# Technical Report No. 20-01

# Aquatic Biomonitoring at the Arctic-Bornite Prospect, 2019

**by Chelsea M. Clawson**

**July 2020**

**Alaska Department of Fish and Game** **Habitat Section**

## Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in reports by Habitat Section and the Divisions of Sport Fish and Commercial Fisheries. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

| **Weights and measures (metric)** | |
|---|---|
| centimeter | cm |
| deciliter | dL |
| gram | g |
| hectare | ha |
| kilogram | kg |
| kilometer | km |
| liter | L |
| meter | m |
| milliliter | mL |
| millimeter | mm |

| **Weights and measures (English)** | |
|---|---|
| cubic feet per second | $ft^3/s$ |
| foot | ft |
| gallon | gal |
| inch | in |
| mile | mi |
| nautical mile | nmi |
| ounce | oz |
| pound | lb |
| quart | qt |
| yard | yd |

| **Time and temperature** | |
|---|---|
| day | d |
| degrees Celsius | °C |
| degrees Fahrenheit | °F |
| degrees kelvin | K |
| hour | h |
| minute | min |
| second | s |

| **Physics and chemistry** | |
|---|---|
| all atomic symbols | |
| alternating current | AC |
| ampere | A |
| calorie | cal |
| direct current | DC |
| hertz | Hz |
| horsepower | hp |
| hydrogen ion activity (negative log of) | pH |
| parts per million | ppm |
| parts per thousand | ppt, ‰ |
| volts | V |
| watts | W |

| **General** | |
|---|---|
| Alaska Administrative Code | AAC |
| all commonly accepted abbreviations | e.g., Mr., Mrs., AM, PM, etc. |
| all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc. |
| at | @ |
| compass directions: | |
| east | E |
| north | N |
| south | S |
| west | W |
| copyright | © |
| corporate suffixes: | |
| Company | Co. |
| Corporation | Corp. |
| Incorporated | Inc. |
| Limited | Ltd. |
| District of Columbia | D.C. |
| et alii (and others) | et al. |
| et cetera (and so forth) | etc. |
| exempli gratia (for example) | e.g. |
| Federal Information Code | FIC |
| id est (that is) | i.e. |
| latitude or longitude | lat. or long. |
| monetary symbols (U.S.) | $, ¢ |
| months (tables and figures): first three letters | Jan,...,Dec |
| registered trademark | ® |
| trademark | ™ |
| United States (adjective) | U.S. |
| United States of America (noun) | USA |
| U.S.C. | United States Code |
| U.S. state | use two-letter abbreviations (e.g., AK, WA) |

| **Measures (fisheries)** | |
|---|---|
| fork length | FL |
| mideye-to-fork | MEF |
| mideye-to-tail-fork | METF |
| standard length | SL |
| total length | TL |

| **Mathematics, statistics** | |
|---|---|
| *all standard mathematical signs, symbols and abbreviations* | |
| alternate hypothesis | $H_A$ |
| base of natural logarithm | *e* |
| catch per unit effort | CPUE |
| coefficient of variation | CV |
| common test statistics | (F, t, $\chi^2$, etc.) |
| confidence interval | CI |
| correlation coefficient (multiple) | R |
| correlation coefficient (simple) | r |
| covariance | cov |
| degree (angular ) | ° |
| degrees of freedom | df |
| expected value | *E* |
| greater than | > |
| greater than or equal to | ≥ |
| harvest per unit effort | HPUE |
| less than | < |
| less than or equal to | ≤ |
| logarithm (natural) | ln |
| logarithm (base 10) | log |
| logarithm (specify base) | $log_2$, etc. |
| minute (angular) | ' |
| not significant | NS |
| null hypothesis | $H_O$ |
| percent | % |
| probability | P |
| probability of a type I error (rejection of the null hypothesis when true) | α |
| probability of a type II error (acceptance of the null hypothesis when false) | β |
| second (angular) | " |
| standard deviation | SD |
| standard error | SE |
| variance | |
| population | Var |
| sample | var |

# *TECHNICAL REPORT NO. 20-01*

# AQUATIC BIOMONITORING AT THE ARCTIC-BORNITE PROSPECT, 2019

By

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July 2020

Cover: Ambler Lowlands, July 17, 2019. Photograph by Chelsea Clawson.

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# ACKNOWLEDGEMENTS

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# INTRODUCTION

The Ambler mining district is located in northwest Alaska in the Kobuk River drainage along the southern end of the Brooks Range (Figure 1). There are two primary deposits currently being explored by Ambler Metals (formerly Trilogy Metals). The Bornite deposit is located about 17 km north of Kobuk in the Ruby Creek drainage, and the Arctic deposit is located approximately 37 km northeast of Kobuk in the upper end of the Subarctic Creek drainage. The Bornite deposit contains primarily copper and cobalt while the Arctic deposit contains copper, lead, zinc, silver and gold. Both Ruby and Subarctic creeks are tributaries to the Shungnak River, which flows into the Kobuk River. A large waterfall in the lower Shungnak River prevents upstream passage of fish, so no anadromous fish occur near the sites (Figure 2). All fish in the area of the Bornite and Arctic deposits complete their life cycle within the Shungnak River drainage.

All sample sites except Riley Creek are in the Shungnak River drainage. Riley Creek, which flows into the Kogoluktuk River, was selected to sample as it is being considered as a possible location for a tailings storage facility.


**Figure 1. Location of the Arctic and Bornite deposits in northwest Alaska.**

**Figure 2. Waterfall on the Shungnak River blocking fish passage upstream, July 21, 2016.**

Aquatic baseline work conducted in the area in 2010 focused on macroinvertebrate and fish species presence (Tetra Tech, 2011). The fish species documented in the 2010 survey were Arctic grayling (*Thymallus arcticus*), round whitefish (*Prosopium cylindraceum*), slimy sculpin (*Cottus cognatus*), and Dolly Varden (*Salvelinus malma*). Ambler Metals contracted the ADF&G Habitat Section to continue aquatic sampling beginning in 2016. The ADF&G study plan was based on aquatic biomonitoring the Habitat Section conducts at various large hard rock mines in the state. Three primary types of data were collected: periphyton, aquatic invertebrates, and fish, which included samples for whole body element analyses.

This report will summarize samples collected by ADF&G in 2019, as well as water quality data collected by Ambler Metals in 2019.

# METHODS

## Sampling Overview

Based on results from previous years, sampling events were condensed and streamlined. Baseline data collection continued on Ruby, Subarctic, Red Rock, Jay, Riley, and Center of the Universe creeks, as well as the Upper Shungnak River.

The first sampling event took place July 15 – 19, 2019. At each baseline location replicate samples of the aquatic community were performed; including aquatic invertebrates, periphyton, and fish. Some fish were retained for whole body element analysis. Additional fish sampling occurred on Dahl and Wesley creeks to determine fish species presence at several crossing locations.

The second sampling event occurred September 3 – 5, 2019. The objective was to determine Dolly Varden distribution in the early fall, assess their spawning condition, and obtain additional fish for element analysis, if needed. An aerial survey of the Kogoluktuk River was flown to assess adult chum salmon spawning distribution, and aerial surveys of Dahl and Wesley creeks were flown to look for anadromous fish presence.

Sampling effort was concentrated in Ruby and Subarctic creeks as there may be changes to these aquatic systems based on projected mining development. The reference site in the upper Shungnak River was sampled again in 2019, as well as the Riley and Jay creek sites. The Red Rock/Center of the Universe drainage is the next system up the Shungnak River drainage from Subarctic Creek, and could provide alternative fish habitat if Subarctic Creek is impacted by future mining activity.

The objective of the biological monitoring program was to document in-situ productivity of aquatic communities in the vicinity of and downstream of potential project facilities.

## Water Quality

Ambler Metals has collected water quality data from many locations throughout the Arctic-Bornite Prospect project area. The 2016 report summarized all water quality data collected since 2008 (Bradley 2017a). This report summarizes only data collected in 2019. These data were provided to ADF&G and were compiled and graphed showing median, minimum, and maximum values (Appendix 1). Only water quality data from locations in close proximity to the 2019 sample sites were used. Depending on the sample site, two to four water samples were collected from March to December 2019.

## Periphyton

Periphyton, or attached micro-algae, are sensitive to changes in water quality and are often used in monitoring studies to detect changes in aquatic communities (Ott et al. 2010). The presence of periphyton in a stream system is evidence of in-situ productivity (Ott et al. 2010). Periphyton samples were collected at eight locations around the Arctic-Bornite area (Table 1; Figure 3).

Ten flat rocks, each larger than 25 $cm^2$ were collected from submerged areas at each site. A 5-cm x 5-cm square of high density flexible foam was placed on the rock. All the material around the foam was scrubbed off with a toothbrush and washed back into the stream. The foam square was then removed from the rock, and that section of the rock was brushed and rinsed onto a 0.45 µm glass fiber filter receptacle attached to a hand vacuum pump. Material from the toothbrush was also rinsed onto the filter. The water was extracted from the periphyton covered filter using a hand vacuum pump. Just before all the water was pumped through the filter, one to two drops of magnesium carbonate ($MgCO_3$) were added to the water to prevent acidification and additional conversion of chlorophyll-a to phaeophytin.

Filters from each rock were folded in half, with the sample material on the inside, and placed in individual dry paper coffee filters. All ten coffee filters were placed in a zip-lock bag containing desiccant to absorb remaining moisture. The bags were then wrapped in aluminum foil to prevent light from reaching the samples, placed in a cooler with ice packs, then transferred to a freezer at the Bornite camp. Samples were kept frozen until they were analyzed at the ADF&G laboratory in Fairbanks. Additional details regarding periphyton sampling and analysis methods can be found in ADF&G Technical Report No. 17-09 (Bradley 2017b).

