Forest and Range Evaluation Program
Multiple Resource Value Assessment Report

Robson Valley Timber Supply Area

June 2016

CONTEXT FOR UNDERSTANDING THIS REPORT

All natural resource development will have an impact on ecosystem condition. The role of effectiveness evaluations is to assess the status and trends of British Columbia's natural resource values, and to identify related causal factors and opportunities for improvement. The site-level "impact ratings" presented here are based on assessments conducted within the working land base (e.g., areas where resource extraction takes place). The ecological contributions of parks, protected areas, and other conservancy areas (approximately 21% of the provincial land base (22% in the Robson Valley TSA)) are not covered in this report. Where possible, impact ratings reflect both resource development and the effects of natural impacts, such as those related to the mountain pine beetle infestation and fire or wind disturbances.

Effectiveness evaluations do not assess compliance with legal requirements. Instead, these evaluations assess the effects of development activities and natural influences on the condition of *FRPA* values, regardless of whether practices are in compliance with legislation. These evaluations are meant to help resource managers:

- assess whether resource development is done sustainably;
- provide transparency and accountability for the management of public resources;
- balance decision making in consideration of environmental, social, and economic factors; and
- guide ongoing improvement of resource management practices, policies, and legislation.

Multiple Resource Value Assessment (MRVA) reports reflect the results of monitoring carried out under the Forest and Range Evaluation Program (FREP). This is generally stand/site-level monitoring which is conducted on forestry cutblocks or resource roads. As such, these evaluations provide a stewardship assessment of site-level resource development practices. In the near future, MRVA reports will include an assessment of landscape-level biodiversity.

RESOURCE VALUE ASSESSMENT CLASSIFICATIONS AND MEANINGS

Monitoring results are summarized using four impact ratings.

1. very low
2. low
3. medium
4. high

"Very low" and "low" impact ratings are considered consistent with the government's goal of sustainable management of the resource values within the *Forest and Range Practices Act*. The "medium" impact rating is considered borderline and the "high" rating is generally considered unsustainable.

Site-level resource value trends are provided when there is sufficient data to compare sites impacted over time. Much of the information presented in this report is focused on the ecological state of the values and provides useful information to resource managers and professionals on the outcomes of plans and practices. For a description of the methodologies used in this report, see Appendix 1.

The presentation style is similar to that used in previous Multiple Resource Value Assessments.[1] The "Impact Ratings" diagram indicates the effect of resource development on the resource value, from "very low" to "high" impact. The "Summary" presents a descriptive outline of the monitoring results. The "Causal Factors"

[1] See http://www.for.gov.bc.ca/hfp/frep/publications/mrva.htm. The methodology is described in FREP Technical Note No. 6 (http://www.for.gov.bc.ca/ftp/HFP/external/!publish/frep/technical/FREP_Technical_Note_06.pdf).

for the impact ratings are derived from the field-based data. The "Opportunities for Improvement" are based on practices that resulted in the best outcomes and (or) expert knowledge.

Where sufficient data is available, the "Overall Stewardship Trend" shows trends between time periods. A chi-squared test, which determines a probability value, is used to determine trends between sampling eras for riparian, water quality, stand-level biodiversity, and visual quality results. *P*-values are used to help assess the likely significant difference between two populations (e.g., 2005–2013 and 1997–2004 eras). Because the evaluations conducted by FREP are generally routine-level monitoring, a critical *p*-value of 0.1 is used; this is higher than the standard for significance in research studies. Setting the critical value at this level balances the likelihood of committing a Type 1 versus a Type 2 error (i.e., accepting something as significant when it isn't, as opposed to missing a significant effect because the trial was not powerful enough to detect it).

