

# Appendix 4-GG

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Aquatic Working Group Meeting -  
June 2019

# Crown Mountain Coking Coal Project

Aquatics Meeting

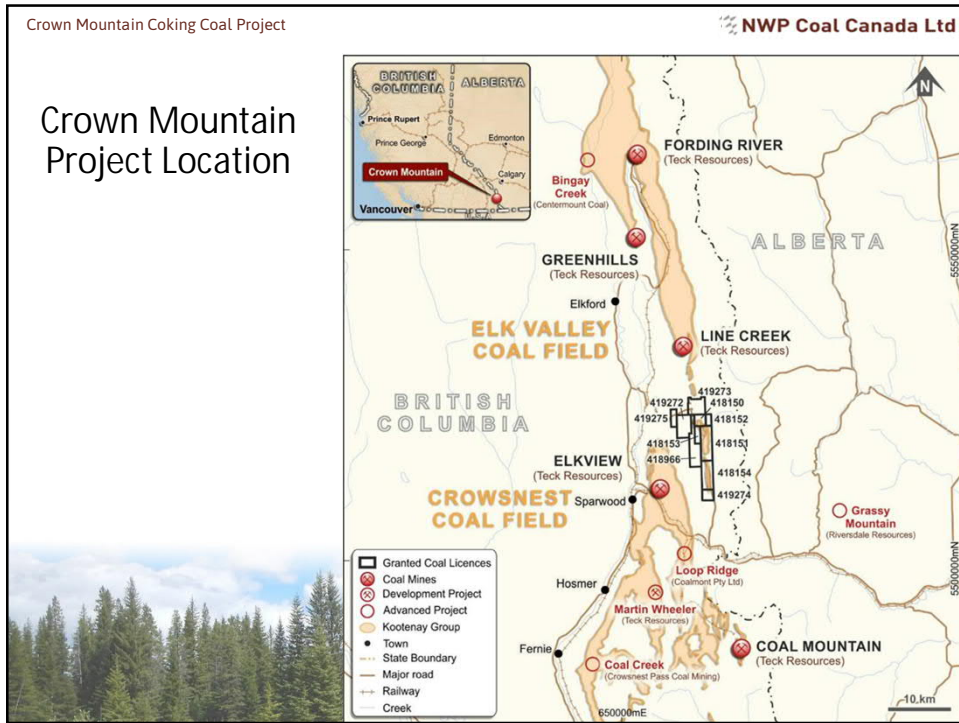
June 6, 2019



## Presentation Format

1. Project Overview
2. Aquatics Valued Components
3. Overview of Baseline Program
4. Outstanding Aquatics Baseline
5. Other Baseline Programs
6. Questions / Discussion





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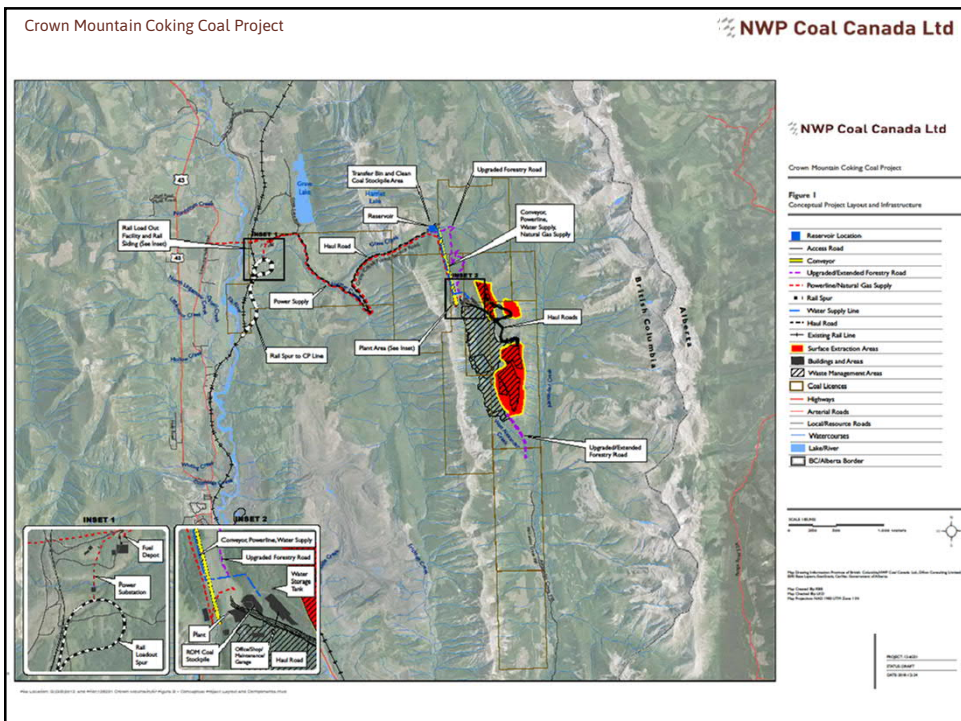
## Project Overview

