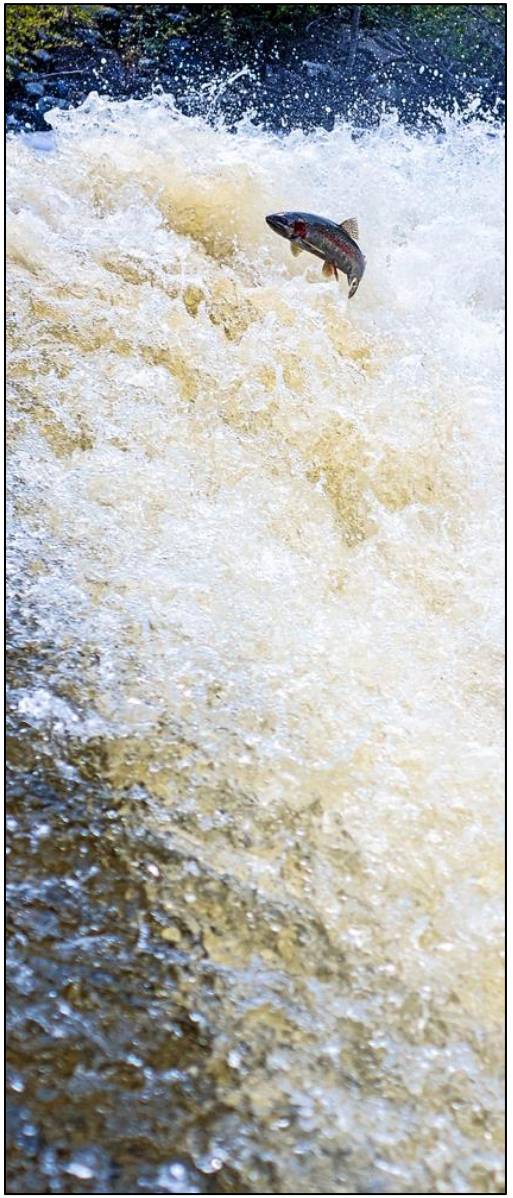
Linkages between ECA and riparian health on aquatic values: current pressures and future directions



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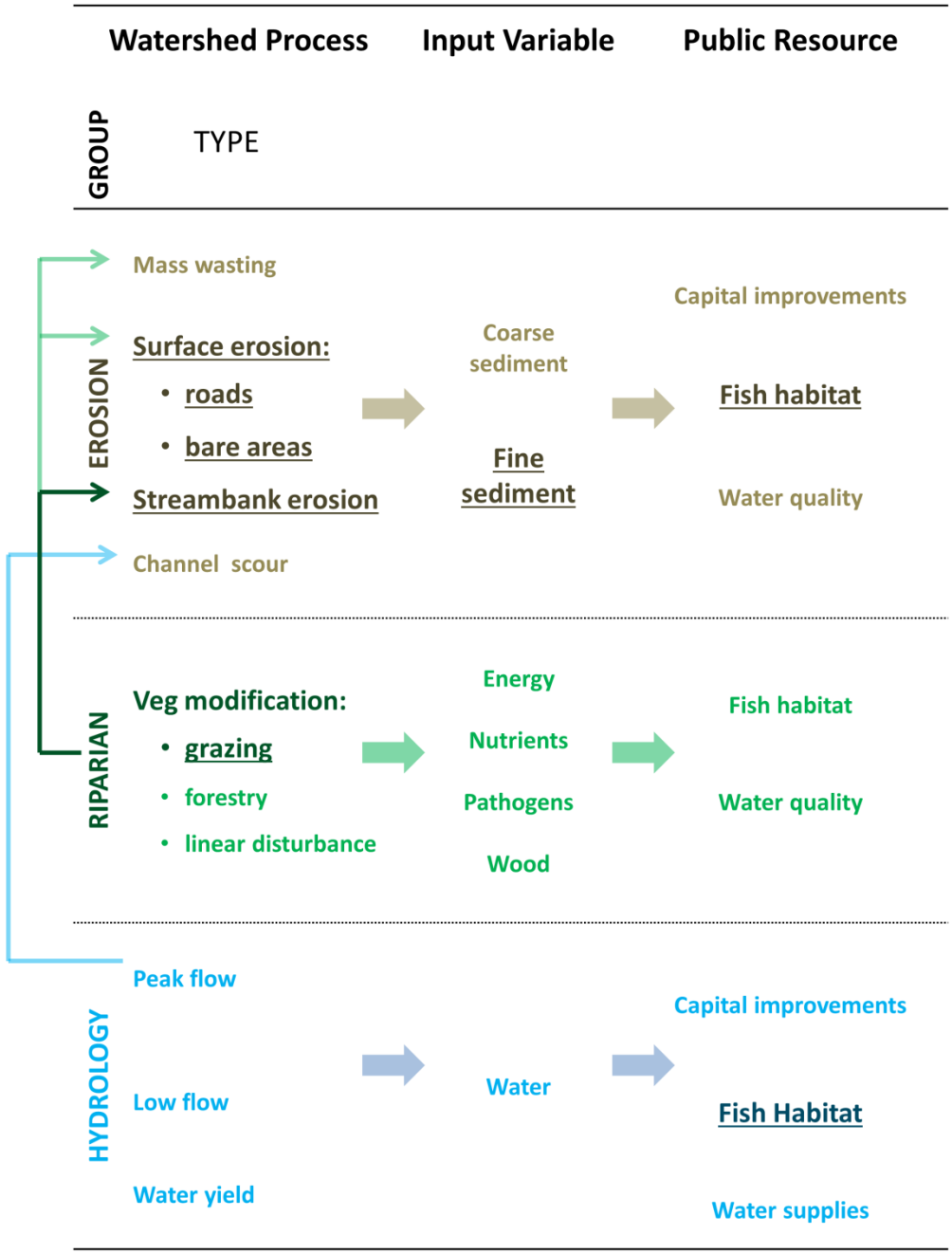
Thompson-Okanagan Region

