



Multiple Resource Value Assessment (MRVA)

Merritt Timber Supply Area

Cascades Natural Resource District

November 2013

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 11 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.

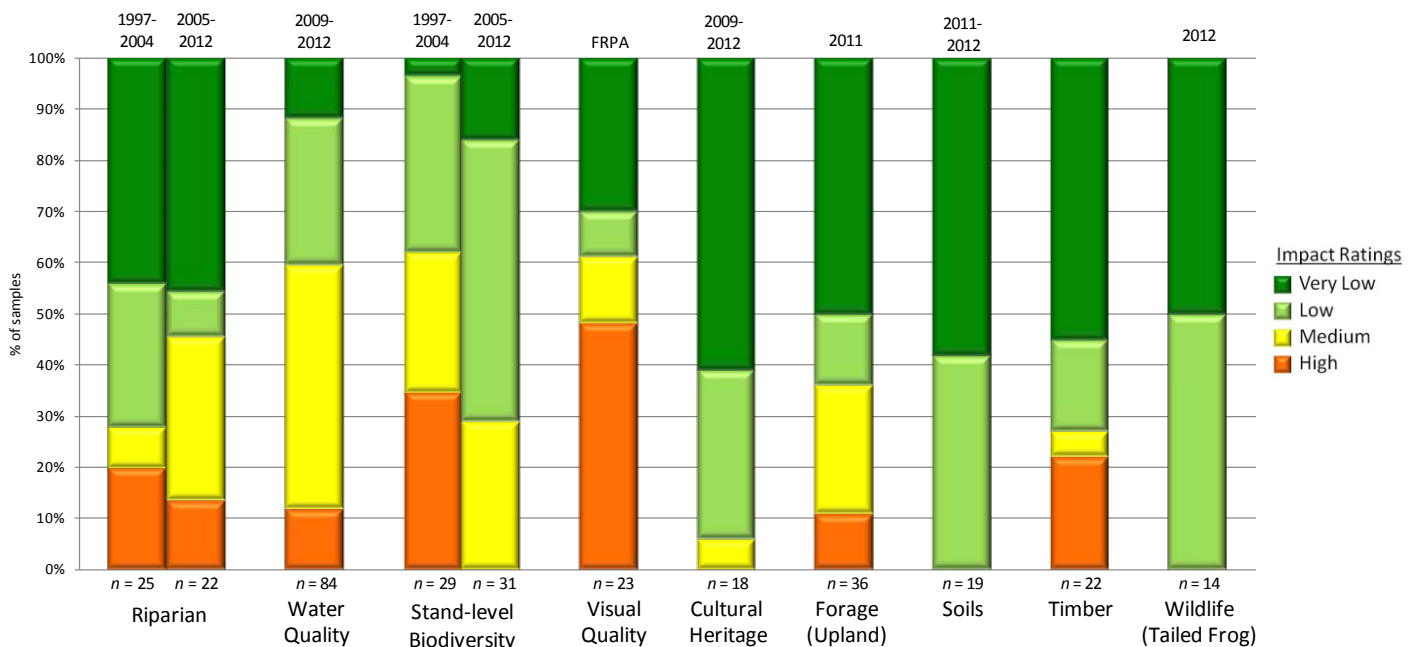
I encourage readers to review the full report and direct any questions or comments to the appropriate district office.

Tom Ethier
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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, biodiversity, water quality (sediment), visual quality, cultural heritage, forage, soils, timber (stand development monitoring) and wildlife (tailed frog) monitoring conducted in the Merritt Timber Supply Area 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: Merritt Timber Supply Area site-level resource development impact rating by resource value with trend (Riparian, stand-level biodiversity and visual quality trend by harvest year/era. Water quality, cultural heritage, forage, soils and wildlife trend 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 Merritt Timber Supply Area. 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 detailed description of the MRVA methodology and terms used in this report, please go to:

http://www.for.gov.bc.ca/ftp/HFP/external!/publish/frep/technical/FREP_Technical_Note_06.pdf. Appendix 1 contains a brief description of the criteria used to determine impact ratings.

