Small Stream Riparian Zones: Why are they important and how can we manage them?

Southern Interior Silviculture Committee
Annual Meeting
Kamloops, BC
February 1, 2017

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Outline

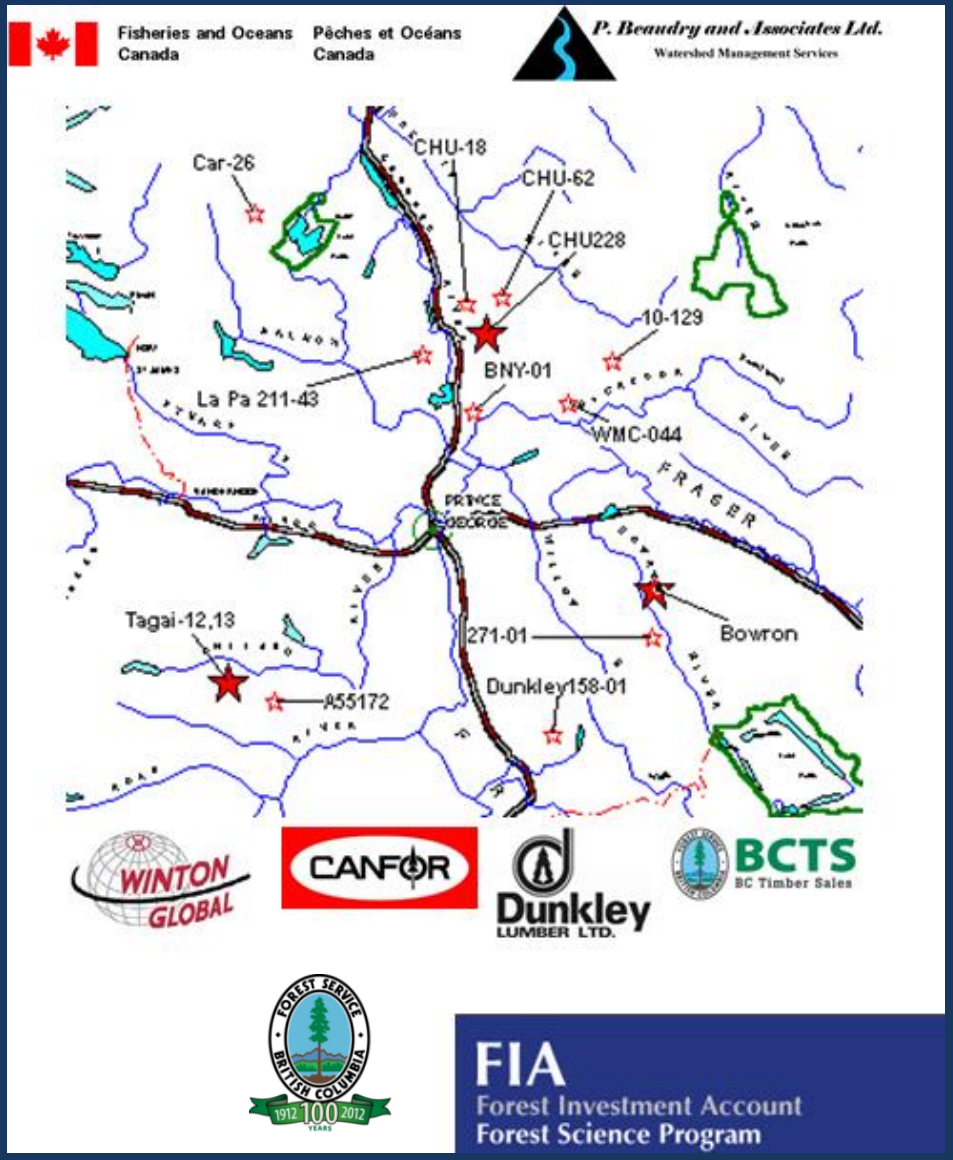
- Why are small streams important?
- Projects Past and Present:
  - PG Small Streams
  - Bowron River Watershed
  - THLB - Industry Collaboration
  - FREP Extension
- Opportunity to improve outcomes for small streams!

The what and why of small streams

- Contribute water, nutrients, energy to downstream,
- Habitat,
- Most abundant,
- Most sensitive,
- Least buffered,
- Often most at risk from resource management activities.

Past : Prince George Small Streams Study

J. Rex, D. Maloney, E. MacIsaac, H. Herunter, P. Beaudry, and L. Beaudry



- District manager policy to address small stream retention around fish-bearing streams.
- A paired watershed before and after control study.
- Test effectiveness of minimum prescription (10 stems/100m to meet 5 management objectives).

Parameters Monitored

Agency	Parameters Studied
Department of Fisheries and Oceans	Water Quality and Quantity Biological productivity (Primary and Secondary) Fisheries Surveys
Pierre Beaudry & Associates	Channel Morphology (LWD/Erosion) Riparian Tree Inventory Angular Canopy Densiometer
Ministry of Forests and Range	Air and Stream Temperature

Study Sites: Tagai, Bowron, and Chuchinka

- BEC zone - SBSdw2
- Tag-13 Active stream width 0.8m, gradient 3%. Tag 12 1.1m, 5%
- Elevation: 900-1000m
- Aspect: NE
- Tag 13-March 2004 Tag-12 July 2004 - BCTS (operator)

- BEC zone - SBSvk
- Active stream width 1m, gradient 4%
- Elevation: 900-920m
- Aspect: NW
- December 2002 - BCTS (operator)

- BEC Zone: SBSwk1
- Active stream width 0.9m, Gradient 1%
- Elevation:780-820m.
- Aspect: SW
- July 2003- Canfor

Prince George Findings

- Change identified for most parameters but a management concern for shade, temperature, wood dynamics, and litterfall.
- LWD modeling and source distance information identifies loss of future LWD and importance of retention within first 10m.