Outline

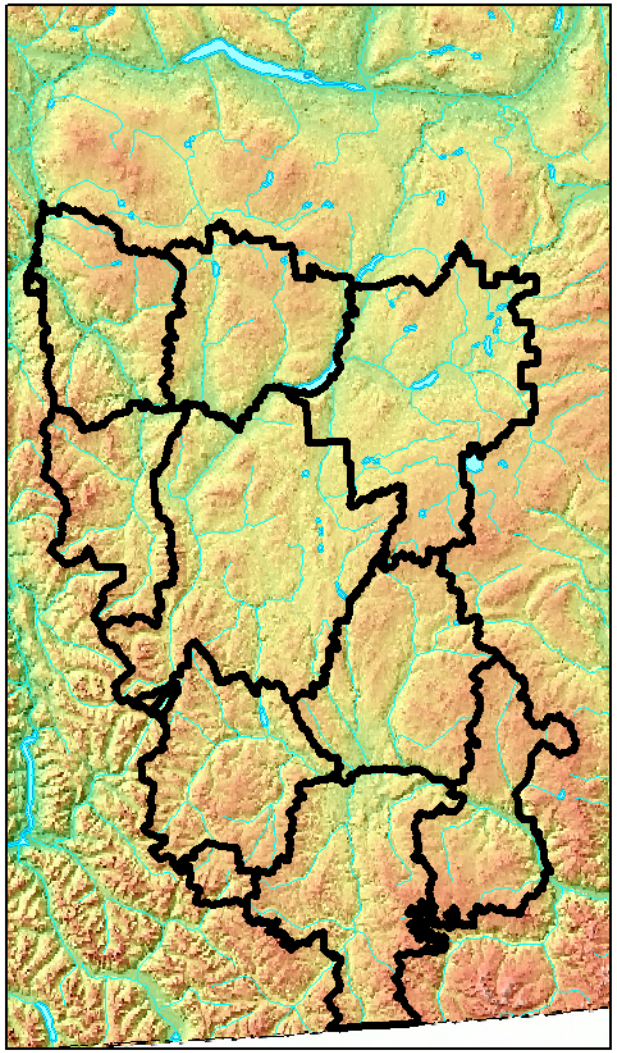
1. Why it's difficult to split out riparian management
2. Present challenges relating to forestry:
   - Managing existing impacts
   - Planning for the future
3. Watershed assessment procedures
4. Opportunities for managing risk using LIDAR

Connections between watershed processes, watershed input variables, and public resources (adapted from WDNR 2011)