- Proposed open pit metallurgical coal mine in the Elk Valley
- 10 tenured coal exploration licenses (approx 5,630 ha)
- Other nearby mines in Elk Valley include Teck’s Elkview (8 km southwest) and Line Creek mine (12 km north)
- Anticipated production capacity of 3.7 million run-of-mine tonnes (M ROMt) per annum for 16 years (not including site decommissioning)
- Construction estimated at 1 to 1.5 years

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# Project Overview

- Key project components include (approximately 1,100 ha):
  - Surface extraction areas (three pits - north pit, east pit, and south pit)
  - Waste rock management areas
  - Plant area (includes raw coal stockpile, processing plant, site support facilities)
  - Clean coal transportation route (overland conveyor and haul road)
  - Rail load out facility and rail siding
  - Power and natural gas supply
  - Explosives and fuel storage
  - Sewage treatment
  - Water supply

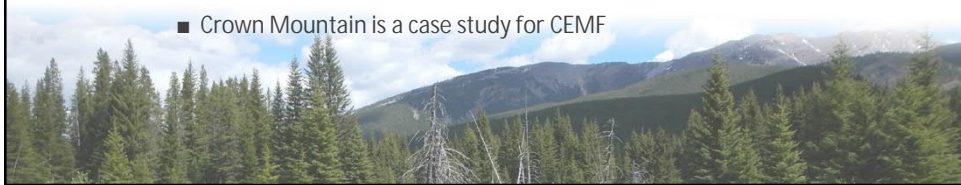





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## Project Overview

- Currently in Pre-Application phase:
  - Project Description, approved November 2014
  - Federal EIS Guidelines, issued February 2015
  - Provincial Valued Components for Environmental Assessment, completed April 2016
  - Provincial Application Information Requirements, approved April 2018
- Consultation and engagement is on-going:
  - Ktunaxa Nation Council
  - Local municipalities
  - Participation in the Elk Valley Cumulative Effects Management Framework (CEMF) group
    - Crown Mountain is a case study for CEMF




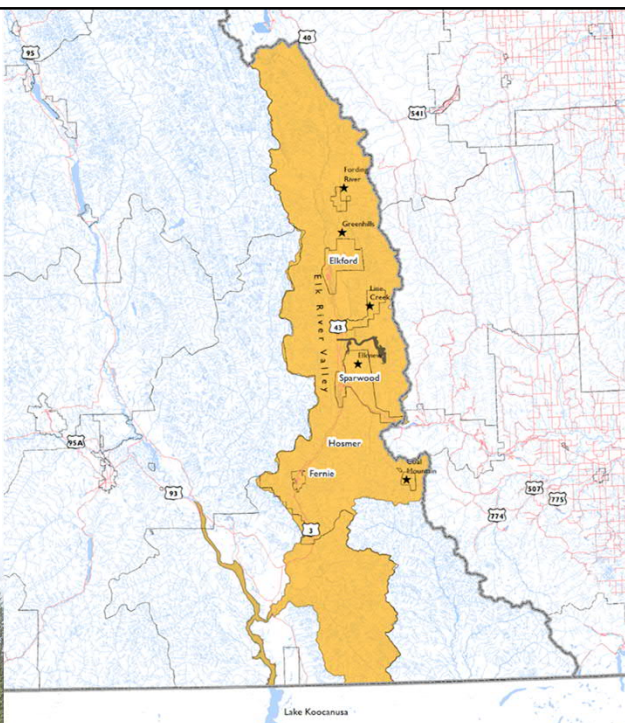
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## Aquatic Regional Study Area


- Aquatic Regional Study Area
- Existing Operating Mines
- Highways/Major Roads
- Watercourses
- Project Footprint
- Lakes/Rivers
- Regional District/Municipal Boundaries
- BC/Alberta/USA Border

SCALE: 1:50,000





Lake Koocanusa





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## Fish and Fish Habitat

- Alexander, West Alexander, and Grave Creeks
- Variety of fish surveys were conducted from 2014 to present

Dates	Survey
March - Oct 2014	<ul style="list-style-type: none"> <li>● Overwintering</li> <li>● Fish inventory</li> <li>● Fish and Fish Habitat Procedures (FHAP) Level 1</li> <li>● Fish spawning</li> </ul>
June - Oct 2017	<ul style="list-style-type: none"> <li>● Fish inventory</li> <li>● Fish community</li> <li>● Fish spawning</li> <li>● FHAP Level 1</li> <li>● Fish tissue collection</li> </ul>
Aug - Nov 2018 April 2019 - Current	Fish migration assessment





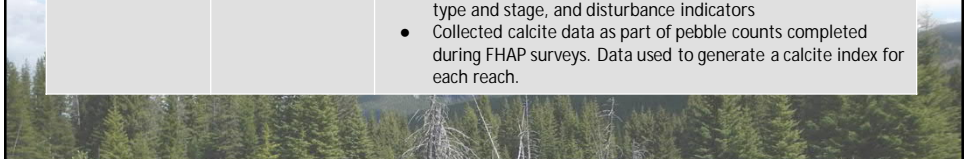
Photo: Riffle habitat at West Alexander Creek Reach 1 with suitable habitat for all life stages of westslope cutthroat trout and bull trout