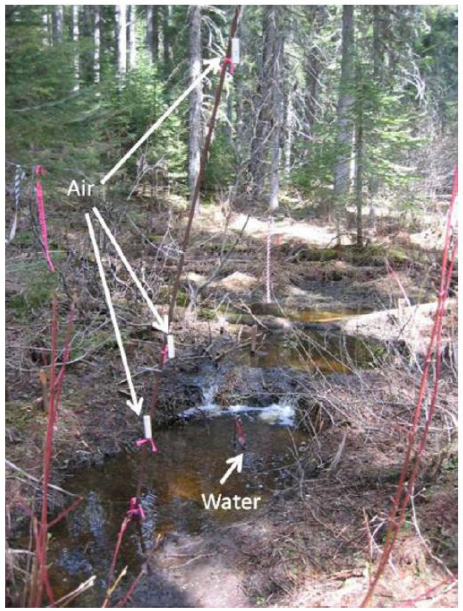
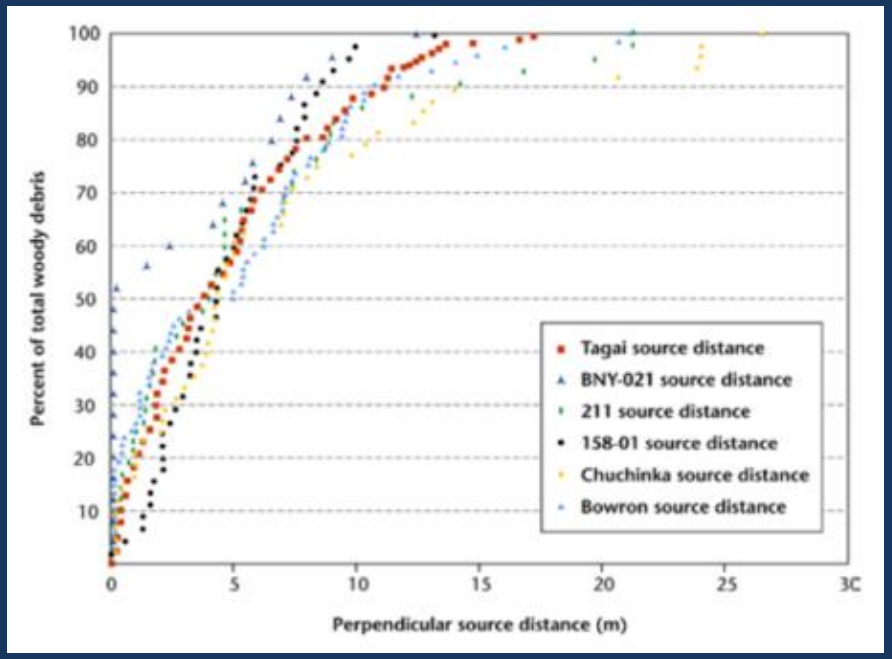
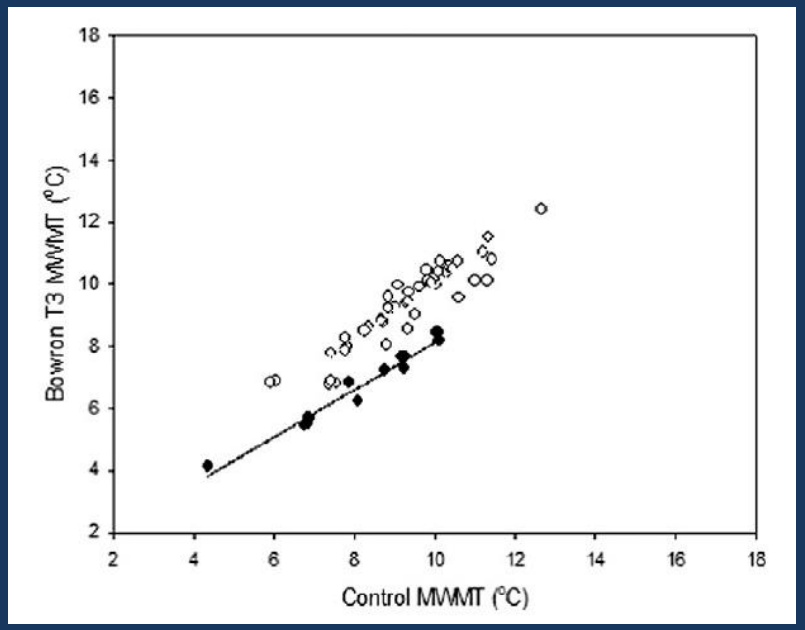


Fig. 2. Study stream showing placement of air temperature probes at 0.5, 1.0, and 2.5 m along with the water temperature probe in the thalweg.



