Murray River Watershed Aquatic Cumulative Effects Assessment

Outline

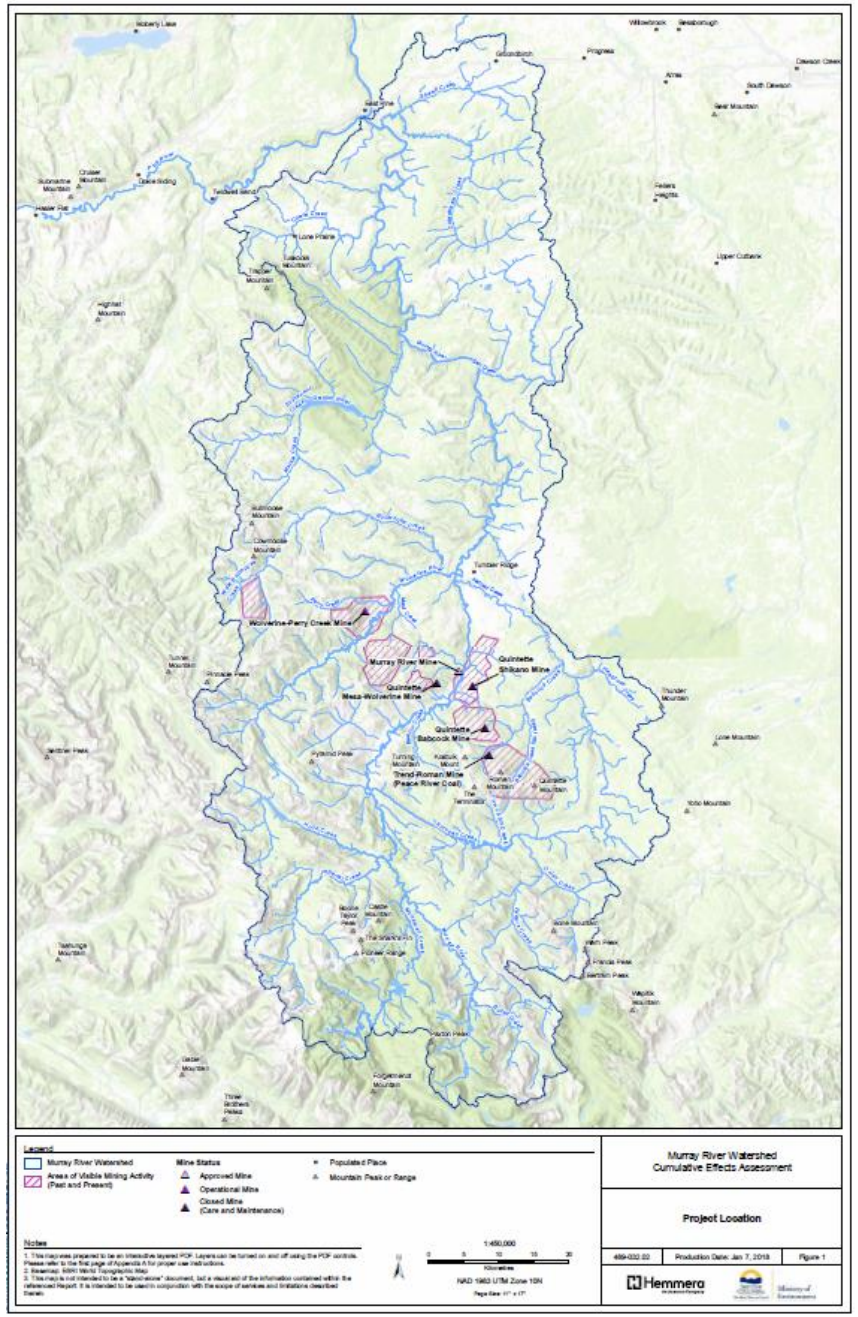
- Introduction
- Purpose and Objectives
- Structure and Milestones
- Parameters of Concern
- Next Steps

Source: Hikebc.com

Murray River Watershed

- The Murray River Watershed covers an area of approx. 6500 km2

- The Central portion of the watershed has a strong coal mining presence. Other activities include:
  - Oil and Gas
  - Wind Power
  - Agriculture
  - Forestry
  - Recreation



Murray River Watershed Aquatic Cumulative Effects Assessment Purpose and Objectives

Purpose

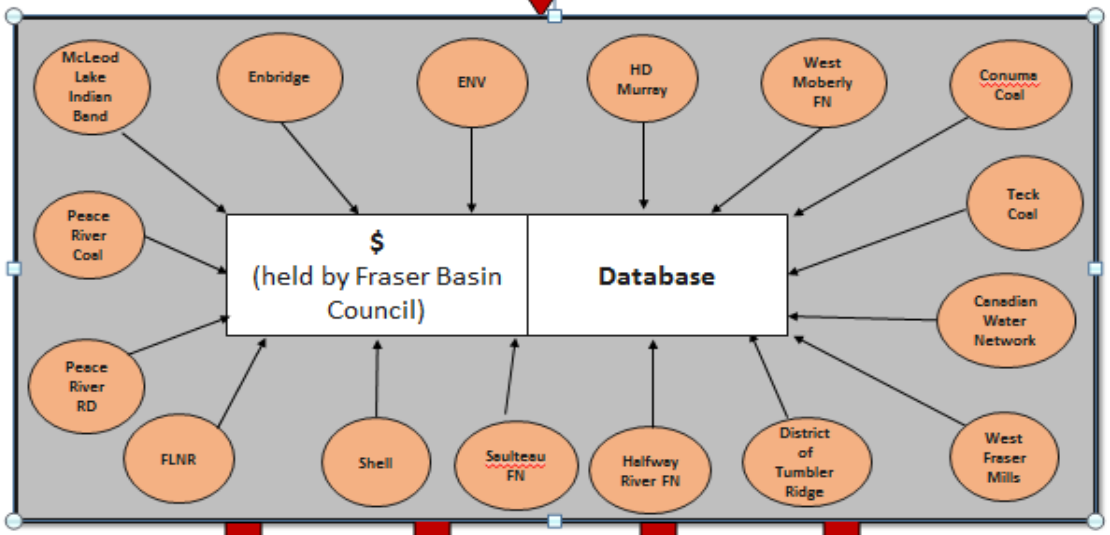
- To assess and better understand the aquatic ecosystem of the Murray River watershed and cumulative effects of development in order to inform the management actions required to improve the sustainability of the watershed

Objectives

- To work together to align and combine monitoring initiatives in order to better understand the cumulative impacts on the watershed
- To develop an aquatic CEA framework that can be used to inform future management decisions

