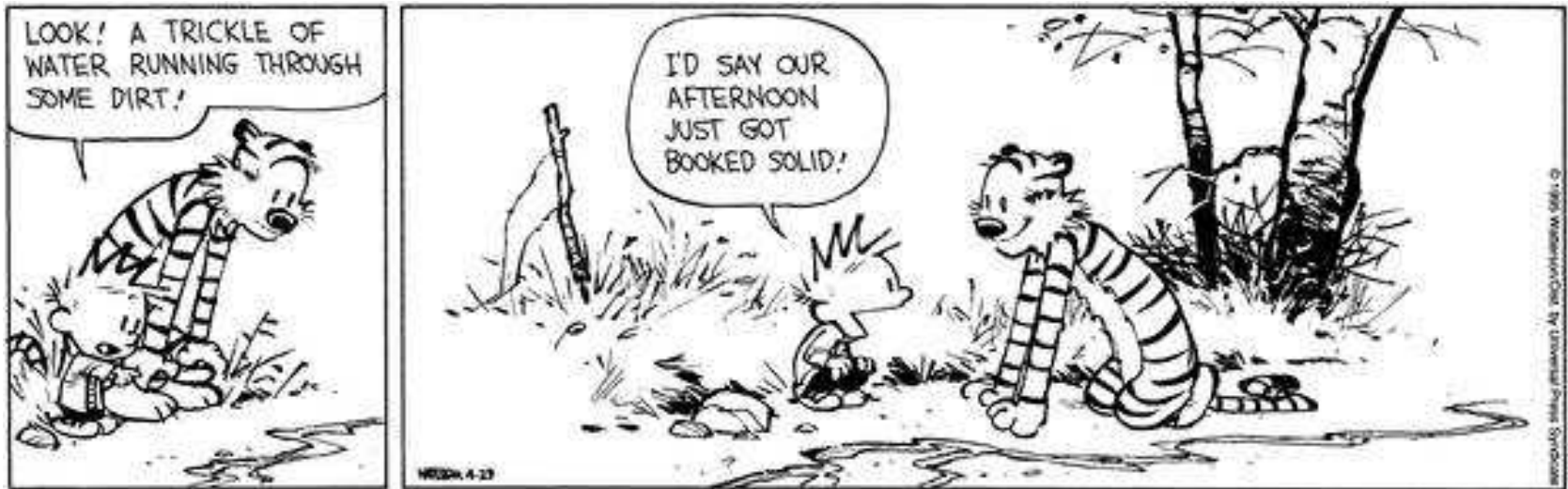


Routine effectiveness evaluations for streams, wetlands, watersheds



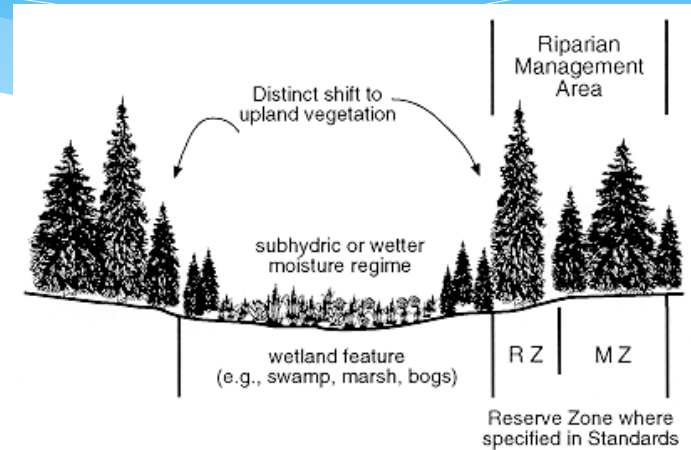
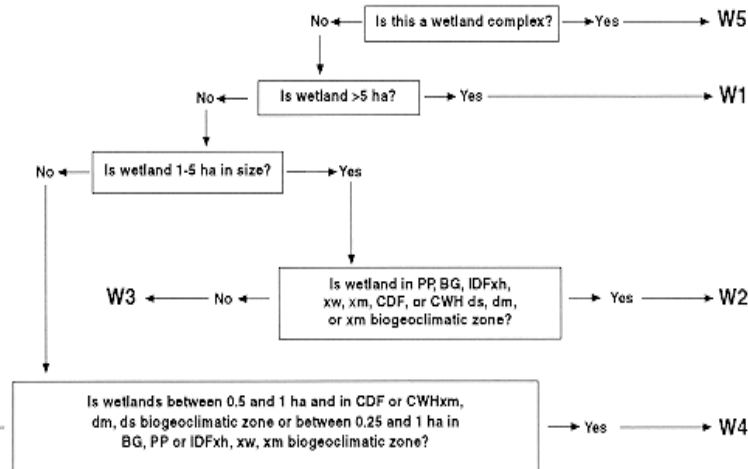
Lisa Nordin, M.Sc., R.P.Bio.
Aquatic Resource Stewardship Evaluation Officer
Forest Science, Planning, and Practices Branch

Forest and Range Practices Act (FRPA)



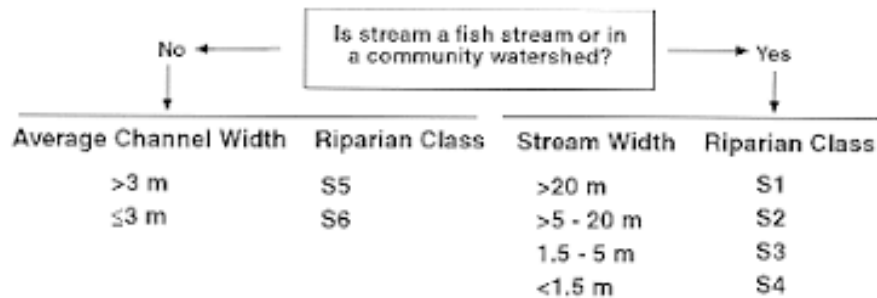
- FRPA s. 149 (1) gives authority for (FPPR) regulations/objectives for 11 resource values including water, fish, wildlife and biodiversity.
- FRPA s. 150.5 gives authority for (FPPR) regulations around classifying streams and wetlands, including setting reserve and management zones and regulating activities within them. Different riparian management areas for different classifications of streams and wetlands.

Wetland riparian management under FRPA/FPPR



Riparian class	Reserve zone width (m)	Management zone width (m)	Total RMA width (m)
W1*	10	40	50
W2	10	20	30
W3	0	30	30
W4	0	30	30
W5*	10	40	50

Stream riparian management under FRPA/FPPR



Riparian Classes of Streams and Watercourses (Forest Practices Code of British Columbia Act, 1995).

Riparian Class	Average channel width (m)	Reserve zone width (m)	Management zone width (m)	Total RMA width (m)
S1 Large rivers	≥100	0	100	100
S1 Except large rivers	>20	50	20	70
S2	5≤20	30	20	50
S3	1.5≤5	20	20	40
S4	<1.5	0	30	30
S5	>3	0	30	30
S6	≤3	0	30	20

☐ Fish stream or community watershed

☐ Not fish stream and not in community watershed

Why do we monitor?



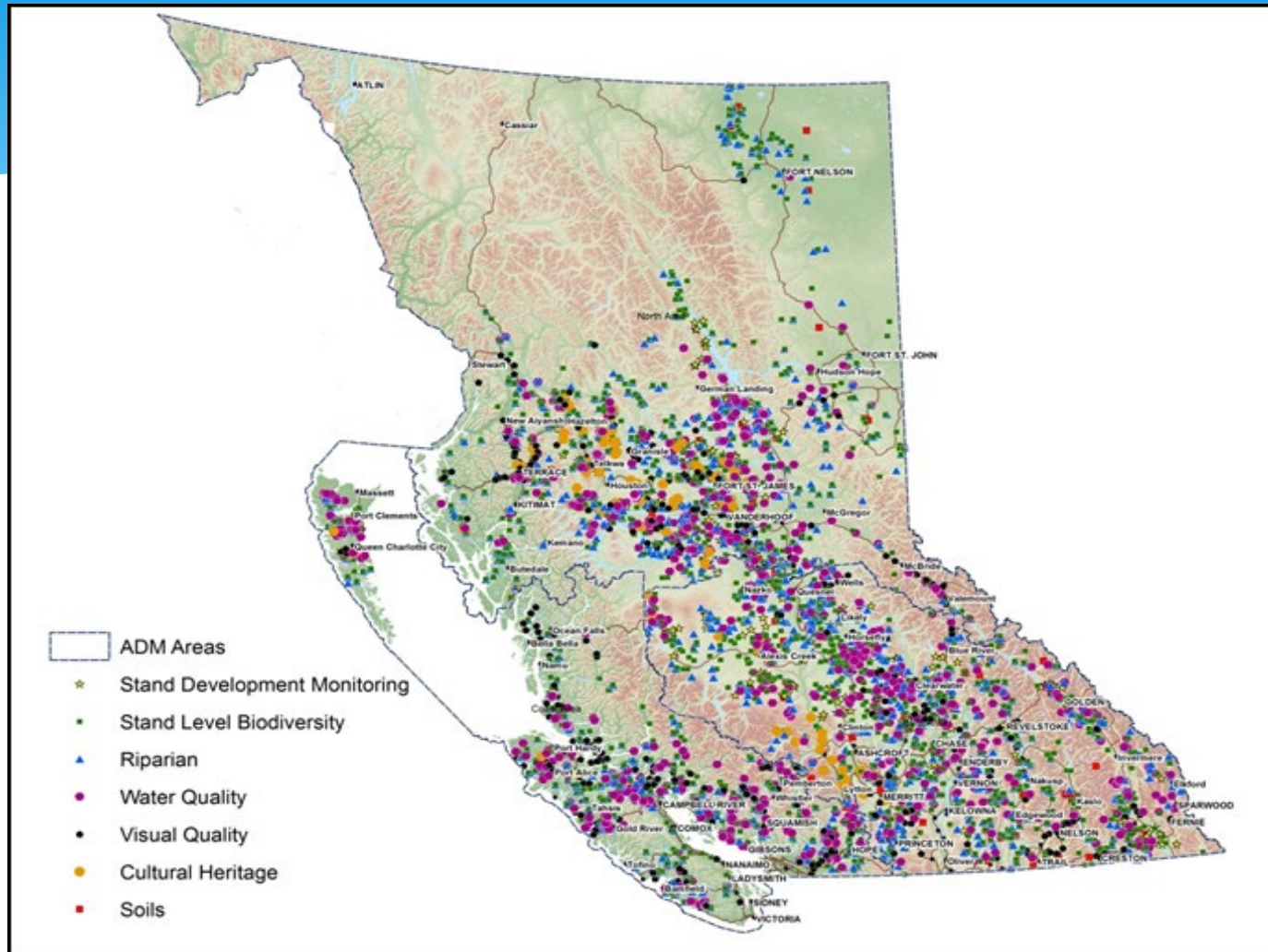
- FPPR s.8. Objectives set by government for water, fish, wildlife and biodiversity within riparian areas.
- Effectiveness monitoring evaluates operational outcomes where a licensee is in compliance with regulation to determine whether strategies were effective in meeting the objectives.
 - Uses “routine” level assessments to conduct timely, credible and appropriate evaluations – by district staff, FN partners, contractors
 - Provides recommendations to licensees (practices) and regulators (legislation and policies)
 - Communicates results and recommendations to stakeholders in a timely and appropriate manner

Effectiveness Evaluation Question

Are riparian forestry and range practices effective in maintaining the structural integrity and functions of streams, wetlands and other aquatic resource features over both short and long terms?