MERRITT TIMBER SUPPLY AREA – ENVIRONMENTAL AND STEWARDSHIP CONTEXT

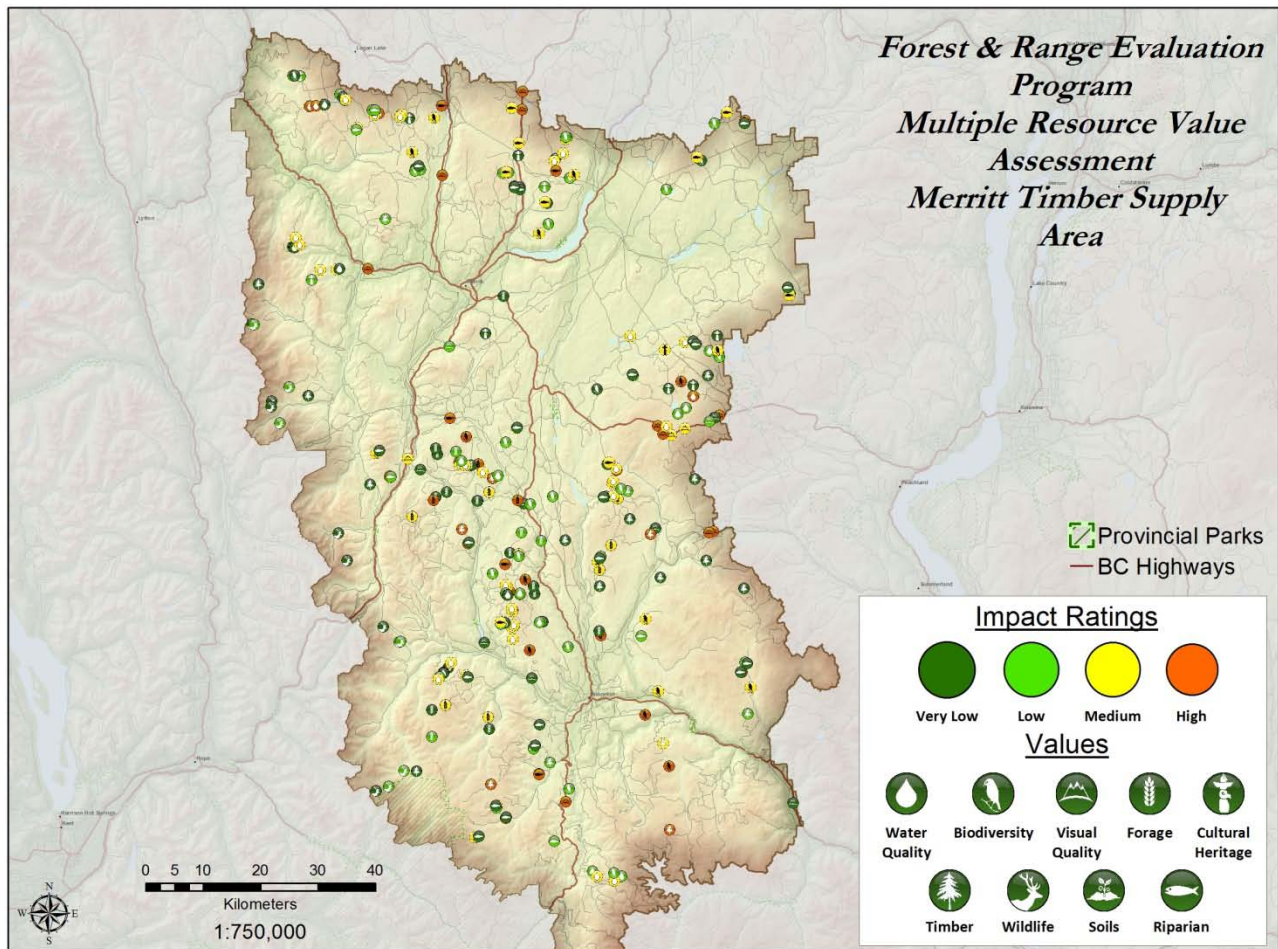
Located within the Ministry of Forests, Lands and Natural Resource Operations' Thompson Okanagan Region, the Merritt TSA (figure 2) is approximately 1.13 million hectares in total area. It is one of fourteen TSAs lying within the Southern Area of BC. Approximately 17 000 people live in the TSA with about 60 percent of the population residing in the major communities of Merritt and Princeton. Other smaller communities include Tulameen, Brookmere, Missezula Lake, Douglas Lake, Lower Nicola, East Gate, Spences Bridge, Osprey Lake, Allison Lake and Aspen Grove. First Nations traditional territories include Nlaka'pamux, Okanagan and Shuswap Nation while First Nations communities include Coldwater, Cook's Ferry, Nooaitch, Shackan, Upper Nicola and Lower Nicola.

The Merritt TSA supports a diversity of habitats for fish and wildlife. Mule deer, moose, black bear, several furbearers, and many species of birds and amphibians are common at lower elevations. Grizzly bears occur at low populations within the TSA. The TSA's numerous rivers and lakes support several fish species including rainbow trout and kokanee.

The public sector, forestry and tourism are the major employment sectors, with agriculture, construction and mining also contributing to the local economy. Numerous natural resources occur within the Merritt TSA. These include timber, forage, minerals, water, fish, wildlife, recreation and tourism resources. Extensive grassland and forested areas provide important forage for both livestock and wildlife. Significant demands are placed on water resources in the TSA for domestic and agricultural purposes.

Mountain pine beetle (MPB) has had extensive impacts within the Merritt TSA. The majority of stands containing pine have seen some level of MPB attack. The MPB epidemic began in 2004 with over 225 000 hectares of red attack observed in each of 2007, 2008, and 2009. In 2008, the peak of the observed infestation, there was over 250 000 hectares of red attack. During this time period, projections indicated 74 percent of the pine on the timber harvesting land base would be killed, by MPB, by the end of the epidemic. Forest licensees focused their harvesting on salvage of MPB infested stands. This has resulted in extensive depletions. Over the past couple of years, MPB is trending towards an endemic population level. The TSA still has a significant amount of live pine, with MPB impacts dispersed throughout. Although salvaging of MPB affected pine will continue for many years, licensees will be transitioning back to harvesting healthy trees over the next several years.