ROBSON VALLEY – ENVIRONMENTAL AND STEWARDSHIP CONTEXT

This report covers the Robson Valley Timber Supply Area, one of two TSAs that make up Prince George Natural Resource District (figure 2). The TSA is bordered to the west by Wells Gray and Bowron Lake provincial parks, and Mitchell Lake-Niagara protected area that connects them, and by Kakwa Recreation Area to the north. To the east are Willmore Wilderness Area, Jasper National Park and Mount Robson and Mount Terry Fox Provincial Parks. The TSA covers a total area of approximately 1.46 million hectares. Mount Robson Provincial Park is found within the TSA as well as West Twin Provincial Park (and protected area) and other small provincial parks and protected areas.

The largest communities are the Village of McBride and the Village of Valemount, smaller communities include Crescent Spur-Loos, Dunster and Tete Jaune Cache. No First Nations' communities are located in the Robson Valley TSA, but ten First Nations have aboriginal interests in the TSA. Lheidli T'enneh Band and Simpcw First Nation claim traditional territories in much of the Robson Valley, and Canim Lake Band, Soda Creek-Xatśūll First Nation, Red Bluff-Lhtako Dene Nation, Neskonlith First Nation, Adams Lake First Nation, Shuswap First Nation, Okanagan First Nation, and Tsilqot'in National Government all have asserted traditional territory in the TSA.

The terrain of the TSA is varied: the bottomlands of the Rocky Mountain Trench are flat to rolling, while the adjacent snow-capped mountain ranges are rugged with steep forested lower slopes and deeply cut side valleys. The diversity of the landscape is reflected in a broad mix of tree species, a diversity of wildlife habitats, and a wide variety of land uses, including forestry, recreation, agriculture, protected areas, and private lands.

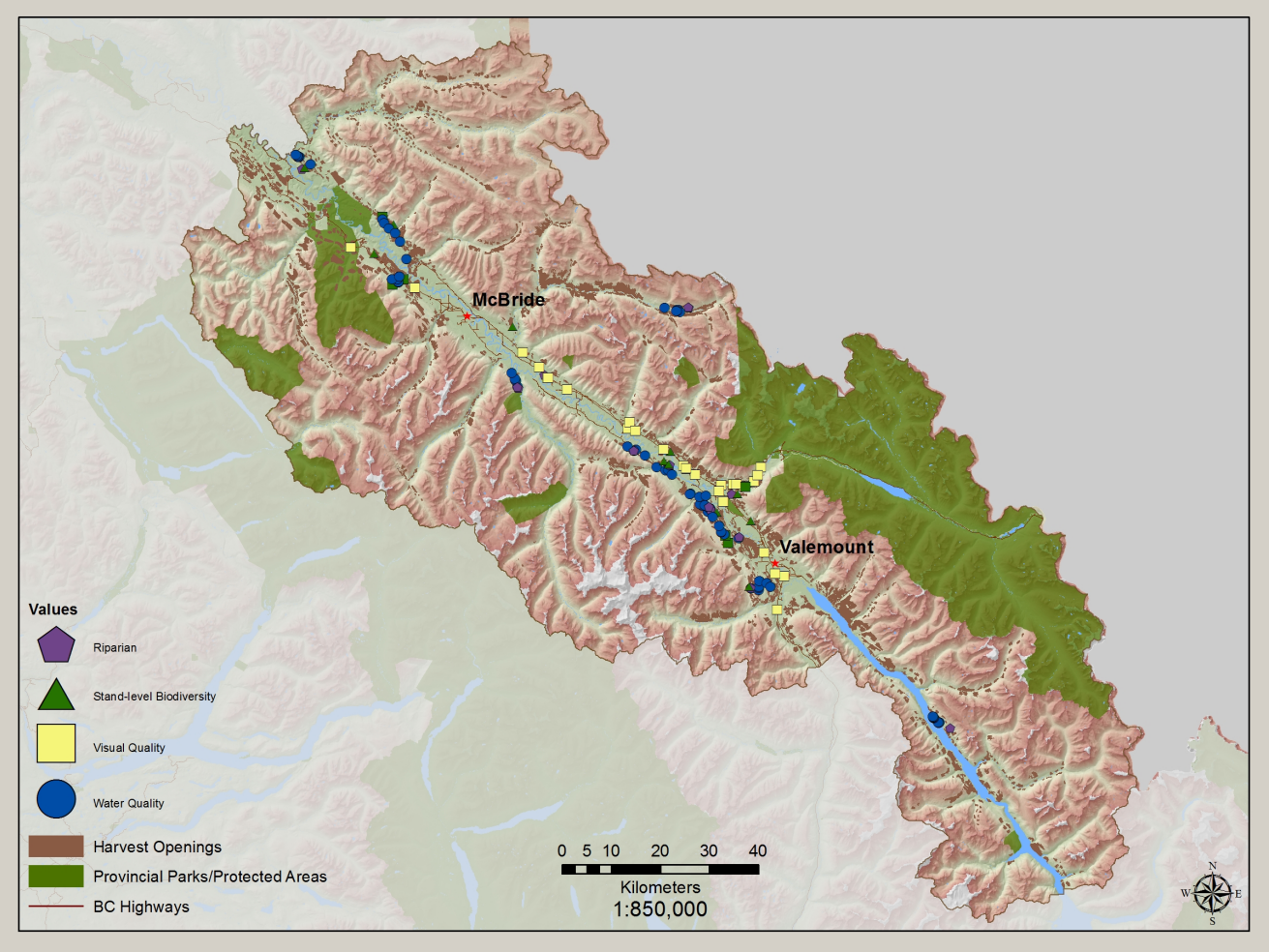
The mix of habitats in this TSA support a variety of wildlife species, including mountain caribou, grizzly bear, black bear, white tail deer and mule deer, as well as wolverine, cougar, wolf and lynx. Chinook salmon and bull trout are also present, and a number of species in the TSA are listed as endangered, threatened or vulnerable. Surface water is the primary source of water for domestic and agricultural use. Summer tourism and winter outdoor recreation are important to the local economy.