1. Question
2. Indicator and Protocol Development
3. Data Collection
4. Analyses and Communication of Results
5. Continued Improvement of Forest and Range Practices

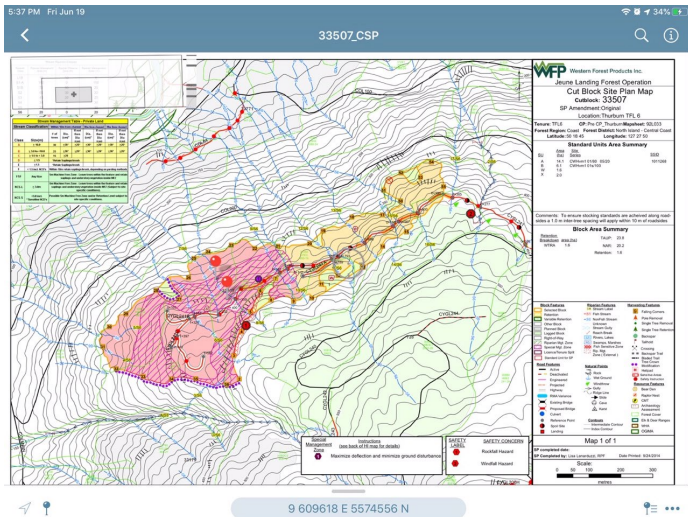
FREP sample sites



2006-2022: Riparian: streams 3000+; wetlands 44

Sample site selection

Random – for reach level results



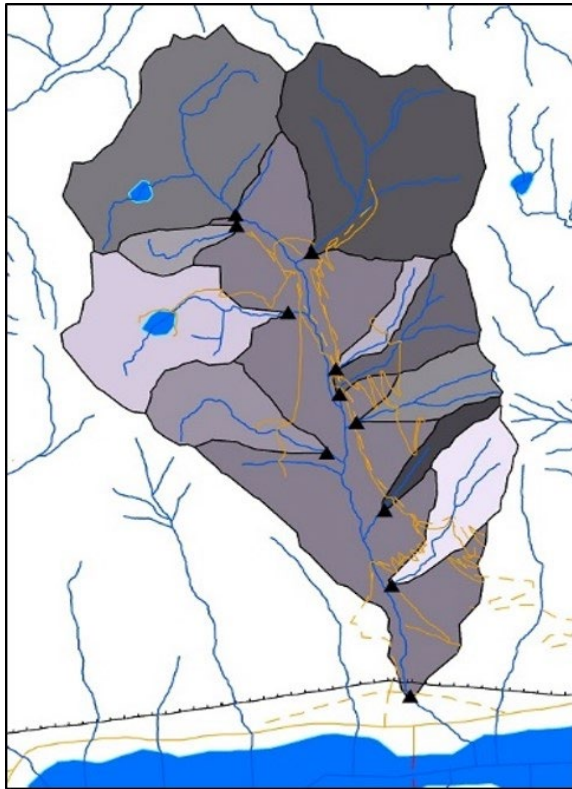
- * Every year, **cutblocks** are randomly selected in each Forest District. Time of harvest = 1-3 yrs prior.
- * Stream and wetland sample sites are within 2 RMAs of a randomly-selected block.
- * Larger fish streams given preference when there is more than one stream in a block
- * Sample reach length is the greater of 100m or 30x Ch width
- * 30 sites needed over past 5 years

Why delay sampling?



Sample site selection

Targeted



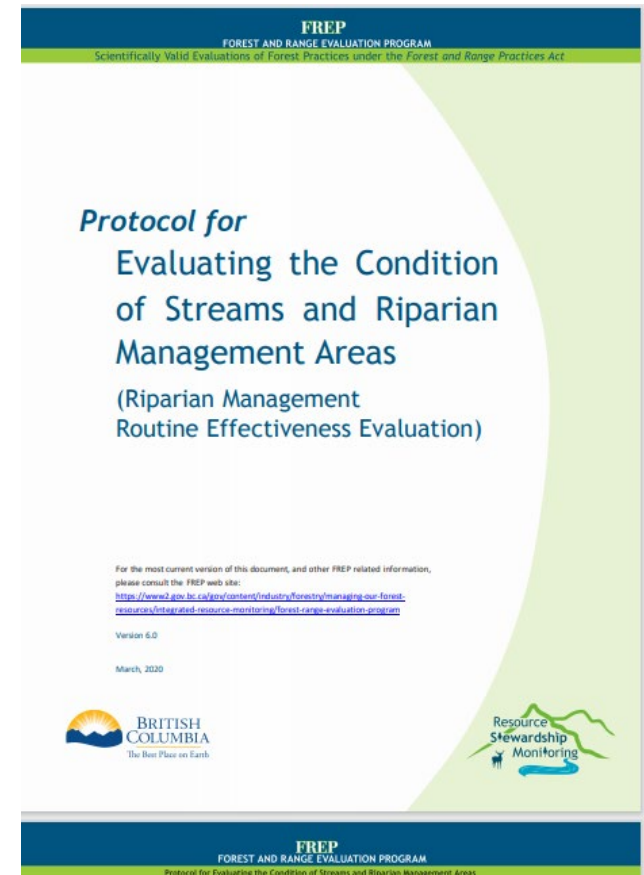
- * Optional. Complete random sites first to meet min req. for effectiveness monitoring for a sample population.
- * Targeting sites might be to sample an area of particular interest/concern, or to review performance by a specific forest licensee.
- * Targeting sites for watershed evaluation might involve sampling at the lowest reach of sub-catchments in a watershed of interest.

Riparian/stream assessment



What does the riparian/stream protocol evaluate?

- Indicators that reflect form and function of a stream and its riparian area. Both physical and biological components are included.
- Developed in 2005 based on results from research projects in different areas of the province along with expert input.
- The outcome of the assessment is based on the number of negative responses given to 15 main indicator questions.



What is measured?

Site assessments vary, with modified indicators based on stream morphology (riffle-pool, cascade-pool, step-pool, non-alluvial channels) and fish use

1. Channel bed disturbance
2. Channel bank disturbance
3. LWD characteristics
4. Channel morphology
5. Aquatic connectivity
6. Fish cover diversity
7. Moss abundance & condition
8. Fine sediments
9. Aquatic invertebrate diversity
10. Windthrow frequency
11. Riparian soil disturbance/
bare ground
12. LWD supply/root network
13. Shade & microclimate
14. Disturbance-increasers/
noxious weeds/invasive
plants
15. Vegetation form, vigour,
& structure

Each main indicator response is based on answers to sub-indicator questions

Q#1: Is the channel bed undisturbed? Yes/No
(riffle or cascade pool streams)

- 1) Does **<50%** of reach have active sediment wedges or mid-channel bars?
- 2) Does **<50%** of reach have active multiple channels and/or braids?
- 3) Does **>50%** of the reach have lateral bars?

If Answer “Yes” to 2 or more, circle “Yes”

Each main indicator response is based on answers to sub-indicator questions

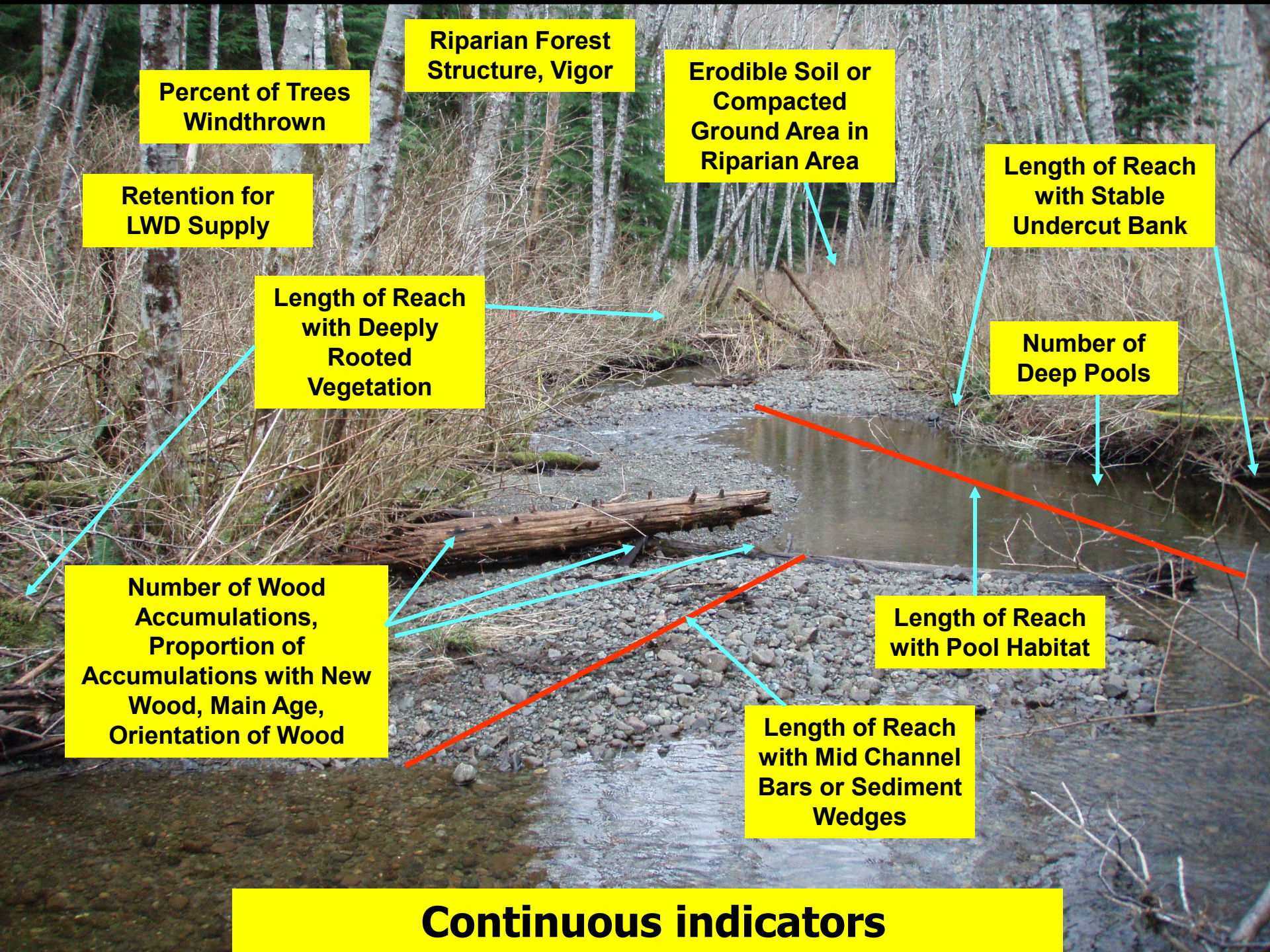
Is the channel bed undisturbed? Yes/No
(non-alluvial streams)

- 1) Does $>25\%$ of the channel bed length have moss on the substrate?
- 2) Do moveable sediments and/or debris deposits that completely fill the channel to the top of the banks represent $<5\%$ of the total reach length?
- 3) Are moveable sediments widely distributed in small pockets along the whole reach, not concentrated in a few relatively large compartments?