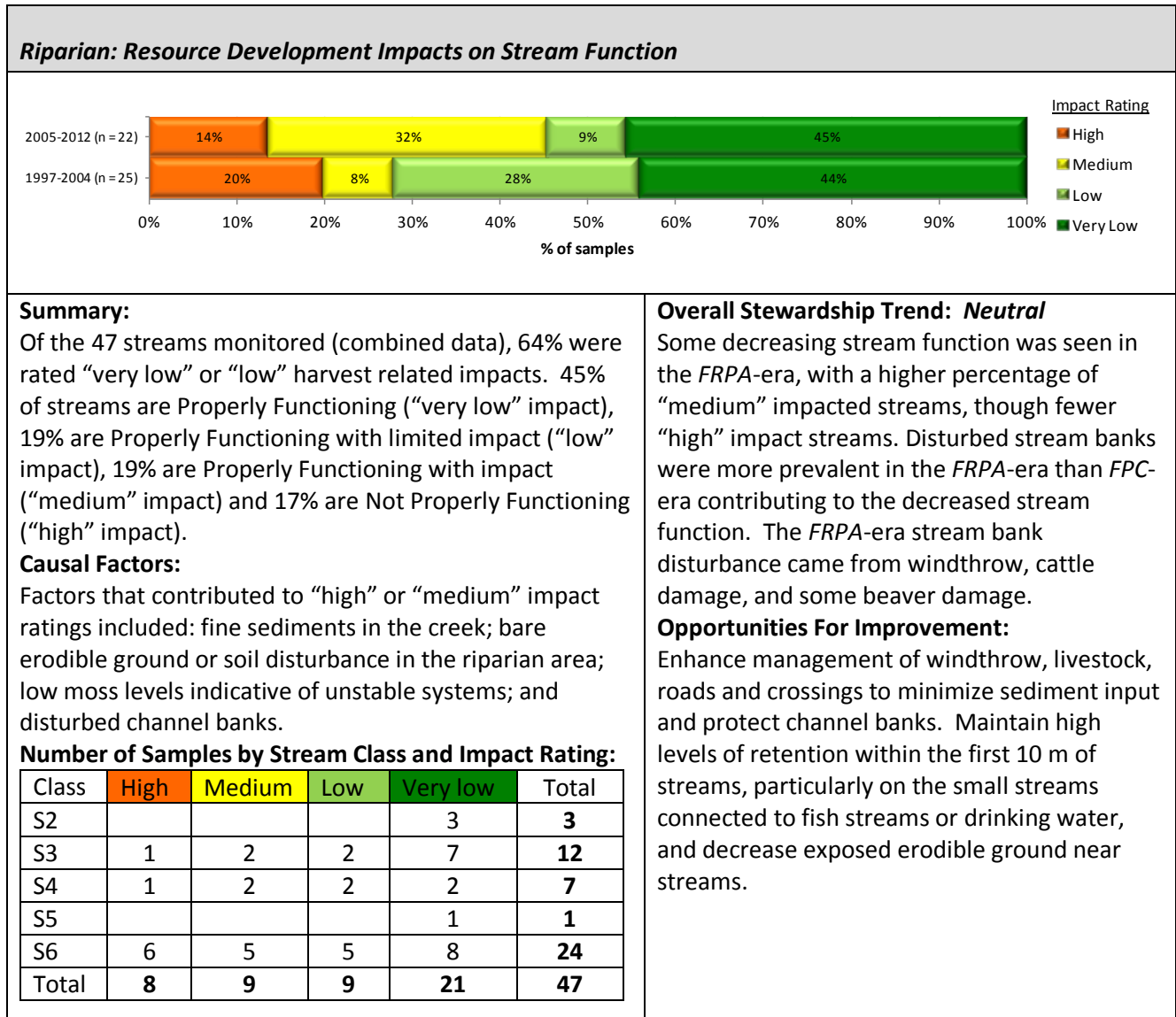
Figure 2: Merritt Timber Supply Area, showing FREP sample locations and results (see http://www.for.gov.bc.ca/ftp/HFP/external/!publish/frep/maps/MRVA_Merritt_TSA.pdf for a high-resolution version of this map).



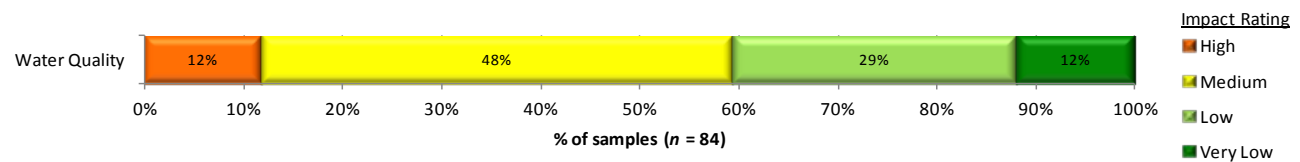
KEY RESULTS BY RESOURCE VALUE AND OPPORTUNITIES FOR CONTINUED IMPROVEMENT

Table 1 shows the resource values assessed for the Merritt Timber Supply Area, 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 Merritt TSA.