**Table 1. Arctic-Bornite sampling locations (WGS 84), 2019.**

| Sample Site | | Latitude | Longitude | July periphyton/ invertebrate | July minnow | July fyke | September minnow |
|---|---|---|---|---|---|---|---|
| Shungnak R. | | | | | | | |
| | Upper | 67.24404 | -156.61598 | X | --- | --- | --- |
| Subarctic Cr. | | | | | | | |
| | Upper | 67.19264 | -156.39114 | X | X | --- | X |
| | Lower | 67.17198 | -156.62079 | X | X | --- | --- |
| | Mouth | 67.16942 | -156.62933 | --- | --- | X | --- |
| Ruby Cr. | | | | | | | |
| | Upper | 67.04078 | -156.93936 | X | X | --- | --- |
| | Lower | 67.11140 | -156.90843 | X | X | --- | --- |
| | Mouth | 67.11395 | -156.91669 | --- | --- | X | --- |
| Red Rock Cr. | | | | | | | |
| | Lower | 67.19324 | -156.59906 | X | X | --- | --- |
| Center of the Universe Cr. | | | | | | | |
| | Upper | 67.20997 | -156.40411 | --- | --- | --- | X |
| Jay Cr. | | | | | | | |
| | | 67.08041 | -156.94453 | X | X | --- | --- |
| Riley Cr. | | | | | | | |
| | | 67.04264 | -156.69229 | X | X | --- | --- |
| Dahl Creek | | 66.94553 | -156.91512 | --- | X | --- | --- |
| Wesley Creek | | 66.95389 | -157.02138 | --- | X | --- | --- |

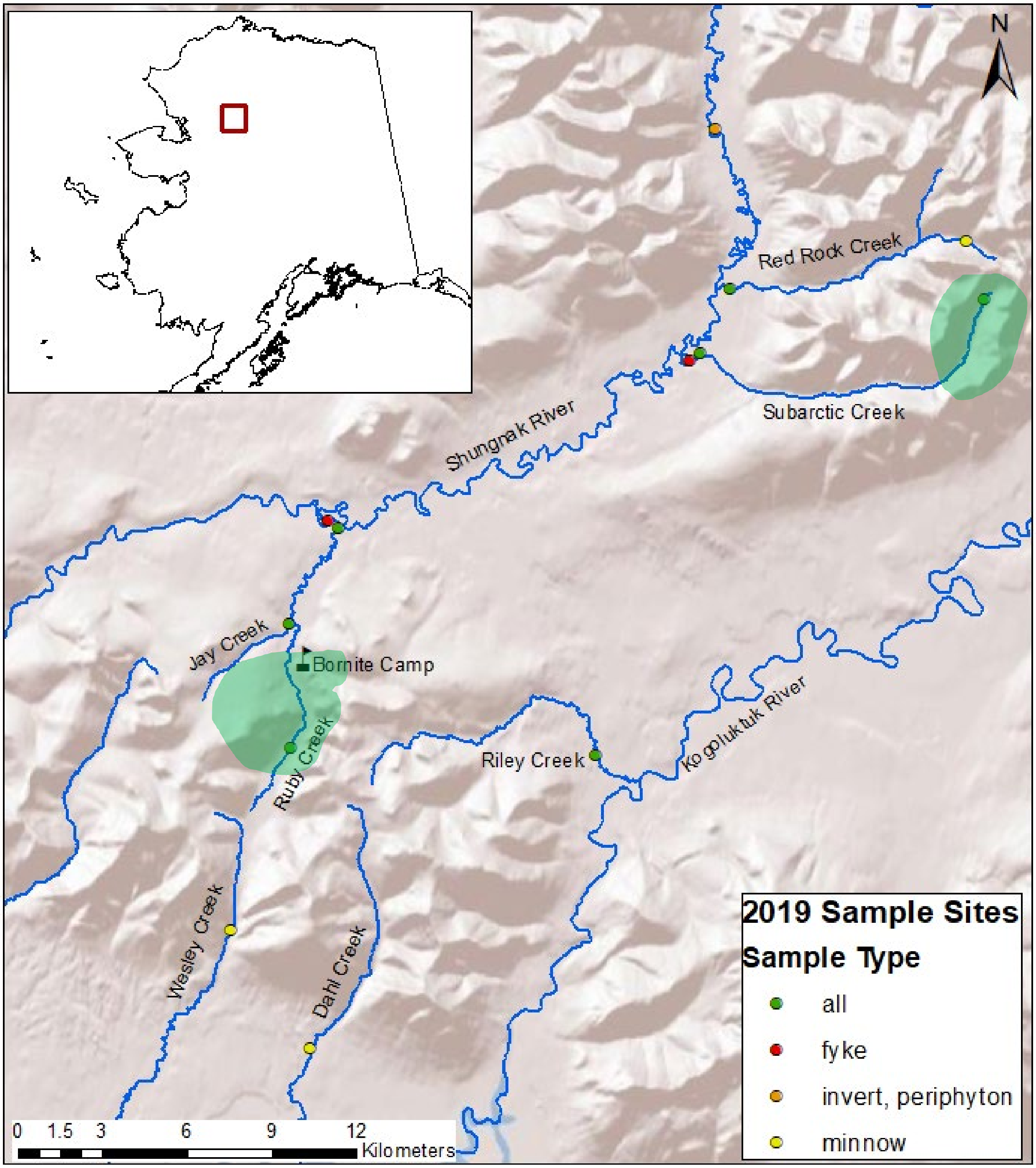


**Figure 3. All locations sampled in 2019. The approximate location of the Bornite and Arctic deposits are denoted by the green polygons.**

## Aquatic invertebrates

At each sample site, five drift nets were installed along a transect perpendicular to the flow (Table 1; Figure 4). The drift nets were 45.7 cm wide, 30.5 cm tall with 363 µm mesh size. At each net, water depth and water velocity were measured using a Marsh McBirney FH950 flow meter. By using these parameters, the volume of water sampled by each net could be calculated. After one hour, the nets were removed and material was flushed into the cod end by splashing water on the outside of the net. The cod end contents were then removed and placed in individual pre-labeled Nalgene bottles. Denatured ethyl alcohol was added to preserve the samples. Samples were sorted and invertebrates identified to the lowest taxonomic level, typically family or genus, by a private aquatic invertebrate lab in Fairbanks. Because invertebrates belonging to the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) are more sensitive to water quality, percent composition of EPT was calculated and compared to groups of other invertebrates, which are less sensitive.

**Figure 4. Drift nets set for capturing aquatic invertebrates at Lower Ruby Creek (July 16, 2019).**

## Fish

The primary fish sampling event occurred July 15 – 19. At each baseline sample site, after the periphyton and aquatic invertebrates were sampled, ten minnow traps were baited with cured salmon roe in a perforated plastic bag and placed upstream and downstream of the periphyton and aquatic invertebrate sampling locations (Table 1). Minnow traps on Dahl and Wesley creeks were set upstream and downstream of the road crossings. Traps were placed in a variety of habitats, including cut banks, pools, and near submerged woody debris. Traps were soaked overnight and checked about 24 hours later. All captured fish were measured for fork or total length, depending on species. Some fish were retained for whole body element analyses. Those fish were handled wearing class 100 nitrile gloves and placed in individual pre-labeled plastic zip-lock bags. The fish bags were placed in a cooler with ice packs and transferred to a freezer in the camp as soon as possible. The samples remained frozen until they were analyzed by ACZ Laboratories, Inc.

In addition to the minnow traps, fyke nets were set at the mouth of Ruby Creek and the mouth of Subarctic Creek during the July sampling event (Table 1, Figure 5). Two nets were set at Ruby Creek to capture fish moving both upstream and downstream, and a single net was set at Subarctic Creek to capture fish moving downstream. Nets were fished for approximately 72 hours and checked daily. All captured fish were measured for fork or total length, depending on species. Some fish were retained for whole body element analyses. Captured fish received an upper caudal fin clip to prevent double counting recaptures.

The fall sampling event occurred September 3 – 5. Two sites were sampled for fish with minnow traps, using methods identical to the July sampling event (Table 1). Aerial surveys to look for anadromous fish were flown on Wesley Creek, Dahl Creek, and the Kogoluktuk River from its mouth on the Kobuk River to two miles upstream of the mouth of Riley Creek.

**Figure 5. Fyke nets near the mouth of Ruby Creek (July 21, 2018).**

# RESULTS AND DISCUSSION

## Water Quality

A summary of sample dates and water quality results are shown in Appendix 1. Alaska Department of Environmental Conservation (ADEC) water quality standards are presented for some metals for both acute (24 hr) and chronic (one month) aquatic life exposure limits (Appendix 1). Most of the water quality sites are at the same location as the periphyton, aquatic invertebrate, and fish sampling. However, the water quality data from the Shungnak River used in these results were collected just upstream of the mouth of Subarctic Creek, not at the reference site further upstream (Upper Shungnak River). Non-detect element data are graphically presented as the detection limit.

In general, median cadmium concentrations in 2019 were low and similar to previous years (Figure 6). Upper Ruby, Lower Ruby, and Riley were all at or below the detection limit (0.025 µg/L). The highest median concentration occurred in the Shungnak River, consistent with past years. Acute and chronic water quality standards for aquatic life for cadmium depend on water hardness. Based on water hardness values, cadmium concentrations were below the acute and chronic standards at all sites for all sampling events except the June and August samples on the Shungnak River (Appendix 1). In June the result of 0.239 µg/L slightly exceeded the chronic exposure limit of 0.205 µg/L, and in August the result of 0.369 µg/L exceeded the chronic exposure limit of 0.225 µg/L. Both samples were well below the chronic exposure limits of 1.562 µg/L and 1.778 µg/L, respectively.

Median selenium concentrations were very low and similar among all sample sites (Figure 6, Appendix 1). All concentrations were well below the current water quality standard for aquatic life which is 20 µg/L for acute exposure and 5 µg/L for chronic exposure.

Median copper concentrations ranged from 0.249 µg/L at Upper Subarctic Creek to 1.800 µg/L at the Shungnak River site (Figure 6, Appendix 1). The highest maximum concentration for copper was 2.230 µg/L and occurred at Lower Subarctic Creek in June. Acute and chronic water quality standards for aquatic life for copper depend on water hardness. Based on water hardness values, copper concentrations were below the acute and chronic standards at all sites for all sampling events (Appendix 1).