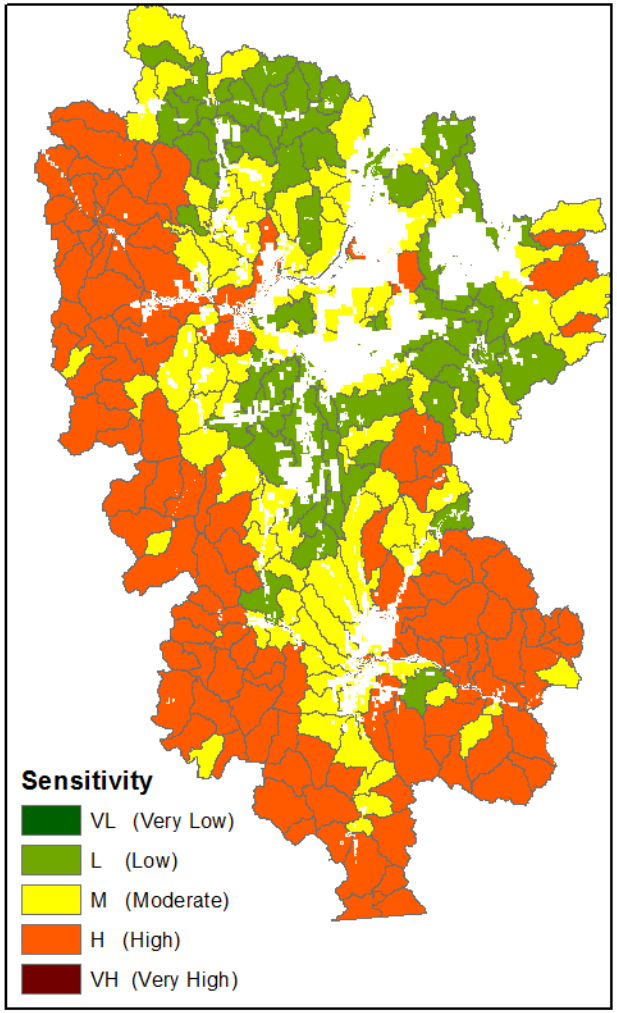


1. Present Challenges:
Unanticipated Outcomes and Future Constraints

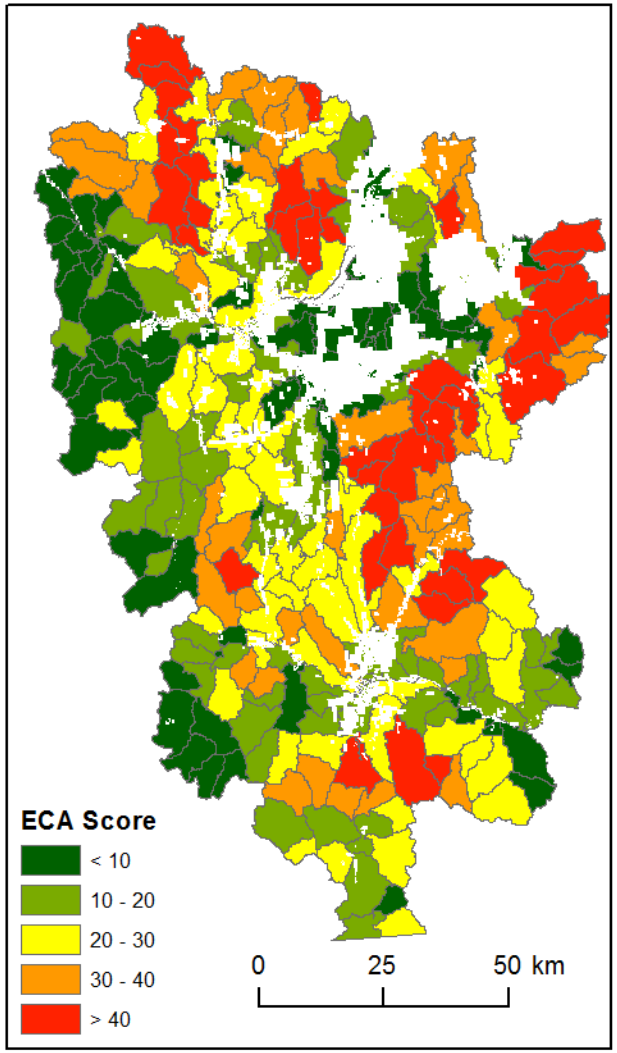
Merritt TSA



Runoff Sensitivity
(runoff + efficiency)



2014 ECA




Value #1: Angling Opportunities
in Thompson Region Small Lakes
Pressure: Unanticipated eutrophication and
winter kills following salvage

Issue:

In 2014, Roche (and other stable lakes) suffered near total trout winterkill.

This event surprised all experts.

Watershed Process:

Elevated phosphorus inputs following salvage shifted nutrient cycling in lake.

Management:

1. Need to adjust streamflow sensitivity.
2. UBC Post Doc (lake nutrient cycling) + Queen's University (sediment coring) :
   - thresholds for other systems
   - duration
   - mitigation

Results of Headwaters Forest District GIS Assessment of Buffers on Class A & B Lakes

	% lakes with LMZ harvest impacts	Average % harvest withi LMZ
Pre-Forest Practices Code		
Class A	14% (n=4)	12%
Class B	52% (n=16)	22%
Class A and B combined	33% (n=20)	20%
Forest Practices Code		
Class A	0%	0%
Class B	32% (n=10)	6%
Class A and B combined	16% (n-10)	6%
Forest and Range Practices Act		
Class A	17% (n=5)	9%
Class B	48% (n=15)	39%
Class A and B combined	33% (n=20)	32%

Classification intended to offer appropriate protection from development impacts.

Although the Classification Objectives were not carried forward into FRPA, the **"Intent"** of the Classifications were to be followed.

Fisheries are assessing remainder of the Thom/Ok Region

Value #2: Healthy Late Summer Baseflow

Many streams in the region are prone to drought

2. FLNRO Goal: Shift from Reactive to Proactive Management of Drought

1. Optimize management of storage:
   a) Snow
   b) Soil
   c) Aquifers
   d) Reservoirs
2. Improve streamflow forecasting:
   a) Sub-basin scale
   b) Account for basin physiography
   c) Account for land-use
3. Improve communication
4. Rainfall is important, but there is no means to manage it.

Changes in flow during summer baseflow period

Table 4. Pre-treatment (1986–1992) linear regression model statistics including change in yield (actual minus predicted if not treated) post-treatment (2008–2014) at Upper Penticton Creek. Shading indicates a statistically significant change due to treatment at $p \leq 0.05$, based on the ANCOVA analysis.

Month	Total Water Yield (% of Long Term Mean Annual Discharge)				Percent Change (%)
	Pre-Treatment Water Yield		Post-Treatment Water Yield		Post-Treatment
	240 Cr	241 Cr	240 Cr	241 Cr	
July	74%	64%	86%	61%	-17
August	24%	19%	24%	16%	-20
September	15%	10%	12%	10%	-4

Soil storage:
Changes in Runoff Source (Active) Area after Snowmelt
(Nippgen, McGlynn and Emanuel 2015)