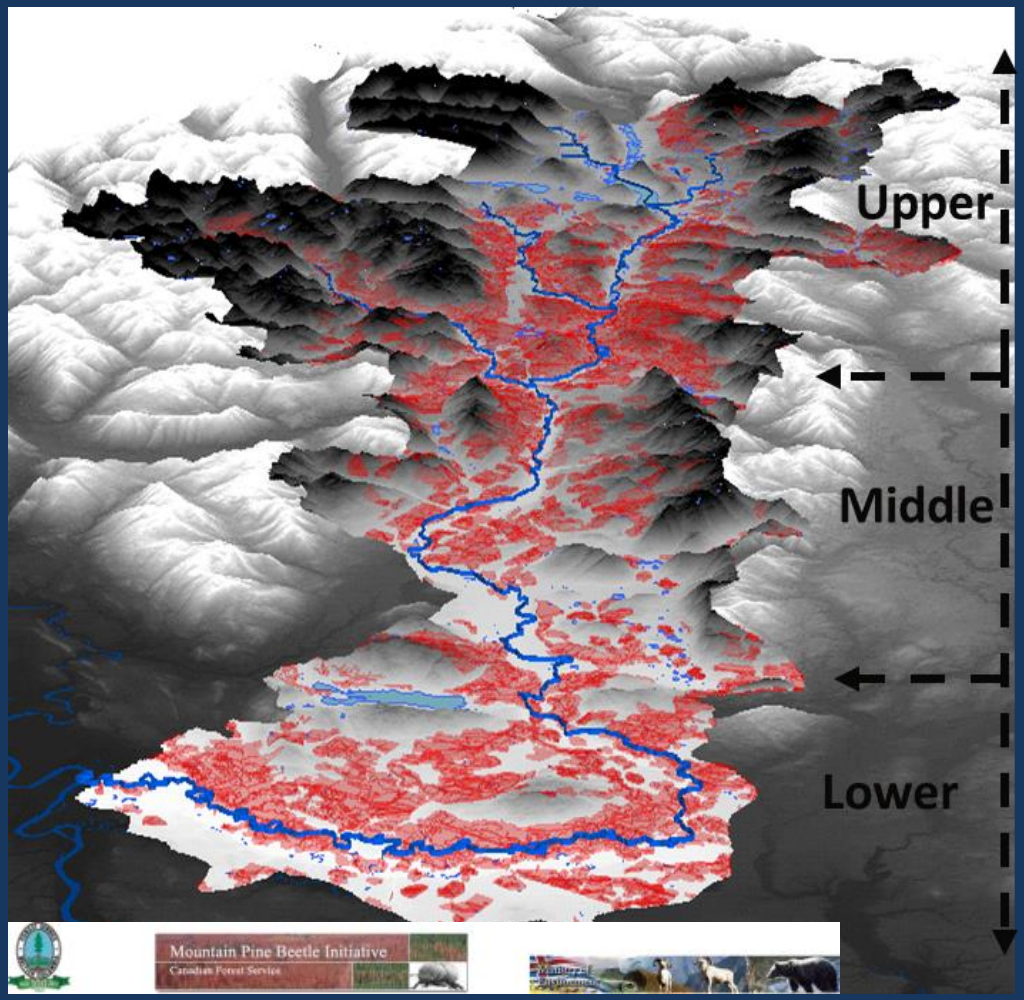
(Pierre and Leisbet Beaudry)- Extension Note 100

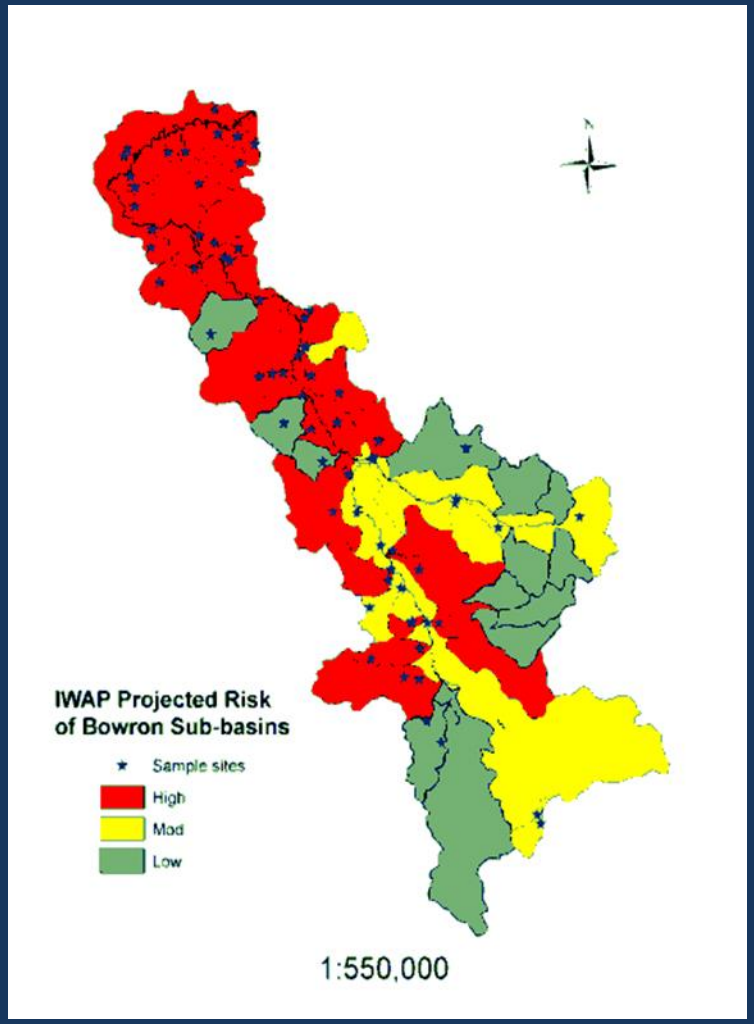


(Rex et al., 2012)

