–6	> 6
Stand-level Biodiversity	Is stand-level retention providing the range of habitat and attributes understood as necessary for maintaining species dependant on wildlife trees and coarse woody debris?	Percent retention, retention quality from nine key attributes (e.g., big patches, density of large diameter trees), coarse woody debris volume, coarse woody debris quality from two key attributes (e.g., density of pieces \geq 10 m and 20 cm, and volume of large diameter pieces)	Cumulative score. A 60/40 weighting is used for tree retention versus coarse woody debris, recognizing the longer-term ecological value of standing retention.	> 70%	55–70%	40–55%	< 40%
Water Quality (sediment)	Are forest practices effective in protecting water quality?	Fine sediment potential	Fine sediment (m^3) due to expected surface erosion or past mass wasting	< 0.1	< 1	1–5	> 5
Soils	Are forest practices preventing site disturbance that is detrimental to soil productivity and hydrologic function?	Amount of access, restoration of natural drainage patterns, road side work area soil disturbance, amount of mature forest and coarse woody debris and restoration of natural drainage patterns	Overall assessment of practices on cutblock to maintain soil productivity and hydrologic function	Well	Moderately		Poor
Cultural Heritage	Are cultural heritage resources being conserved and where necessary protected for First Nations cultural and traditional activities?	Evidence and extent of damage to features, operational limitations, management strategies and type and extent of features	Combined overall cutblock assessment results with consideration of individual feature assessment results	See methodology report			
Timber: Stand Development Monitoring	What is the overall health and productivity of managed 20-40 year stands?	Impacts of forest health factors on stand stocking (ratio of total and well spaced)	Forest health damaging agent (% level of incidence) and level of stocking (well spaced stems per hectare)	\geq 1.7	0.8–1.69	0.3–0.79	0–0.29
Landscape-level Biodiversity	Is the forested matrix at the landscape-level providing the range of habitat understood as necessary for maintaining ecosystem function and old and mature forest dependant species?	Ecosystem representativeness, age class and interior old	Overall ranking: within protected and non-protected areas	Ranking under development			
Visual Quality	How are we managing views in scenic areas and achieving visual quality objectives?	Visual evaluation of block, design of block, percent of landform altered, impact of roads, tree retention and view point importance	Basic visual quality class (determined using the VQC definitions) is compared with the Adjusted VQC (derived using percent alteration measurements and adjustment factors) to determine if VQO is achieved.	VQO achieved, and % alteration low or mid-range	VQO achieved, but % alteration for one or both close to alteration limit	Only one method indicates VQO achieved	Both methods indicate VQO not achieved

APPENDIX 2. COMPARATIVE FREP RESULTS BY RESOURCE VALUE FOR OTHER AREAS

Table 2 in the main body of the document describes overall ratings for the Mackenzie Natural Resource District as compared to adjacent TSAs or districts. The table below describes the same results but by the North, South and Coast areas and the province as a whole. The three operational areas represent combined natural resource regions.

Table A2.1: FREP monitoring results by resource value for the North, South, and Coast Areas and the province as a whole compared to the Mackenzie Natural Resource District.

Resource Value	Effectiveness of Practices in Achieving Resource Stewardship Objectives: % Very low + low resource development impact rating (sample size in brackets)				
	Mackenzie Resource District	Forests, Lands and Natural Resource Operations Areas			Province
		North	South	Coast	
Riparian – all data	73% (62)	71% (654)	69% (678)	58% (451)	67% (1783)
FRPA-era data	60% (25)	71% (257)	68% (277)	62% (198)	67% (732)
FPC-era data	81% (37)	71% (394)	70% (401)	55% (253)	67% (1048)
Water quality – all data	48% (82)	66% (992)	70% (1515)	76% (1526)	71% (4033)
2010–2012 samples	39%(41)	67% (505)	70% (823)	79% (1021)	73%(2349)
2008–2009 samples	56% (41)	64% (487)	70% (692)	70% (505)	68% (1684)
Stand-level biodiversity –all data	22% (63)	42% (655)	54% (780)	77% (455)	56% (1890)
FRPA-era data	25% (32)	49% (270)	61% (347)	84% (201)	63% (818)
FPC-era data	20% (31)	38% (385)	49% (433)	72% (254)	50% (1072)