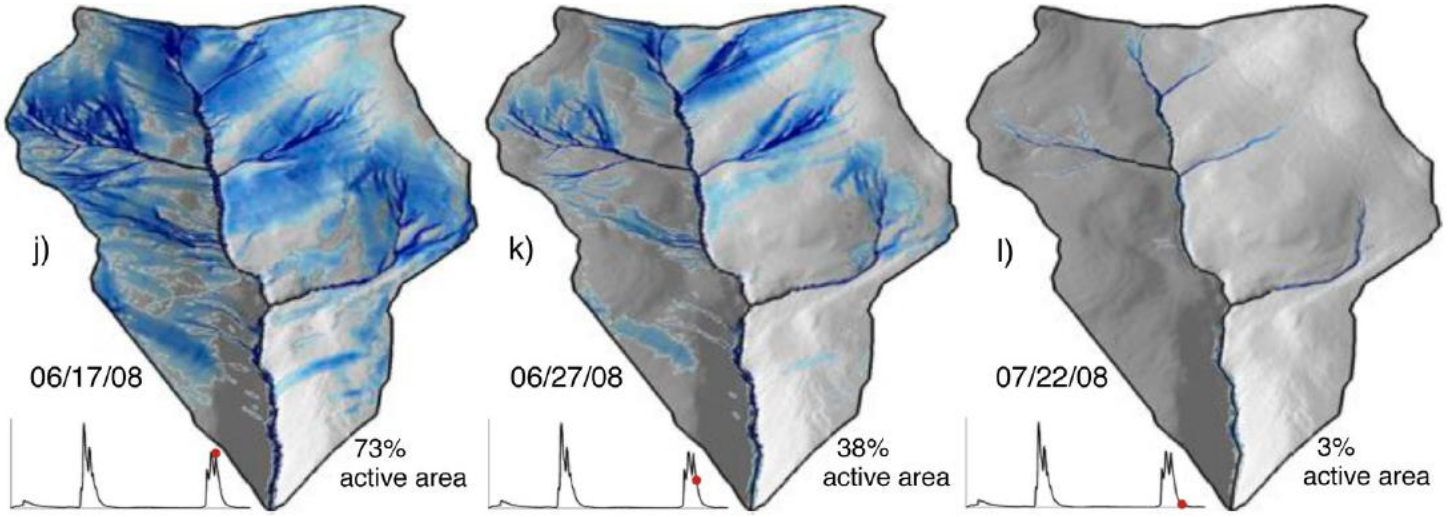


Figure 9. Evolution of watershed active area over the course of the 2007–2008 study period. Gray areas were below the 293 mm storage threshold and thus inactive. The blue shading denotes the degree of storage, with light blue areas at 293 mm to dark blue areas at 500 mm. The insets show the time of the snapshot on the hydrograph for reference.

Riparian function throughout network may influence late summer baseflow.

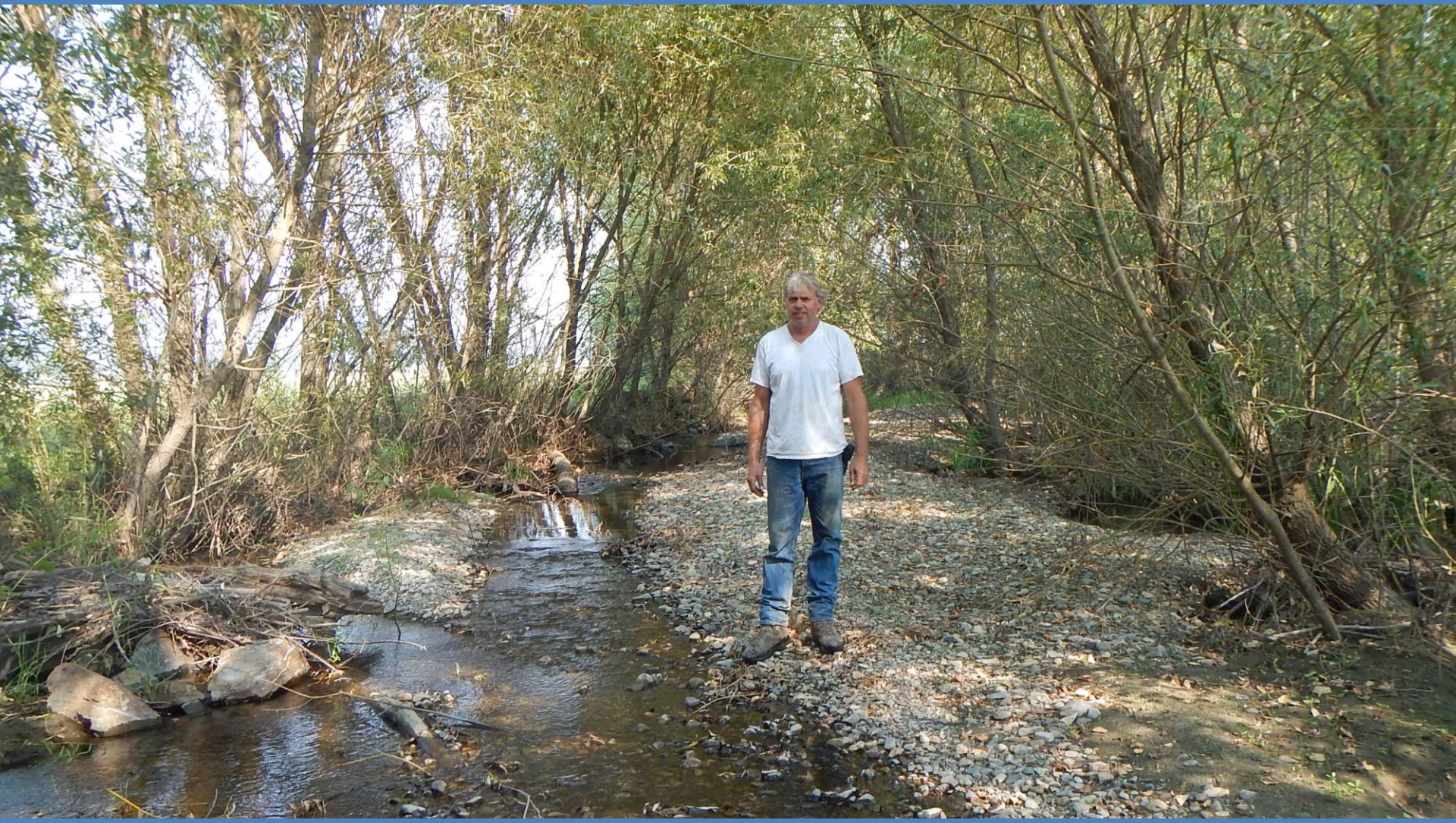
Future work

FLNRO initiating MSc low flow research project with UBC to further examine effects of forestry on late summer baseflow.