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



Summary:

Of the 84 road segments assessed, 41% were rated as “very low” or “low” road related impact. The range for potential sediment generation on these samples is: 12% “very low” (“very low” impact), 29% “low” (“low” impact), 48% “moderate” (“medium” impact), 12% “high” and 0% “very high” (“high” impact).

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.

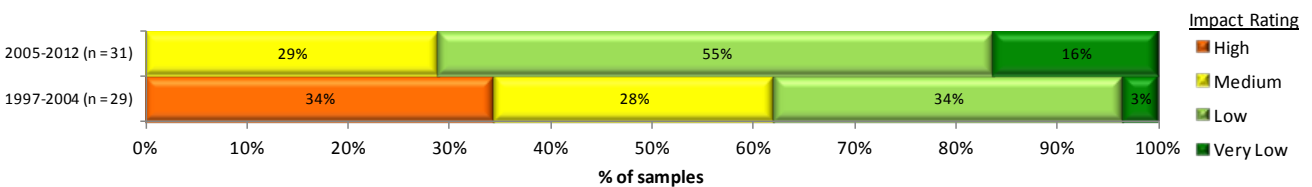
Overall Stewardship Trend: *Insufficient data*

Trending for water quality is based on survey years, to capture impact of road traffic and maintenance.

Opportunities For Improvement:

The most common recommendations were: to remove roadside berms that channel water and allow sediment build-up; and, increase the number of strategically located culverts.

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



Summary:

Of the 60 cutblocks (combined data), 55% were rated as “very low” or “low” harvest-related impact. Considering total retention, retention quality, and coarse woody debris quantity and quality, 10% of cutblocks have “very low” impact on biodiversity 45% “low”, 28% “medium” and 17% “high” impact.

Causal Factors:

Average retention is 16.1%. Both patch and dispersed retention is used though there was less dispersed retention and more patch in the FRPA-era. 95% of the sampled cutblocks had over 3.5% retention, and there was some level of retention on every block.

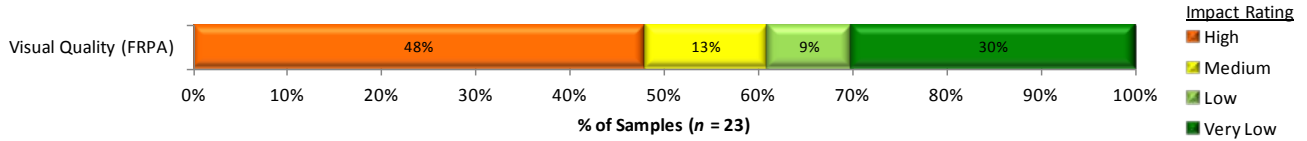
Overall Stewardship Trend: *Improving* ↑

Total percent retention decreased slightly in the FRPA-era. Retention quality slightly increased considering density of large snags and large diameter trees. The amount and quality of coarse woody debris left on the harvested areas increased in the FRPA-era, a major driver for the improving trend.

Opportunities For Improvement:

Continue retaining large snags, large diameter trees and the full range of tree species in densities similar or better than pre-harvest conditions. Look for opportunities to leave large patches of 2 hectares or greater. Retain higher densities of big coarse woody debris pieces (≥10 m long & 20 cm diameter) in harvest areas.

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



Summary:

Of the 23 landforms assessed (all harvested under FRPA), 39% were rated “very low” or “low” impact of harvesting to achieving the visual quality objective (VQO). VQOs were “well met” (“very low” impact) on 30% of landforms, “met” (“low” impact) on 9%, “borderline” (“medium” impact) on 13%, “not met” (“high” impact) on 9% and “clearly not met” (“high” impact) on 39%.

Causal Factors:

VQOs were not achieved because of three factors: Large opening size, lack of visual landscape design (block shaping) and lack of retention within openings.

Number of Samples by VQO and Impact Rating:

VQO ¹	High	Medium	Low	Very Low	Total
M	1			3	4
PR	8	3	2	3	16
R	2			1	3
Total	11	3	2	7	23

¹ M=modification, PR=partial retention, R=retention

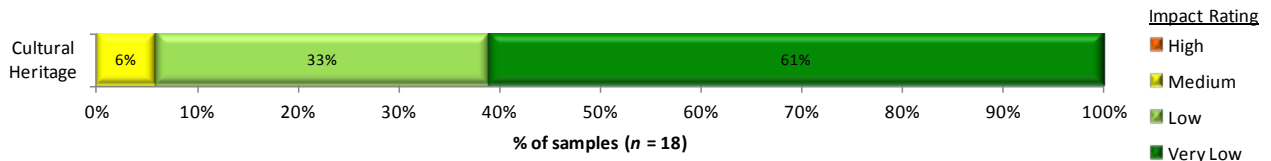
Overall Stewardship Trend: *Insufficient data*

No FPC sampling was completed in this TSA, therefore, no FPC/FRPA trends are available. Future trend analysis will use year of assessment.

Opportunities For Improvement:

Utilize visual landscape design techniques to better blend openings into the landscape and/or increase the amount of in-block retention (15-24% retention is considered visually effective).