Bowron River Watershed Study

L. Nordin, P. Krauskopf, D. Maloney, J. Rex, P. Tschaplinski, D. Hogan





November 1984 on top of a hill at the Indian Point Creek area (view is North)

Photo Credit: Robert Hodgkinson

Methodology – FREP Routine Riparian Effectiveness Evaluation Protocol

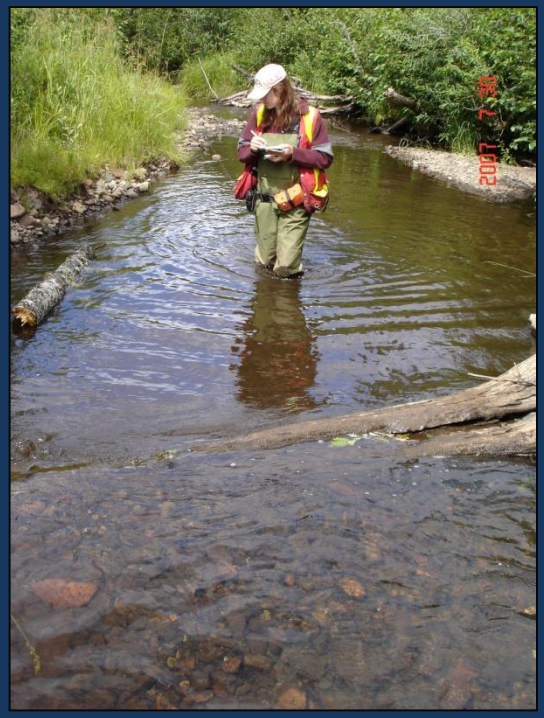
- The evaluation has 15 indicator questions:

Stream indicators

1. Channel bed disturbance
2. Channel bank disturbance
3. Large woody debris processes (jams)
4. Channel morphology
5. Aquatic connectivity
6. Fish cover diversity
7. Moss abundance and condition
8. Fine sediments
9. Aquatic invertebrate diversity

Riparian indicators

10. Windthrow frequency
11. Riparian soil disturbance
12. LWD supply
13. Shade and bank microclimate
14. Disturbance increaser plants
15. Vegetation vigour, form, and structure



Key characteristics of healthy streams and their riparian habitat

Functioning Streams

Spruce Creek

Ames

Tsus-Fly

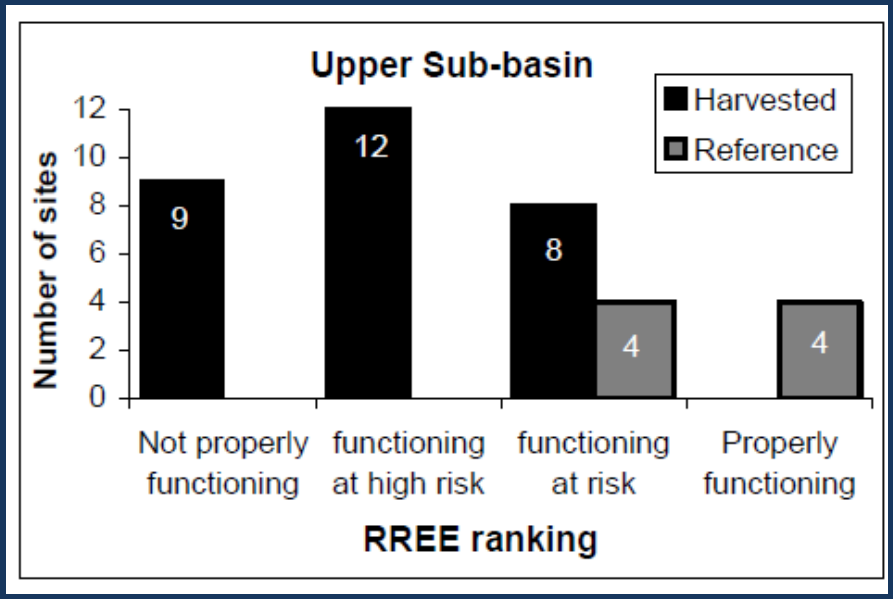
Not Properly Functioning Streams

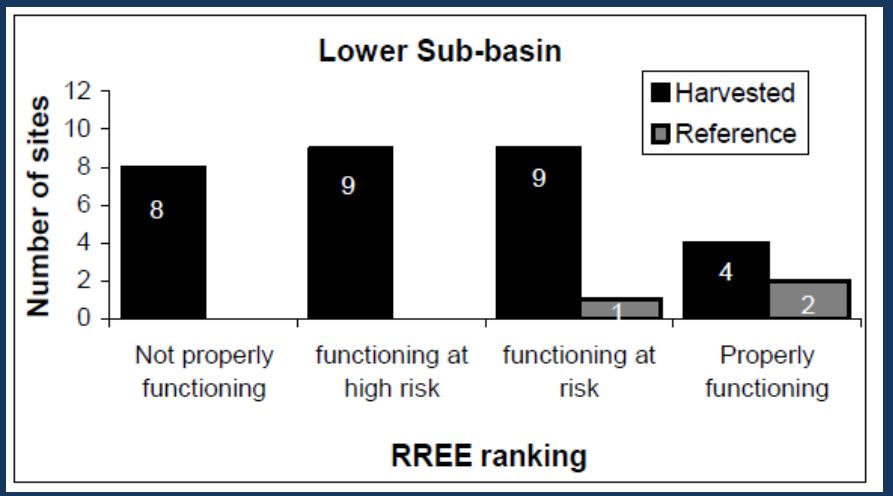
Landing hydrologically connected to stream by road