NE Water Strategy
Identified priority watersheds

Murray River Watershed Aquatic CEA Framework
To address water quality concerns



Tools to inform members' decision makers

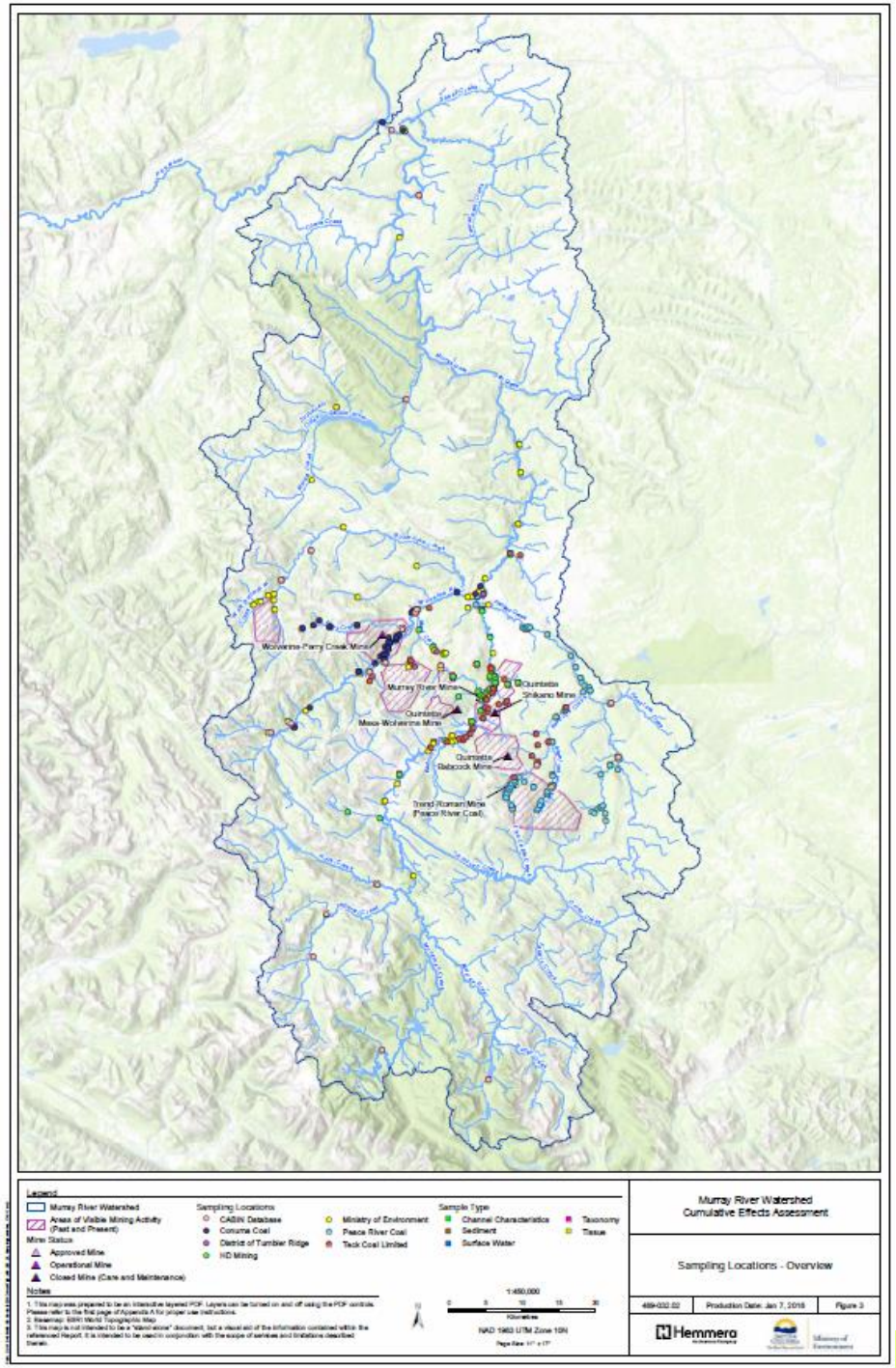
TOR	Database	Conceptual Model	Data Assessment	Data Gap Filling	Water Quality Objectives	Coordinated Monitoring	Predictive Model
Completed 2015	Built 2016	Completed 2017	In progress	In progress	2018	2018	Future
Updated Annually	Ongoing	Updated if needed	Complete	Ongoing	RFP in progress	Ongoing	Future
Can be used for other watersheds.	How to update and share effectively?	Communicat-ion tool, input to WQO.	Input into WQO, under standing of current & historical condition	Gaps Identified in draft data assessment.	ENV Policy, will be considered in ENV's NE permitting strategy	Ensure all permit conditions and needs of Steering Committee are met	To inform decisions on future projects and changes at mine sites.

Water Samples

- A data assessment was completed by Hemerra Envirochem corp in 2017
- Central part of watershed well characterized – near mining activity
- Surface water most frequently collected data type
- Reference (12%), Downstream (88%)
- Data analyzed from 1976 to 2017

Table 2-2 Data Quality by Data Provider

Data Provider	Data Quality	Number of Sampled Records						
		TOTAL	Channel Characteristics	Surface Water	Sediment	Soil	Taxonomy	Tissue
CABIN Database	High	3,435	1,455	1,269	-	-	711	-
Conuma Coal	High (Lab Summary)	83,179	99	68,558	766	2421	-	11,335
	High	480	344	-	-	-	-	136
District of Tumbler Ridge	High (Lab Summary)	275	-	275	-	-	-	-
HD Mining	High (Lab Summary)	191,927	42	98,474	9,018	-	42,523	41,870
MOECC	Medium	37,801	-	31,355	2,449	144		3,853
Peace River Coal	High (Lab Summary)	316	-	-	52	-	-	264
	High	3,009	-	118	-	-	-	2,891
	Medium	98,666	-	98,666	-	-	-	-
Teck Coal	High	434	-	-	-	-	-	434
	Low	81,489	-	81,489	-	-	-	-