Mercury concentrations were low at all sample sites (Figure 6). Median mercury concentrations ranged from 0.610 ng/L at Shungnak River to 1.615 ng/L at Lower Subarctic Creek. The highest maximum concentration (2.190 ng/L) occurred at Upper Ruby Creek in December. All mercury concentrations were well below the water quality standards for aquatic life for mercury which are 2,400 ng/L for acute exposure and 12 ng/L for chronic exposure.

Median zinc concentrations were at or below the detection limit (5 µg/L) at Upper Ruby, Lower Ruby, Upper Subarctic, and Riley (Figure 6). The highest maximum concentration occurred at Shungnak River in August (29.00 µg/L). Overall, zinc concentrations were very low and well below the water quality standard for aquatic life, which depends on water hardness (Appendix 1).

Total Dissolved Solids (TDS) concentrations in 2019 followed a pattern very similar to past years. Lowest median concentrations occurred in Upper Subarctic Creek (57 mg/L) and Lower Subarctic Creek (50 mg/L) and the highest median concentrations occurred in Upper Ruby Creek (182 mg/L) and Lower Ruby Creek (173 mg/L) (Figure 6, Appendix 1).

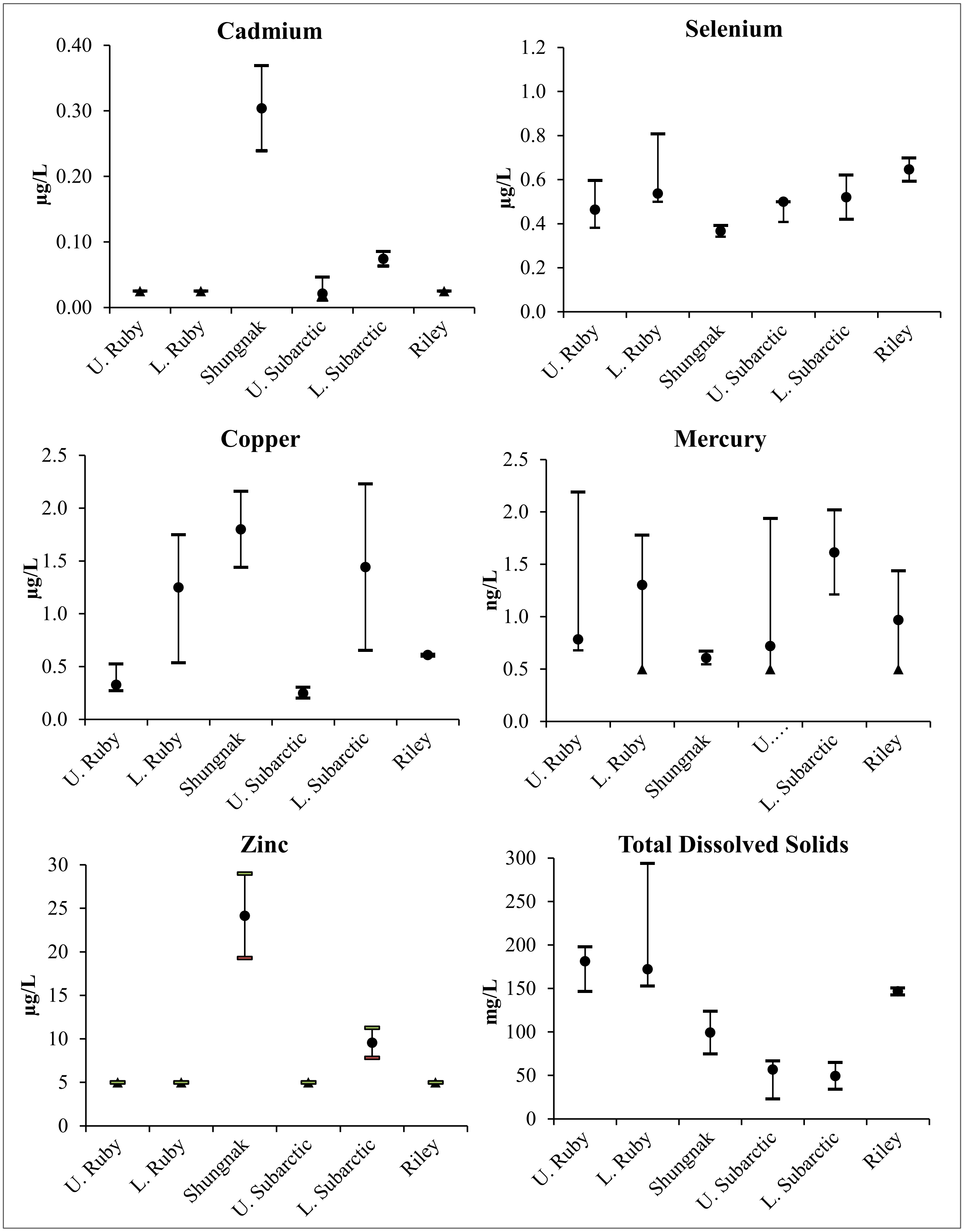


**Figure 6. Median, minimum, and maximum analyte concentrations at water quality sample sites, 2019. Triangles indicate results below the detection limit, which are reported as the detection limit.**

**Periphyton**

In 2019, mean chlorophyll-a concentrations were highest in Upper Ruby Creek (43.29 $mg/m^2$) and lowest in Lower Red Rock Creek (0.30 $mg/m^2$) (Figure 7). The mean chlorophyll-a concentrations at the remaining sites ranged from 0.76 $mg/m^2$ to 3.38 $mg/m^2$. Mean chlorophyll-a concentrations in 2019 were similar to 2018 values (Figures 7 and 8)

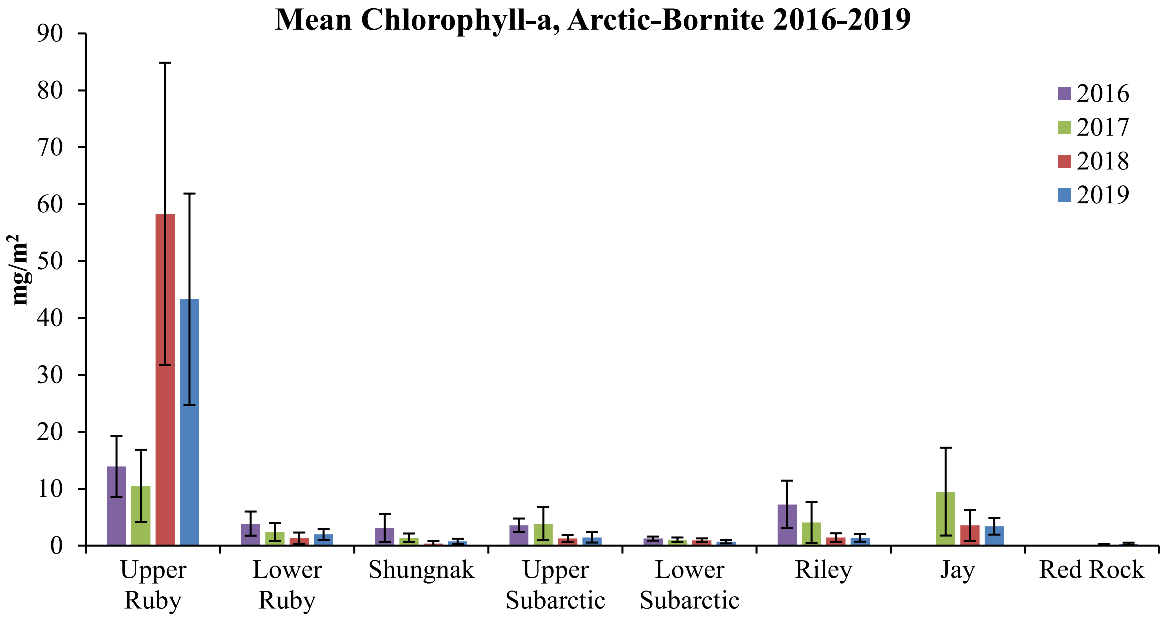


**Figure 7. Mean chlorophyll-a concentrations ± 1 SD, 2016 to 2019. The Jay Creek site was added in 2017, and the Red Rock Creek site was added in 2018.**

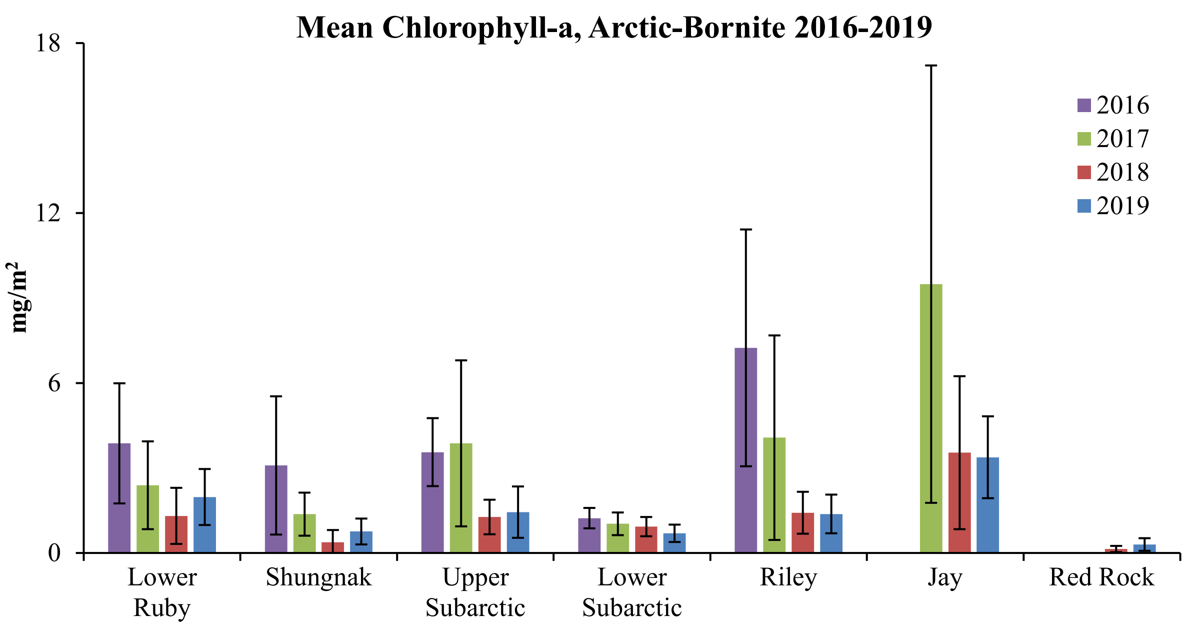


**Figure 8. Mean chlorophyll-a concentrations ± 1 SD for all sites except Upper Ruby, 2016 to 2019. The Jay Creek site was added in 2017, and the Red Rock Creek site was added in 2018.**

## Aquatic Invertebrates

The Upper Ruby Creek site is characterized by beaver pond habitats, deep water, dense vegetative cover, short channels between beaver dams, and minimal gravel/cobble. The sample site is located in a channel between beaver dams and was chosen for its gravel/cobble substrate. Aquatic invertebrate densities in Upper Ruby Creek were the highest among the sample sites and averaged 12.7 aquatic invertebrates/$m^3$ of water (Figure 9). A total of 23 taxa were identified in the Upper Ruby Creek samples. Samples were dominated by aquatic Diptera (54%), which were primarily chironomids, and followed closely by other species (43%), which were primarily Ostracods and Cladocerans (Figure 10). Ephemeroptera, Plecoptera, and Tricoptera (EPT) only made up 3% of the sample (Figure 11).