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## Fish and Fish Habitat

Survey Type	Dates	Survey Details
Fish inventory sampling	July 2014 Aug 2017	<ul style="list-style-type: none"> <li>● Determined upstream limit of fish distribution</li> <li>● Electrofishing and minnow traps</li> <li>● Habitat data collected</li> </ul>
Fish community sampling	Aug - Oct 2017	<ul style="list-style-type: none"> <li>● Assessed fish density within fish-bearing sections</li> <li>● Collected habitat type, length, gradient, water depth, cover type, off-channel habitat, and barriers</li> </ul>
Fish spawning surveys	July 2014 June 2017 Oct 2014/2017	<ul style="list-style-type: none"> <li>● Assessed spawning activity and spawning habitat</li> <li>● Described redds, spawning fish, and spawning habitat (cover, proximity to holding water, adequate flows, suitable grave size)</li> </ul>
Overwintering surveys	March 2014	<ul style="list-style-type: none"> <li>● Assessed suitable overwintering habitat</li> <li>● Collected water temperature, dissolved oxygen, water depth, ice cover, and flow rates.</li> </ul>
Level 1 Fish and Fish Habitat Procedures (FHAP)	Aug - Sept 2014 Oct 2017	<ul style="list-style-type: none"> <li>● Described habitat quality within fish bearing reaches and delineate stream reaches into channel units, assessed quantity of functional large woody debris, riparian vegetation type and stage, and disturbance indicators</li> <li>● Collected calcite data as part of pebble counts completed during FHAP surveys. Data used to generate a calcite index for each reach.</li> </ul>





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## Fish and Fish Habitat

Survey Type	Dates	Survey Details
Aquatic Health (fish tissues, benthics, sediments)	July - Aug 2017	<ul style="list-style-type: none"> <li>Determined baseline contaminant levels for the Aquatic Health discipline</li> <li>8 fish per reach were captured by electrofishing and 4 mm muscle plug was collected using a biopsy punch</li> </ul>
Fish Migration assessment (Grave Creek)	Aug - Nov 2018 April 2019 - Current	<ul style="list-style-type: none"> <li>Assessed fish habitat changes that may result from reductions in the quantity of stream flow from the proposed point of diversion on Grave Creek, downstream to the confluence with Harmer Creek</li> <li>Surveys to be completed in low-flow conditions</li> </ul>




Photo: Adult Westslope Cutthroat Trout (fork length of 202 mm) salvaged from West Alexander Creek Reach 2

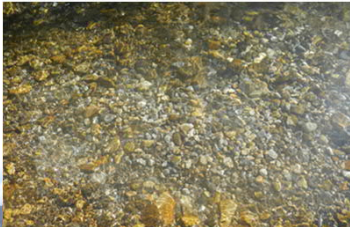
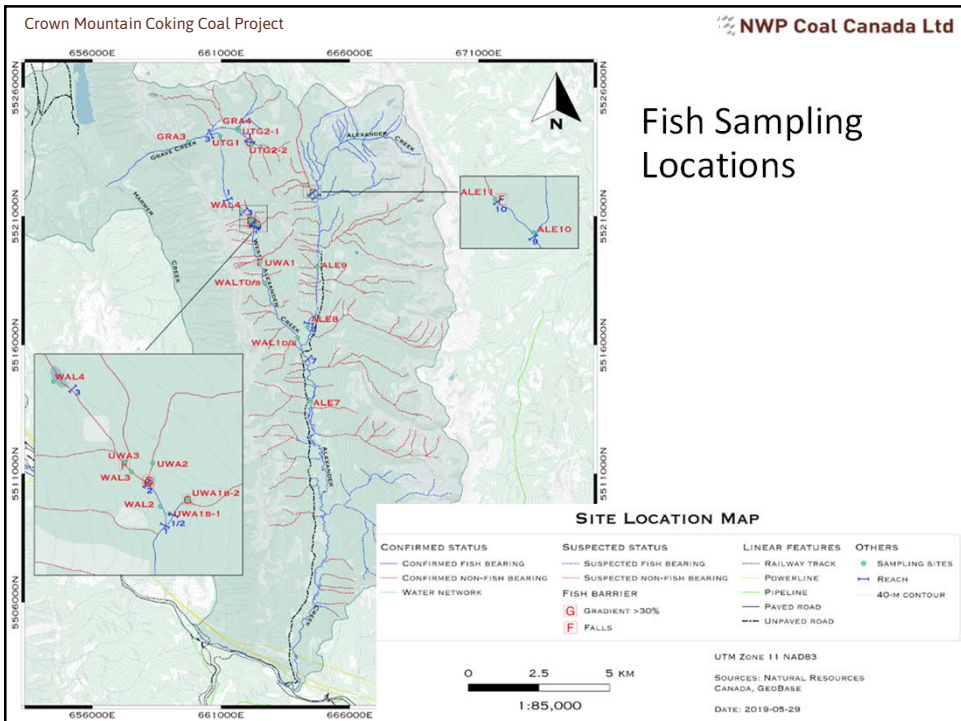