If Answer “Yes” to 2 or more, circle “Yes”

Moveable sediments and/or debris deposits that completely fill the channel to the top of the banks





**Percent of Trees
Windthrown**

**Riparian Forest
Structure, Vigor**

**Erodible Soil or
Compacted
Ground Area in
Riparian Area**

**Length of Reach
with Stable
Undercut Bank**

**Retention for
LWD Supply**

**Length of Reach
with Deeply
Rooted
Vegetation**

**Number of
Deep Pools**

**Number of Wood
Accumulations,
Proportion of
Accumulations with New
Wood, Main Age,
Orientation of Wood**

**Length of Reach
with Pool Habitat**

**Length of Reach
with Mid Channel
Bars or Sediment
Wedges**

Continuous indicators

Moss area in a square plot

**% Shade on each side
of the stream, take
average**

**% Fines along
a transect**

**Weeds and disturbance-
increasers along a transect**

Invertebrate diversity

Point indicators



How is the riparian/ stream data used?

- 114 – 120 measurements, estimates, and observations are taken to complete a stream-riparian assessment
- 38 – 60 specific indicator questions are answered that roll up to the 15 main questions.
- 15 questions answered “Yes = OK”, N/A, or “No = Problem”
- Roll-up of negative responses = overall site condition

Number of Negative Responses (out of 15 Indicator Questions)	Condition Ranking
0 - 2	Properly functioning
3 - 4	Functioning, but at risk (limited impacts)
5 - 6	Functioning, but at high risk (intermediate impacts)
> 6	Not properly functioning

Functioning Condition

riparian/streams

Criteria related to the ability of a stream and its riparian area to:

- (1) withstand normal peak flood events without experiencing accelerated soil loss, channel movement, or bank movement;
- (2) filter runoff;
- (3) store and safely release water;
- (4) maintain the connectivity of fish habitats;
- (5) maintain an adequate riparian root network and LWD supply;
and
- (6) provide shade and reduce bank microclimate change.

Causal Factors

“No” answer questions	Causes of “No” Answers						
	Current Logging	Old Logging	Animal Disturbance	Roads	Other Impacts	Natural Impacts	Unknown Upstream
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐

If the cause of the impact is not apparent at the reach scale, upstream sources are investigated. If unidentifiable, then Unknown Upstream is selected

Specific Causes of “No” Answers and Proximity to Reach of Each Cause. Check off each Question with a “No” answer, then beside each main specific cause that applies, record a 1 for within the reach, 2 for above the reach, and 3 for within and above the reach															
Cause of “No” Answers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OLD LOGGING															
Low retention															
Falling and yarding															
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Non-logging roads, trails															
Utility corridors															
Recreation															
Agriculture															
Mining															
Urban, industry															
Other															
UNKNOWN															

SPECIFIC causes for EACH “No” are recorded where they occur (within and/or upstream of the sample reach)



Riparian/wetlands



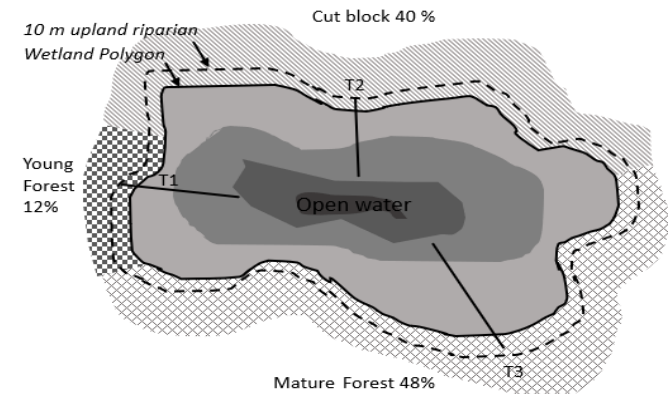
What does the riparian/wetlands assessment evaluate?

- * The health or functioning condition of wetland sites in or adjacent to development activities (e.g., forestry).
- * Developed for people with basic working knowledge of wetlands (e.g., forest and range practitioners, FN guardians, consultants, land managers, or other land users.)
- * Largely field-based indicators and attributes. Like riparian/streams, designed to provide consistency among users.
- * Pertinent information is collected to inform on the condition of the wetland and be cost effective as a tier 2 approach for monitoring (i.e., relatively quick to use in the field (e.g., 2-4 hours)).

Stratifying upland areas



Sample design



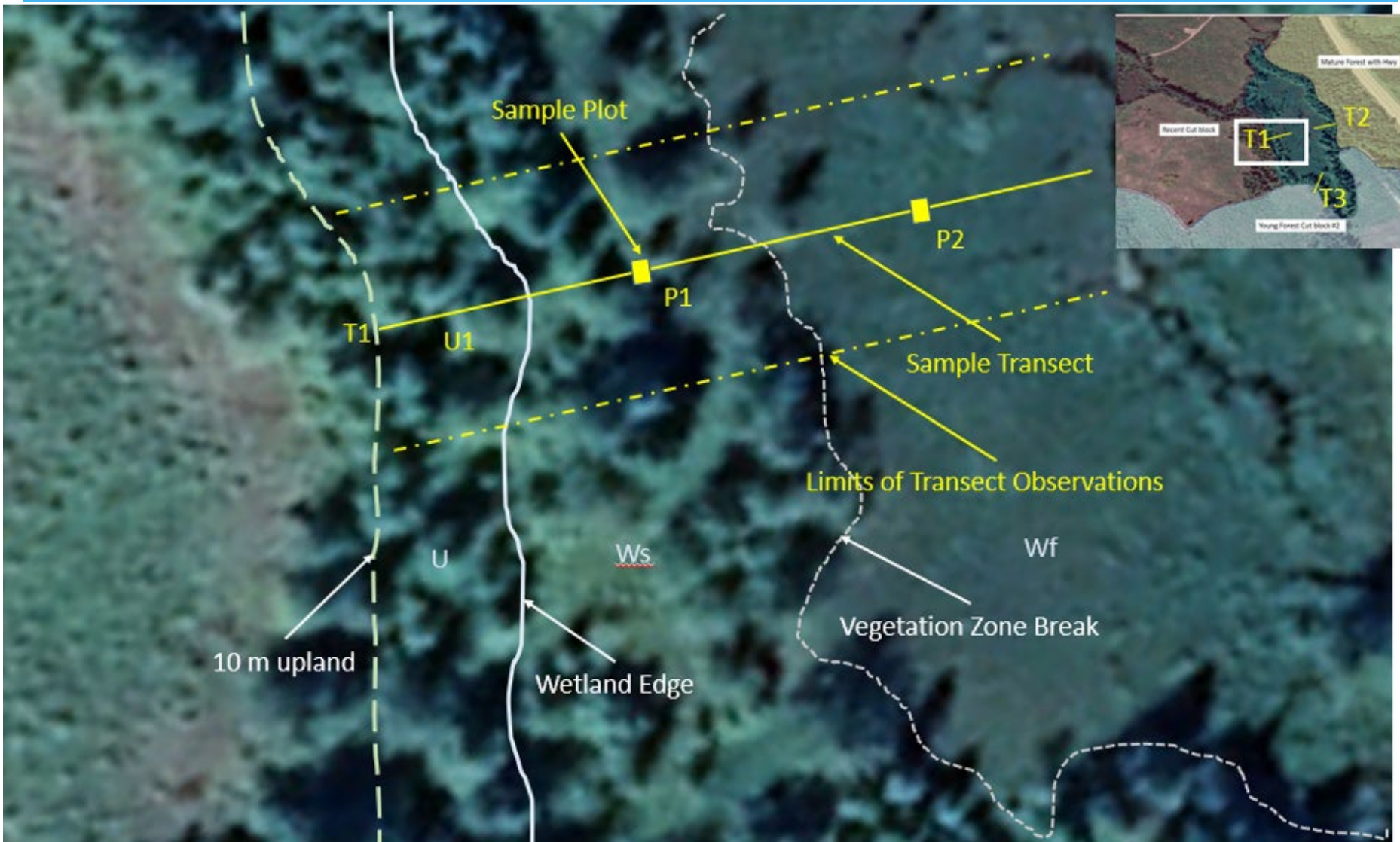
Transects Representing

- T1, Young Forest = 12% of Total Wetland Assessed
- T2, Cut Block = 40% of Total Wetland Assessed
- T3, Mature Forest = 48% (6/2) of Total Wetland Assessed

Total Polygon Assessed

= A + 10 m upland buffer – Open Water

Zones, transects, plots



Wetland components



What is measured?

Indicators and attributes are associated with soils, vegetation, water.

1. Vegetative cover
2. Invasive Plants
3. Disturbance/Increaser Plants
4. Vegetation structure, form, vigor, recruitment
5. Timber or other vegetative removal
6. Over-browsing or grazing
7. Bare soil
8. Physical alteration of wetland
9. LWD processes
10. Windthrow
11. Evidence of hydrologic changes
12. Threats to water levels
13. Water Quality
14. Habitat Connectivity
15. Intactness of surface and subsurface flows

Format similar to streams

Question Indicator	TRANSECT SUMMARY INFO	T1	T2	T3	Average/ Weighted Average	% Large non-homogenous patches	Total = Weighted average
NA	width (m) of retention upland from wetland						
NA	% retention (basal area) upland from wetland						
3	% cover disturbance/increaser plant 10 m upland from wetland edge						
2a	% invasive species in polygon						
3	% disturbance/increaser plants in polygon						
1	% vegetation cover in polygon						
7a	% bare and compacted ground in polygon						
	% bare and compacted ground hydrologically connected upslope of						



T.7.3. Continuous observations: snag and coarse woody debris within wetland and 10 m upland											
Softwood						Hardwood					
Dead						Dead Fallen	Dead			Dead Fallen	
Hard →		Spongy		→ Soft		Not Sampled	Hard →	Spongy	→ Soft	Not Sampled	
3	4	5	6 2/3 original height	7 1/2 original height	8 1/3 original height	9	3	4	5	6	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Check all decay classes of snags observed within 10 m upland of the wetland edge

Check all Diameter Sizes observed: 0 < 10 cm ☐; 10 < 20 cm ☐; 20 < 30 cm ☐; 30 < 40 cm ☐; 40 < 50 cm ☐; 50 cm + ☐

T.9. PHYSICAL AND HYDROLOGICAL ALTERATION INDICATORS			
	Tally of occurrences (m²)	Total	%
8a	% total polygon altered (pg. 32)		
8b	severity of physical alteration¹ (pg. 33)	☐ severe ☐ moderate ☐ slight ☐ no alteration	
11a	Are hydrologic changes minor or non-existent?	Y N NA	
11b	Are recent dead trees or shrubs absent from the wetland edge that would indicate a rise in water level? (pg. 39)	☐ ☐ ☐	
11c	Upland plant or tree species are not encroaching, and the wetland is not shrinking (pg. 39)	☐ ☐ ☐	
11d	If the wetland has a defined stream channel through it, any stream channel incision is minor or non-existent (i.e., minor impacts to adjacent vegetation) (pg. 40)	☐ ☐ ☐	
11e	Natural surface or subsurface areas are not altered by disturbance. If drainage tiles, ditches, dikes, gullies are present they are having a minor to non-existent impact to vegetation in the wetland. (pg. 40)	☐ ☐ ☐	
12a	If an outlet structure is present, is it structurally stable (i.e. not eroding at the outlet)? (pg. 41)	☐ ☐ ☐	
12c	% of the streambank or shoreline is structurally altered (interface of open water and vegetation communities) (pg. 41)	_____ %	☐
12d	% streambank with deep binding rootmass? (Lotic (moving water) only) (pg. 42)	_____ %	☐
13a	Does the wetland lack any signs of excessive nutrient loading such as algae mats, blooms, fish kills?	☐ ☐	
13b	Do basic water quality parameters (smell, colour, pH, turbidity, temperature) appear to be within a reasonable range of natural variation?	☐ ☐	

How is the data used?