The Lower Ruby Creek sample site is characterized by pool/riffle habitat, shallower water, gravel/cobble substrate, and grass riparian habitats. Aquatic invertebrate densities in Lower Ruby Creek averaged 4.6 aquatic invertebrates/$m^3$ of water (Figure 9). A total of 23 taxa were identified in Lower Ruby Creek. Samples were dominated by aquatic Diptera (56%), which were primarily chironomids, other species (27%) which were primarily Cladocerans, Ostracods, and Acarians, followed by EPT species (17%) (Figures 10 and 11).

The Shungnak River sample site is characterized by deep water, outside bend cut banks and inside bend gravel bars. The substrate is primarily gravel with some cobble. Species richness was the highest among all the sample sites with 32 total different taxa identified, yet it had the second lowest density at 2.8 aquatic invertebrates/$m^3$ (Figure 9). This site also had the second highest percentage of EPT species at 26%, most of which were species in the order Ephemeroptera (Figures 10 and 11). The remaining samples were comprised of aquatic Diptera (43%), primarily chironomids, and other species (32%).

The Upper Subarctic Creek sample site is located in alpine tundra and is characterized by high gradient with step pools and large boulders. There are some shrubby willows along the banks, but most vegetation is limited to ground cover. The average aquatic invertebrate density in Upper Subarctic Creek in 2019 was 8.5 aquatic invertebrates/$m^3$ (Figure 9), which is lower than the densities observed in 2016 (23.9 aquatic invertebrates/$m^3$) and 2017 (11.1 aquatic invertebrates/$m^3$). Similar to past years, this site had the lowest species richness with 16 total taxa identified. Aquatic Diptera, mostly chironomids, accounted for 50%, other species, primarily Ostracods, accounted for 37%, and EPT accounted for 13% (Figure 10). In past sample years, Upper Subarctic Creek has had higher % EPT than % Chironomidae, but that was not the case in 2019 (Figure 11). This sample site is located a few hundred yards below the origin of the creek, which abruptly forms when water transitions from subsurface to surface flow.

The Lower Subarctic Creek site has a much lower gradient than the upper site, is wider, and is characterized by riffle/pool habitat with gravel/cobble substrate. The average aquatic invertebrate density was 3.1 aquatic invertebrates/m$^3$ (Figure 9). Aquatic invertebrates were comprised of aquatic Diptera (59%), most of which were chironomids, EPT (24%), most of which were Ephemeroptera, and other species (17%) (Figures 10 and 11).

The Riley Creek site is characterized by riffle/pool habitat with gravel and cobble. The average aquatic invertebrate density in Riley Creek was 7.5 aquatic invertebrates/m$^3$ (Figure 9). A total of 27 taxa were captured represented primarily by aquatic Diptera (60%), followed by EPT (31%), then other species (9%) (Figures 10 and 11).

The Jay Creek site is characterized by riffle/run habitats with very dense vegetation and canopy cover barely wide enough for the five drift nets. The second highest average aquatic invertebrate densities occurred here with 8.8 aquatic invertebrates/m$^3$ (Figure 9). Aquatic Diptera dominated the community composition (51%), most of which were chironomids, followed by other species (35%), and EPT (14%) (Figures 10 and 11).

The Lower Red Rock Creek sample site has similar habitat to the Lower Subarctic Creek site, with riffle/pool habitat and gravel/cobble substrate. The average aquatic invertebrate density was the lowest of all sample sites in 2019 with 1.06 aquatic invertebrates/m$^3$ (Figure 9). Other species, primarily Acarians, dominated the community composition (52%), followed by aquatic Diptera (29%), and EPT species (19%) (Figures 10 and 11).