Photo: Redd of unknown spawning species at Alexander Creek Reach 7






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## Fish and Fish Habitat

Results	Outstanding Baseline
<ul style="list-style-type: none"> <li>● Fish-bearing watercourses:                             <ul style="list-style-type: none"> <li>○ Alexander Creek</li> <li>○ West Alexander Creek</li> <li>○ Grave Creek</li> <li>○ Unnamed Tributaries of Grave Creek #1 and #2</li> </ul> </li> <li>● Low fish densities in the LSA</li> <li>● Westslope cutthroat trout most abundant species, found in Alexander, West Alexander, and Grave Creeks. Bull trout and eastern brook trout also detected in Alexander Creek</li> <li>● Varied habitat quality in Alexander and West Alexander Creek. Highly suitable fish habitat in lower reaches. Good overwintering potential in Alexander Creek (Reach 7) due to warm water temperatures and suitable pools. Decreased quality in the upper reaches due to increased gradient and reduced stream size</li> </ul>	<ul style="list-style-type: none"> <li>● Wetland fish presence survey</li> <li>● Bull trout distribution study</li> <li>● Lower Alexander Creek fish and fish habitat survey</li> <li>● On-going fish migration assessment in Grave Creek</li> </ul>



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## Westslope Cutthroat Trout

- Species listed as Schedule 1 – Special Concern under SARA
- Provincially Blue-listed in BC
- Important recreational, commercial, and/or First Nations values
- Largest range within LSA
- The only fish species found in the upper reaches of the Grave Creek watershed and tributaries



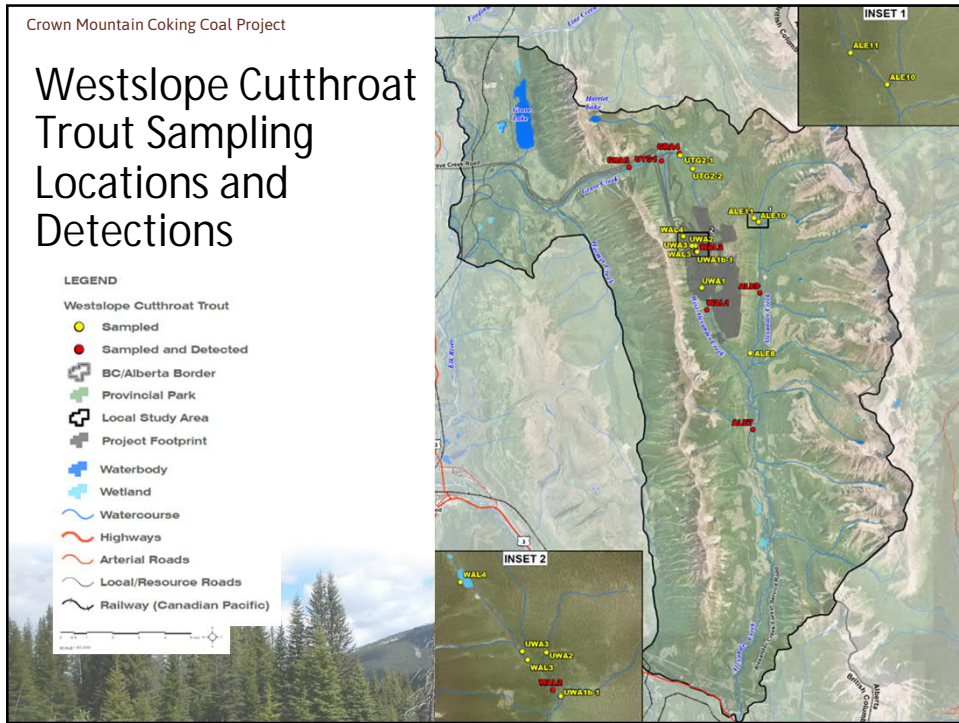


Photo: Westslope Cutthroat Trout (fork length of 146 mm) from Alexander Creek Reach 9

Survey Dates	Survey Details	Results	Outstanding Baseline
2014 and 2017	<ul style="list-style-type: none"> <li>● Spring spawning</li> <li>● Fish inventory sampling</li> <li>● Fish community sampling</li> </ul>	<ul style="list-style-type: none"> <li>● Suitable spawning habitat:                             <ul style="list-style-type: none"> <li>○ Alexander Creek 7-9</li> <li>○ West Alexander 1</li> <li>○ Grave Creek 3-4</li> <li>○ Unnamed Tributary of Grave Creek #1 and #2</li> </ul> </li> <li>● Adult WCT observed pairing during surveys, suggesting spawning is occurring in LSA</li> <li>● Highest WCT densities at Grave Creek and West Alexander Creek.</li> <li>● WCT was only species found in upper Grave Creek at time of surveys, assumed isolated population</li> </ul>	<ul style="list-style-type: none"> <li>● Wetland fish presence survey</li> <li>● Lower Alexander Creek fish and fish habitat survey</li> </ul>