Forestry operations must comply with land-use objectives for visual quality, ungulate winter range, old growth, wildlife movement corridors, and fisheries sensitive watersheds. In many locations steep rocky slopes, unstable terrain, streams and avalanche chutes make forestry operations physically difficult. About 15 percent of the gross TSA area is considered available for timber harvesting under current management practices.

The two large mills that used to operate in the TSA closed in 2006, so most timber is trucked to mills outside the TSA. Community forests provide local management of forested lands around McBride, Dunster and Valemount. In recent years timber harvesting was accelerated to address mountain pine beetle infestations, primarily in the Rocky Mountain trench. Now low levels of spruce beetle have been detected and are being

monitored. Old spruce-subalpine fir stands dominate the timber supply. Therefore, in the future the timber supply is expected to drop significantly because regenerated stands will be harvested at younger ages and smaller volumes than existing old stands.

Figure 1: Robson Valley TSA, showing FREP sample locations up to and including 2014 sample years.

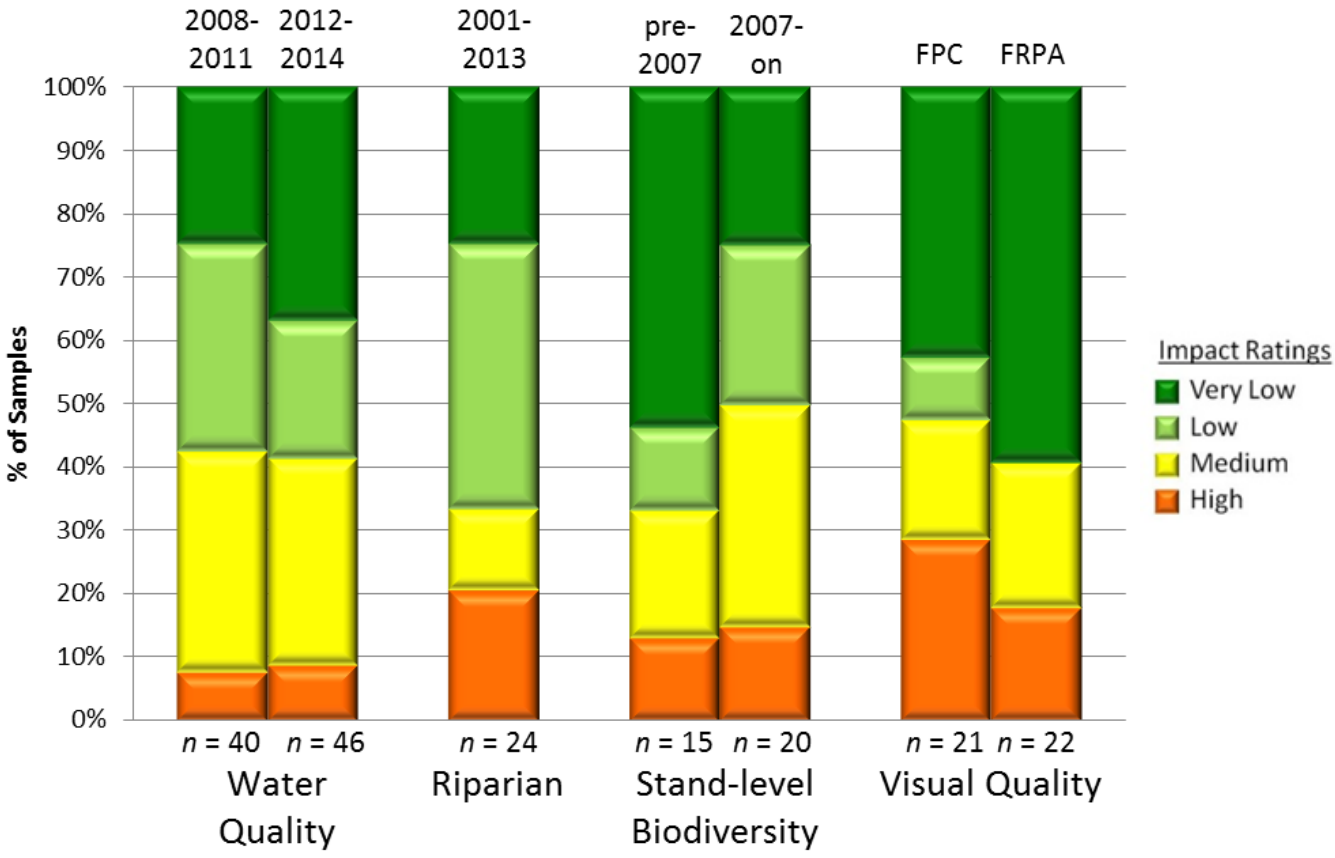


ROBSON VALLEY TSA — MONITORING IN BRIEF

This report summarizes monitoring conducted in the Robson Valley TSA. MRVA reports allow decision makers to communicate expectations for sustainable resource management of public resources and identify opportunities to improve stewardship. This report concludes with a district manager commentary on the key strengths and opportunities for improvement of natural resource management in the area.

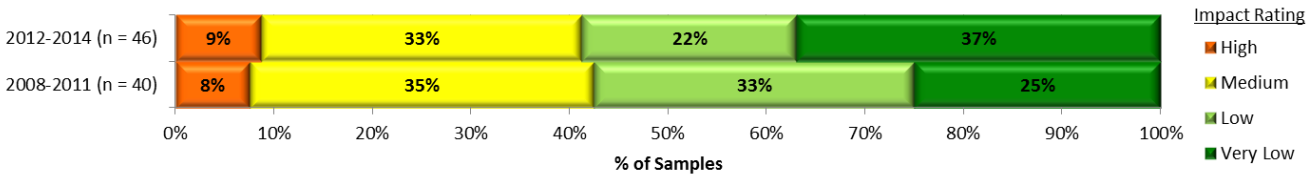
Figure 2: Robson Valley stewardship impact ratings by resource value with trends

Note: Trending for water quality is done by sample year to assess impacts to fine sediment based on annual traits (e.g. climate, traffic, maintenance). Trending for riparian and stand-level biodiversity is done by harvest years to assess impacts to the value based on harvest choices and practices. Trending for visual quality is done comparing blocks within scenic areas that were associated with forest development plans (Forest Practices Code) and forest stewardship plans (FRPA).