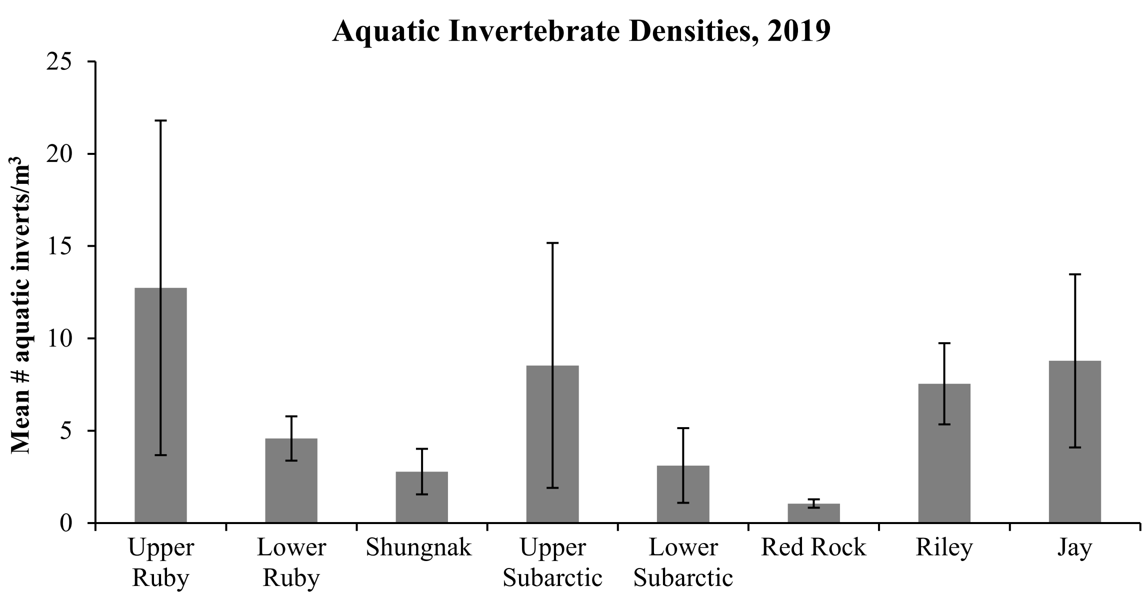


**Figure 9. Mean number of aquatic invertebrates/m$^3$ (± 1 SD) at each sample site, 2019.**

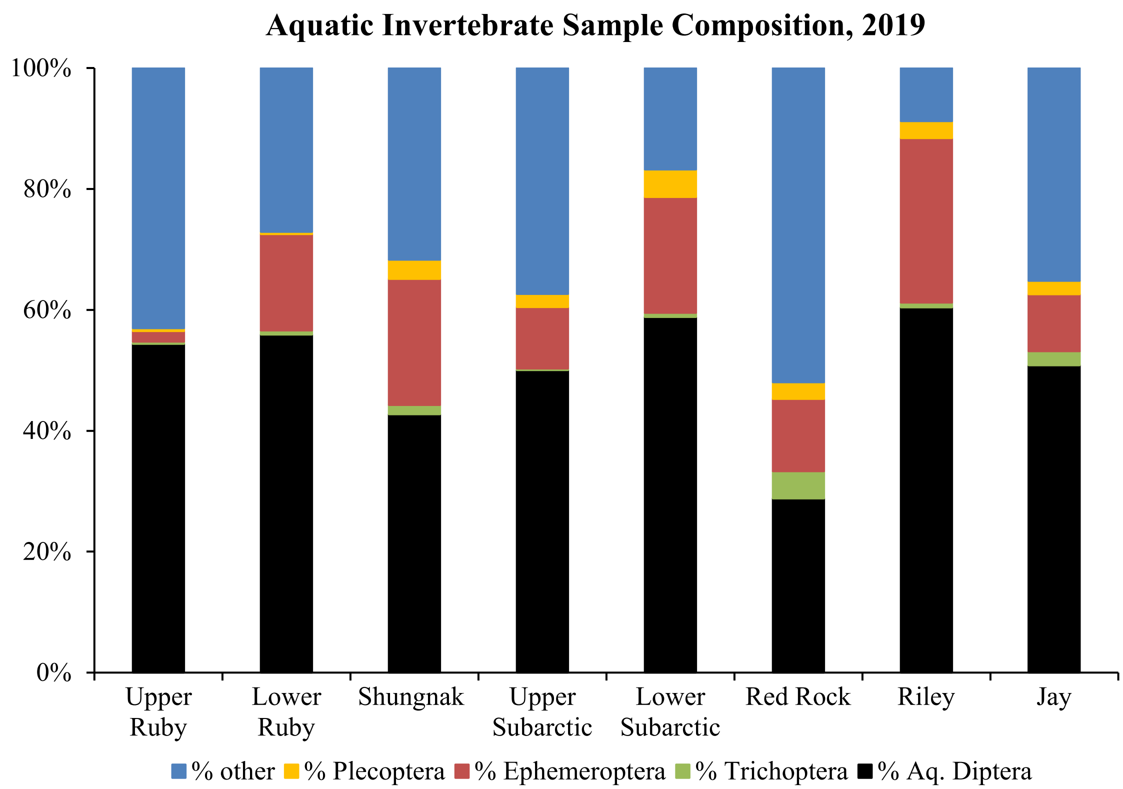


**Figure 10. Mean percent EPT, aquatic diptera, and other species in the aquatic invertebrate samples, 2019.**

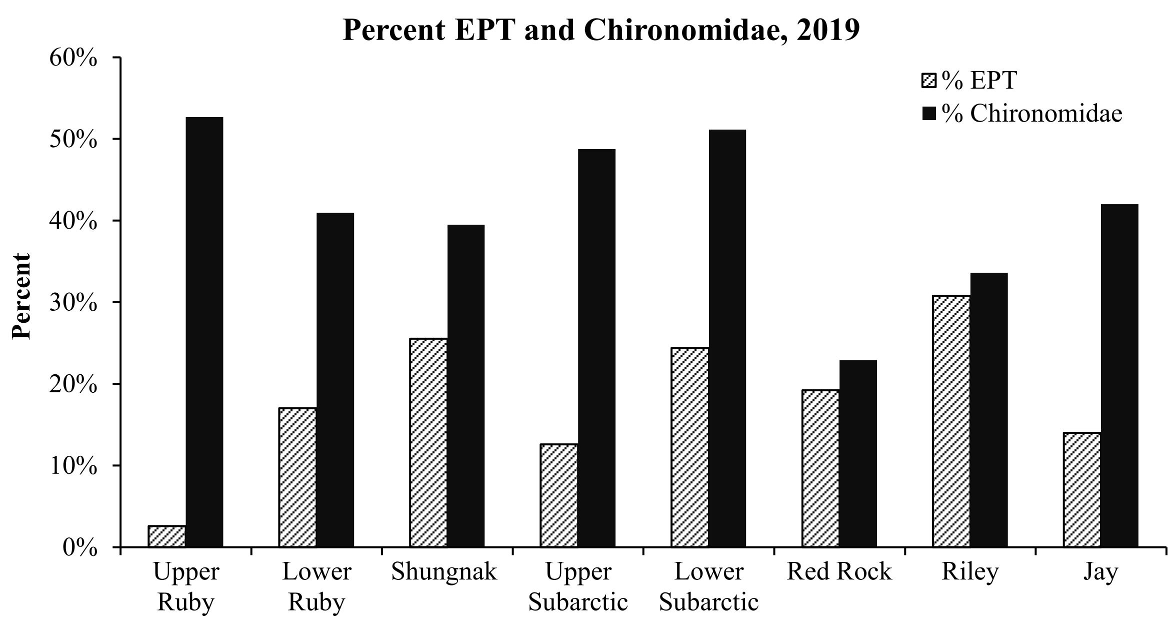


**Figure 11. Percent EPT and Chironomidae in the aquatic invertebrate samples at all sample sites, 2019.**

## Fish Captures

*July Minnow Traps*

Throughout Ruby Creek, slimy sculpin dominated catches, followed by Dolly Varden (Table 2). There are many beaver dams in this drainage which may impede upstream passage of fish. Ponds created by beavers may also provide overwintering habitat in Upper Ruby Creek by creating large, deep pools. Fifteen slimy sculpin from Lower Ruby Creek were retained for element analysis.

Dolly Varden dominated catches in Subarctic Creek, with only three slimy sculpin captured at the Lower Subarctic Creek sample site (Table 2). Catches of Dolly Varden at the Upper Subarctic Creek site are typically high, but nine out of ten minnow traps were crushed by a bear in July 2019 and any captured fish were lost (Figure 12). Fourteen Dolly Varden from the lower sample site were retained for whole body element analysis.

A total of 15 slimy sculpin, five Dolly Varden, and one Arctic grayling were captured on Riley Creek in 2019 (Table 2). Seven slimy sculpin were retained for whole body element analysis.

Jay Creek is a small tributary to Ruby Creek and is characterized by riffle run habitat and dense vegetation cover. A total of three Dolly Varden were captured on Jay Creek, and one was in the correct size range for whole body element analysis. Since we are unable to consistently catch enough fish for an adequate sample size in this creek, we plan to cease lethal sampling in future years.

**Figure 12. Minnow traps from Upper Subarctic Creek that were crushed by a bear.**

Three sample sites in Red Rock Creek were added in 2018 to ascertain if Red Rock Creek could provide viable fish habitat in case Subarctic Creek is impacted by mine development. Dolly Varden were captured at all three sample sites, even above a series of small waterfalls between the middle and upper sample sites. In 2019 we sampled the lower site only. A total of 25 Dolly Varden were captured and 15 were retained for element analysis.

In addition to the standard aquatic biomonitoring in the Ruby and Subarctic drainages, we set minnow traps on Wesley and Dahl creeks. The Bornite Road connects the Bornite Camp to the Dahl Creek Airstrip, and traps were set upstream and downstream of the Bornite Road crossings on these two creeks to ascertain fish presence (Figure 13). The lower section of Wesley Creek is classified as anadromous for Dolly Varden.

**Figure 13. Bridges over Dahl Creek (left) and Wesley Creek (right) in July 2019. The Dahl Creek bridge is scheduled to be replaced in 2020.**

**Table 2. Number, mean length, and length range of slimy sculpin and Dolly Varden captured in minnow traps at nine sample sites, July 15 – 19, 2019.**

| Sample Site | Slimy Sculpin | | | Dolly Varden | | |
|---|---|---|---|---|---|---|
| | Number captured | Mean total length (mm) | Length range (mm) | Number captured | Mean fork length (mm) | Length range (mm) |
| Subarctic | | | | | | |
| Upper[1] | 0 | --- | --- | 5 | 105 | 83-122 |
| Lower | 3 | 52 | 47-59 | 31 | 102 | 35-155 |
| Ruby | | | | | | |
| Upper | 22 | 81 | 68-90 | 4 | 137 | 116-155 |
| Lower | 30 | 63 | 44-87 | 0 | --- | --- |
| Red Rock | | | | | | |
| Lower | 3 | 65 | 63-67 | 2 | 109 | 108-110 |
| Jay | 0 | --- | --- | 3 | 109 | 86-148 |
| Riley[2] | 15 | 63 | 50-81 | 3 | 102 | 75-129 |
| Dahl[3] | 0 | --- | --- | 10 | 112 | 75-154 |
| Wesley | 0 | --- | --- | 21 | 130 | 120-147 |

[1]Nine of ten minnow traps were destroyed by a bear
[2]One Arctic grayling was also captured
[3]Two Arctic grayling were also captured

*Fyke nets*

On July 15, two fyke nets were set near the mouth of Ruby Creek, one to capture fish moving upstream, and the other set to capture fish moving downstream. The nets were checked every day and pulled on July 18. All captured fish except slimy sculpin received a fin clip on the upper caudal fin to prevent double counting. A total of 69 round whitefish, 24 Arctic grayling, three Dolly Varden, three longnose suckers, and seven slimy sculpin were captured (Figure 14). The captured Arctic grayling ranged from 119 – 235 mm FL, with an average size of 186 mm (Figure 15). Captured round whitefish ranged from 41 – 310 mm FL, with an average size of 105 mm (Figures 16 and 17). Fifteen round whitefish between 90 – 13 mm FL were retained for whole body element analysis.