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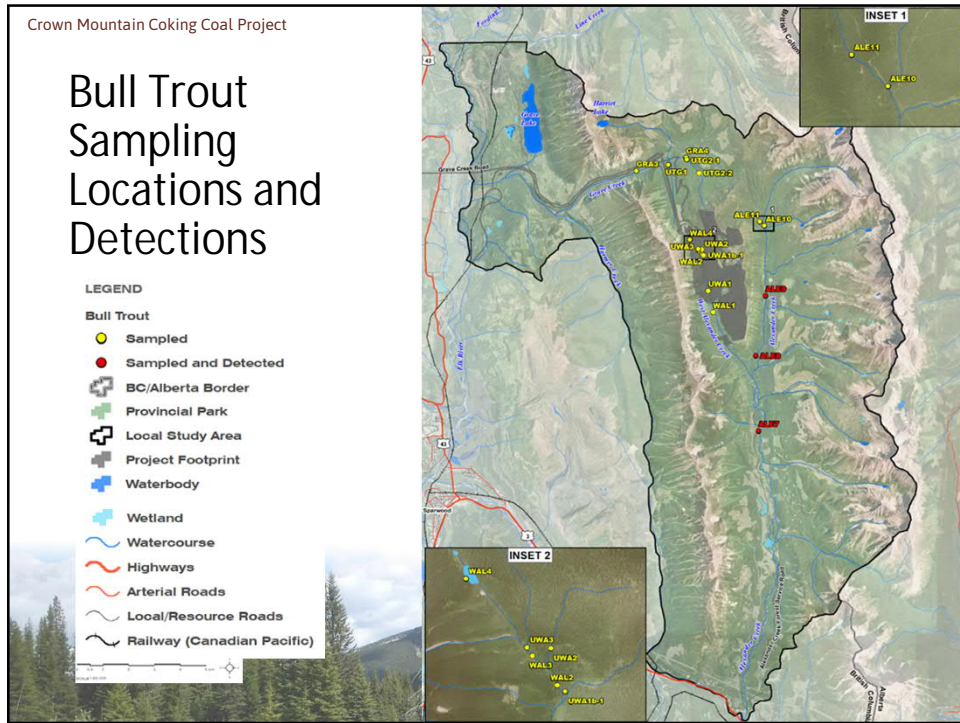
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## Bull Trout

- Listed as Special Concern by COSEWIC
- Provincially Blue-listed
- Important recreational, commercial, and/or First Nations values
- Primarily in the Michel Creek and Elk River mainstem, but also have moderate juvenile distribution in Alexander Creek

Photos: Juvenile Bull Trout salvaged from Alexander Creek Reach 8 and West Alexander Creek Reach 1, respectively

Survey Dates	Survey Details	Results	Outstanding Baseline
2014 and 2017	<ul style="list-style-type: none"> <li>Fall spawning</li> <li>Fish inventory sampling</li> <li>Fish community sampling</li> </ul>	<ul style="list-style-type: none"> <li>BT captured/observed in Alexander Creek Reaches 7-9</li> <li>BT spawning suspected to occur in Alexander Creek (presence of potential redds and BT presence)</li> </ul>	<ul style="list-style-type: none"> <li>Wetland fish presence survey</li> <li>Bull trout distribution study</li> <li>Lower Alexander Creek fish and fish habitat survey</li> </ul>



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## Kokanee & Burbot

- **Kokanee:**
  - Provincially Yellow-listed
  - Important for fishing and consumption
  - Grave Lake population stocked
  - Key representative planktivore species - important to assess impacts to aquatic resources
- **Burbot:**
  - Lower Kootenay population is provincially Red-listed
  - Important recreational, commercial, and/or First Nations values
  - Found within the RSA

Photo: Wetland at West Alexander Creek Reach 4, not suitable fish habitat due to steep slope gradient and frequent dewatering

Survey Dates	Survey Details	Results	Outstanding Baseline
2014 and 2017	Fish inventory sampling	Kokanee and burbot not detected in the LSA during baseline surveys	Baseline complete



## Longnose Sucker

- Provincially Yellow-listed
- Important recreational, commercial, and/or Indigenous values
- Primarily in lentic/wetland habitats and in lower gradient reaches of the Elk River watershed
- Useful wildlife prey species



Photo: Cascade habitat at Alexander Creek Reach 7. Longnose Sucker not detected within this reach.