Value #3: Functioning floodplains and riparian areas

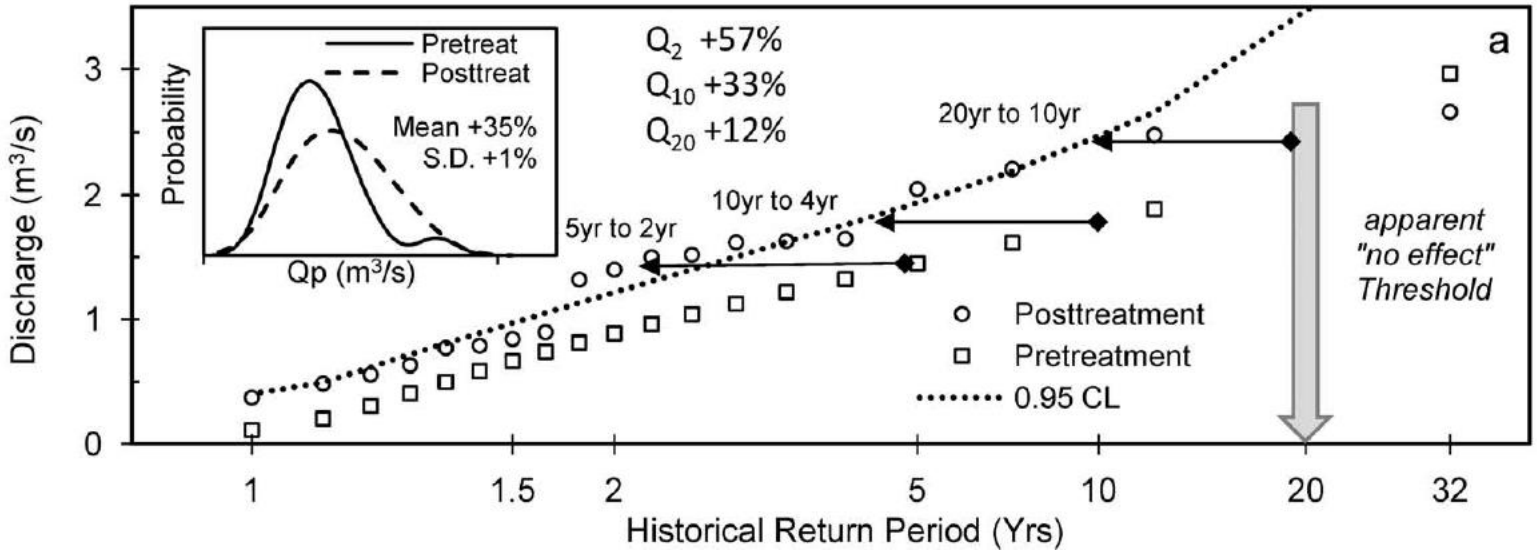
Observing channels become entrenched into floodplains