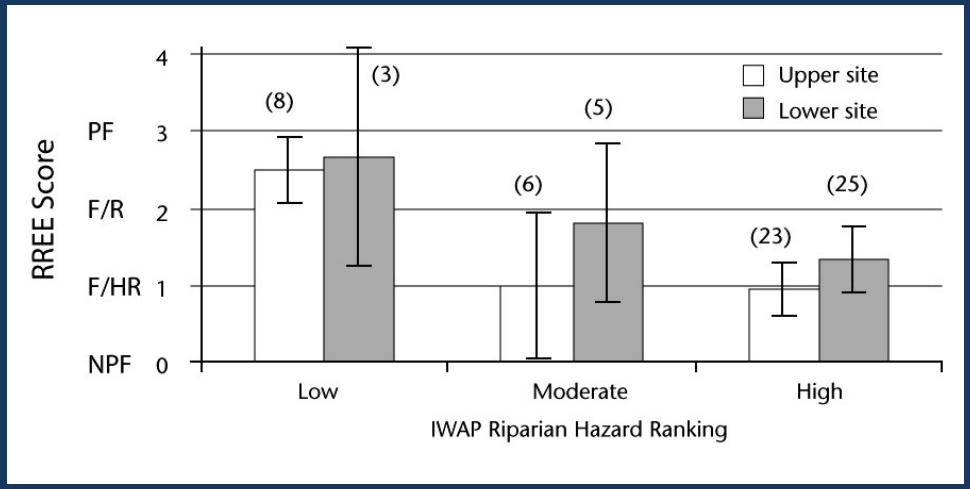
Limited riparian re-growth

Bowron Findings

- Headwater and larger streams slow to recover from extensive harvesting.
- Buffers of ~3m for small streams were inadequate.
- Value of IWAP as a screening tool.

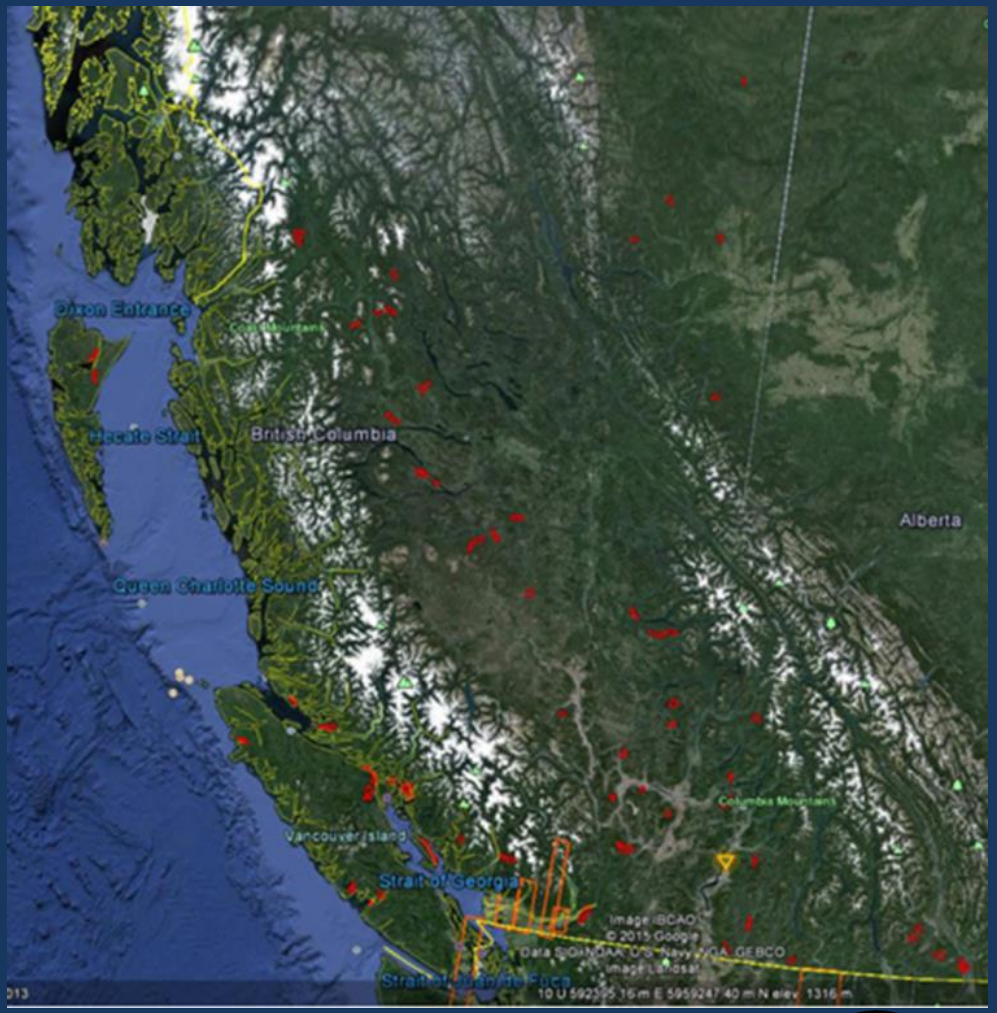






Research Present: THLB

Terry Sullivan, Shannon Pearce, Peter Baird, Jeff Mycock, John Rex



- GIS analysis completed of 104 randomly selected watersheds (Forsite),
- Buffer first and second order streams,
- Field validation.