Survey Dates	Survey Details	Results	Outstanding Baseline
2014 and 2017	Fish inventory surveys	<ul style="list-style-type: none"> <li>• No detection in LSA during baseline surveys</li> <li>• Previously documented in nearby wetlands - may be found in LSA during proposed 2019 wetland fish surveys</li> </ul>	<ul style="list-style-type: none"> <li>• Wetland fish presence survey</li> <li>• Lower Alexander Creek fish and fish habitat survey</li> </ul>



## Mountain Whitefish

- Provincially Yellow-listed
- Important recreational, commercial, and/or Indigenous values
- Primarily mainstream species, not frequently observed in reaches lower than 4th order
- Known spawning in mainstream Michel Creek and Elk and Fording Rivers.

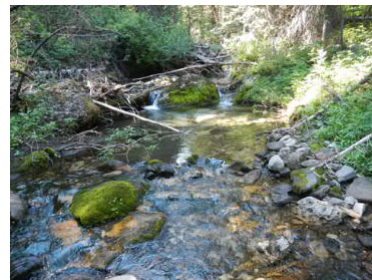


Photo: Typical stream habitat at Alexander Creek Reach 11. Mountain Whitefish not detected within this reach.

Survey Dates	Survey Details	Results	Outstanding Baseline
2014 and 2017	Fish inventory surveys	<ul style="list-style-type: none"> <li>• No detection in LSA during baseline surveys</li> <li>• Species known to occur in lower Alexander Creek near Michel Creek</li> </ul>	Lower Alexander Creek fish/fish habitat site






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## Benthic Invertebrates

- Sampling conducted in Alexander Creek, West Alexander Creek, Grave Creek, and unnamed tributaries of West Alexander and Grave Creeks
- Both benthic invertebrates and periphyton sampled

Survey Dates	Survey Details	Results	Outstanding Baseline
Oct 2014 and 2017	<ul style="list-style-type: none"> <li>● 23 benthic samples at 9 and 10 sites (2014 and 2017 respectively) at riffle/glide habitats</li> <li>● Periphyton not a VC but sampled to better understand baseline</li> </ul>	<ul style="list-style-type: none"> <li>● Sites generally good condition</li> <li>● Benthics mostly Ephemeroptera and Plecoptera orders (sensitive species)</li> <li>● EPT proportions between 65% and 99%</li> <li>● Periphyton communities mainly cyanobacteria and diatoms</li> </ul>	Lower Alexander Creek fish and fish habitat survey

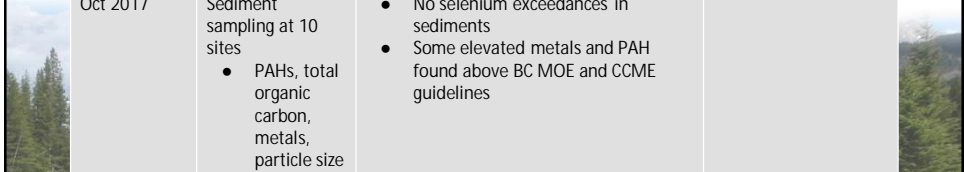


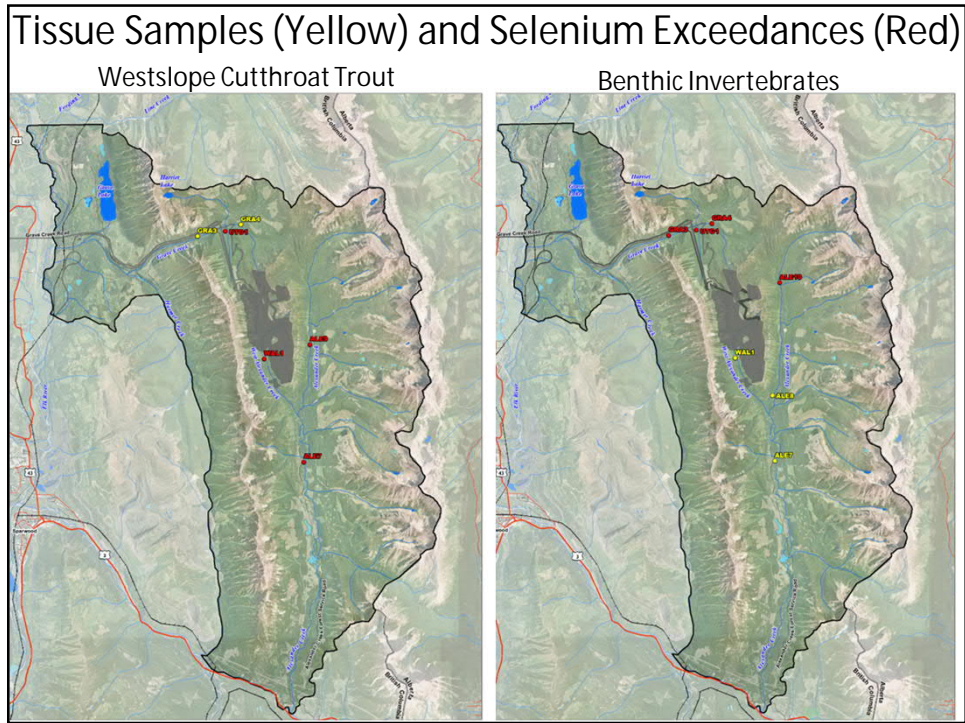
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## Aquatic Health