Value #3: Functioning floodplains and riparian areas

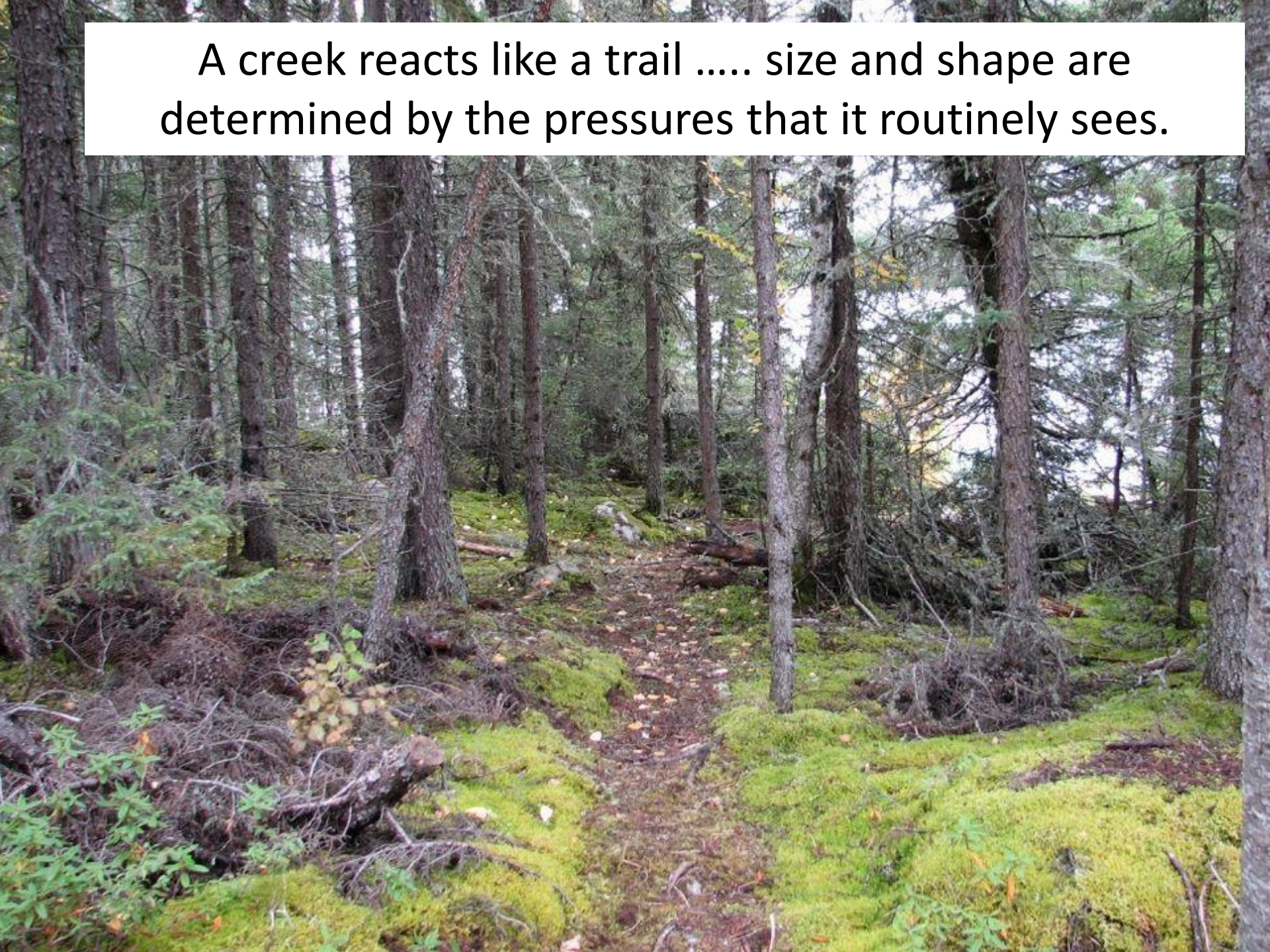


Sediment build-up on some alluvial fans

Peak Flow Increases following Harvest

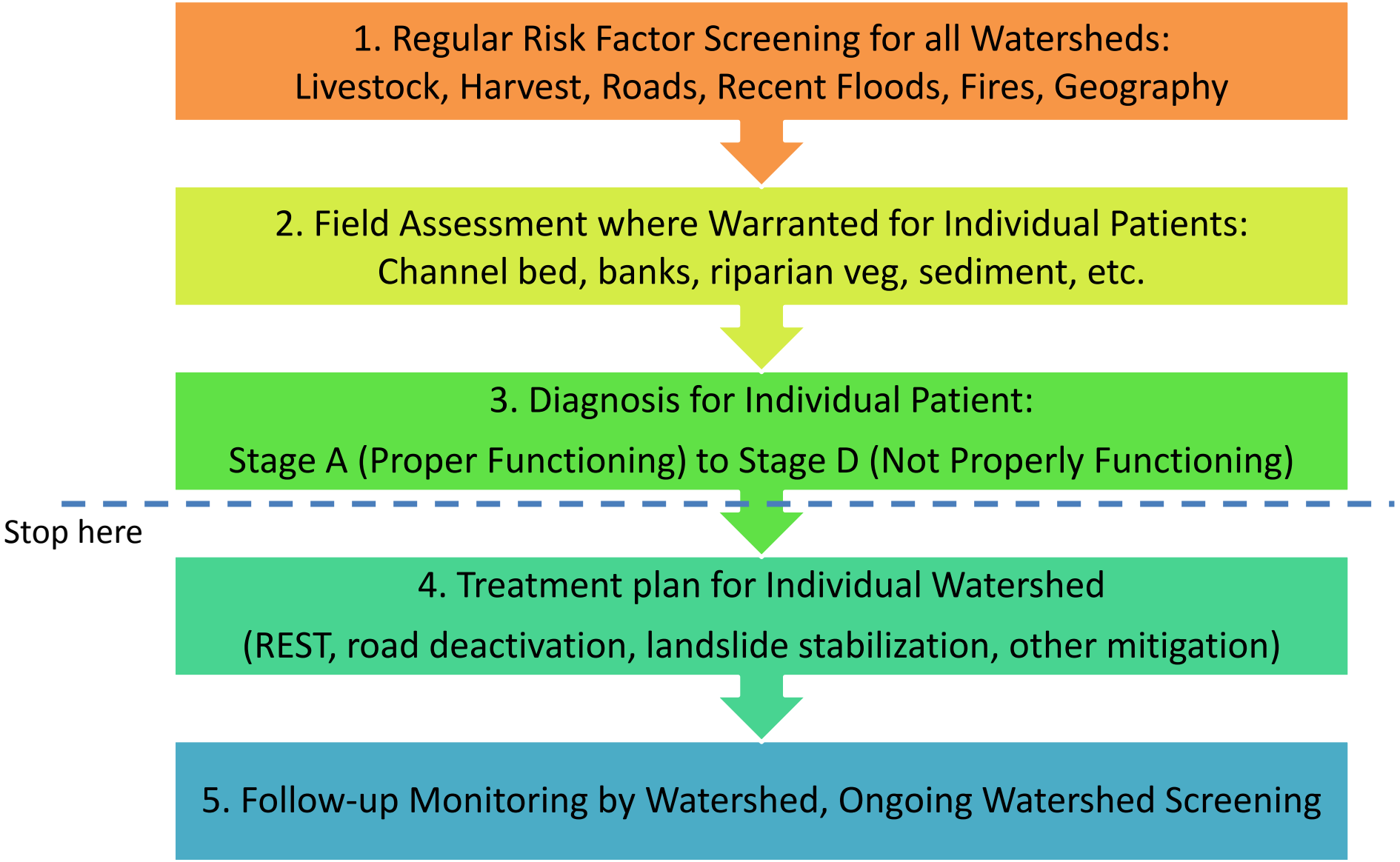


- Green and Alila (2012): Figure 2. Flow duration curve analysis for pre- and post-treatment daily peak flows at Camp Creek.


A creek reacts like a trail ….. size and shape are determined by the pressures that it routinely sees.


Field observations: Functioning riparian zones improve channel resiliency.