- * Values are compared to pre-determined thresholds
- * Sub-indicators are rolled up to answer indicator questions linked to variability in soils, vegetation and hydrological processes.
- * All indicators are tallied and final scoring is reflected in 4 condition categories.

Properly functioning condition

Functioning, but at risk

Functioning, but at high risk

Not properly functioning



Functioning Condition

riparian/wetlands

Criteria related to the ability of a wetland and its riparian area to:

- * Receives water from upslope and inlets to filter runoff and improve wetland and downstream water quality;
- * Support a variety of wildlife species, both within and directly surrounding the edge of the wetland by providing habitat niches and adequate cover through a diversity of well vegetated canopy layers, coarse woody debris, microtopography, and snags;
- * Maintain the connectivity of fish habitats where these exist;
- * Withstand hydrodynamic processes in terms of water input, timing and quantity that regulates high flow events without erosion or modifications to vegetation types.

Specific Causes of "No" Answers and Proximity to Reach of Each Cause. Check off each Question with a "No" answer; then beside each main specific cause that applies, record a 1 for within the reach, 2 for above the reach, and 3 for within and above the reach															
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Other															
UNKNOWN															

Causal factors of impacts are recorded and SPECIFIC causes are identified



Training and assessment tools– online self guided training

[Home](#) > [Farming, natural resources and industry](#) > [Evaluation Program](#) >

- * Sustainable Forest Management Practices
- * Timber Supply Review and allowable annual cut
- * Forest Inventory
- * Forest health
- Soil Conservation
- * Old Growth Forests
- * Forest Stewardship Plans
- Wildfire Management
- * Forest Landscape Plans
- * Visual Resource Management
- * Silviculture
- * Tree Seed
- * Integrated Resource Monitoring
 - Integrated Monitoring Reports
- * Forest & Range Evaluation Program
 - * FREP Monitoring Protocols
 - FREP Multiple Resource Value Assessments
 - FREP Reports & Publications
 - * **FREP Training**
 - * Riparian/Streams Protocol Self-Guided Training
 - * Riparian/Wetlands Protocol Self-Guided Training

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 - * [Riparian/Streams Protocol Self-Guided Training](#)
 - Lesson 1-

Riparian Guided

Routine R Evaluation

The primary goal of training in riparian we have created knowledge of the Evaluation (RRE) and practices u

At the end of the performing RRI skills more con



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Riparian/Wetlands Protocol Self-Guided Training



The primary goal of this course is to help prepare you for field-oriented training in wetlands assessment. The field-training is rigorous and we have created this online course so that you will already have a basic knowledge of the Wetlands Management Routine Effectiveness Evaluation (WMREE) process and understand some of the terms, procedure and practices used as you undertake the field-based WMREE training.

[Expand All](#) | [Collapse All](#)

- [Who Should Take This Course?](#)
- [Learning Objectives & Format](#)
- [How Will I Be Evaluated?](#)
- [How Much Time Will The Course Take?](#)
- [Course Modules](#)

Forest & Range Evaluation Program



[Link to wetland protocol documents](#)

For questions about wetland training, please contact FREP@gov.bc.ca

Training and assessment tools– webinars, guidance documents

FREP Riparian Classroom Training

2021-06-04 16:34 UTC

Recorded by
Nordin, Lisa J FLNR:EX

Organized by
Malkinson, Leah
FLNR:EX

Microsoft Teams

Forest and Range Evaluation Program - FREP FREP CI Session Stephanie Wilkie FREP Peer Award EDIT LINKS

FREP MAP Guidance • frepmap and wetland calcs ⓘ

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	FREP Map intro+wetlands buffer	... August 27, 2019	☐ Lohr, Christine P FLNR:EX
	How to calc upstream disturbance	... October 18, 2019	☐ Nordin, Lisa J FLNR:EX
	steps for calculating forest within a buffer	... January 11, 2021	☐ Nordin, Lisa J FLNR:EX

Drag files here to upload

Wetland Health Assessment Form and Protocol

Prepared for:

The Resource Practices Branch (RPB) - Ministry of Forests, Range, Natural Resource Operations, and Rural Development (FLNRORD)

&

Ministry of Environment and Climate Change
Technology (ENV)

Neil Fletcher

Manager, BC Wildlife Federation
Stewardship Partnership

Project Lead: Lisa Nordin
Project Evaluation Officer, FLNRORD



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Riparian • Riparian Filemaker APP + Documents ⓘ

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	riparian_field_form_v3.5_blank	... April 20, 2021	☐ Tkalec, Miodrag FLNR:EX
	v2_FAQs_LN- Copy	... June 4, 2020	☐ Estlin, Murray FLNR:EX
	v3 Read me_LN	... March 8, 2021	☐ Nordin, Lisa J FLNR:EX

Training and assessment tools- FREPmap

<https://governmentofbc.maps.arcgis.com/apps/MapSeries/index.html?appid=b738c13cda9e4b8d9bd6e05ff9f9d2a9>

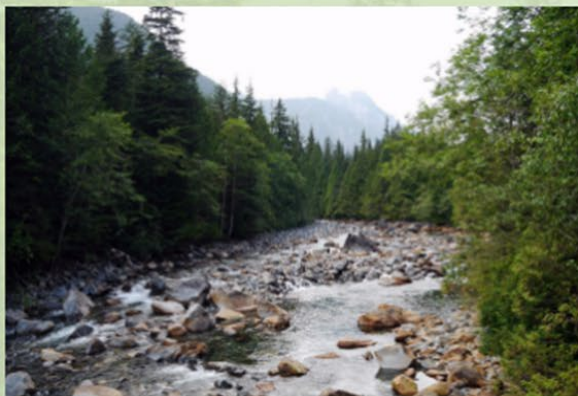
The Forest and Range Evaluation Program - FREP Map Portal

FREP Map Portal

FREP Map



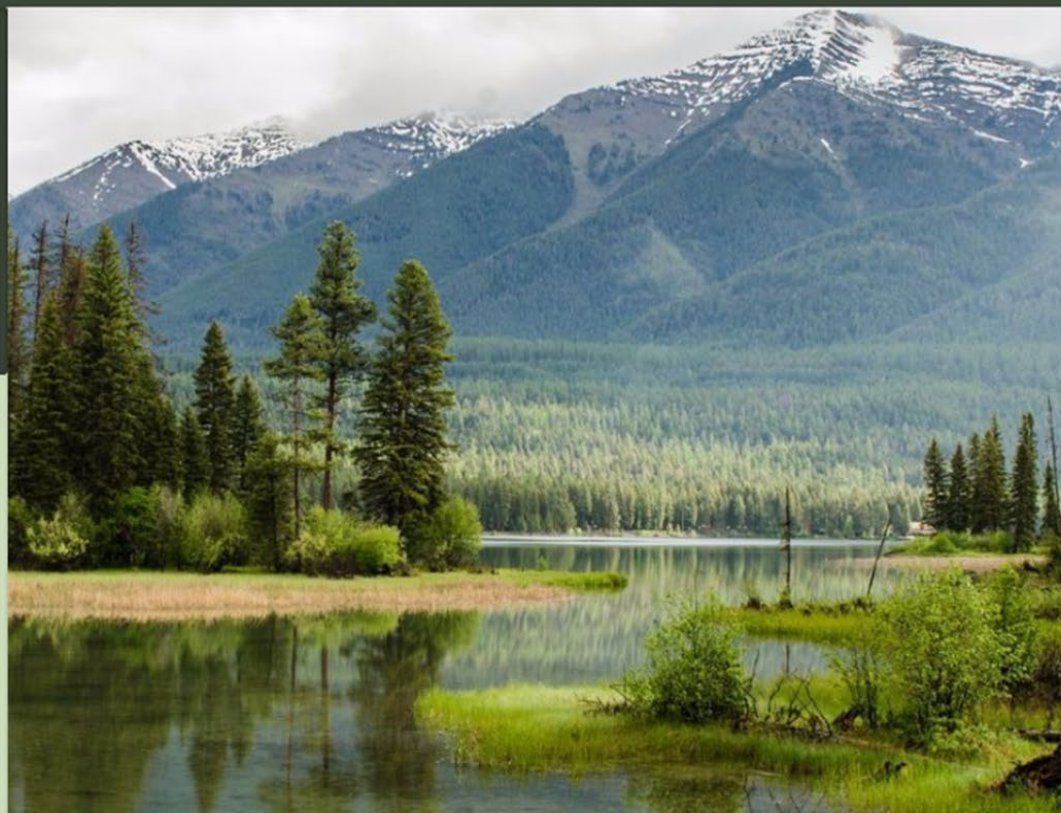
Welcome to
The FREP Map Portal



This portal provides information and mapped datasets to the Provincial Stewardship individuals involved with the Forest and Range Evaluation Program (FREP).

Search Box

Please use the search box function in the FREP Map to find the location of your study area, field site or site of interest.