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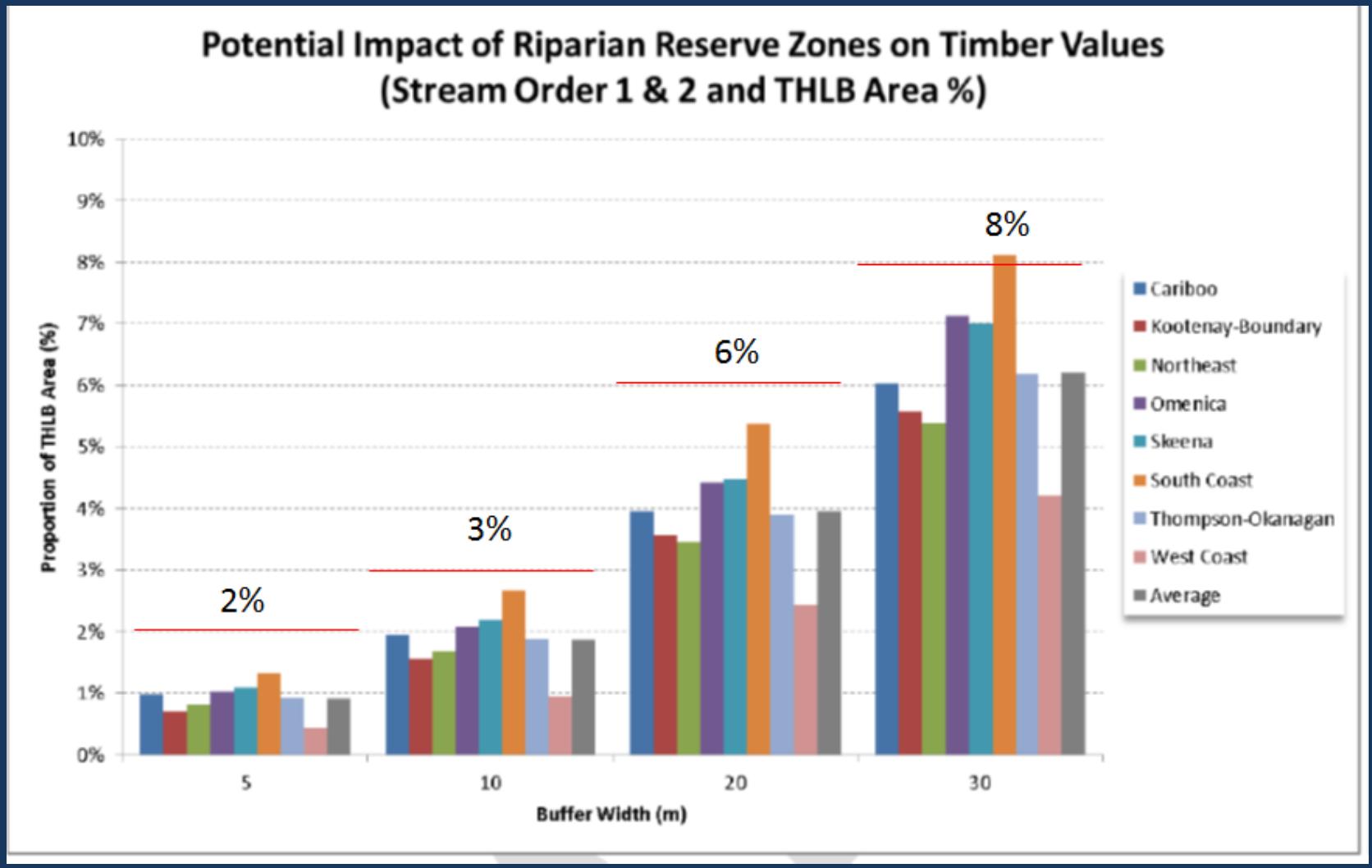
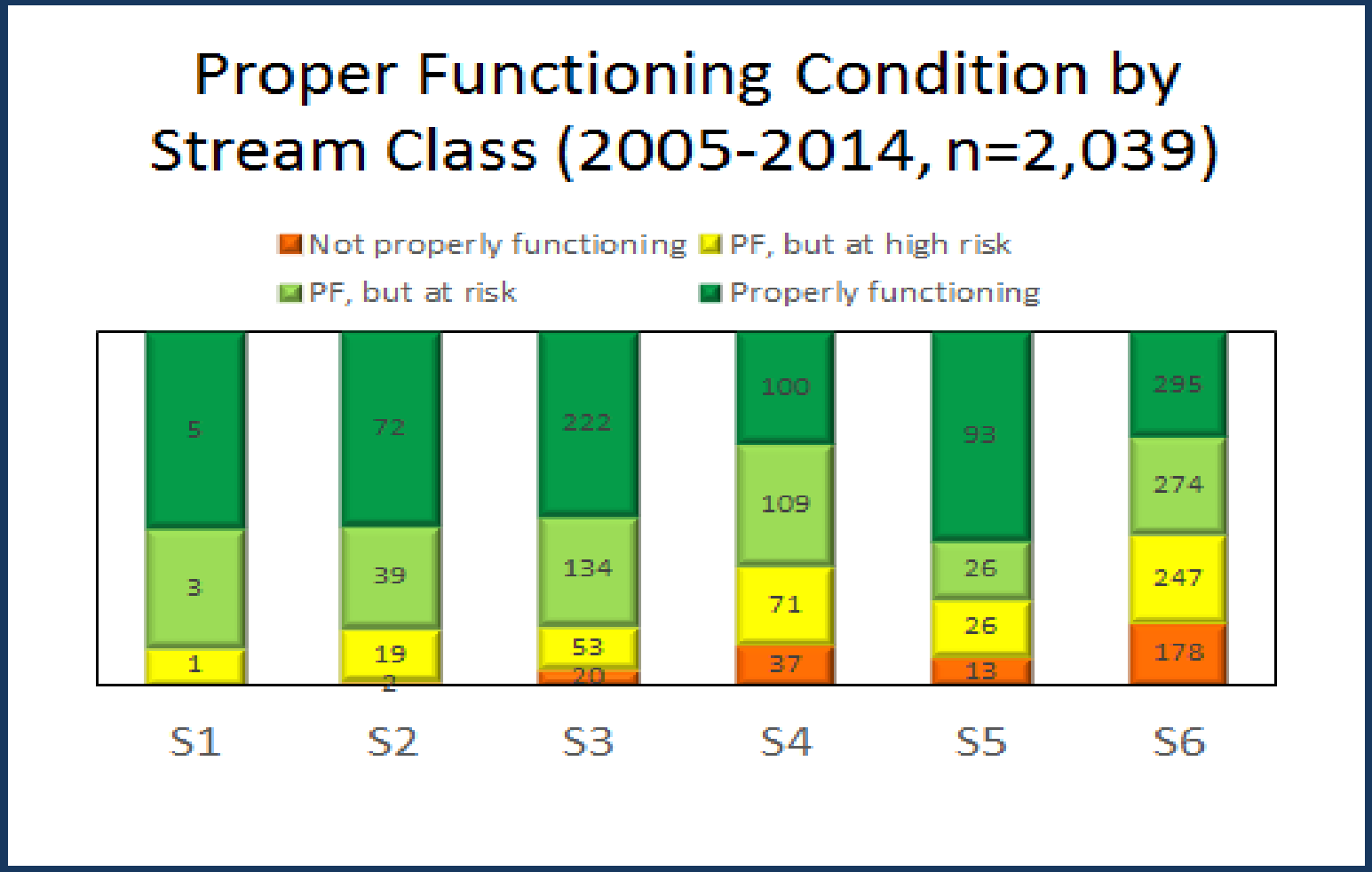