Watershed Health Management



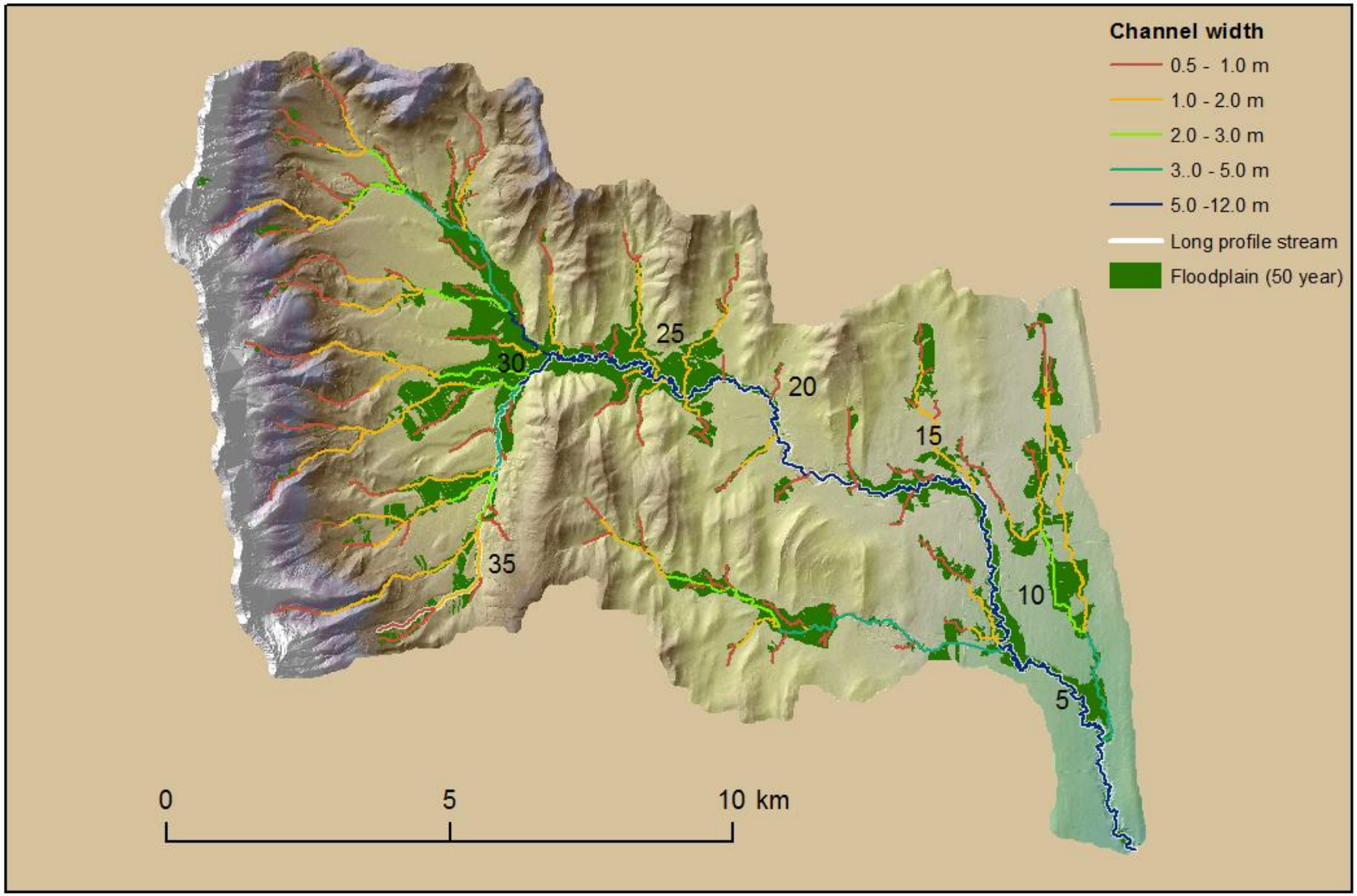
Watershed Assessment Considerations

1. Set the downstream point of interest to include valuable and vulnerable habitats.
2. Manage the snow and soil water storage elements to conserve late summer flows.
3. Peak flow hazard remains an important risk indicator.
4. Riparian zones are important baseflow source during late summer.