KEY RESULTS BY RESOURCE VALUE AND OPPORTUNITIES FOR CONTINUED IMPROVEMENT

Water Quality (potential to generate fine sediment): Resource Development Impacts on Water Quality



Data Source: Data for water quality assessments was collected by FLNR staff using the Forest and Range Evaluation Program water quality monitoring protocol between 2008 and 2014. The sample sites for water quality are stream road crossings and mass wasting sites (landslides) connected to fish habitat and/or drinking water sources along roads that originate at randomly selected recently harvested cutblocks. Water quality is assessed from the potential for fine sediment generation at each sample site.

Summary:
Of the 86 road segments assessed 31% were rated "very low" impact, 27% "low", 34% "medium", 8% "high" impact regarding fine sediment generation potential.

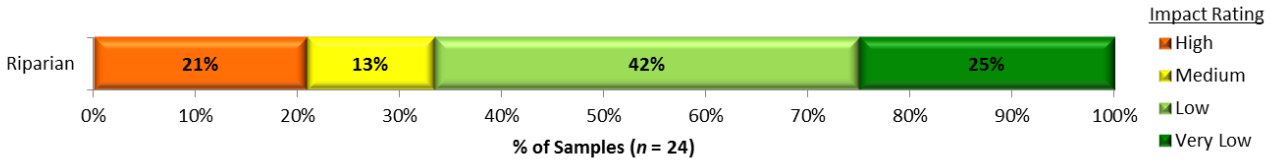
Causal Factors:
See opportunities for improvement for "medium" or "high" impacted road segments. Some opportunities will apply to ongoing maintenance issues, while others apply mainly to new road construction.

Overall Stewardship Trend:
There is no statistical difference between sampling eras (p=0.6).

Opportunities For Improvement:
The most common recommendations resulting from the water quality monitoring assessments were:

- use good quality materials and crown roads
- Remove/break-up roadside berms that channel water and allow sediment build-up
- armour, seed and protect bare soil.

Riparian: Resource Development Impacts on Stream Function



Data: The data for riparian stream assessments was collected by Forests, Lands and Natural Resource Operations (FLNR) staff using the FREP riparian monitoring protocol. The sampling population for stream assessment is randomly selected cutblocks with streams in or adjacent to cutblock boundaries harvested 2001 to 2013 (sampled from 2006 to 2014). The largest stream with sufficient stream length, in or adjacent to, the block is assessed.

Summary: Of the 24 streams monitored, 22 were associated with cutblocks harvested 2005 or later.

Samples by Stream Class and Impact Rating:

Class	High	Medium	Low	Very Low	**Total**
S2			1	1	**2**
S3			1	1	**2**
S4			2	2	**4**
S6	5	3	6	2	**16**
Total	**5**	**3**	**10**	**6**	**24**

Causal Factors:

Cause of impact, % of total	Most common specific impacts
Logging 39% *falling and yarding low retention*	• large woody debris process altered • Large woody supply decreased • Stream or riparian blockages increased
Natural events 36% *high natural sediment*	• Moss levels decreased • In-stream sediments increased
Roads 14% *erosion causing sedimentation*	• In-stream sediments increased
Upstream factors 8% *natural events logging, roads*	• Moss levels decreased • In-stream sediment increased
Other manmade 3% *non-timber licensee*	• Moss levels decreased • In-stream sediment increased

Near-stream human actions (logging, roads, other) caused on average 56% of the negative impacts on the streams.