Cultural Heritage: Resource Development Impacts on Cultural Heritage Resources



Summary:

Of the 18 cutblocks assessed, 94% were rated as “very low” or “low” impact of harvesting on the cultural heritage resources. 61% of blocks were considered “well” to “very well” managed, 39% “moderately” and no blocks were “poorly” or “very poorly” managed. At the feature level, 63% showed no evidence of harvest-related damage while 38% showed evidence of damage. 7% of damaged features showed irreversible damage and (or) were rendered unsuitable for continued use.

Causal Factors:

Primary causes of damage include removal of features and windthrow.

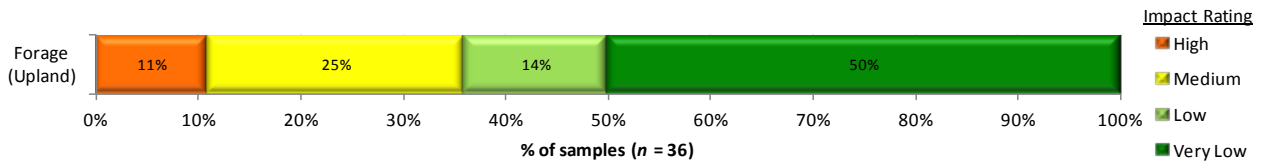
Overall Stewardship Trend: *Insufficient data*

There was no FPC-era sampling; therefore, no FPC/FRPA-era trends are available. Future trend analysis will use year of harvest.

Opportunities For Improvement:

Continue careful consideration of cultural heritage resource values in the planning phase. Continue discussions between licensees and First Nations to: enhance understanding of perspectives; ensure existing cultural heritage resource information is shared and increase the potential for effectively identifying on-site values. Put cultural heritage resource features on site plans and logging plans. Communicate management actions (verbally and with maps) to operators before harvesting begins.

Forage: Resource Development Impacts on Desired Plant Succession and Water Cycle/Hydrologic Function



Summary:

Range staff conducted 36 upland health assessments, 3 wetland health assessments, and 6 stream health assessments in the Merritt TSA in 2011. Upland assessments rated 50% as “very low” impact on the forage resource, 14% “low”, 25% “medium” and 11% “high” impact.

Causal Factors:

Most livestock grazing is within an acceptable level of use. However, livestock grazing has affected ecosystem function where inadequate distribution allowed animals to overgraze an area or where tenure was licensed to graze more animals than it has the capacity to sustain. In-growth of trees or initial overestimation of carrying capacity, contributes to this overstocking in some areas. Lack of management or lack of fencing also contributed to poor distribution.

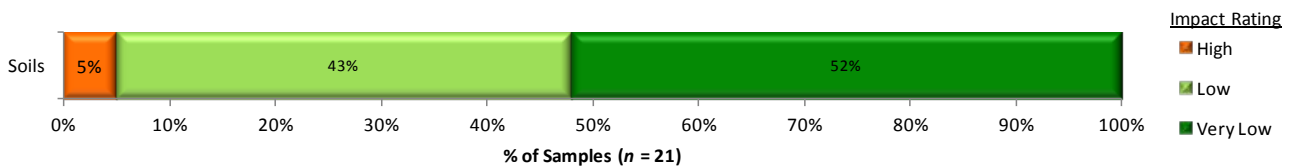
Overall Stewardship Trend: *Insufficient data*

There was no *FPC*-era sampling. Future trend analysis will use year of assessment.

Opportunities For Improvement:

Range tenure holders can improve rangeland health by increasing riding on their tenure and improving salting practices. Range staff promote the construction of fences (where appropriate and when funds allow) to replace lost natural range barriers or where distribution problems occur. Staff review licences prior to renewal to ensure tenures are not overstocked. Comprehensive analyses of carrying capacity on tenures that appear to be overstocked are completed with the goal to reduce animals on overstocked tenures. Forest licencees can reduce grazing effects by maintaining/increasing tree retention (natural range barriers), which acts to restrict or impede cattle access near fish bearing and/or drinking water sources.

Soils: Resource Development Impacts on Soil Productivity and Hydrologic Function



Summary:

Of the 21 cutblocks assessed, 11 were rated as “objectives achieved” (“very low” impact), nine were rated “moderate achievement” (“low” impact) and one was rated “objectives not achieved” (“high” impact). Overall, the forest practices observed appeared to conserve the major aspects of soil productivity.

Causal Factors:

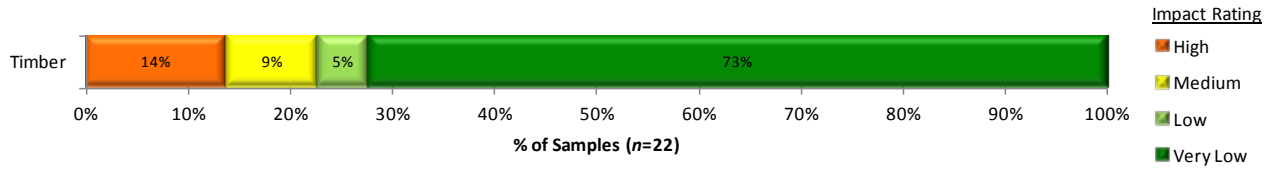
Although results from most of the cutblocks assessed showed that good planning and implementation minimized the amount of soil disturbance associated with access development, roadside work areas and dispersed machine traffic, in some cases, inefficient road layout and un-rehabilitated temporary access led to more soil disturbance than was necessary to efficiently harvest the block.