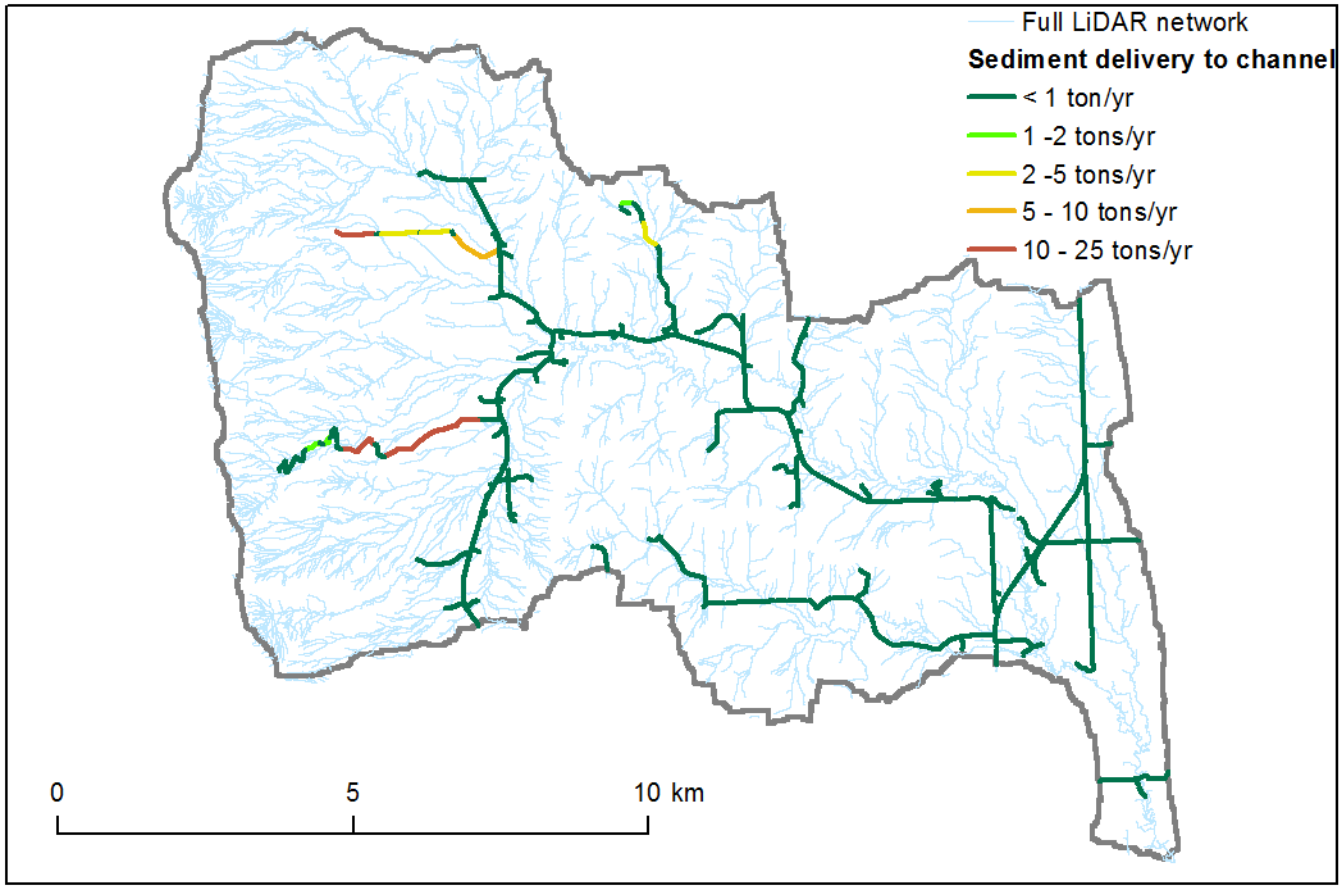
Future work

UBC Okanagan MSc student working on recovery processes and timelines on Creighton Creek.

LiDAR Application #1.
Stream Classification



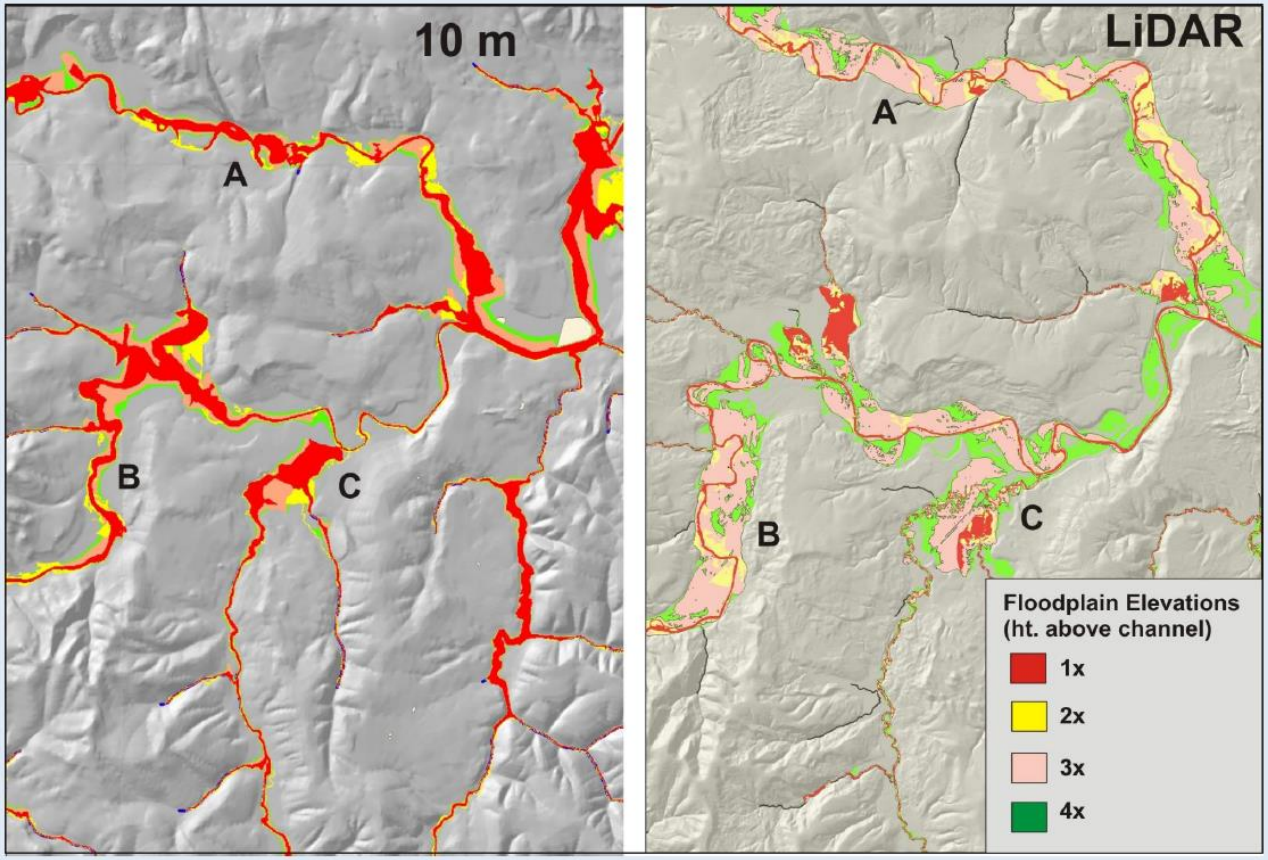
LiDAR Application #2:
Modelling sediment delivery to streams



Road type	Tons/year	Total Length	Average slope (%)
Paved, undivided, 2 lane	2	7 km	1
Road, gravel, 1 lane	1	31 km	1.5
Road, unimproved	1	25 km	2.9
Truck trail	70	11 km	4

LiDAR Application #3. Floodplain mapping

One of LiDAR's biggest advantage is in mapping and analyzing valley floors and floodplains



TerrainWorks (www.terrainworks.com)

Future work

Expand LIDAR uses beyond timber values

Thanks. Questions??