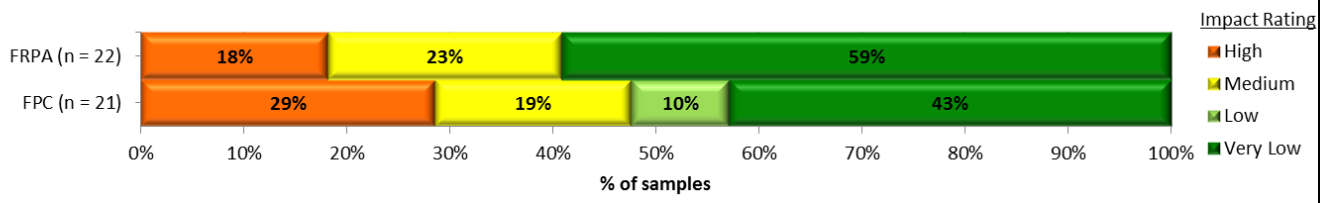
All sampled S2, S3 and S4 streams were in the two lowest impact ratings. The majority of the sample was S6 streams with half the samples in the two lowest impact ratings. The 5 "high" impact streams were all within-block streams with no near stream retention. High natural background sediment is prevalent in this area.

Stewardship Trend: Insufficient data to allow for comparison between harvest periods.

Opportunities for improvement (and/or continuation) based on streams with the best outcomes:

- Continue maintaining intact channel banks by protecting near stream deeply rooted vegetation on naturally erodible reach sections.
- Considering the already high contribution of background sediment, work to minimize potential fine sediments from roads entering streams
- Keep logging slash out of streams to allow for unimpeded flow
- Leave higher levels of retention on S6 streams.

Visual Quality: Resource Development Impacts on Achievement of Visual Quality Objectives (VQO)



Data Source: Data for visual quality assessments was collected by FLNRO field staff between 2008-2015 using the Forest and Range Evaluation Program visual quality monitoring protocol. The sampling population for visual quality is landforms with visual quality objectives, randomly selected based on recently harvest cutblocks.

Summary: Collectively, 51% were rated with "very low" harvest-related impacts on achieving the Visual Quality Objectives, 5% were "low" impact, 21% were "medium" impact and 23% were "high" impact.

Number of *FPC* Samples by VQO and Impact Rating:

VQO[1]	High	Medium	Low	Very Low	Total
M				3	**3**
PR	3	2	2	3	**10**
R	3	2		3	**8**
Total	**6**	**4**	**2**	**9**	**21**

[1] M = modification, MM = maximum modification, PR = partial retention, R = retention

Number of *FRPA* Samples by VQO and Impact Rating:

VQO[1]	High	Medium	Low	Very Low	Total
MM				2	2
M				3	3
PR	3	4		7	14
R	1	1		1	3
Total	**4**	**5**		**13**	**22**

Causal Factors in the *FRPA* era:

For the three Partial Retention and one Retention landforms where VQOs were not achieved ("high" impact):

- 4 had "no design or poor design"
- 2 had low retention within openings.
- 4 had high (9.3% to 14.8%) landform alteration more indicative of a Modification VQO

Thirteen landforms had VQOs that were fully achieved ("very low" impact). For the seven of these that were Partial Retention and the one that is Retention VQO:

- 6 had "good" design, one neutral and one no design or poor design.
- 6 had good or moderate levels of retention within openings
- 7 had % landform alteration consistent with their VQO.