Surface Water POCs

- Aluminum
- Nitrate
- Selenium
- Sulfate
- Total Suspended Solids

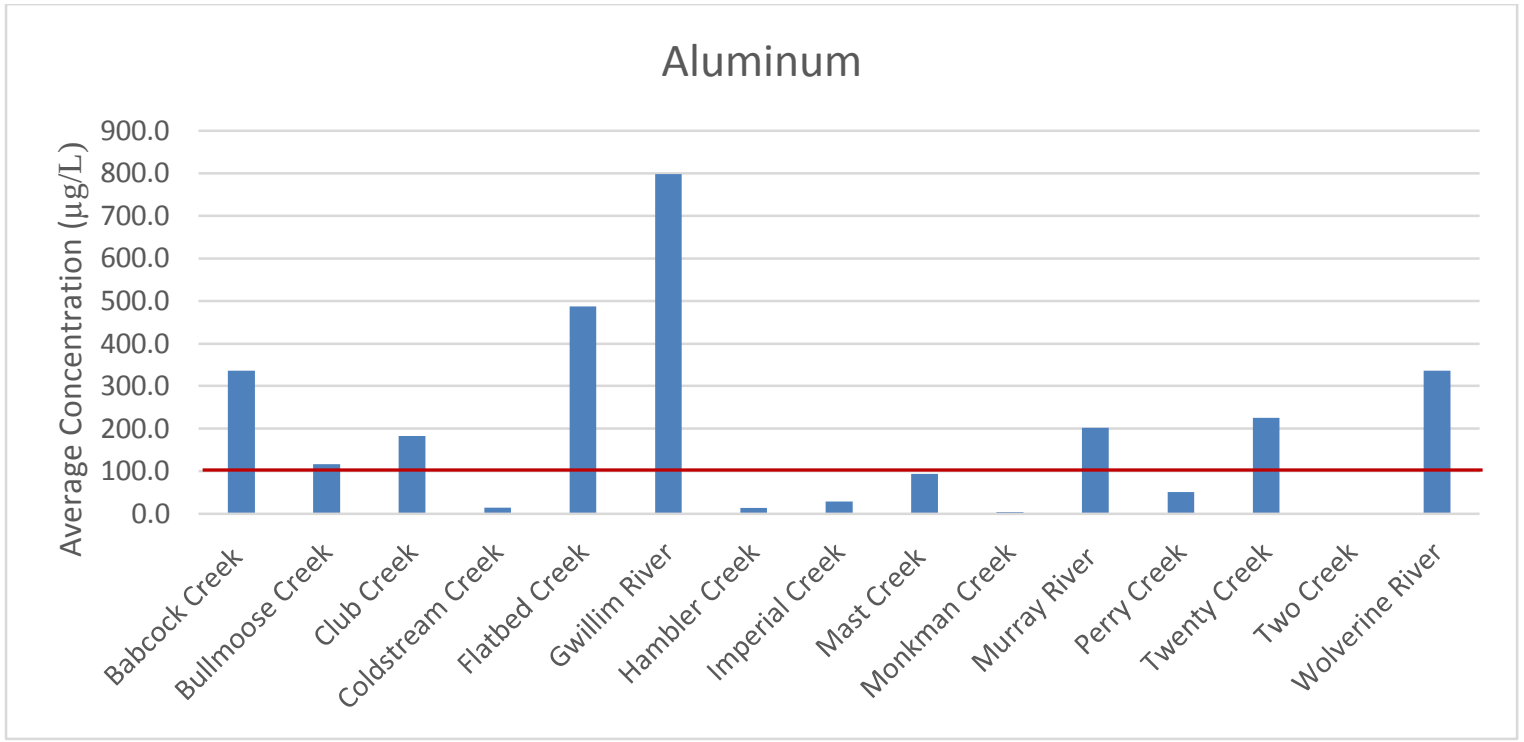
Source: Chad Lishman

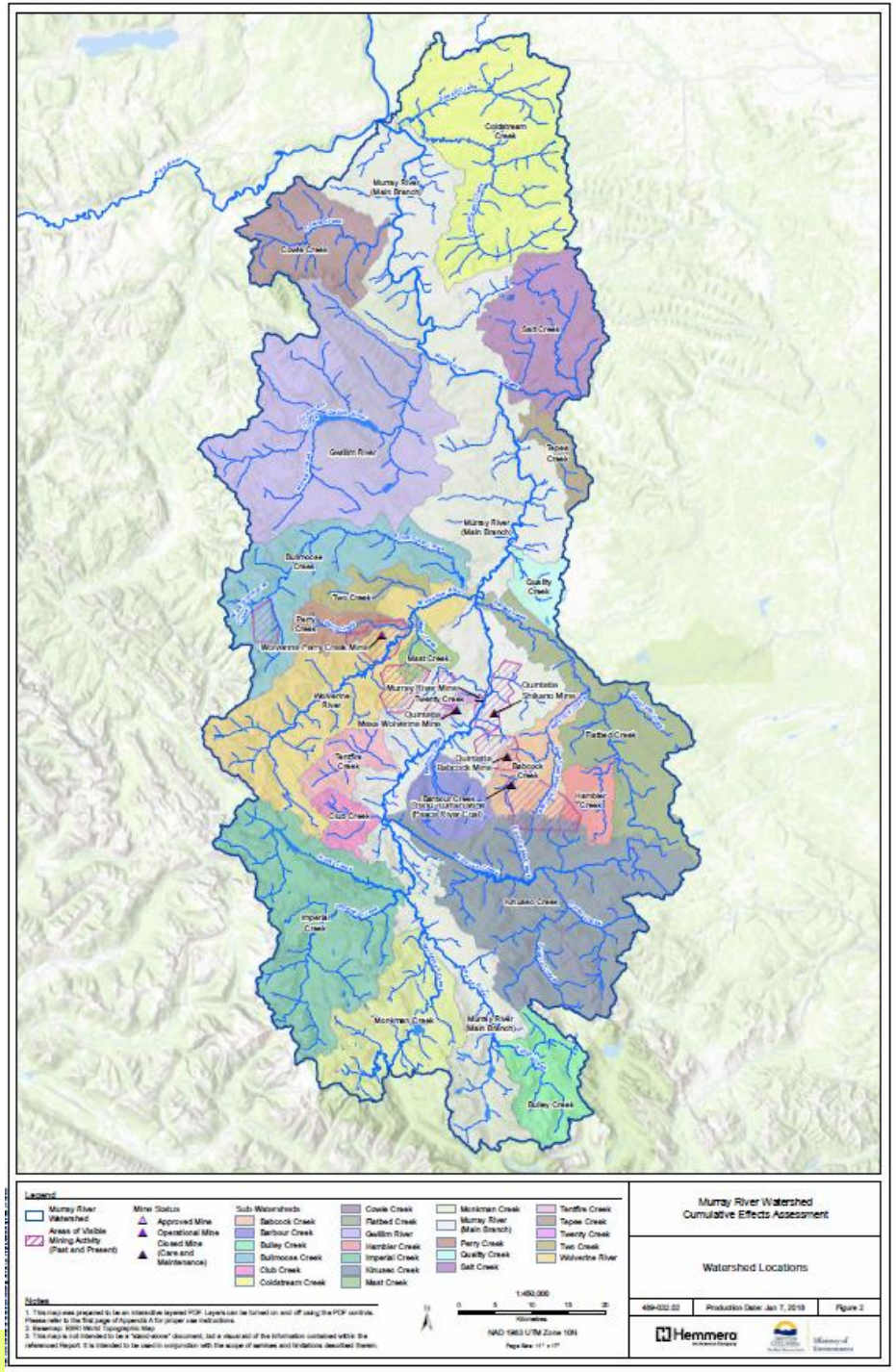
Parameters of Concern (POC)

- Thresholds
  - BC Approved and Working WQGs
  - BC Working SQGs
  - CCME WQGs for Protection of Aquatic Life