FREP Map Portal

FREP Map



BRITISH
COLUMBIA

Forest & Range Evaluation Program Map



1365852



Show search results for 1365852

Layer List



Operational layers



▶ ☐ FREP Riparian Data



▶ ☐ Water Quality Rating



▼ ☒ Roads



▶ ☒ Forestry Roads



▶ ☒ Openings

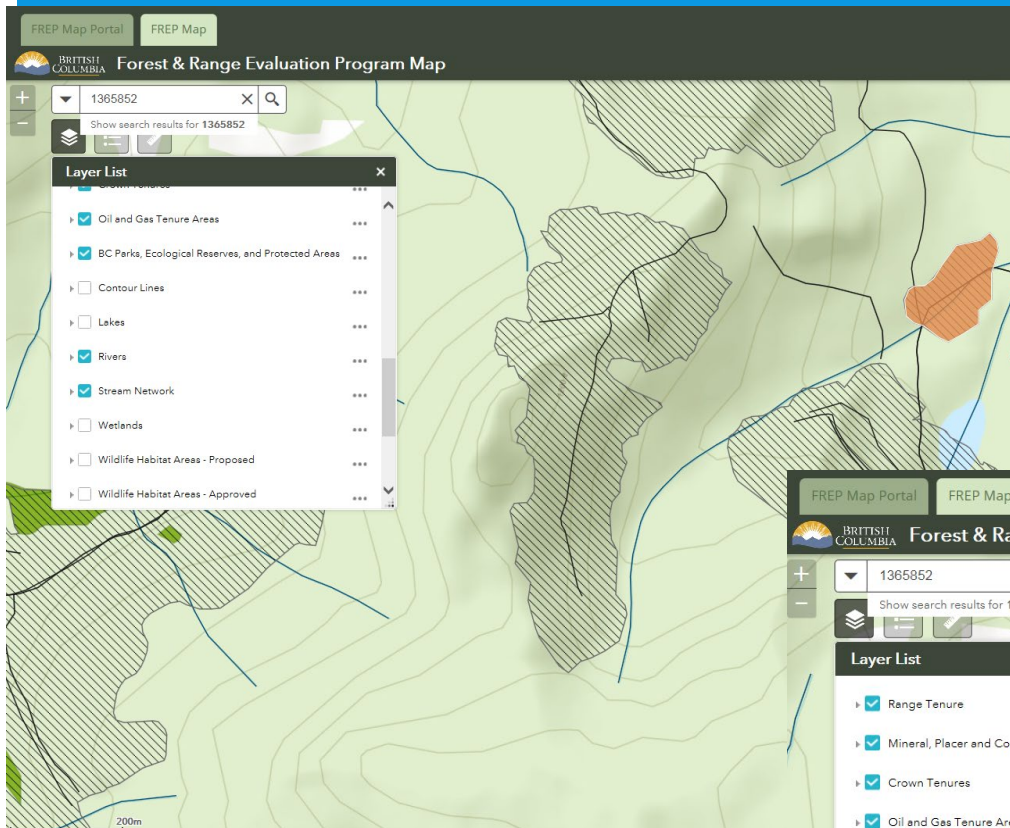
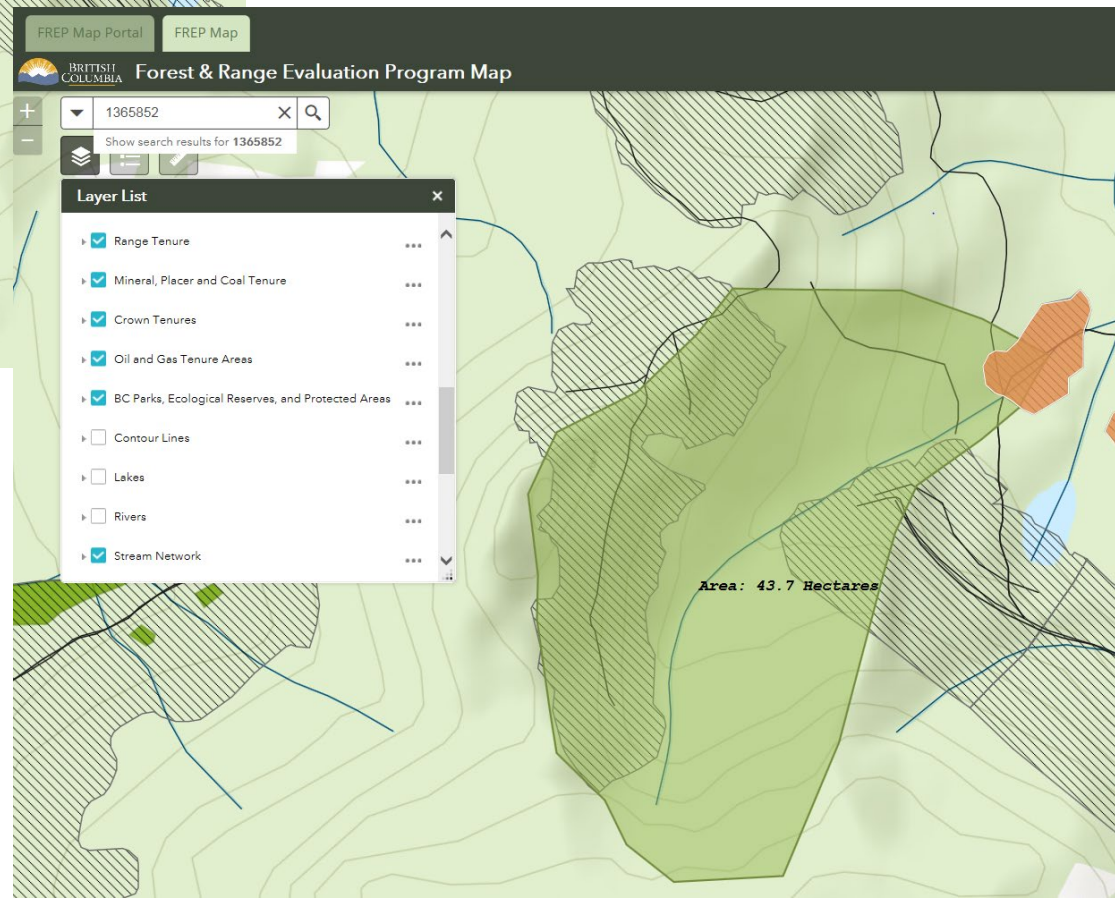


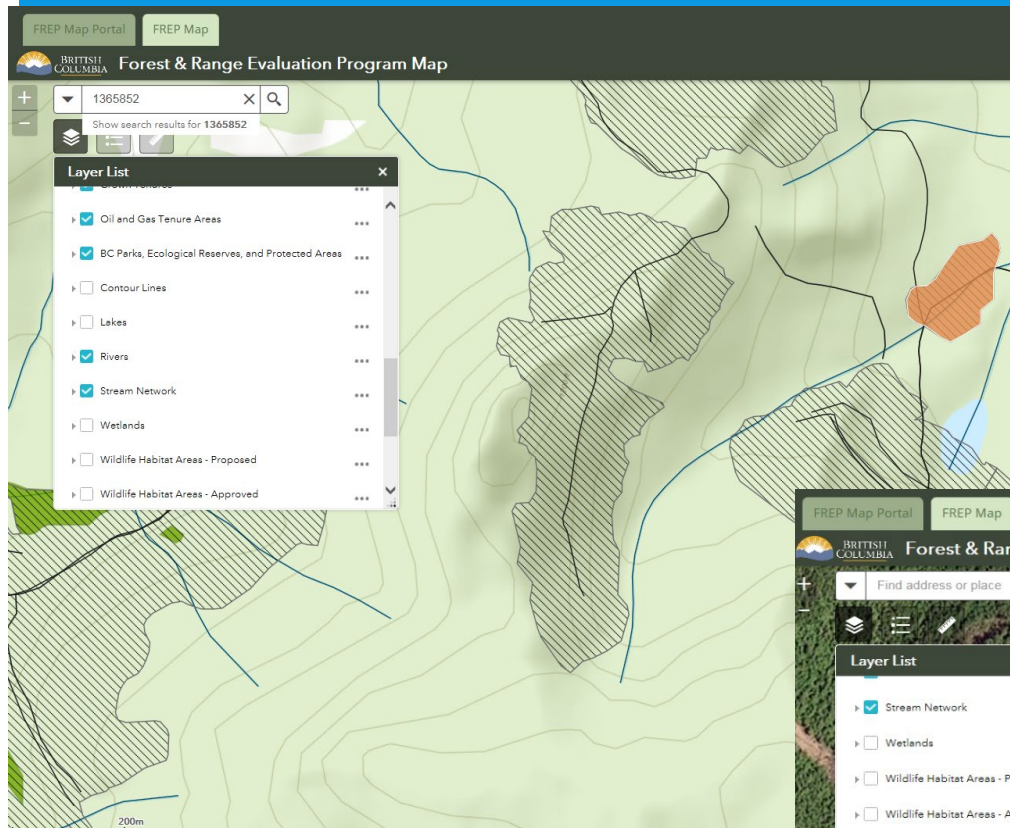
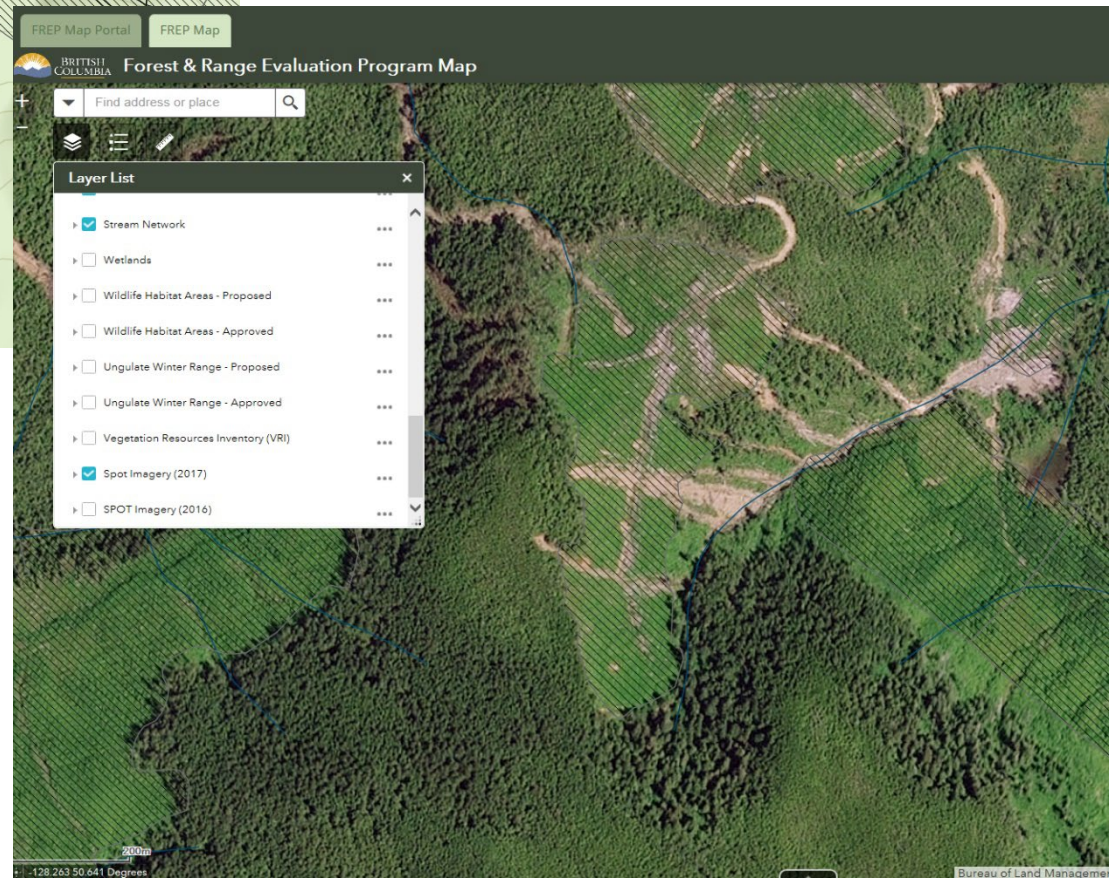
▶ ☒ Forest Cover Reserve