Overall Stewardship Trend: There was not enough historical monitoring to establish a reliable trend, but ‘point in time’ *FRPA*-era results are consistent with reasonable soil conservation practices.

Opportunities For Improvement:

Continue existing good practices and ensure that all temporary access structures are rehabilitated. Plan operations in roadside work areas to minimize soil disturbance. Continue to ensure that measures to conserve coarse woody debris are implemented.

Timber Resource Value Stand Development Monitoring (SDM): Resource Development Impacts on the Overall Health and Stocking of Managed 20-40 Year Stands



Summary:

Of the 22 polygons sampled, the weighted average well spaced density over the three biogeographic ecosystem classification (BEC) zones (ESSF, IDF, MS) achieved 86% of Target Stocking Standard (TSS).

Percent of target stocking standard by BEC

BEC	ESSF	IDF	MS	All
TSS	83%	91%	85%	86%

78% of the polygons were rated as “very low” or “low” impact on overall health and stocking; 9% “medium” and 14% “high”. Four of the polygons were spaced and all four were rated “very low” impact. The two “medium” and three “high” impact rated polygons were a result of lower total and well spaced stems/ha. It was not clear whether these stands were spaced or not. The two leading forest health factors in all these polygons were relatively low presence.

A draft Stand Development Monitoring Data Summary was produced for the Merritt TSA. The mean age of the 22 polygons was 26.8 years. The six leading stand damaging agents were; western gall rust (DSG); tree competition (VT); unknown (U); unknown forking (UF); moose browse (AM), and snow press (NY).

Agent	DSG	VT	U	UF	AM	NY
220 plots	73/220	39/220	24/220	23/220	16/220	16/220

Total stand density at declaration and during stand development monitoring were 3541 and 3611 stems/ha, respectively. Well spaced at declaration and during stand development monitoring were 1028 and 1036 stems/ha, respectively. No change in leading species was found in 15 (94%) of the 16 polygons sampled.

Causal Factors:

The major contributing factor to five “high” impact rated polygons was due to initial low stand density at declaration and significant loss in stand density between declaration and stand development monitoring. It is not clear why these polygons have lower total and well spaced densities. If they were indeed spaced then their rating would be re-assessed to “very low” or “low” impact.

Overall Stewardship Trend:

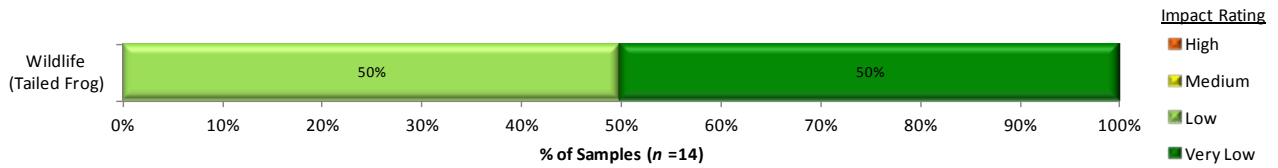
No trend can be established at this time

Opportunities For Improvement:

Further review of the “medium” and “high” impact rated polygons may reveal why their total and well-spaced stems/ha are relatively lower than the “very low” and “low” impact polygons. It does not appear to be related to the forest health factor levels on these polygons.

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

Wildlife: Resource Development Impacts on the Effectiveness of Wildlife Habitat Areas at Maintaining Suitable Tailed Frog Habitat and Occurrences



Summary:

Based on the draft protocol, 100% (n=14) of sampled sites were rated “very low” or “low” impact on the wildlife habitat area (WHA) effectiveness. Tailed frogs were detected in all but one site and habitat was maintained; thus, the wildlife habitat areas are considered functioning. Further work is underway to confirm indicator and condition category thresholds.

Causal Factors:

Wildlife habitat areas for tailed frogs were established in productive locations and were found to have roughly twice the relative abundance of tailed frogs as similar non-wildlife habitat area sample points. Factors contributing to “low” rather than “very low” impact condition included lower values for: channel stability; evidence of recent reproduction; and degree of cobble embeddedness. However, a lack of evidence of reproduction may be a result of sampling reaches with differing habitat types (i.e., WHAs were established to protect either core larval rearing and/or frontier dispersal habitat).

Overall Stewardship Trend: *Insufficient data*

There was no FPC-era sampling; therefore, no FPC/FRPA trends are available.

Opportunities For Improvement:

Establishment of tailed frog WHAs in the Merritt TSA is incomplete and tailed frog conservation could be improved by establishing additional wildlife habitat areas in appropriate habitats, particularly in occupied sub-basins that currently do not have any protection.

Forest condition in basins containing sampled tailed frog wildlife habitat areas was within acceptable levels; however, road and stream crossing density may be high for several basins putting some tailed frog WHAs at risk. The following actions could improve tailed frog conservation:

- Avoid stream crossings upstream of WHAs
- Where stream crossing are absolutely necessary, use open bottom structures
- Minimize sediment input (e.g., “very low” to “low” sediment generation potential)
- Avoid chemical applications on road segments connected to the stream

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 site-level 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 ratings by resource value for the North, South and Coast Areas and the province as a whole.