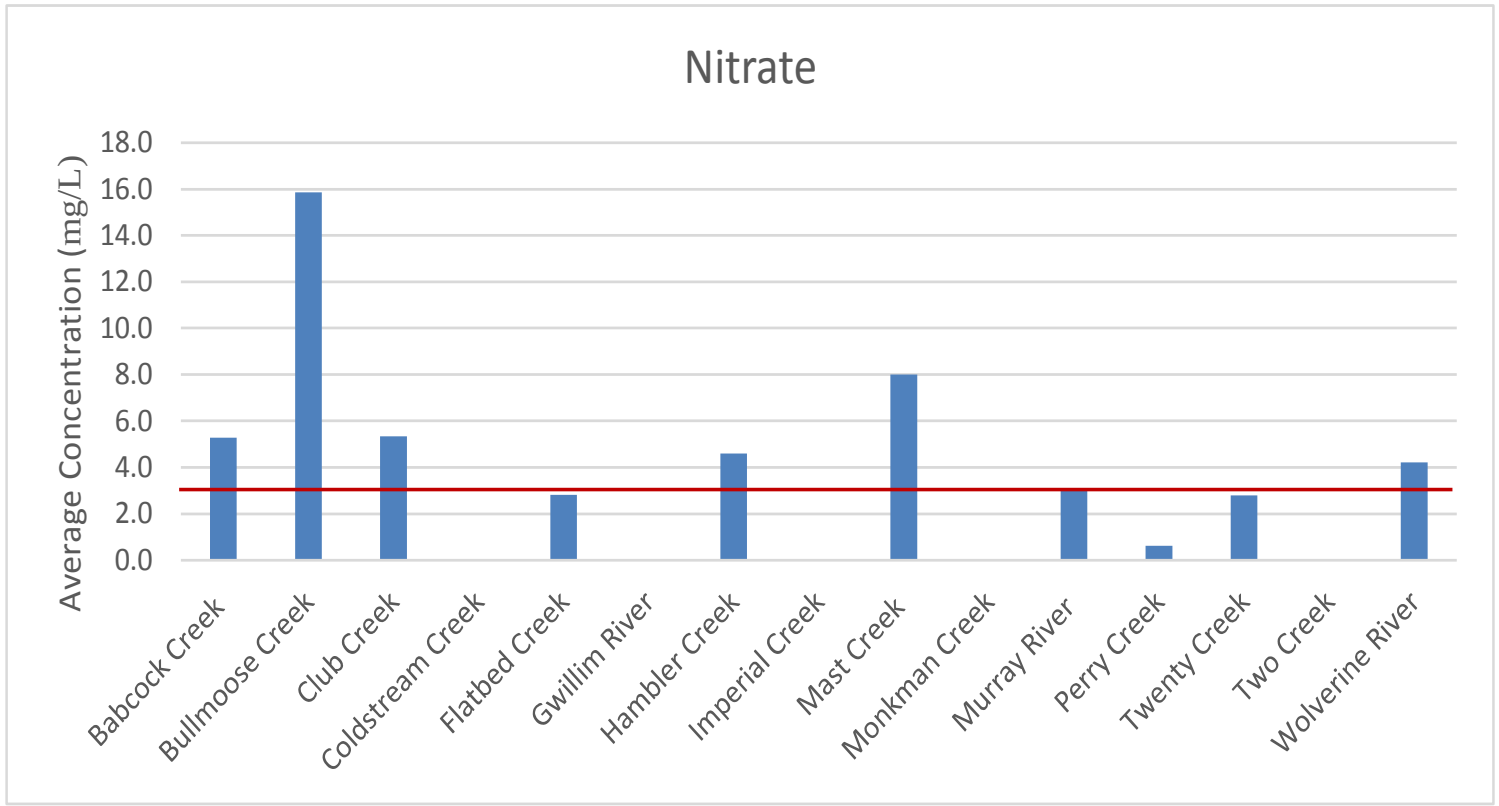
Source: Chad Lishman

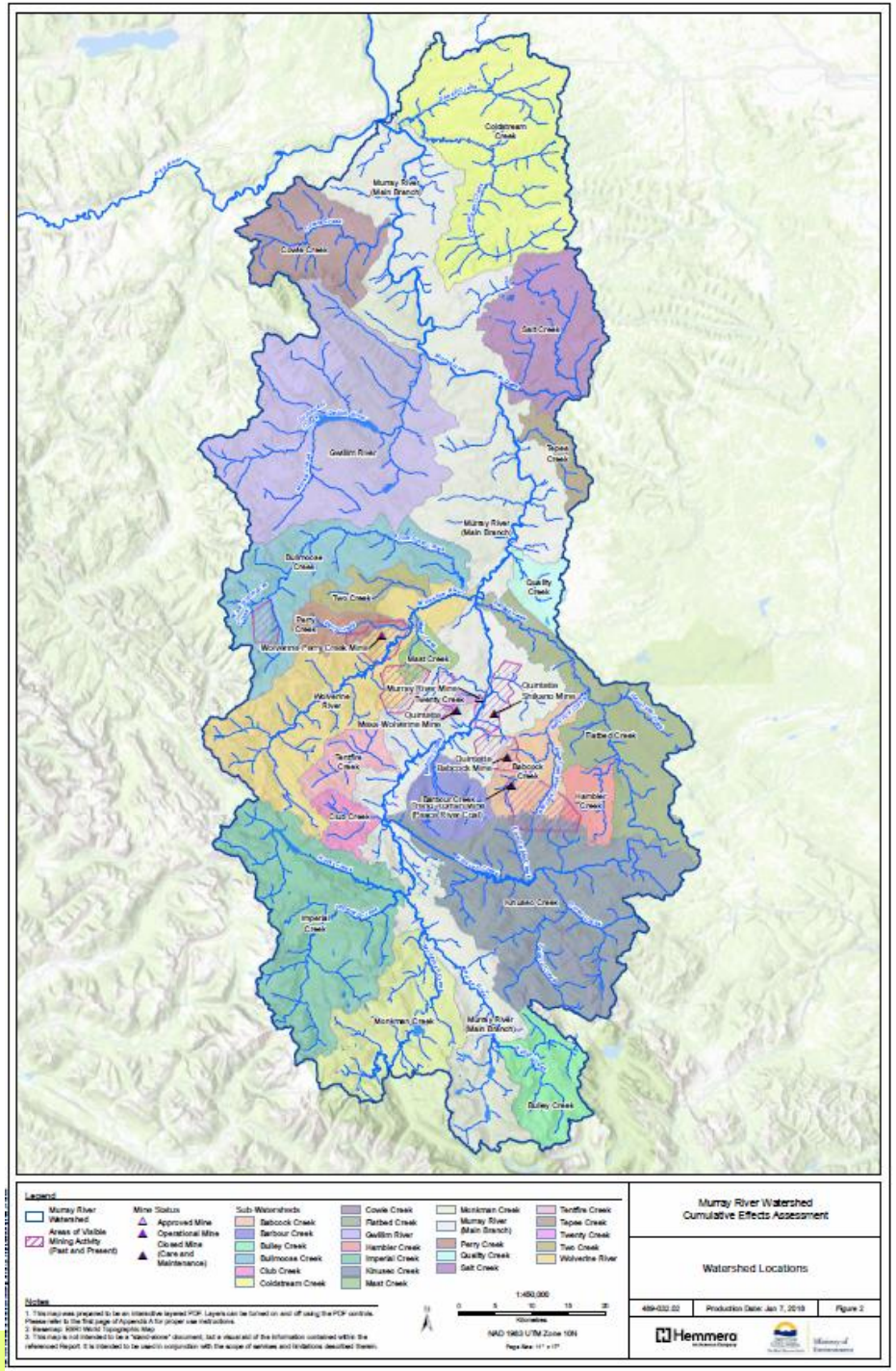
Aluminum - SW


Aluminum
Average Concentration (µg/L)
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Babcock Creek
Bullmoose Creek
Club Creek
Coldstream Creek
Flatbed Creek
Gwillim River
Hambler Creek
Imperial Creek
Mast Creek
Monkman Creek
Murray River
Perry Creek
Twenty Creek
Two Creek
Wolverine River


Murray River Watershed
Cumulative Effects Assessment