Overall Stewardship Trend:

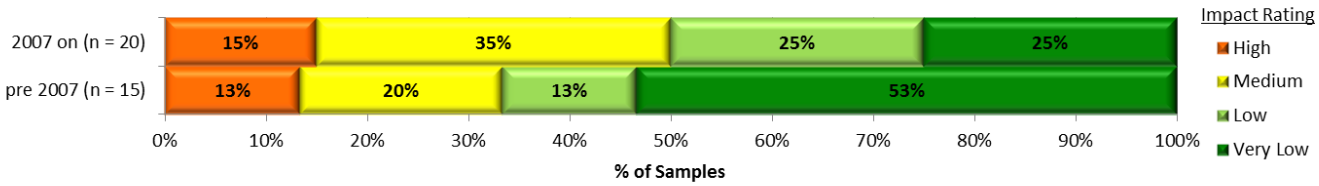
There is no statistical difference between sampling eras (p=0.53)

Opportunities for Improvement based on viewscapes that meet visual quality objectives:

When in viewscapes:

- Utilize visual landscape design techniques to blend openings into the landscape
- Utilize in-block retention
- Ensure total landform % alteration is within allowance for VQO, after considering factors specific to block such as design and in-block retention.

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



Data Source: The data for stand-level biodiversity assessments was collected by FLNR field staff using the FREP stand-level biodiversity monitoring protocol. Sampling sites are randomly selected recently harvested cutblocks. The data was collected from 2006 to 2014. Trending is done by harvest era with above bar showing the cutblocks harvested before 2007, and 2007 and later.

Summary: Of the 35[2] cutblocks sampled (all harvest years), 57% were rated as "very low" or "low" harvest-related impact, considering total retention, retention quality, and coarse woody debris quantity and quality. The table below shows the percent of blocks and average cutblock size by impact category, indicating that larger blocks in the later harvest era are more likely to be in the "very low" or "low" impact categories.

2007 on harvest	High	Medium	Low	Very low
% of blocks	15%	35%	25%	25%
Ave gross (ha)	5	18	75	57
% of area	2%	16%	47%	36%

pre-2007 harvest	High	Medium	Low	Very low
% of blocks	13%	20%	13%	53%
Ave gross (ha)	16	17	20	19
% of area	11%	19%	14%	56%

Causal Factors: Average retention is 22.5%, decreasing over time from 27.4% in pre-2007 harvest-era to 20.5% in the later harvest era. Much of this decrease was driven by three pre 2007 harvested SBSdh blocks with greater than 50% retention. 7% of total samples had zero retention, and another 12% had less than 3.5% retention. Dispersed retention is the predominant retention technique, with 61% of the retention coming from dispersed trees. Half of the sampled cutblocks (21 of 42 blocks) had no patch retention. Average gross cutblock size has increased from 19 to 39 hectares in the later harvest era. The density of large diameter trees, live and dead is low compared to baseline (timber cruise data) in the ICHmm (50 cm) and wk (70 cm), but similar to baseline in the SBSdh (40 cm).

Tree species diversity is generally good, representing that expected from baseline. Large snag density is low in the ICH subzones. CWD volume in the harvested areas is similar to that found in baseline (retention patches). CWD quality in terms of large diameter (20 cm) volume is good in the ICH, though low in SBS.

Overall Stewardship Trend: There is no statistical difference between harvest eras (p=0.37). However, this is influenced by the relatively low sample sizes.

Opportunities For Improvement and/or continuation of practices that effectively manage stand-level biodiversity:

- Have at least low levels of retention on every cutblock with a wide range of retention over many blocks (e.g. 3% to 30%)
- Use more patch retention to maintain intact forest floors, have potential for interior habitat, and better cover habitat for wildlife.
- Continue retaining a full diversity of live tree species.
- Retain more of the largest trees for the site in the ICH subzones.
- Look for opportunities, particularly on ICH cutblocks, to safely leave large snags as ecological anchors in retention patches.

[2] 7 additional blocks (ESSFmm1) were sampled and assessed for some indicators but could not be categorized since insufficient baseline was available.

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 results by resource value for the North, South and Coast Areas and the province as a whole.