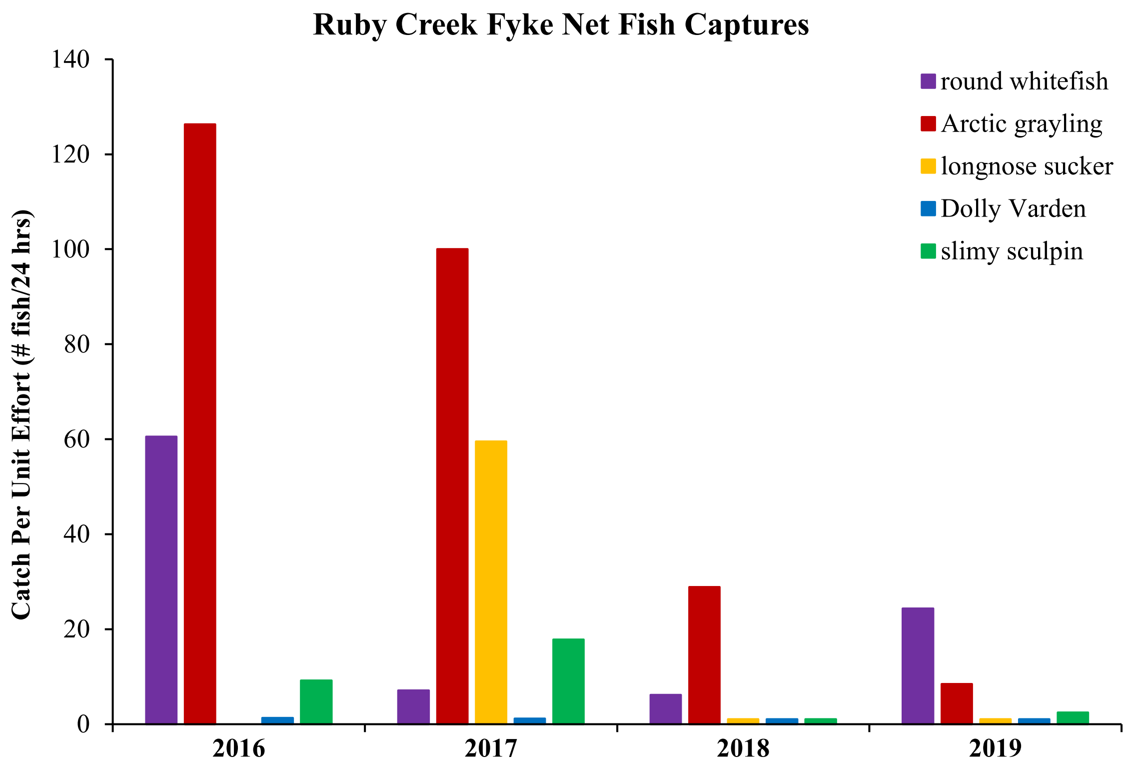


**Figure 14. Ruby Creek fyke net fish captures by species for 2016 – 2019.**

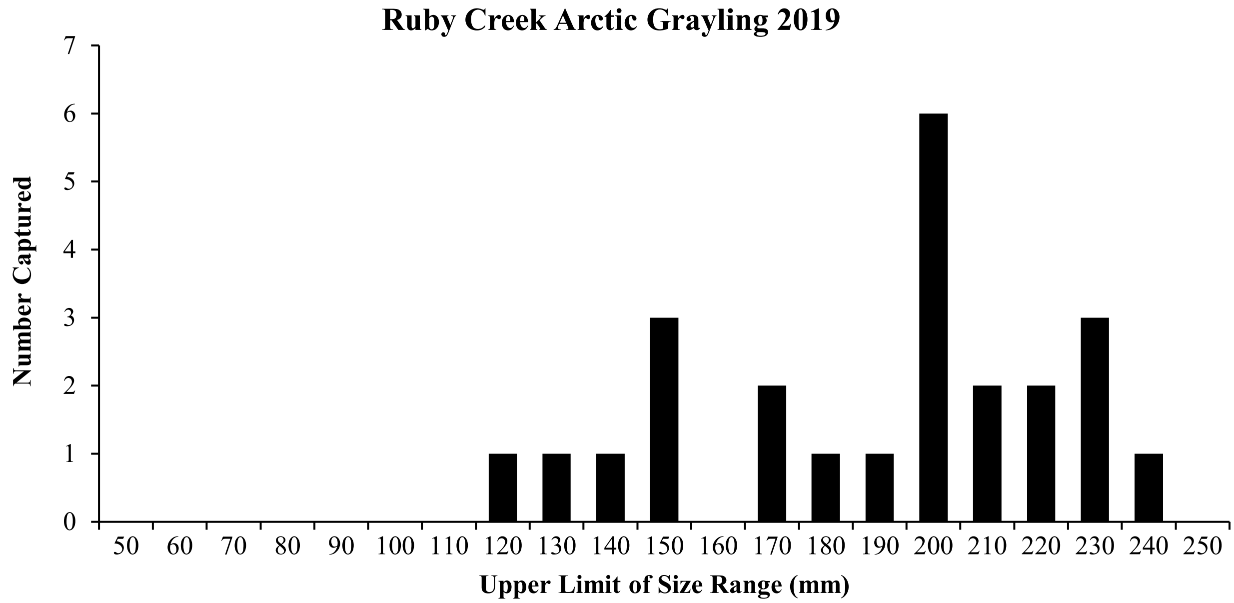


**Figure 15. Length frequency distribution of Arctic grayling captured near the mouth of Ruby Creek in 2019.**

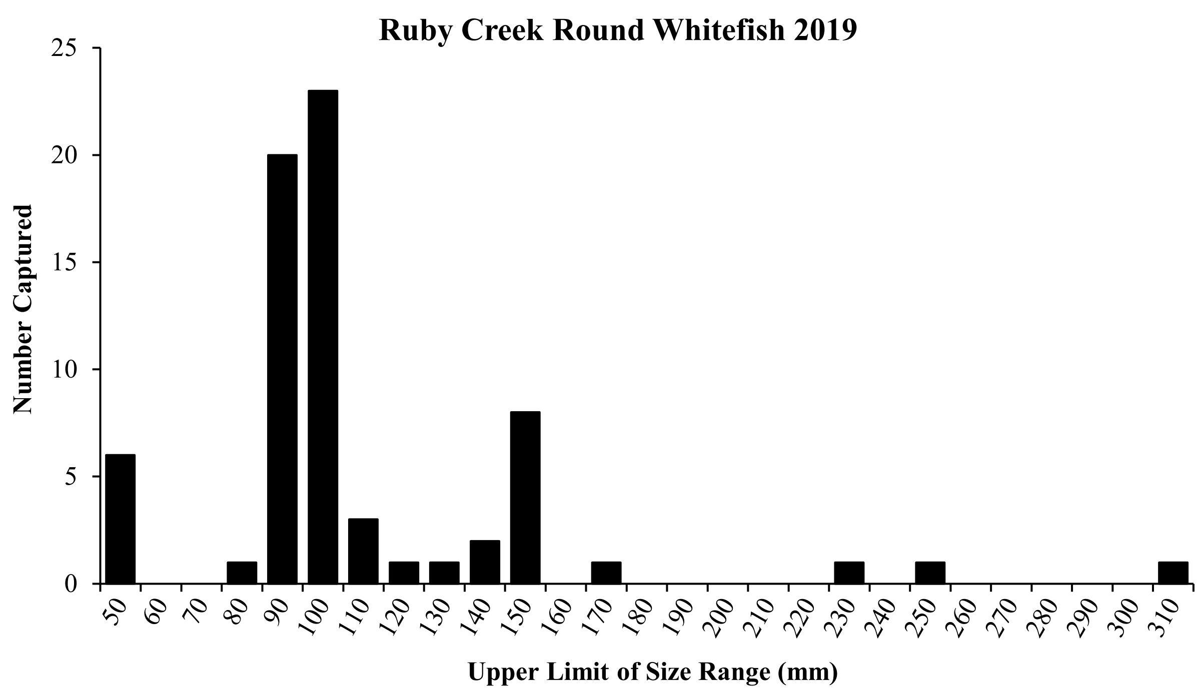


**Figure 16. Length frequency distribution of round whitefish captured near the mouth of Ruby Creek in 2019.**

**Figure 17. Round whitefish captured in the fyke net near the mouth of Ruby Creek in July 2019.**

One fyke net was set at the mouth of Subarctic Creek on July 16. The net was checked approximately every 24 hours and was pulled on July 18. Only the downstream net was set, as the upstream net had very low catches in previous years. A total of 14 fish were captured, of which three were Dolly Varden, five were Arctic grayling, two were round whitefish, and four were slimy sculpin. The Dolly Varden ranged from 103 – 162 mm FL with an average size of 127 mm, the Arctic grayling ranged from 104 – 207 mm FL with an average size of 147 mm, the round whitefish were 91 and 358 mm FL, and the slimy sculpin ranged from 51 – 66 mm TL with an average size of 56 mm.

*September Minnow Traps*

A total of 47 fish were captured at the Upper Subarctic Creek site, ranging from 61 – 157 mm FL with an average size of 118 mm FL. Some of the captured fish appeared to be in spawning condition with very bright spots and white fins, and 17 of the fish were ripe males, i.e. they expelled milt when gently squeezed (Figure 18). None of the fish spilled eggs when squeezed, but eight of the fish were tentatively identified as female because they had large, soft bellies and did not produce milt.

**Figure 18. Ripe male Dolly Varden captured at Upper Subarctic Creek (September 4, 2019).**

The sample sites on Center of the Universe Creek were added in 2018. Center of the Universe Creek is a tributary of Red Rock Creek that enters above the Upper Red Rock Creek sampling location. Both sites are characterized by riffles and runs interspersed with pools. Substrate here is smaller gravel than at other downstream sites. A total of 17 Dolly Varden were caught at the Upper Center of the Universe Creek sample site, ranging from 86 – 157 mm FL with an average size of 124 mm FL. Six of the fish were males, one fish was tentatively identified as female, and the rest were immature.

A total of 64 Dolly Varden were captured over both sites, and ranged in length from 61 – 157 mm FL (Figure 19). Mature fish averaged 136 mm Fl and immature fish average 100 mm FL.

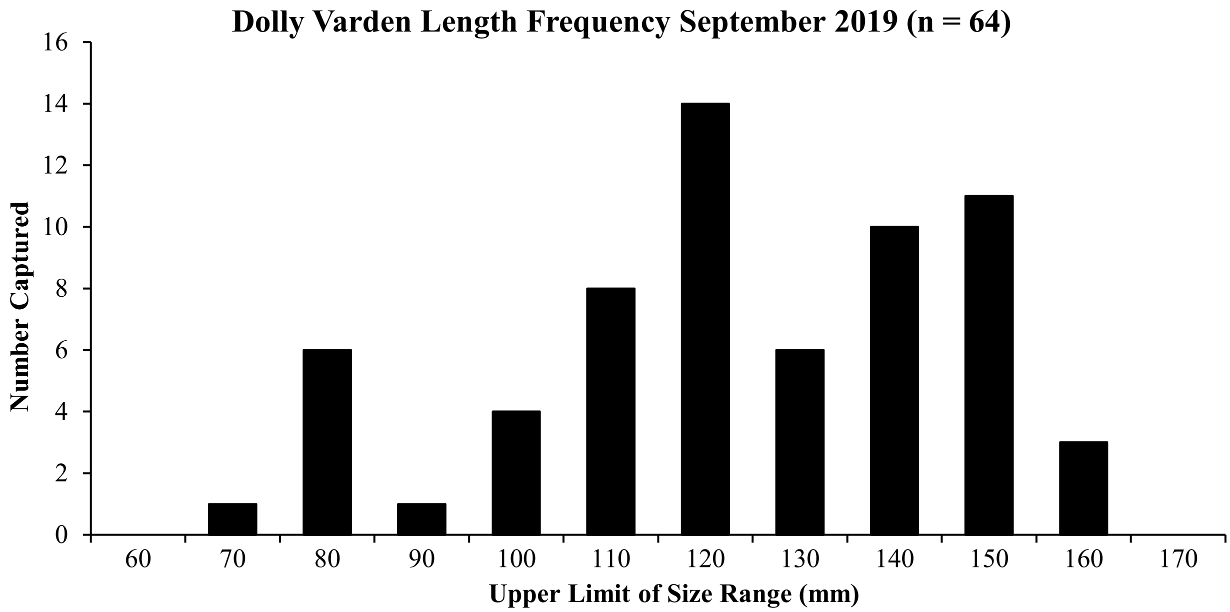


**Figure 19. Length frequency distribution of resident Dolly Varden in the Subarctic and Red Rock drainages.**

*September Aerial Surveys*

An aerial survey of the Kogoluktuk River was flown from approximately two miles upstream of the mouth of Riley Creek downstream to where the Kogoluktuk joins the Kobuk River. The Kogoluktuk River is documented as anadromous for chum salmon, Dolly Varden, and whitefish to 66.9901°N, 156.7062°W, where a series of rapids end, approximately five miles downstream from the mouth of Riley Creek (Figure 20). On this survey, no anadromous fish were observed until near the mouth of the Kogoluktuk on the Kobuk. Hundreds of chum salmon were holding in deep pools in this area, possibly waiting to move upstream to spawn.