Watershed Locations
Hemmera

Nitrate - SW


Nitrate
Average Concentration (mg/L)
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Babcock Creek
Bullmoose Creek
Club Creek
Coldstream Creek
Flatbed Creek
Gwillim River
Hambler Creek
Imperial Creek
Mast Creek
Monkman Creek
Murray River
Perry Creek
Twenty Creek
Two Creek
Wolverine River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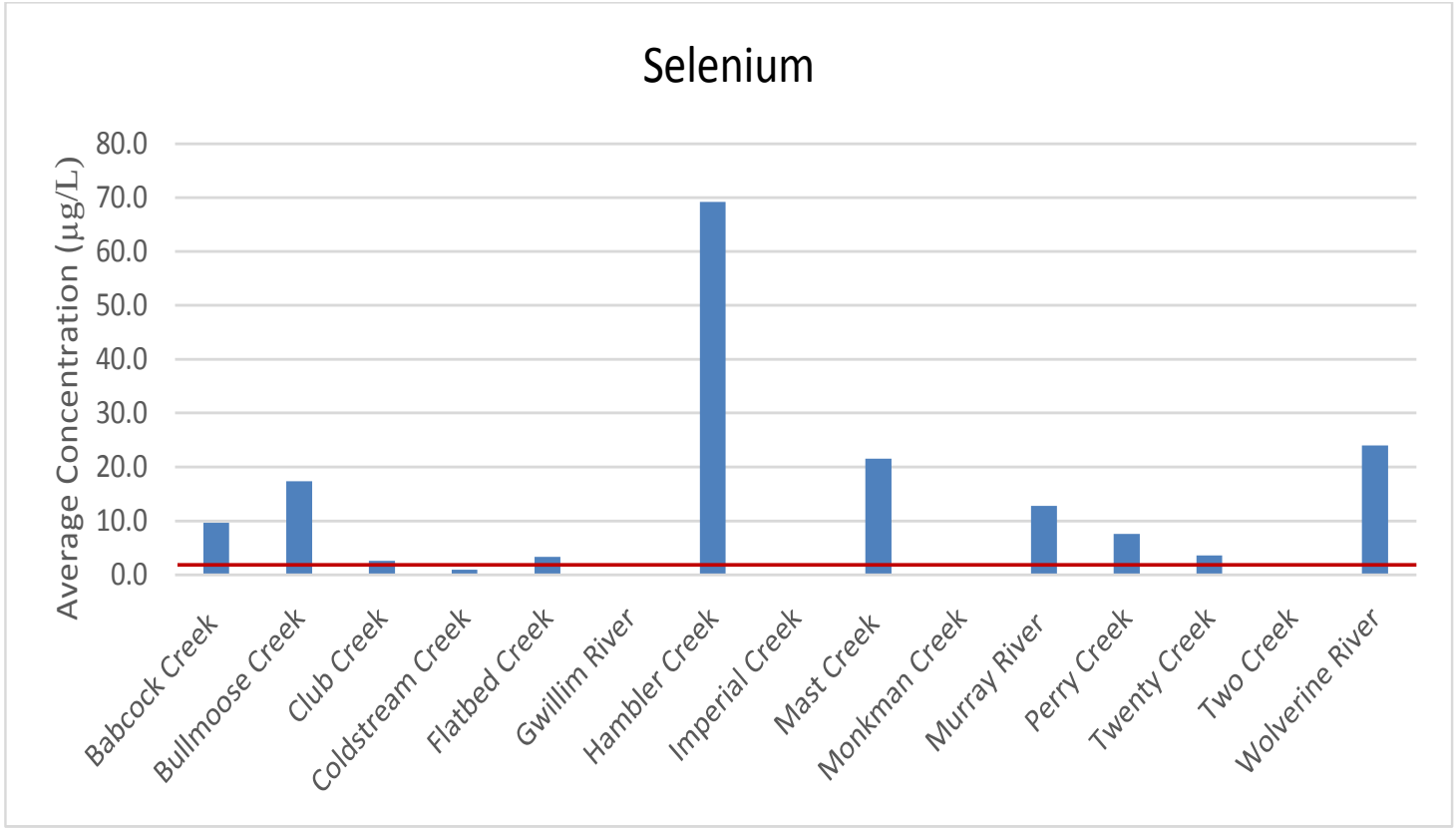
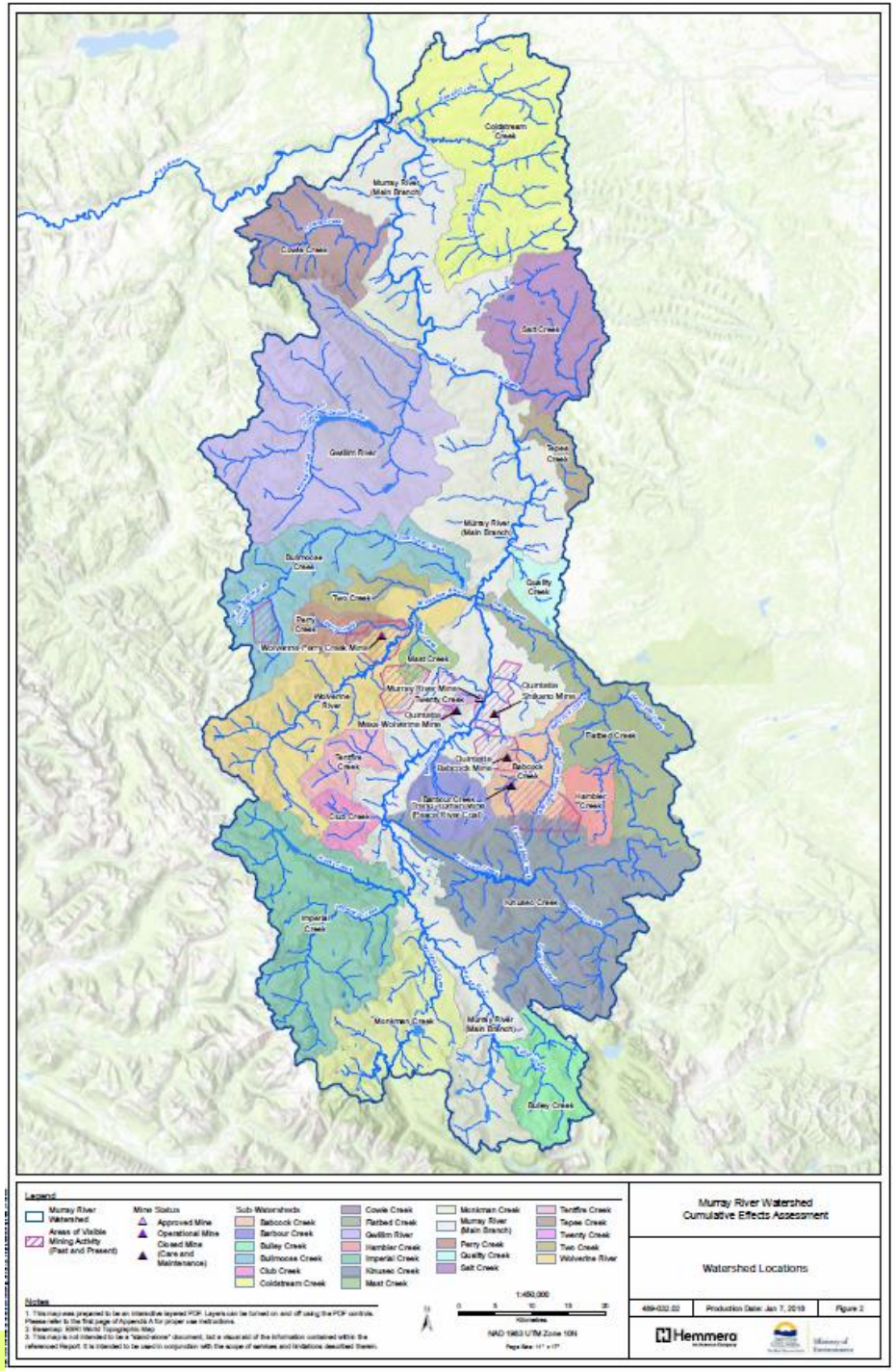
Selenium - SW