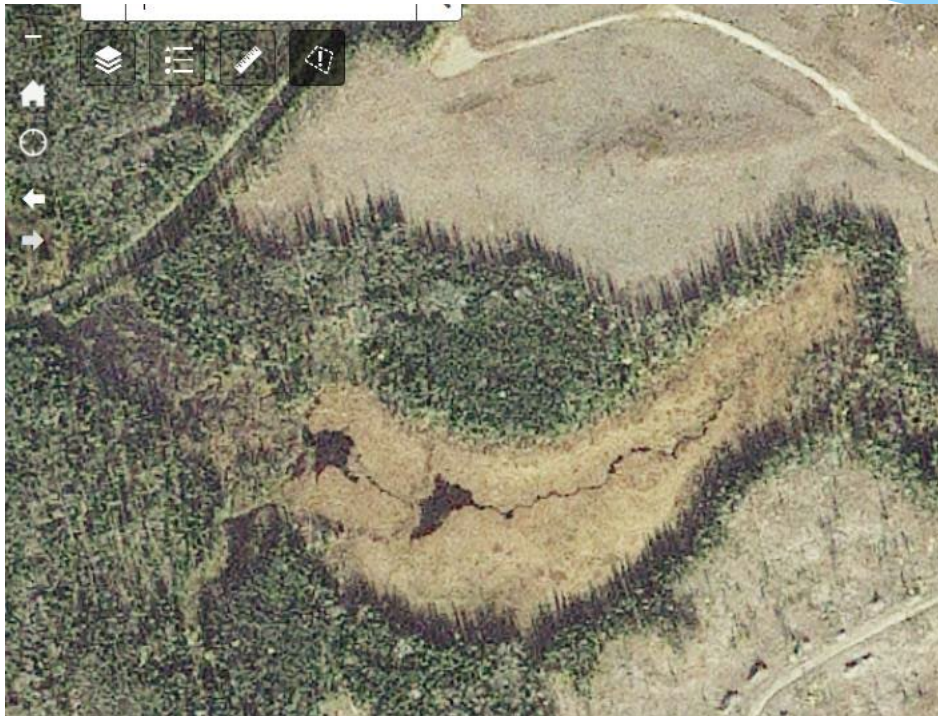
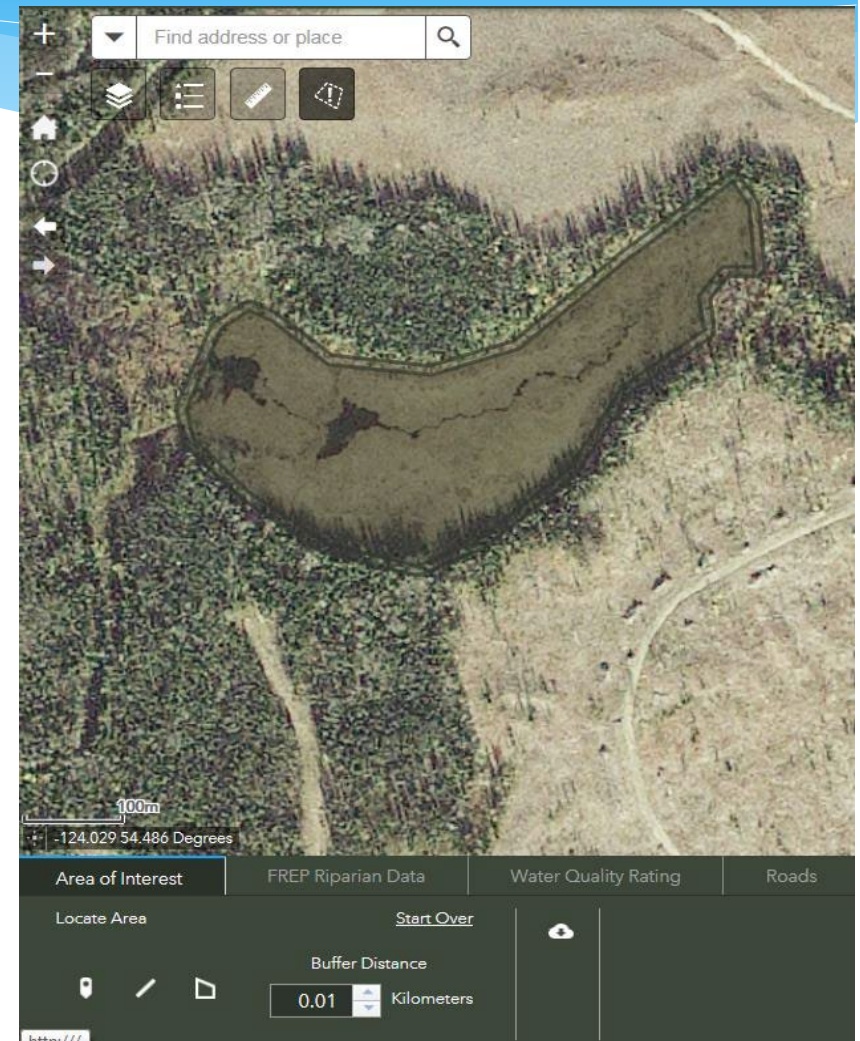
▶ ☐ Forest Cover Silviculture



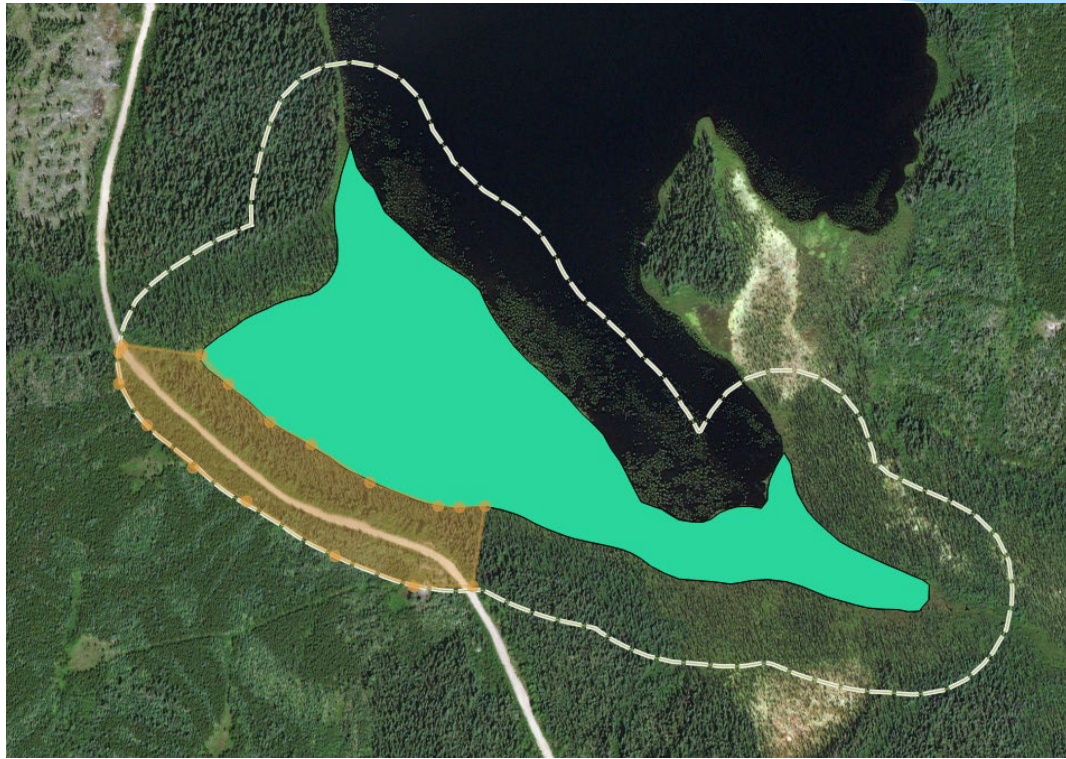




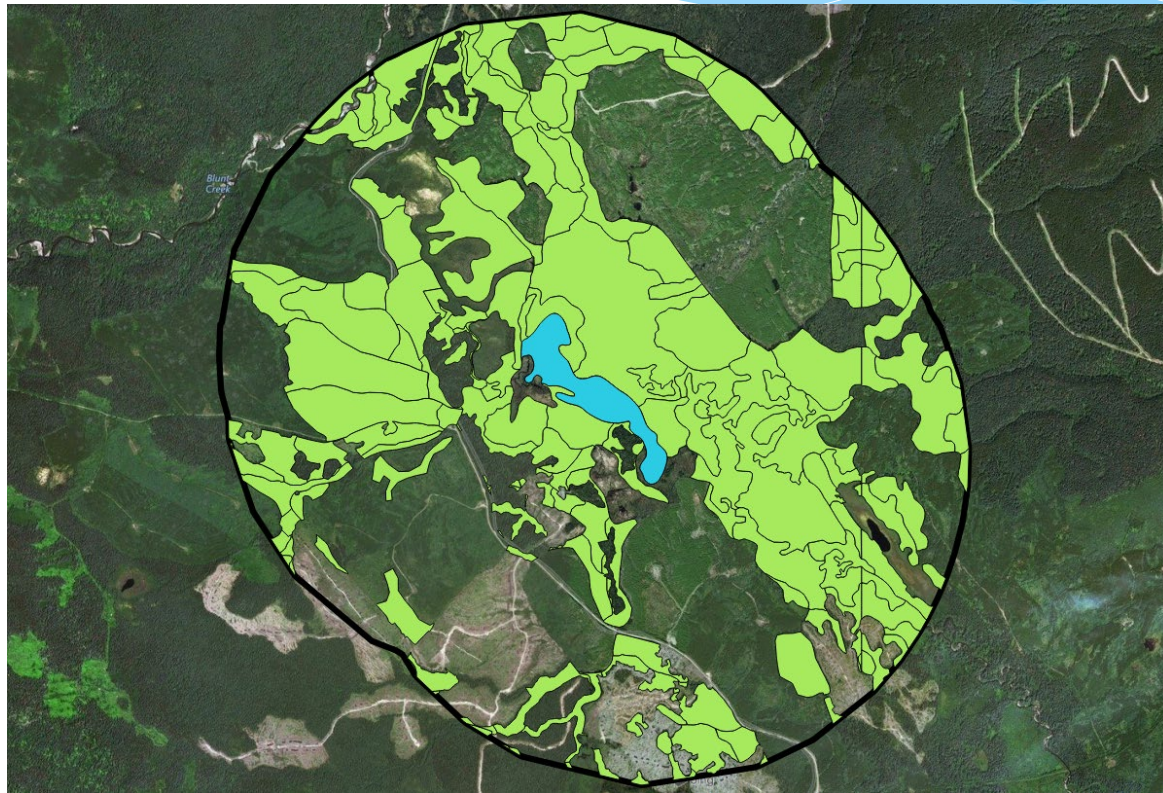
Wetland buffer – 10 m



Wetland buffer – 100m



Mature and old forest within 2km



Routine-Level Watershed Assessment

- * Combination of GIS and field data to inform on the condition of a specific watershed.
- * Sites are targeted and selected using a systematic sampling design at the “pour point” of sub-catchments.
- * Stream attributes are collected in the field as per the riparian/stream protocol (3 dozen+ are associated with Q# 1-9)