- Includes benthic invertebrate tissues, fish tissues, and sediments
- Evaluation of baseline metal levels

Survey Dates	Survey Details	Results	Outstanding Baseline
July-Aug 2017	Fish tissue sampling at 6 sites for metals	<ul style="list-style-type: none"> <li>● Selenium tissue concentrations compared to the BC MOE guideline of 4 µg/g dry weight</li> <li>● Four sites had exceedances of selenium (4.10 - 6.20 µg/g dry weight) in fish tissues</li> </ul>	Results to be incorporated into the Human Health and Ecological Risk Assessment
Oct 2017	Benthic invertebrate and periphyton tissue sampling at 7 sites for metals	<ul style="list-style-type: none"> <li>● Four sites had exceedances of selenium (5.19 to 6.12 µg/g dry weight) in benthics</li> <li>● One exceedance of selenium (4.25 µg/g dry weight) in periphyton tissue at Alexander Creek 7</li> </ul>	
Oct 2017	Sediment sampling at 10 sites <ul style="list-style-type: none"> <li>● PAHs, total organic carbon, metals, particle size</li> </ul>	<ul style="list-style-type: none"> <li>● No selenium exceedances in sediments</li> <li>● Some elevated metals and PAH found above BC MOE and CCME guidelines</li> </ul>	



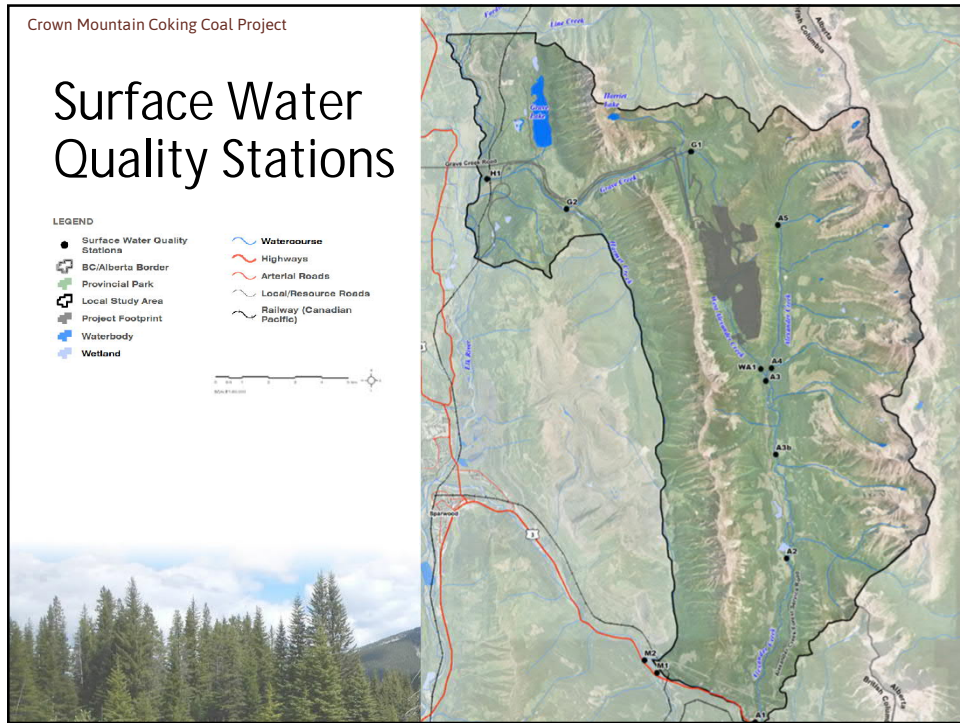


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## Surface Water Quality

- Ongoing for last 7 years - a total of 57 sampling rounds completed
- Program developed in 2012 in consultation with MOE
- Ongoing quarterly sampling (next event June 2019)

Survey Dates	Survey Details	Results	Outstanding Baseline
Monthly 2012 to 2016  Quarterly July 2018 to Present	<ul style="list-style-type: none"> <li>● 11 sampling stations across LSA in Grave, Harmer, Alexander, West Alexander, and Michel Creeks.</li> <li>● Parameters measured:                             <ul style="list-style-type: none"> <li>○ Physical tests (pH, conductivity, turbidity, dissolved oxygen, total, dissolved, suspended solids, temperature, hardness)</li> <li>○ Anions and nutrients</li> <li>○ Organic and inorganic carbon</li> <li>○ Total and dissolved metals</li> <li>○ Polycyclic aromatic hydrocarbons</li> </ul> </li> <li>● Included 4 intensive sampling periods (i.e. 5 consecutive weekly surveys):                             <ul style="list-style-type: none"> <li>○ 2 spring freshet periods in May/June of 2014 and 2015</li> <li>○ 2 low-flow periods in Aug/Sept of 2014 and 2015</li> </ul> </li> </ul>	Baseline report ongoing  Results will be compared to CCME and the BC Ambient Water Quality Guidelines  Results to support Water Quality Modelling by SRK	Quarterly sampling ongoing