Selenium
Average Concentration (µg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Babcock Creek
Bullmoose Creek
Club Creek
Coldstream Creek
Flatbed Creek
Gwillim River
Hambler Creek
Imperial Creek
Mast Creek
Monkman Creek
Murray River
Perry Creek
Twenty Creek
Two Creek
Wolverine River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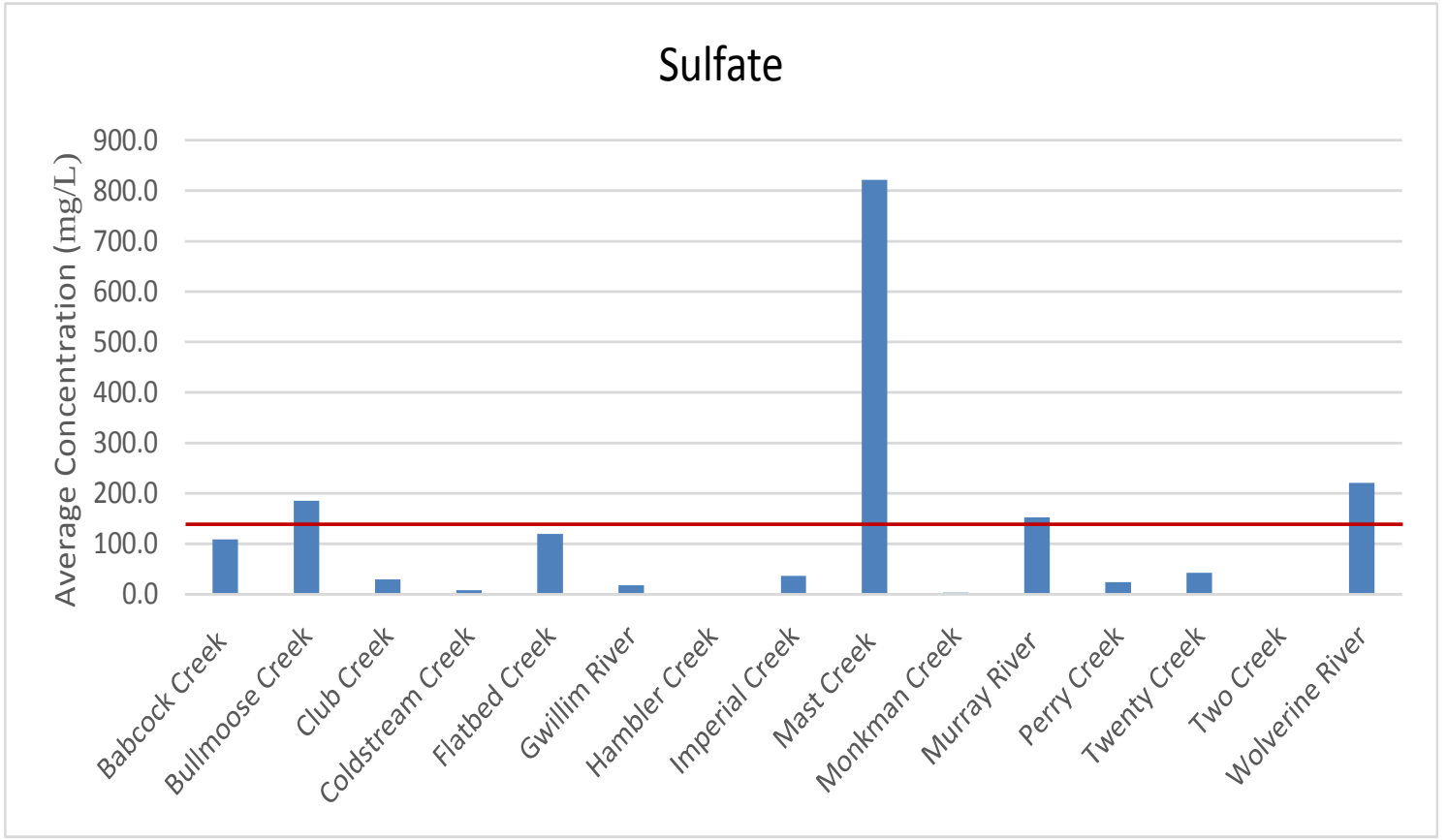
Sulfate - SW