Field Validation: (7 regions, 17 Watersheds)

- Variability in stream presence and estimates,
- Riparian volumes overestimated (limited coastal data)

Operational considerations

Present: FREP Analysis



- Generally positive, particularly so for larger streams S1-S3,
- Opportunity for improved outcomes for small streams in all regions.

Present: FREP Data Analysis

- Sample size of 1314 for small streams (<3m).
- Reviewing data with FREP team to look for trends and ways to improve outcomes.
- Three eras sampled, namely
  - FPC –pre 2004 (n= 559)
  - Transition 2004-2007 (n=398)
  - FRPA >2007 (n=357)

- FREP data files include information on:
  - Area
  - Timing of harvesting and licensees,
  - Stream morphology,
  - Distance to merchantable trees,
  - 15 indicator questions,
  - Commentary related to questions – i.e. is response due to natural disturbance or forest, range, mining, or other human development factors

A properly functioning stream and non-properly functioning stream.

https://www.for.gov.bc.ca/hfp/frep/values/watershed.htm

FREP Collaboration and Extension Reports

- Series of three extension notes:
  - Importance of small streams (available)
  - Data analysis by region (March 2017)
  - Collaborative recommendations on small stream management (Fall 2017)
- Regional workshops to be held in Coast, North, and South areas.

THE IMPORTANCE OF SMALL STREAMS IN BRITISH COLUMBIA

FREP

EXTENSION NOTE #38

January 2017

Prepared by Derek Tripp, Lisa Nordin, John Rex, Peter Tschaplinski, and John Richardson

INTRODUCTION

What is a "small stream"? This article provides the Ministry of Forests, Lands and Natural Resource Operations' definition and explains their importance. It is the first of three extension notes that are specific to small streams. This series is prompted by monitoring results obtained from the Province of British Columbia's Forest and Range Evaluation Program (FREP), indicating that many small streams have been left in poorly functioning condition (Tschaplinski 2010, 2011). The second note in this series will summarize the condition of small streams in British Columbia, using FREP data collected from 2006 to 2015, and describe the causes of impacts that affected the condition ranking. The third, to be released after feedback and collaboration with forest licensees, will identify methods and opportunities to avoid and mitigate impacts to small streams and, subsequently, to downstream reaches. These extension notes are intended for resource professionals and managers interested in riparian areas and the influence that small streams have on overall watershed condition. The overall goal is to promote further discussion and research on successful harvest strategies around small streams, and to ultimately reach agreement on effective and feasible forest harvest standards that will protect this important resource.