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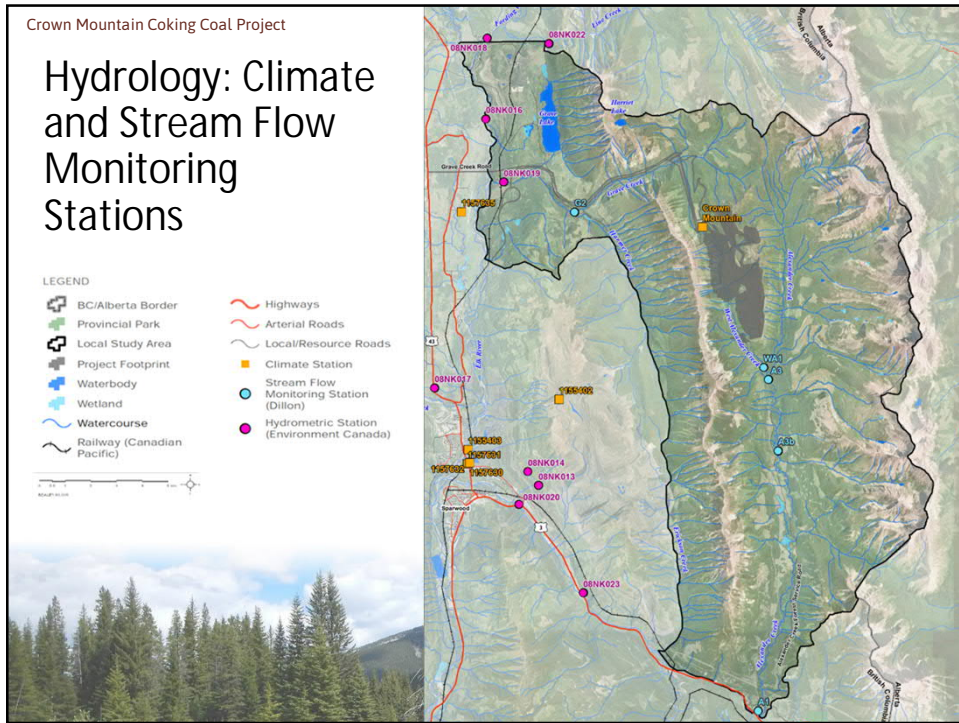
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## Hydrology

- Initiated in 2012 at 4 stations in LSA
- Currently active at 2 stations - Grave Creek and lower Alexander Creek

Survey Dates	Survey Details	Results	Outstanding Baseline
2012 to May 2016	Water level loggers: A1, A3 (relocated to A3B in June 2014 for better accessibility), WA1, G2	<ul style="list-style-type: none"> <li>• Developed stage-discharge relationships and derived daily flow estimates</li> <li>• Open water season typically extends between May and November; watercourses freeze during winter and early spring</li> <li>• Significant streamflow variability exists with low flows in the fall/winter and high flows during freshet (May-August)</li> </ul>	Quarterly sampling on-going at A1 and G2
Nov 2017 to Present (A1 and G2 stations)	Stream flow gauging at all sites (15 rounds completed to date)		Potential to re-install A3B and WA1 in 2019
Nov 2013 to May 2016	Installation of temporary climate station	<ul style="list-style-type: none"> <li>• Substantial amount of climate and streamflow data available through secondary sources</li> <li>• Baseline report currently in development. Data has been provided to SRK to support development of the water quality model</li> </ul>	N/A





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## Outstanding Aquatics Baseline

Anticipated Timing	Baseline Surveys
June 2019	<ul style="list-style-type: none"> <li>Surface water quality and quantity quarterly sampling</li> <li>Grave Creek fish migration assessment</li> </ul>
July 2019	<ul style="list-style-type: none"> <li>Fish and fish habitat in wetlands surveys</li> </ul>
September 2019	<ul style="list-style-type: none"> <li>Bull trout spawning survey</li> <li>Lower Alexander Creek fish and fish habitat survey</li> <li>Grave Creek fish migration assessment</li> </ul>
September and December 2019	<ul style="list-style-type: none"> <li>Surface water quality and quantity quarterly sampling</li> </ul>



## Other Baseline Programs

- Groundwater / hydrogeology
  - 16 single monitoring wells, 3 nested wells, and 12 locations with 1 pumping well; seepage survey; additional wells to be developed
- Geochemistry
  - Geochemical analysis of core collected during fall of 2018 is underway; to be completed within 2-3 months
- Terrestrial (e.g., wildlife, vegetation, species at risk, etc.)
- Terrain assessment and geohazard identification
- Noise
- Air quality
- Traditional Land Use and Ecological Knowledge
- Ecological Risk Assessment
- Social and economic assessment



## Questions and Discussion