Sulfate
Average Concentration (mg/L)
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Babcock Creek
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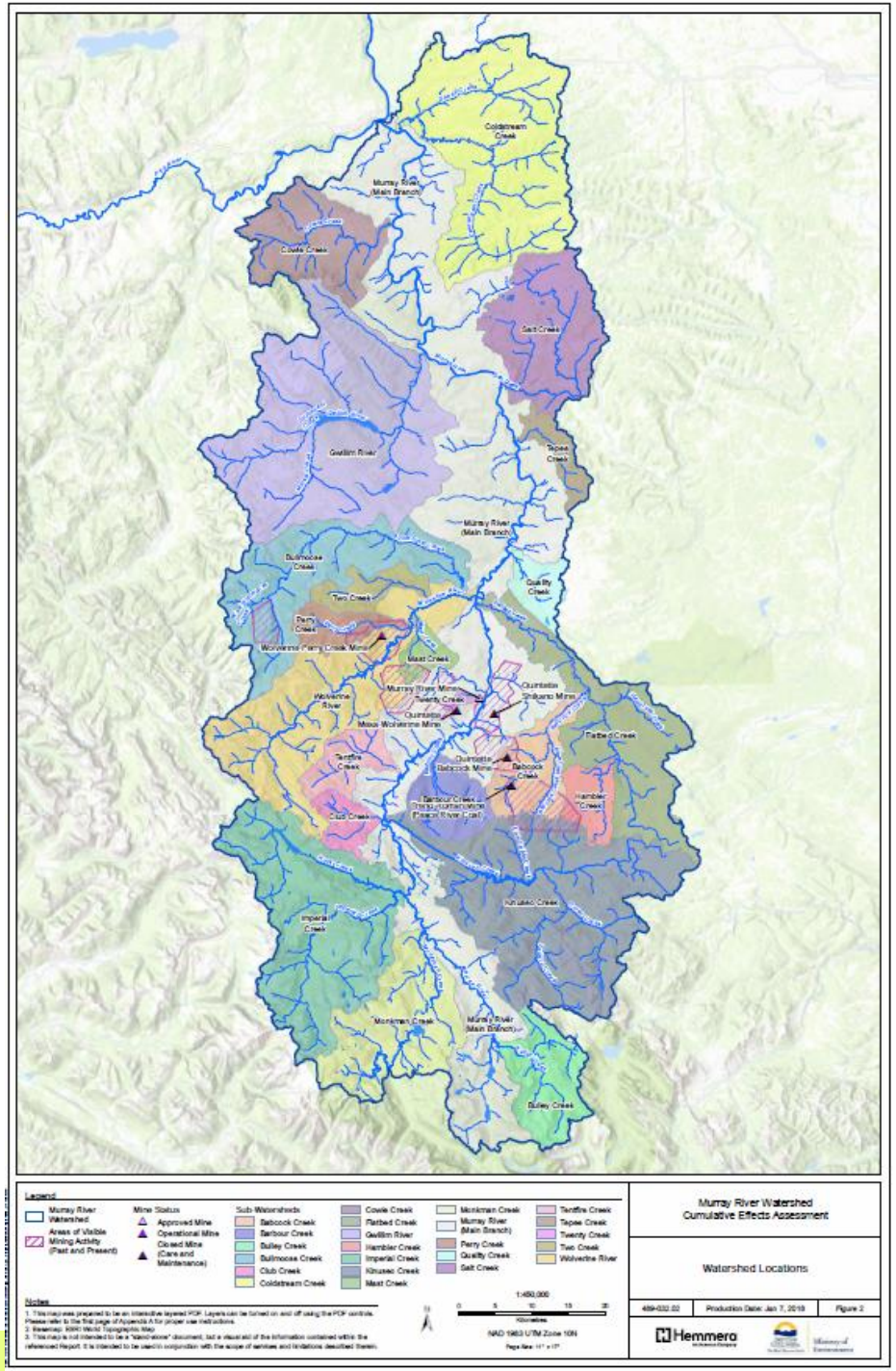
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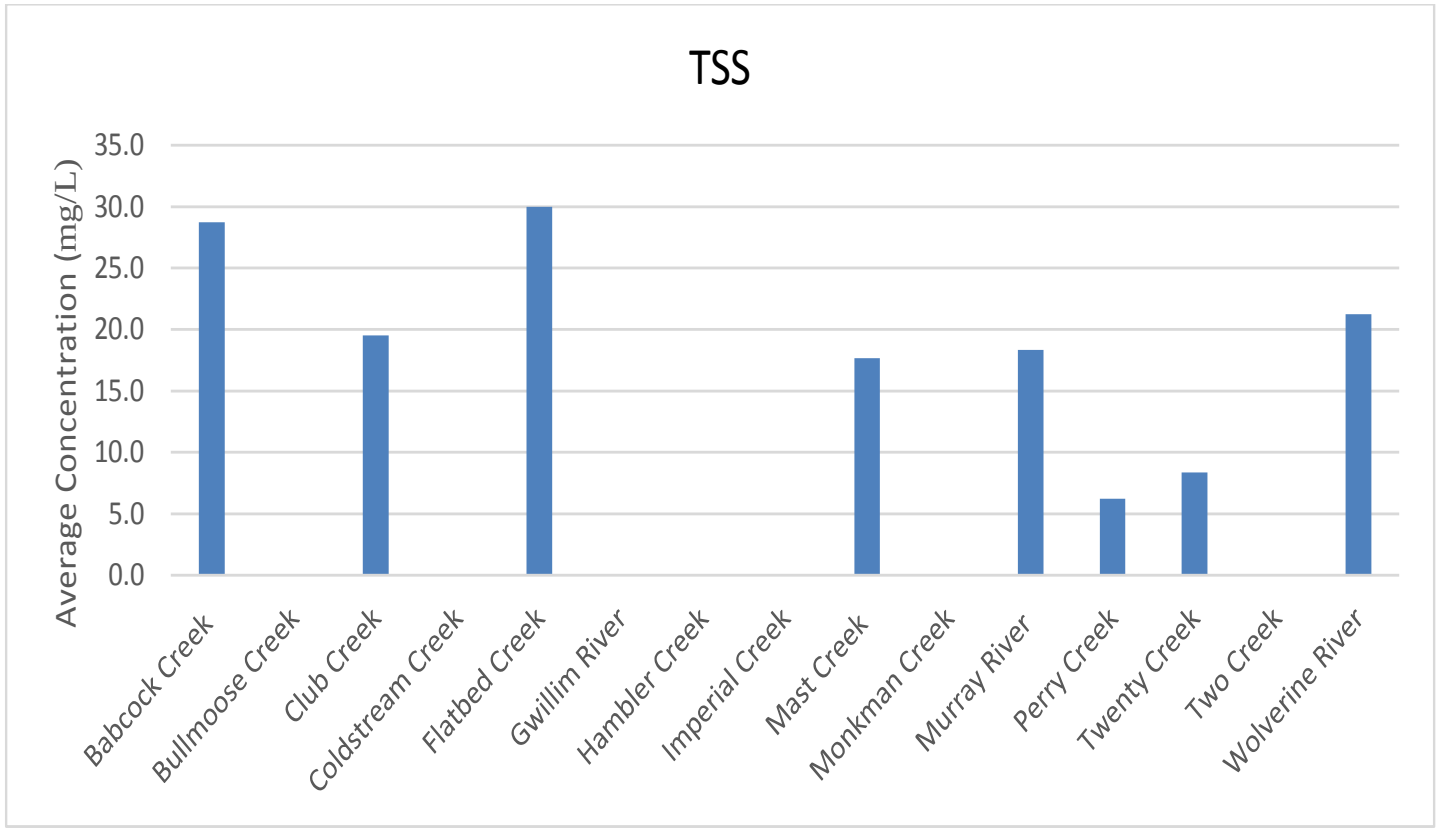
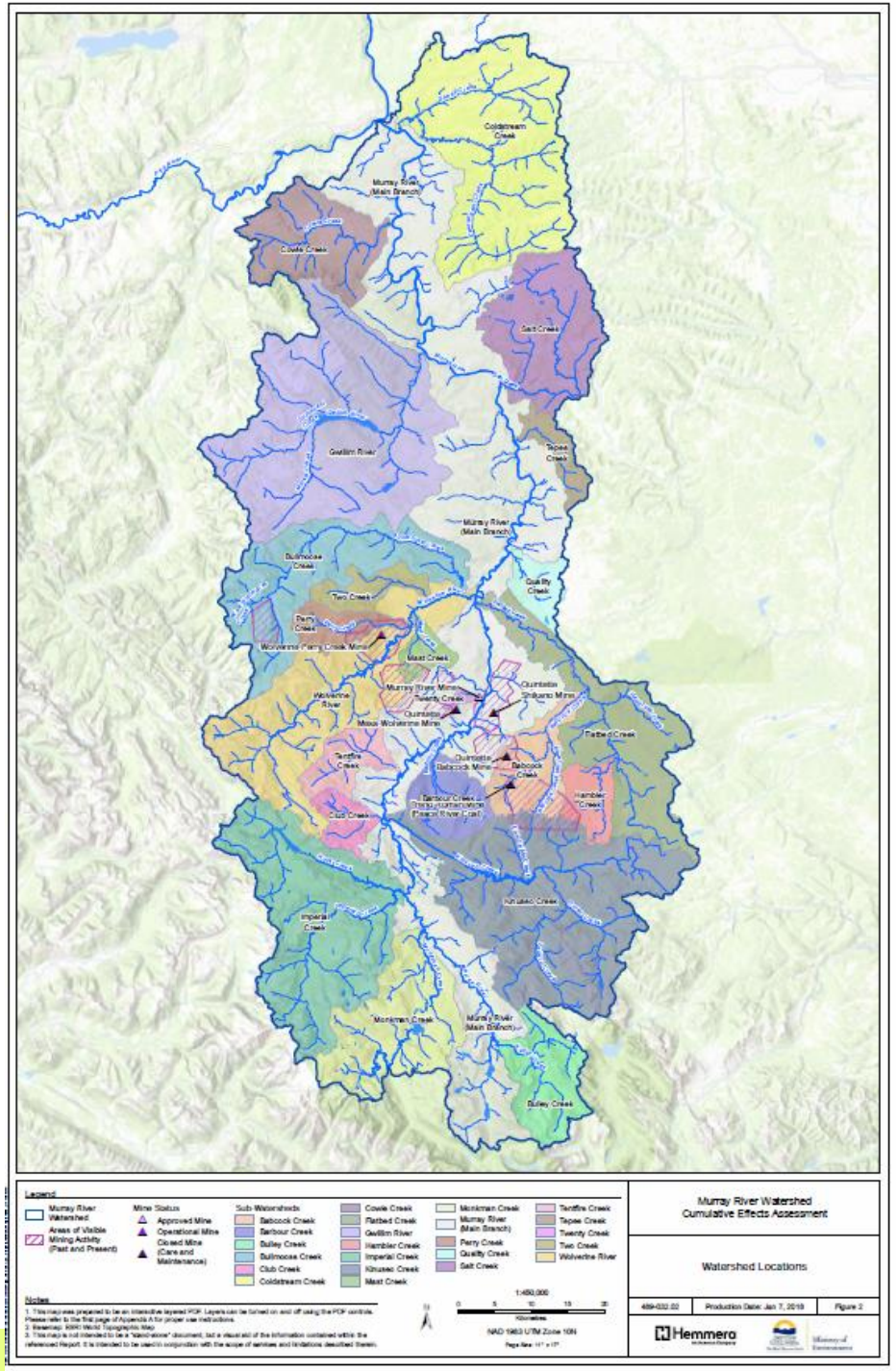
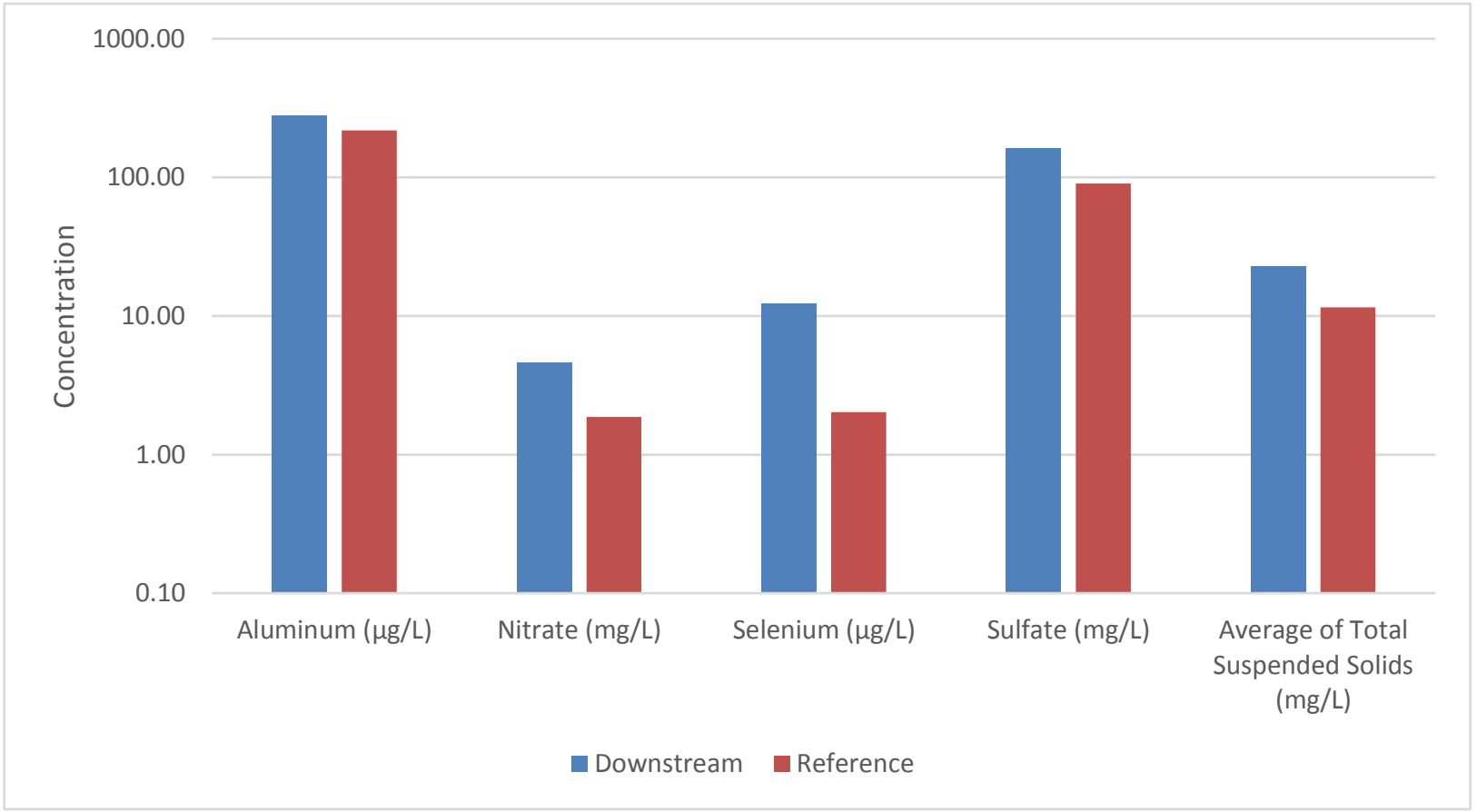
Total Suspended Solids (TSS) - SW