Small streams and the plant communities alongside them are valuable ecosystems because they often support a diversity of vegetation, invertebrates, and vertebrates not found in other areas of a watershed (Meyer et al. 2007). Along with supporting unique assemblages of plant and animal species, small streams have been shown to contain necessary habitat for juvenile fish (Rosenfeld et al. 2002). Whether they contain fish or not, all small streams contribute water, sediments, nutrients, and vegetative matter to downstream fish-bearing reaches (Chamberlin et al.1991; Wipfli and Gregovich 2002; MacDonald and Coe 2007). These contributions are increasingly being recognized as the key drivers of overall watershed condition and function (Gomi et al. 2002; Richardson and Danehy 2007; Wipfli et al. 2007; Wipfli and Richardson 2016).

Changes to small streams that result from harvest activities close to a stream edge are well documented (e.g., Bisson and Bilby 1998; Richardson and Danehy 2007), and include:

- higher water temperatures (MacDonald et al. 2003a; Moore et al. 2005; Gomi et al. 2006; Rex et al. 2012);
- changes to large wood supply and in-stream volumes (Bilby and Bisson 1998; Hassan et al. 2005; Benda et al. 2015);
- increased sediments (Benda et al. 1998; Richardson and Béraud 2014);
- loss of bank vegetation, leading to lower amounts of terrestrial invertebrates and coarse particulate organic matter (Piccolo and Wipfli 2002);
- fluctuations in stream flow dynamics (MacDonald et al. 2003b); and
- changes in benthic invertebrate communities (Fuchs et al. 2003; Kiffney et al. 2003).

These changes could affect ecosystem processes beyond the harvested reach, also impairing downstream condition and function.

FREP Forest&Range EvaluationProgram

Present: Interior FREP Analysis (Draft)

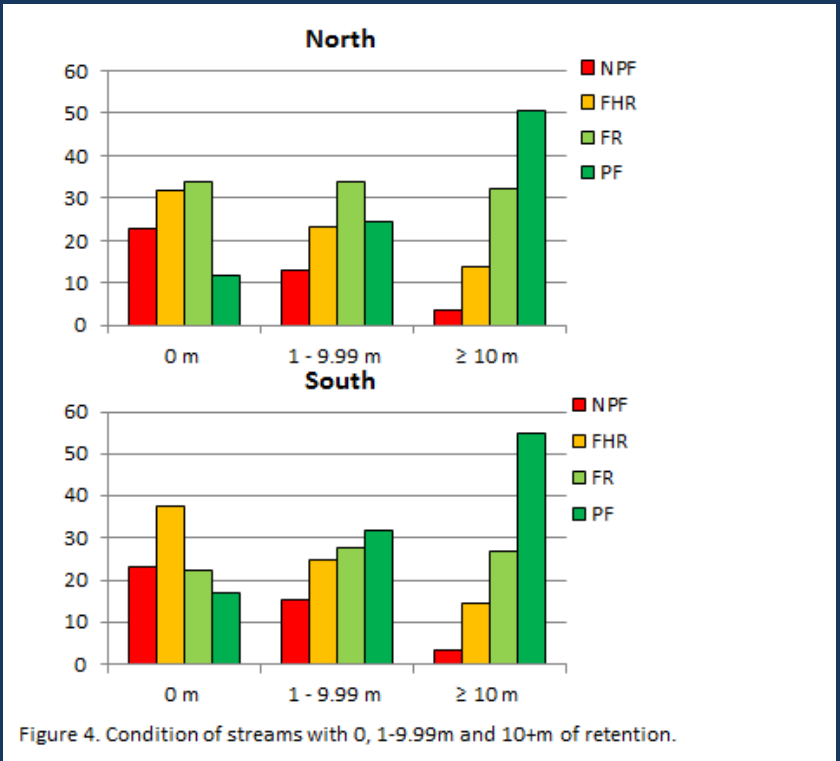


Figure 4. Condition of streams with 0, 1-9.99m and 10+m of retention.

Nordin et al., in process

Factors Influencing Outcomes	Factors Not Influencing Outcomes
Distance to Harvest	Gradient
10m Buffer	Bedrock
RMA Retention	Stream Class
Understory Retention	Location of Stream (N not S)

Opportunities & Next Steps

- Develop consistent provincial messaging:
  - Support District Manager Engagement with FSP preparers/reviewers
  - Deliver winter workshops with the Small Stream Community of Practice, FLNRO, ABCFP, Licencees (Nanaimo Jan. 31, Prince George Feb. 21/22, Kamloops – TBD March)
- Explore recommendations to manage small streams at the watershed or landscape level
- Pilot recommendations, target monitoring, and obtain results and feedback.

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Consider natural disturbance regimes and responses.

Table 3. Sources of large wood in the North Fork of

	Wood pieces (%)		W
	Colluvial tributaries	Alluvial mainstem	C tr
Local hillslopes and riparian areas	63	36	8
Fluvial redistribution	1	9	
Debris flow transported	—	33	—
Unknown source	36	22	1

UBC- Fishtrap Creek

May and Gresswall, 2003; Hassan et al., 2016; Wohl, 2017

Reference Material:

ADM Resource Stewardship Report Regional Results of the Forest and Range Evaluation Program: FREP Report #41. http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/frep/frep-docs/reports/adm_resource_stewardship_report_frep_results_2016.pdf

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