INTEGRATING GIS AND GROUND-BASED METHODOLOGIES WITH POUR-POINT SAMPLE DESIGN FOR ROUTINE-LEVEL WATERSHED ASSESSMENT

Lisa Nordin and Leah Malkinson

FREP

TECHNICAL
GUIDANCE #7

July 2020

INTRODUCTION

In 2019, the Forest and Range Evaluation Program (FREP) piloted a study with multiple objectives, one of which was to test an integrated method for effectively assessing watershed conditions that could be repeated by trained non-specialists with a working knowledge of GIS. The creation of this pilot evolved from an increasing interest in expanding stream and riparian assessments from a local scale to one that more effectively captures processes at a watershed level. Prior to this new methodology, there was only one watershed sampling protocol within FREP, which had been developed for fisheries-sensitive watersheds (FSWs). The FSW design uses stratified-random site selection derived from sections of a grid overlay of the drainage area. The overall results subsequently roll up in an additive manner by fish/non-fish stream grouping to conclude on watershed

cumulative effects model output layers can assist in the identification of watersheds that might be at high risk owing to potential increases in peak flows, sedimentation, or riparian disturbance. As watershed patterns are hierarchical or “nested” it is important to understand the level of resources available for sampling before deciding on the scale of watershed for assessment. The scale does not have to align with existing mapped boundaries, such as those basins identified in current spatial layers, but if the watershed has a customized scale to meet specific objectives, additional GIS work to define the drainage boundary will have to be completed. The Freshwater Atlas and other topographic spatial layers are useful tools to help determine height of land and drainage direction if drawing a custom boundary.

POUR-POINT DESIGN AND RATIONALE

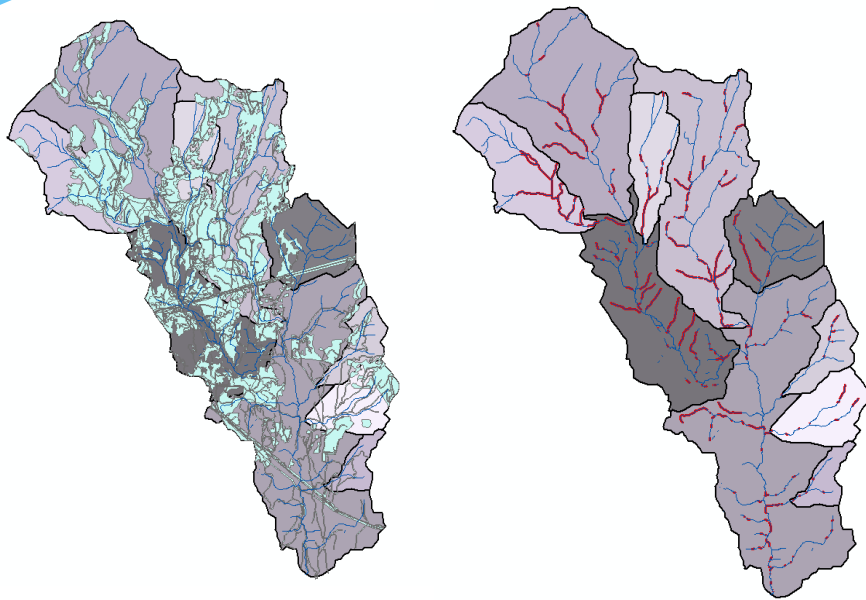
Research Report

BC Journal of Ecosystems and Management

Detecting effects of upper basin riparian harvesting at downstream reaches using stream indicators

Lisa J. Nordin¹, David A. Maloney², and John F. Rex³

Routine-Level Watershed Assessment

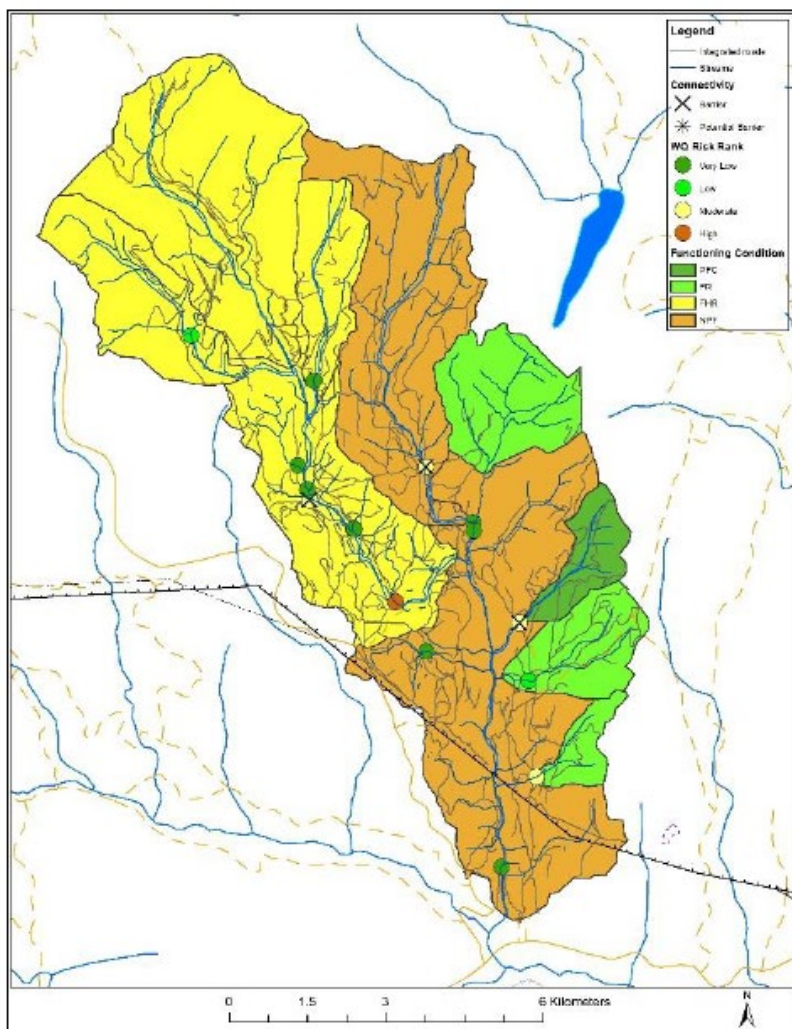


- * Uses disturbance layer from CE as a proxy for riparian indicators in riparian/stream protocol.
- * Also collect information on habitat connectivity, sediments from roads, and wetland health and condition using established protocols.
- * Reports out on functioning condition by sub-catchment; uses a weighted average for watershed

Weighted Stream Score		Riparian disturbance within 10 m					
		Low	Moderate		High		V. High
		< 0.12	0.12 <0.16	0.16-0.21	>0.21-0.25	>0.25-0.30	>0.30
	Score	Score 0	Score 1	Score 2	Score 3	Score 4	Score 5
Low	0	PFC	PFC	PFC	FR	FR	FHR
	>0-1	PFC	PFC	FR	FR	FHR	FHR
	>1-2	PFC	FR	FR	FHR	FHR	NPF
Mod	>2-3	FR	FR	FHR	FHR	NPF	NPF
	>3-4	FR	FHR	FHR	NPF	NPF	NPF
High	>4-5	FHR	FHR	NPF	NPF	NPF	NPF
	>5-6	FHR	NPF	NPF	NPF	NPF	NPF
Very High	>6-7	NPF	NPF	NPF	NPF	NPF	NPF
	>7-8	NPF	NPF	NPF	NPF	NPF	NPF
	>8-9	NPF	NPF	NPF	NPF	NPF	NPF

Routine watershed assessment output

Rock creek watershed = NPF



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REPORT # 41

FOREST AND RANGE EVALUATION PROGRAM

August 2020

WATERSHED ASSESSMENTS IN THE KOOTENAY-BOUNDARY REGION: Combining GIS and Ground-Based Methodology with Pour-Point Design

Prepared by:

Lisa Nordin, M.Sc., R.P.Bio.

Integrated Monitoring and Assessment, Resource Planning and Assessment Branch

B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development

August 2020



Boundary Creek. Photo credit: Kristie Steele

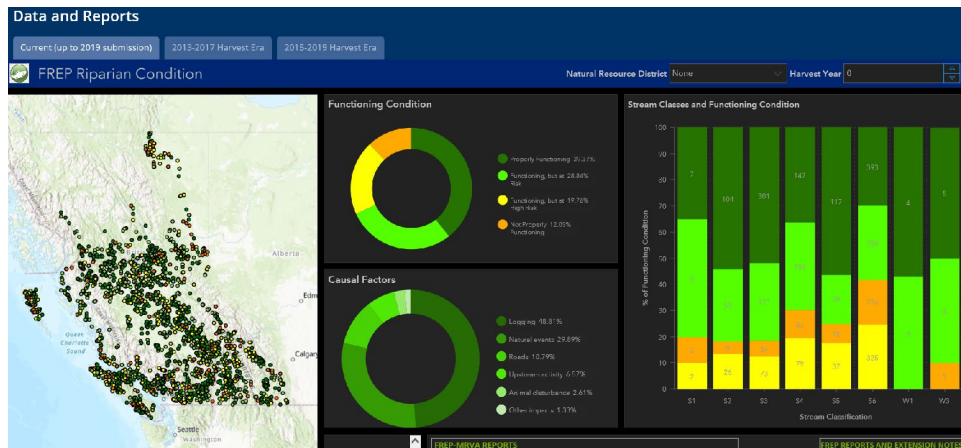


Data Storage and Availability



We are currently working on updating the FREP data storage system.

- * Results of assessments are submitted to branch value leads
- * Datasets are available on the FREP sharepoint for stewardship staff or to others by making a request to the value lead.
- * Dashboard of simplified results is available online.