Table 2: Stewardship effectiveness within the Omineca Natural Resource 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 + Low Resource Development Impact Rating					
	Omineca Region Comparison					Omineca
	Robson Valley TSA	Prince George District[1]	Mackenzie District	Fort St. James District	Vanderhoof District	
Riparian – all data	**67%** (24)	**75%** (64)	**76%** (90)	**67%** (103)	**76%** (90)	**73%** (371)
2005 on (FRPA-era)	68% (22)	82% (22)	72% (53)	76% (49)	82% (51)	76% (197)
pre 2004 (FPC-era)	ID (2)	71% (42)	81% (37)	59% (54)	67% (39)	68% (174)
Water quality – all data[3]	**58%** (86)	**25%** (48)	**49%** (167)	**63%** (168)	**71%** (153)	**57%** (622)
2012–2014 samples	59% (46)	ID (0)	46% (126)	58% (38)	71% (115)	60% (374)
2008 -2011 sample year	58% (40)	25% (48)	56% (41)	64% (130)	71% (38)	54% (248)
Stand-level biodiversity –all data	**57%** (35)	**60%** (89)	**27%** (81)	**70%** (97)	**17%** (78)	**45%** (345)
post 2006	50% (20)	52% (27)	40% (35)	83% (18)	19% (21)	47% (101)
2004-2006	64% (11)	77% (30)	6% (16)	82% (22)	22% (27)	51% (95)
pre 2004	ID (4)	50% (32)	23% (30)	61% (57)	10% (30)	41% (149)
Visual Quality						
FRPA	**59%** (22)	**ID** (6)	**ID**[2] (0)	**65%** (26)	**81%** (21)	**69%** (75)
FPC	**52%** (21)	**50%** (12)	**ID** (0)	**70%** (10)	**ID** (0)	**56%** (43)

[1] not including Robson Valley TSA, except for stand-level biodiversity which uses the entire PG District

[2] currently no harvesting in VQO areas in Mackenzie

[3] at time of writing this report – does not include water quality 2015 field season data.

DISTRICT MANAGER COMMENTARY[3]

This is the second multi-resource value assessment report for Robson Valley. The monitoring results presented show that recent forest practices can be rated as "very low" or "low" impact (sustainable) on half of the sites sampled for stand level biodiversity, and on slightly more than half of the sites sampled for water quality, visual quality and riparian function. Although local conditions provide many challenges for forest management, there is significant room for improvement where resource impact ratings are "high" or "medium" (borderline or unsustainable). Therefore, I expect licensees to do the following:

- Riparian management - maintain intact channel banks by protecting near stream deeply rooted vegetation on naturally erodible reach sections; minimize potential sediments from roads entering streams; keep logging slash out of streams to allow unimpeded flow; and leave higher levels of retention on S6 streams.

- Water quality management - use good quality road materials and crown roads; remove or break-up roadside berms that channel sediment into water bodies; and armour, seed and protect bare soil.

- Visual quality management - use in-block retention; use visual landscape design techniques to blend openings into the landscape; and make the total landform percent alteration within the allowance for the visual quality objective, after considering design and in-block retention.

- Stand level biodiversity management - maintain at least low levels of trees on every cutblock with a wide range of retention over many blocks (e.g., 3% to 30%); use more patch retention to maintain intact forest floors, interior habitat, and better cover habitat for wildlife; retain the full diversity of live tree species, retain more of the largest trees for the site in the interior cedar hemlock (ICH) zone, and retain large snags as ecological anchors in retention patches in the ICH zone, where safe to do so.

District staff will continue to monitor practices and complete sufficient samples to show trends for all values, and should collect baseline data for stand-level biodiversity in the Engelmann spruce-subalpine fir ESSFm1 subzone so sample data can be fully analyzed.

Forest professionals should review monitoring results, and use them when preparing, reviewing and implementing forest stewardship plans.

[3] Commentary supplied by Prince George Natural Resource District, Acting District Manager, Shawn Rice

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?	% retention, retention quality (e.g., big patches, density of large diameter trees), coarse woody debris volume, coarse woody debris quality (e.g., density of pieces ≥ 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
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