Table 2: Stewardship effectiveness within the Thompson Okanagan 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					
	Thompson Okanagan Region Comparison				Similar Ecosystem	Thompson Okanagan ^a
	Merritt TSA	Lillooet TSA	Kamloops TSA	Okanagan TSA	100 Mile House District	
Riparian – all data	64% (47)	55% (11)	59% (124)	80% (65)	83% (54)	65% (247)
FRPA-era data	55% (22)	ID (7)	63% (56)	78% (37)	ID (13)	66% (122)
FPC-era data	72% (25)	ID (4)	56% (68)	82% (28)	78% (41)	65% (125)
Water quality – all data	41% (84)	39% (18)	65% (346)	67% (230)	82% (119)	62% (678)
2010–2012 samples	42% (77)	39% (18)	70% (225)	62% (109)	80% (54)	62% (429)
2008–2009 samples	ID (7)	ID (0)	57% (121)	70% (121)	83% (65)	63% (249)
Stand-level biodiversity –all data	55% (60)	ID (8)	52% (129)	40% (77)	75% (60)	49% (274)
FRPA-era data	71% (31)	ID (4)	58% (57)	44%(45)	87% (23)	57% (137)
FPC-era data	38% (29)	ID (4)	47% (72)	34% (32)	68% (37)	42% (137)
Visual Quality						
FRPA	39% (23)	ID (0)	47% (19)	82% (22)	ID (0)	56% (64)
FPC	ID (0)	ID (0)	ID (0)	ID (4)	62% (21)	ID (4)
Soils	95% (21)	ID (2)	75% (12)	ID (4)	ID (6)	94% (37)
Cultural Heritage	94% (18)	39% (18)	ID (0)	ID (0)	ID (0)	67% (36)
Timber (stand development monitoring)	78% (22)	ID (0)	63% (49)	ID (10)	74% (27)	68% ^b (71)

^a Cascades, Kamloops and Okanagan-Shuswap Districts. Only resource values with comparative data included.

^b Does not include the Okanagan TSA

DESCRIPTION OF ASSESSMENT OF NON-FOREST INDUSTRY IMPACTS ON RESOURCE VALUES

Analysis has been initiated for several other resource sector impacts including: mining (roads), recreation, linear developments (hydro and pipelines), and range. The sample size for these non-forestry impacts is modest – 22 samples in Merritt TSA. While non-forestry impacts for the 22 samples in the Merritt TSA are reported in tables 4 and 5, this is only for illustrative purposes (i.e., potential for using FREP protocols for broad resource sector impact monitoring).

Table 4: Example of non-forest industry impacts on resource values

Resource Value (stand level)	Sample Size <i>n</i>	Impact Rating (Non-Forestry) # of <i>n</i>			
		Very low	Low	Medium	High
Cultural Heritage	4	0	3	0	1
Water Quality	10	1	1	8	0
Riparian	8	2	1	2	3

Table 5: Example of monitoring findings and opportunities for improvement by resource value for non-forest industry impacts on resource values

Resource Value	Key Findings	Opportunities for Improvement
Cultural Heritage	Of the five non-forestry Cultural Heritage samples, four were associated with recreation sites/range use area and one was associated with a hydro transmission line. The features were not found at one recreation site. The remaining recreation sites were all rated “moderately” (“low” impact) while the hydro transmission line site was rated “very poorly” (“high” impact).	Recreation Sites: Signage identifying sites and their heritage values. Less roads and vehicle access to sites/on sites. Fence off most valuable areas against cattle. Hydro transmission line: Stubbing of dead-standing culturally modified trees; better planning and communication; First Nation monitoring during operations; stubbing along trails; and, limiting machine disturbance.
Water Quality	The non-forestry Water Quality samples were all associated with mine access roads. The majority of the sites were in the “medium” impact category indicating a need for better road construction and or maintenance.	Additional culverts and improved maintenance such as removal of grader berms.
Riparian	Of the eight non-forestry riparian samples, six were associated with mining activity. One was in a park (“low” impact) and one in a pasture (“medium” impact). For mining activities, the Tulameen and Similkameen Rivers (S1) were sampled as well as four smaller streams. One S1 river was in “high” impact condition and the other was “medium” impact. These rivers had multiple impacts coming from placer mining, road armouring, agriculture, recreation, plus fires and flooding.	Avoid creation of in-stream blockages. Minimize soil exposure in riparian areas. Minimize stream bank disturbance. Maintain natural vegetation for shade in riparian areas.

DISTRICT MANAGER COMMENTARY¹

Overall, I recognize that the evaluation criteria in this report are based upon stewardship objectives (e.g., sustainable resource management practices) and do not always correspond with the minimum standards set in legislation. A “high” resource development impact rating does not necessarily mean that a practice has not met legislation or the results and strategies contained within a forest licensee’s forest stewardship plan. Readers should be cognizant of MPB and its impacts, and how managing it has affected the management of values. In the earlier years of our MPB epidemic there was the belief that we could suppress the outbreak with targeted, aggressive harvest of all infestations. There was also the belief that without this harvest, the projections of catastrophic impacts would come true. It now appears that through a combination of the targeted harvesting and climatic conditions unfavourable to the beetle, the impacts were minimized and are returning to a state of endemic MPB. I encourage those reviewing this report to ensure they understand the information presented and focus on how practices can improve future results.