Aerial surveys were also flown on Wesley and Dahl creeks from their mouths on the Kobuk River to the Bornite Road crossings. No anadromous fish were observed, although no barriers preventing upstream movement from the Kobuk River were observed. Dolly Varden were captured in minnow traps in July 2019 in both creeks, but it is unknown if those juvenile Dolly Varden were resident or anadromous.

**Figure 20. The upstream extent of a series of rapids on the Kogoluktuk River.**

**Fish Metals**

Fish retained for element analysis are listed in Appendix 2 and results for each fish are listed in Appendix 3. Similar elements have been examined in whole body juvenile Dolly Varden around the state including Tulsequah Chief Mine, the Pebble prospect, Red Dog Mine, Greens Creek Mine, and Kensington Mine and provide a good data set for comparative purposes (Legere and Timothy, 2016). Arctic grayling, slimy sculpin, Dolly Varden, and round whitefish have been captured in creeks around the Arctic-Bornite Prospect and analyzed for whole body element concentrations from 2016 to 2019. In 2016, Arctic grayling were analyzed from Lower Subarctic Creek and Lower Ruby Creek, Dolly Varden were analyzed from Upper Subarctic Creek, and slimy sculpin were analyzed from Upper Ruby Creek. In 2017, the Jay and Riley Creek sites were added, but these samples were lost when the cooler of frozen fish was misplaced by the shipper. Additional samples were collected in the fall, and included Dolly Varden from Upper and Lower Subarctic Creek and slimy sculpin from Upper Ruby Creek. In 2018, Dolly Varden were collected from Upper Subarctic Creek, Lower Red Rock Creek, and Jay Creek. Slimy sculpin were collected from Riley Creek and Upper Ruby Creek. In 2019, Dolly Varden were collected from Jay Creek, Lower Subarctic Creek, and Lower Red Rock Creek. Slimy sculpin were collected from Riley Creek and Lower Ruby Creek, and round whitefish were collected from the fyke net at the mouth of Ruby Creek.

In 2019, median cadmium concentrations were highest, but variable, in the Dolly Varden from Lower Red Rock Creek, with a median cadmium concentration of 1.01 mg/kg (Figure 21). Slimy sculpin and round whitefish from Ruby Creek had the lowest median cadmium concentrations, 0.12 and 0.09 mg/kg. Ruby Creek fish have consistently had the lowest cadmium concentrations since sampling began in 2016.

The annual median whole body cadmium concentration in Dolly Varden captured in Buddy Creek near the Red Dog Mine has ranged from 0.27 mg/kg to 1.64 mg/kg. The cadmium concentrations in fish from Subarctic and Red Rock creeks are similar to the concentrations seen near Red Dog Mine, while concentrations in fish from Ruby, Jay, and Riley creeks are lower (Figure 26).

Median copper concentrations in 2019 were highest in Jay Creek (9.86 mg/kg), although only one fish was sampled, followed by Lower Red Rock Creek (4.83 mg/kg) (Figure 22). Concentrations were lowest in fish from Ruby Creek. These copper concentrations in Dolly Varden at Arctic-Bornite are similar to other locations from across the state (Legere and Timothy, 2016). Dolly Varden from Buddy Creek (Red Dog Mine) were analyzed for copper in 2014 and 2015, and the median copper concentration was 3.2 mg/kg in 2014 and 3.9 mg/kg in 2015. Fish from Subarctic, Red Rock and Jay creeks have slightly higher copper concentrations than Buddy Creek fish, while concentrations in fish from Riley Creek are similar to Buddy Creek fish (Figure 26).

Median mercury concentrations in 2019 were highest in slimy sculpin from Lower Ruby Creek (0.32 mg/kg), followed by slimy sculpin from Riley Creek (0.23 mg/kg). Median mercury concentrations were lowest in Dolly Varden from Lower Subarctic Creek and Lower Red Rock creeks, 0.05 and 0.07 mg/kg, respectively (Figure 23). Median mercury concentrations in Dolly Varden from Buddy Creek (Red Dog Mine) have ranged from 0.02 mg/kg to 0.06 mg/kg. Mercury concentrations in fish from the Arctic-Bornite creeks are generally higher those measured in fish from Buddy Creek (Figure 27).

Selenium concentrations in 2019 were similar among all sample sites. The highest median selenium concentration was 5.74 mg/kg in slimy sculpin from Riley Creek (Figure 24). These values are slightly higher than those found at Tulsequah Chief Mine and the Pebble Prospect, and comparable to those found in juvenile Dolly Varden at Red Dog Mine, Greens Creek Mine, and Kensington Mine (Legere and Timothy, 2016). Median selenium concentrations in Dolly Varden from Buddy Creek have ranged from 3.8 mg/kg to 9.1 mg/kg. Fish from the creeks around the Arctic-Bornite Prospect have similar selenium concentrations (Figure 27).

In 2019, median zinc concentrations were very similar in Dolly Varden from Lower Subarctic and Jay creeks and slimy sculpin from Riley and Lower Ruby creeks (Figure 25). The lowest median zinc concentration was in round whitefish from Ruby Creek (85.44 mg/kg), and the highest was in Dolly Varden from Lower Red Rock Creek (156.25 mg/kg). The median zinc concentrations from fish sampled in 2019 were lower than those found in 2018, but still fall within the range of concentrations found in Dolly Varden in other regions of the state (Legere and Timothy, 2016). Dolly Varden from Buddy Creek have had median zinc concentrations ranging from 116 mg/kg to 227 mg/kg. Concentrations in fish from Subarctic and Red Rock creeks are similar, while concentrations in fish from Ruby, Riley, and Jay creeks are typically lower (Figure 28).

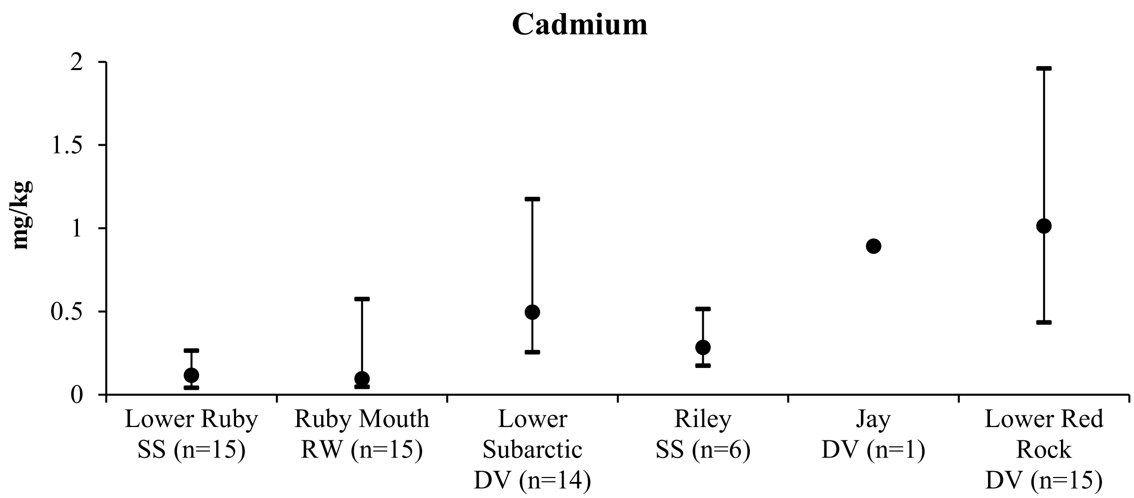


**Figure 21. Minimum, median, and maximum whole body dry weight concentrations of cadmium (mg/kg) in Dolly Varden, slimy sculpin, and round whitefish from various sample sites, 2019.**

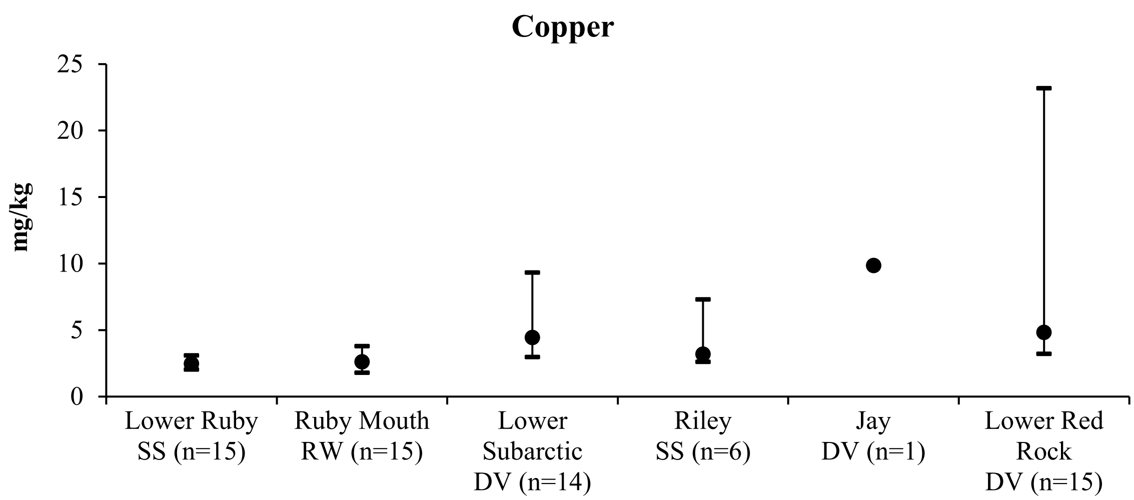


**Figure 22. Minimum, median, and maximum whole body dry weight concentrations of copper (mg/kg) in Dolly Varden, slimy sculpin, and round whitefish from various sample sites, 2019.**