Results to date

- * Small streams are left in worse functioning condition than large streams.
- * Retention is a factor
- * Stream location is a factor

THE CONDITION OF SMALL STREAMS AFTER HARVESTING: A SUMMARY OF FREP DATA FROM 2006-2015

Prepared by Lisa Nordin, John Rex and Peter Tschaplinski

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EXTENSION NOTE #40

October 2017

POST-HARVEST CONDITION OF STREAM CHANNELS, FISH HABITATS, AND ADJACENT RIPARIAN AREAS: RESOURCE STEWARDSHIP MONITORING TO EVALUATE THE EFFECTIVENESS OF RIPARIAN MANAGEMENT 2005-2014

Prepared by: Peter Tschaplinski and Derek Tripp

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EXTENSION NOTE #39

October 2017

Key Messages for Resource Managers:

- Post-harvest monitoring of streams over a 10-year period shows that the percentage of streams in the two top-functioning categories – properly functioning condition (PFC) and functioning at risk (FR) – was 68% in the Forest Practices Code (FPC) era, 66% in the transition era, and 67% in the *Forest and Range Practices Act* era. These outcomes did not vary significantly from the FPC to the FRPA eras.
- Stream reaches in the two top functioning categories reflect forest practices that have achieved riparian management objectives under FRPA.
- Four out of five streams that were deemed not properly functioning (NPF) were small, non-fish bearing streams (class S6, 71%) and the smallest fish-bearing streams (class S4, 16%).
- Streams with the best outcomes occurred where the retention of overstorey trees were managed for windthrow; there was little or no disturbance to the stream bed, banks, and adjacent riparian area; and fine sediments from road construction and maintenance were managed.

Lessons for Resource Managers:

Common harvest-related activities that were observed to cause impacts to small streams were falling and retention, and windthrow.

Streams were left in better condition than S4 and S6 streams, likely because of the 20-m mandatory reserves and related operational considerations that buffer S3 channels.

Streams adjacent to the block were ranked better than those located within the block, which could be due to cross-channel disturbance and retained vegetation on one side of channel.

Stream classes, sites that were given more riparian retention had better outcomes, with more than 80% with a 10-m buffer ranked in the top two functioning categories: properly functioning condition (PFC) and functioning at risk (FR).

Has riparian management improved?

Percent of sites at high risk or not properly functioning by **harvest** era
Parenthesis is % impaired indicators from logging

Stream Class	2006-2017	2018-2020
S1-S3	18% (33%)	14% (47%)
S4-S6	26-40% (66%)	43% (76%) all S6

Results to date

- * Riparian management strategies vary among licensees
- * There are good players!
- * Good outcomes begin at the planning stage, involve multiple groups, consider timing and methods for harvest depending on site characteristics, involve training, operational monitoring and communication from senior staff to operators.



BEST RIPARIAN MANAGEMENT PRACTICES LEADING TO GOOD OUTCOMES FOR SMALL STREAMS

Lisa Nordin and Peter Bradford

INTRODUCTION

More than 2300 riparian monitoring assessments have been completed by the Forest and Range Evaluation Program (FREP) over the past 11 years. This data indicates that smaller-sized streams are not faring as well after harvest compared to larger streams where retention is mandatory (FREP Extension Notes #17, #39, #40). To more effectively communicate this information and increase awareness of the importance of small streams, the FREP team conducted three workshops (coast, north interior, south interior), delivered a webinar in cooperation with the BC Association

FEATURE ▷ BY LISA NORDIN, MSc, RPBIO AND JASON CARMICHAEL, RPF

FREP Spotlight on Effective Riparian Management

Effectiveness evaluations at over 11,000 post-harvest sites have been completed since inception of the Forest and Range Evaluation Program (FREP), including 2,742 associated with riparian areas assessed from 2006 to 2019. Riparian evaluations consist of main indicator questions associated with attributes that are measured, counted, or estimated in the field to give an overall condition ranking for a stream or wetland and its associated riparian area. The four

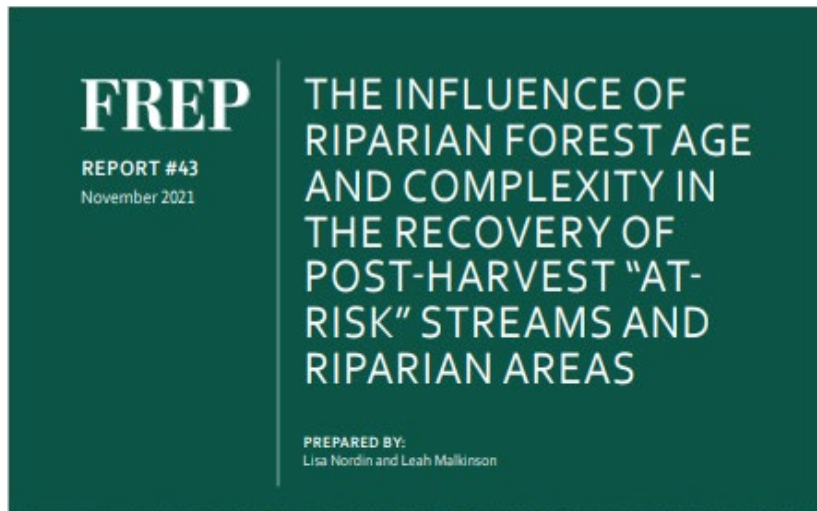
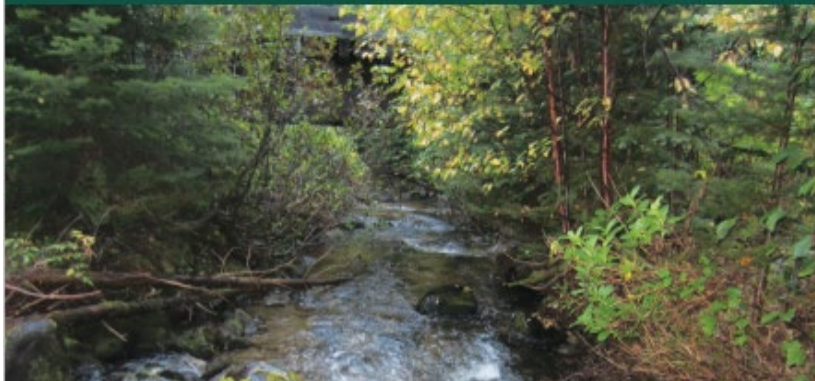
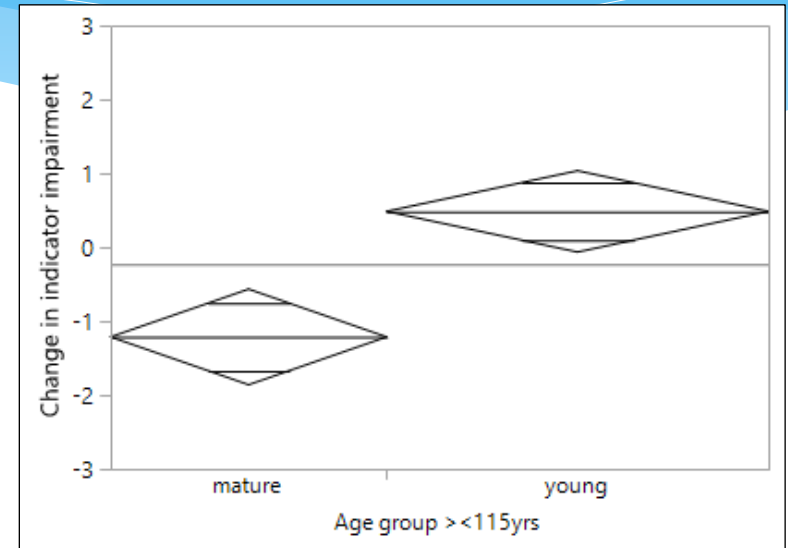
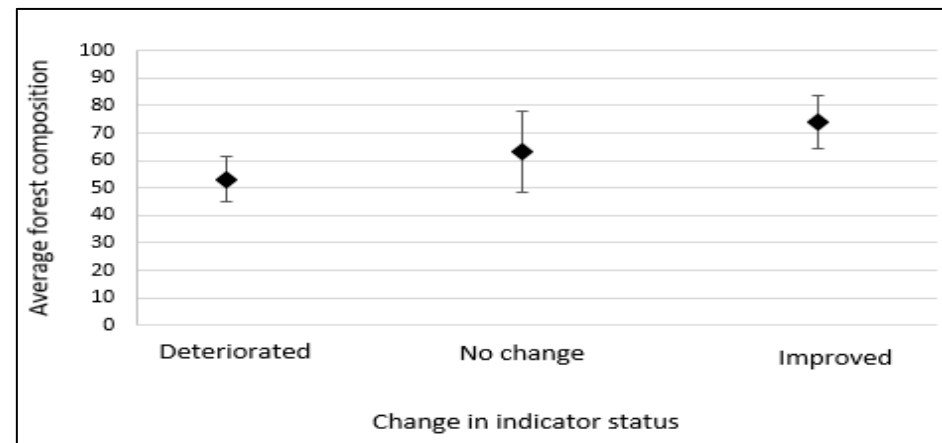
that require specific strategies to minimize impacts from harvesting, there were many common practices around small streams that led to good outcomes. The data shows that ultimately, the avoidance of streams is one of the best practices, and planning cutblocks between streams or retaining wildlife tree patches or other retention around

to the accuracy of field-locating riparian features, mapping their location, and the use of quality georeferenced maps for equipment operators.

Some practices have evolved by identifying standardized treatments we felt were aligned with recent FREP small streams outreach. In general, this has resulted in:

Results to date

Young, second growth riparian forests are not as resilient as older forests after new disturbance



Results to date

- Disturbance effects can be cumulative and affect watershed functioning condition.

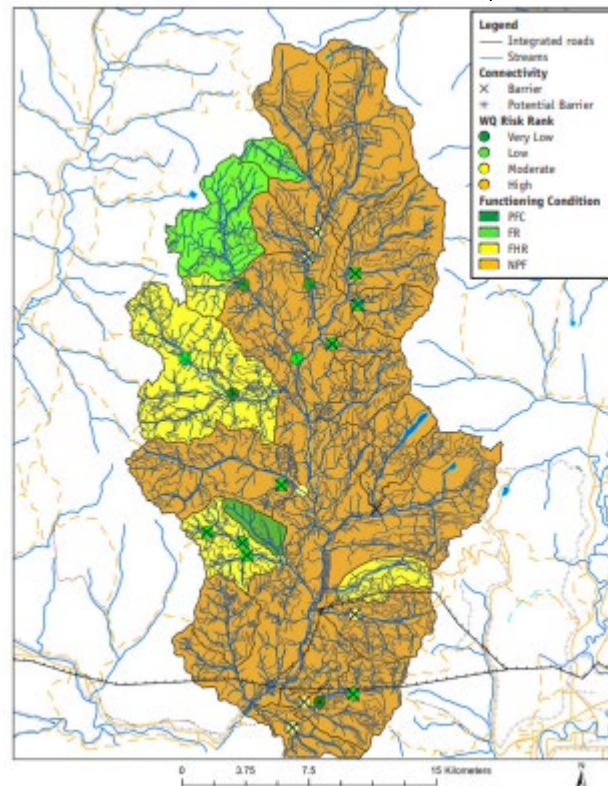


Figure 3. Map of Boundary sub-catchments with riparian/stream, water quality, and habitat connectivity results.

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Thanks for listening!