Riparian assessments potentially assess the cumulative effects of forestry practices, range practices, natural impacts, and a myriad of other past and present industrial impacts both upstream and within the reaches. I see the greatest opportunity for continued improvement as maintaining high levels of windfirm retention within the first 10 meters of streams and minimizing sediment input at road and skidder crossings. I see opportunities for the range industry to move cattle through areas quickly, so as not to let them linger and degrade stream banks causing sedimentation.

Stand-level biodiversity assessments show a trend towards better results for areas harvested post 2005, largely due to increased awareness and continual improvement of retention on all blocks. Forest licensees are doing well in this category and I encourage continued retention of large diameter snags and trees. Opportunities for improvement include retaining more large pieces of coarse woody debris (longer than 10 m and ≥ 20 cm in diameter).

All of the blocks assessed for **visual quality** were impacted by MPB to one degree or another. All of the blocks assessed that had a rating of “medium” or “high” impact on achievement of visual quality objectives (VQO) had a reasonable amount and extent of MPB within their boundaries. Although the scale (size) of harvest was expected to be the main contributor to exceeding the VQO in many visual polygons, there appears to have been some missed opportunities to mitigate the visual impact, such as increased tree retention and block design. As the level of MPB infestation and associated salvage harvest continues to drop within the TSA, I would expect that licensees will be better able to manage visual quality within their planning and that licensees will consider the areas for improvement as indicated in this report.

The FREP **water quality** protocol assesses the amount of potential sediment generation and delivery to watercourses as an indicator for water quality. I encourage the licensees to improve the results in this area as per the opportunities for improvement suggested. I also encourage district staff to continue to monitor this value and communicate the results to all involved parties.

Cultural Heritage Resources were found to be well protected in most cases and it is encouraging to see the improved awareness and understanding between forest licensees, First Nations, and government staff on these cultural features. Although there were some findings of damage to features, the resulting improvements in communication and planning between all parties have helped to improve the results overall and I encourage everyone to continue to consider the opportunities for improvement in the report.

¹ Commentary supplied by Cascades Natural Resource District Manager, Charles van Hemmen

Forage assessments conducted in the Merritt TSA have indicated that most livestock grazing is within an acceptable level of use. It should be noted that assessments were not randomly selected and only carried out on suspected problem areas. I encourage district staff and range licensees to work together to ensure tenures are not overstocked.

Soils assessments are aimed at measuring forest practices and those that may be detrimental to productivity and hydrologic function. I am pleased to see that 100% of the samples were rated “low impact” or better. I encourage licensees to continue their good practices and refine them where they can.

Timber as assessed through the stand development monitoring protocol and monitoring begun in 2012, with the first 22 samples being summarized in this report. I encourage district staff to continue stand development monitoring so that improvement to our practices today can improve timber supply in the future.

Wildlife Habitat Areas were assessed for the tailed frog wildlife habitat areas showing that these areas were well protected. Road and stream crossings densities may be high in some areas and these should be managed so as not to put the tailed frog at risk.

Non Forest Industry impacts are occurring. I recommend continuing monitoring of these types of sites as part of our integrated monitoring.

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 describes overall ratings for the Merritt Timber Supply Area 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 Merritt Timber Supply Area.

Resource Value	Effectiveness of Practices in Achieving Resource Stewardship Objectives: % Very low + low resource development impact rating (sample size in brackets)				
	Merritt TSA	Forests, Lands and Natural Resource Operations Areas			Province
		North	South	Coast	
Riparian – all data	64% (47)	71% (654)	69% (678)	58% (451)	67% (1783)
FRPA-era data	55% (22)	71% (257)	68% (277)	62% (198)	67% (732)
FPC-era data	72% (25)	71% (394)	70% (401)	55% (253)	67% (1048)
Water quality – all data	41% (84)	66% (992)	70% (1515)	76% (1526)	71% (4033)
2010–2012 samples	42% (77)	67% (505)	70% (823)	79% (1021)	73%(2349)
2008–2009 samples	ID (7)	64% (487)	70% (692)	70% (505)	68% (1684)
Stand-level biodiversity –all data	55% (60)	42% (655)	54% (780)	77% (455)	56% (1890)
FRPA-era data	71% (31)	49% (270)	61% (347)	84% (201)	63% (818)
FPC-era data	38% (29)	38% (385)	49% (433)	72% (254)	50% (1072)
Visual Quality					
FRPA	39% (23)	73% (122)	54% (136)	78% (153)	69% (411)
FPC	ID (0)	56% (96)	65% (85)	62% (68)	61% (249)
Soils	95% (21)	65% (218)	58% (221)	73% (221)	66% (660)
Cultural Heritage	94% (18)	77% (95)	69% (35)	53% (15)	57% (14)