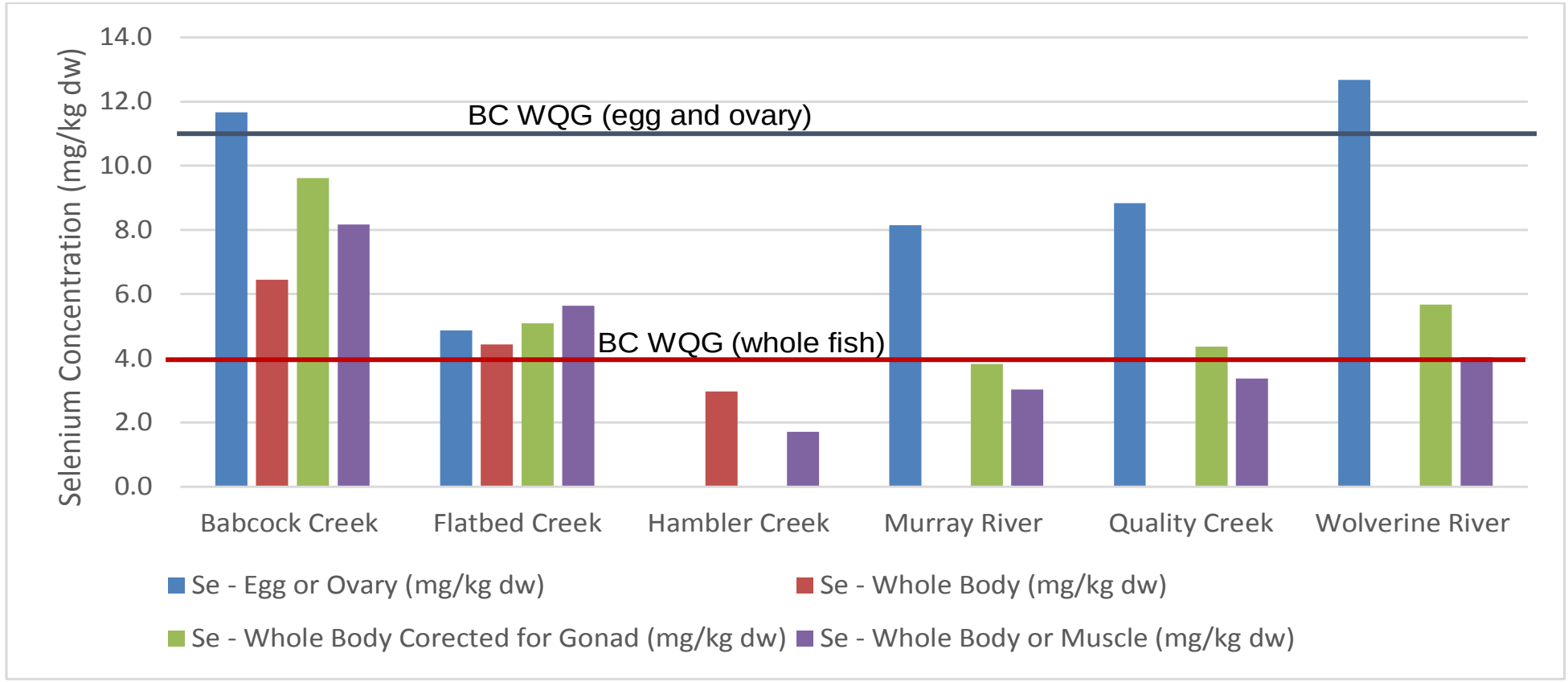




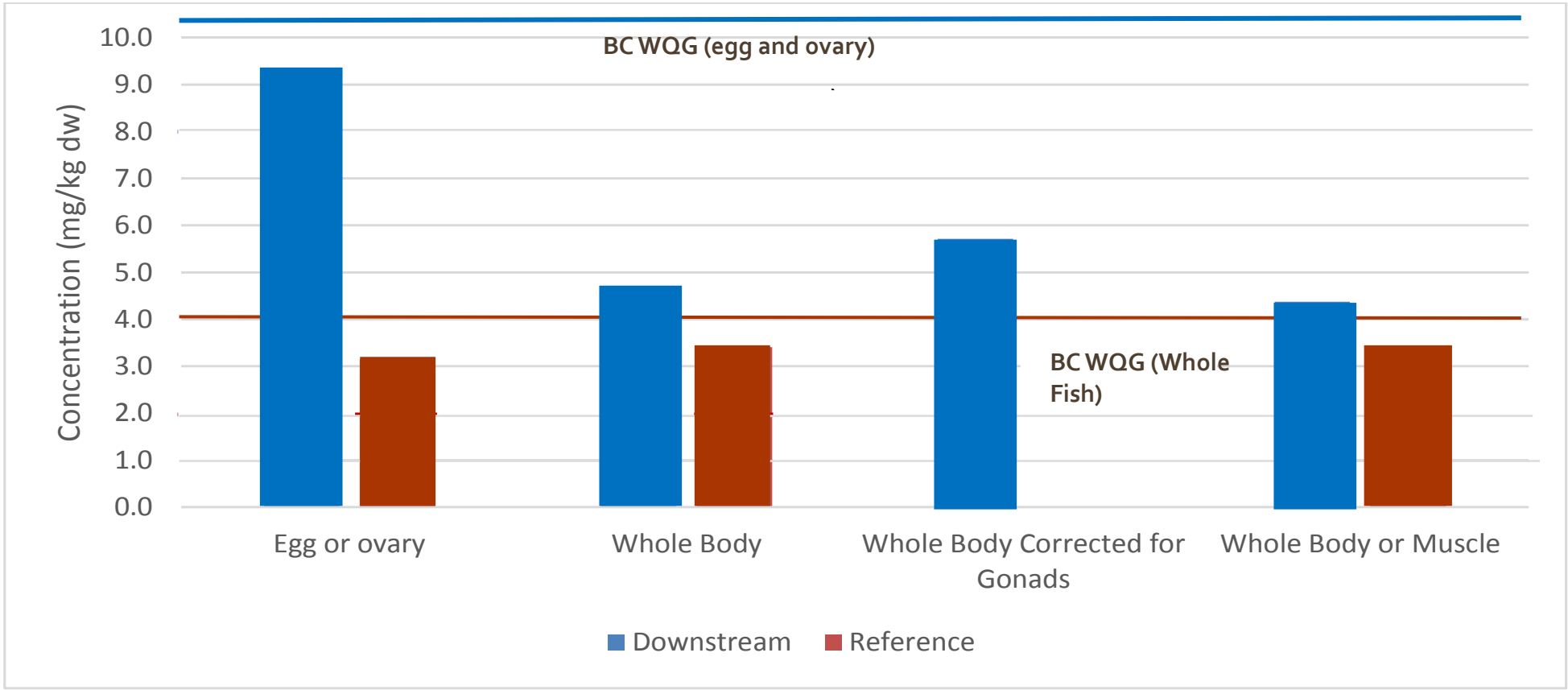
Ref vs. D/S – SW POCs



Selenium – Fish Tissue



Ref vs. D/S – Se Fish Tissue



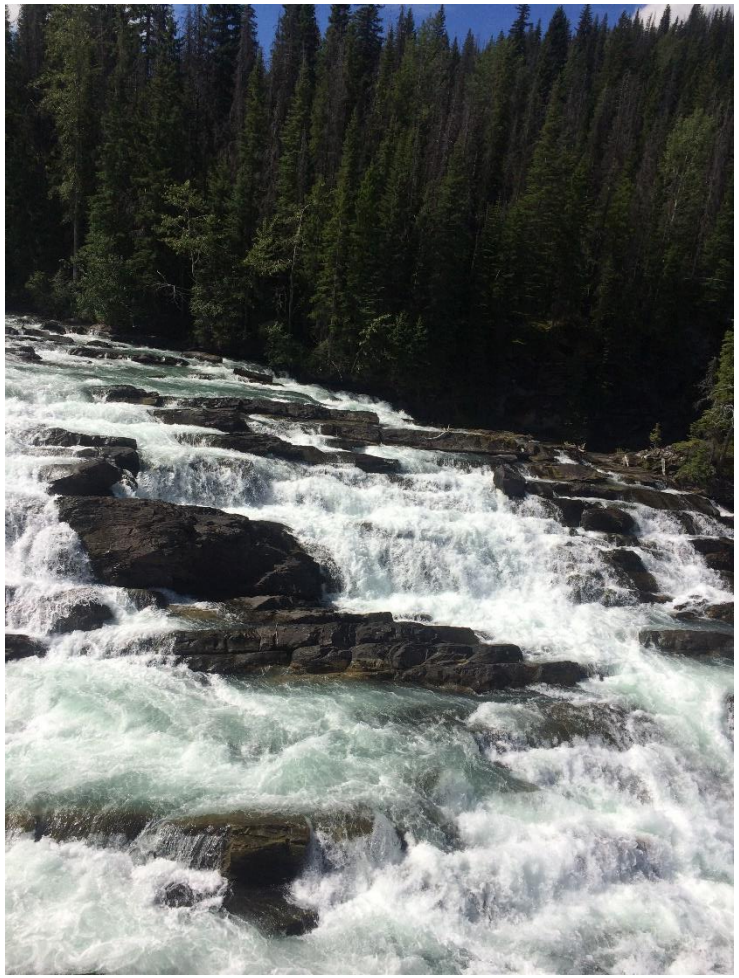
Next Steps

1.) Send out a Request for Proposal to develop Water Quality Objectives for the 5 parameters in the watershed.

2.) Once Water Quality Objectives are in place, they will be considered with MOE's permitting strategy and permit conditions.

3.)Continue to coordinate monitoring

4.) Develop a predicative model to inform decision making for future and existing projects



Source: Chad Lishman

Questions?

Source: Chad Lishman