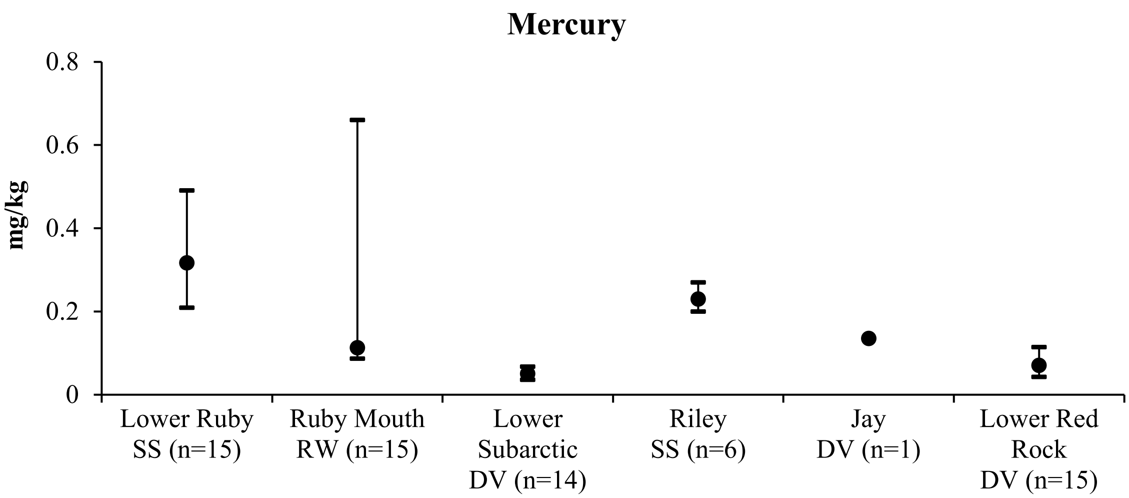


**Figure 23. Minimum, median, and maximum whole body dry weight concentrations (mg/kg) of mercury in Dolly Varden, slimy sculpin, and round whitefish from various sample sites, 2019.**

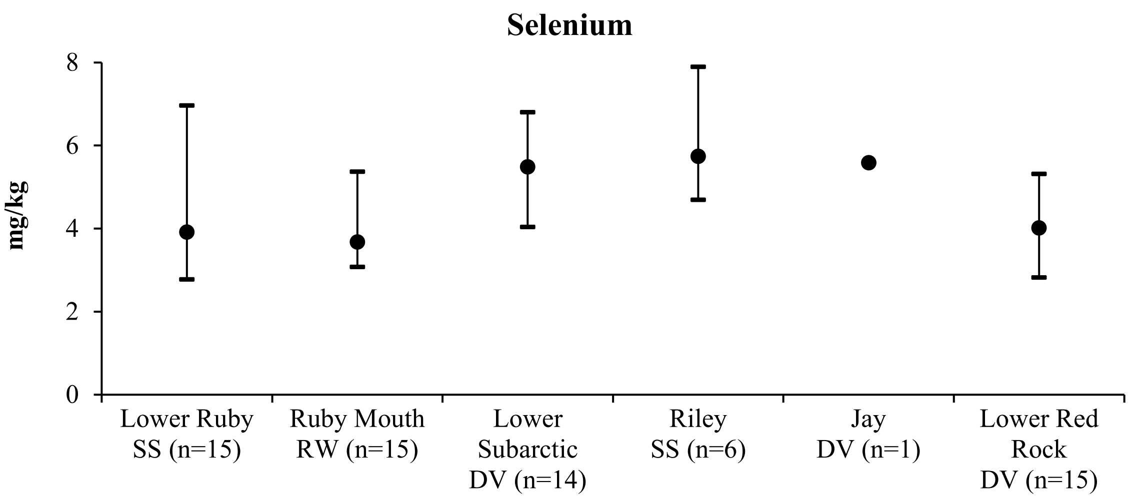


**Figure 24. Minimum, median, and maximum whole body dry weight concentrations of selenium (mg/kg) in Dolly Varden, slimy sculpin, and round whitefish from various sample sites, 2019.**

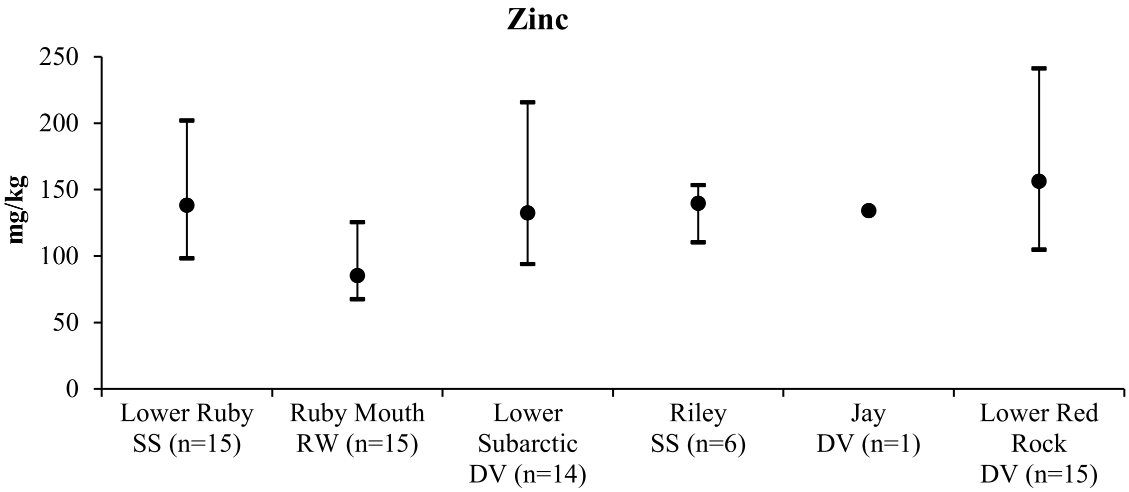


**Figure 25. Minimum, median, and maximum whole body dry weight concentrations of zinc (mg/kg) in Dolly Varden, slimy sculpin, and round whitefish from various sample sites, 2019.**

Over the four years of baseline data collection at the Arctic-Bornite Prospect, different fish species have been sampled at different locations. Sample sites have been moved, added, and deleted based on changing plans for mine development, accessibility, and likelihood of capturing an adequate sample size. Therefore, comparisons between sample results must be evaluated accordingly. Generally, median whole body cadmium concentrations are highest in fish from Subarctic and Red Rock creeks and lowest in Ruby Creek. Median whole body copper concentrations are similar in Subarctic, Red Rock, Jay, and Riley creeks, and lowest in Ruby Creek. Median whole body mercury concentrations are lowest in fish from the Subarctic and Red Rock Creek drainages, highest in fish from Ruby Creek, and intermediate in fish from Jay and Riley creeks. Median selenium and zinc concentrations are similar among all drainages.

# CONCLUSION

Despite being isolated from the Kobuk River by a large waterfall, the Shungnak River drainage supports self-sustaining populations of Arctic grayling, Dolly Varden, round whitefish, slimy sculpin, longnose sucker, and Alaska blackfish.

Similar to previous years, catches in Subarctic Creek in 2019 were dominated by Dolly Varden. Upper Subarctic Creek typically has low aquatic invertebrate species richness, but high density. It is likely the Dolly Varden move into the upper reaches of Subarctic Creek to feed on the abundant aquatic insects, and with the confirmation of fish in spawning condition in September, they likely remain there to spawn. In other populations of dwarf resident Dolly Varden, males mature as early as age 2 and almost all are mature by age 3, while females mature at ages 3 or 4 (McCart and Craig 1973, McCart and Bain 1974, Armstrong and Morrow 1980). The oldest Dolly Varden that has been aged from the sample sites was an age 7 fish from Subarctic Creek. Dolly Varden in other resident populations have attained age 10, but few fish survive beyond age 5 (Armstrong and Morrow 1980).

Dolly Varden spawning location was confirmed in 2018 through the capture of a very small young of the year fish and capture of ripe females in September (Clawson 2019). So far, spawning has been confirmed in Upper Subarctic Creek and Lower Red Rock Creek, but it is likely that spawning occurs in other places like Center of the Universe Creek. The sampling in September 2019 provided additional evidence of spawning with the capture of ripe males and likely females at Upper Center of the Universe Creek.

The Dolly Varden captured in Riley Creek in July have the potential to be anadromous as no permanent physical barrier exists downstream. A series of rapids on the Kogoluktuk River could impede upstream passage, but are not known to definitively prevent upstream movement. If some of these fish are anadromous, Riley Creek may serve as spawning habitat for resident Dolly Varden and rearing habitat for anadromous juveniles. However, the presence of small, sexually mature males found in previous years does not prove there is a self-sustaining resident population of Dolly Varden in Riley Creek. Many anadromous populations of Dolly Varden contain “residual” males that never migrate to the ocean, but instead spend their entire life cycle in freshwater. These males act as sneaker males and spawn with anadromous females (Armstrong and Morrow 1980). If the Riley Creek area remains in consideration as a tailings storage facility location, future fish sampling in Riley Creek will potentially involve genetic sampling to compare to Subarctic resident Dolly Varden and Kobuk drainage anadromous Dolly Varden. With the baseline genetic information on the resident Dolly Varden in Subarctic Creek showing they are reproductively isolated and contain less genetic variation than anadromous Dolly Varden from the Kobuk River, genetics from Riley Creek could provide insight to whether some are anadromous or not. Additional fall aerial surveys in the Kogoluktuk River to look for anadromous Dolly Varden would help confirm the presence or absence of anadromous fish.

In 2016, fyke net catches in Ruby Creek were dominated by age 0 Arctic grayling and round whitefish. In 2017 and 2018, most Arctic grayling were age 1+ and very few round whitefish were captured. In 2019 the fyke nets in Ruby Creek were fished for 72 hours instead of 24 hours to better capture the range of fish movement in these tributaries to the Shungnak River. The increased fishing time resulted in higher numbers of fish captures, including a wider range of age classes of Arctic grayling and round whitefish. Based on catches in 2016 to 2019, it is likely Arctic grayling, round whitefish, and longnose suckers spawn upstream of Ruby Creek in the Shungnak River drainage.

If future aquatic sampling is planned, we recommend continuation of periphyton and aquatic invertebrate sampling. Future fish work should be focused on expanding our understanding of how and when fish utilize target areas around the Arctic and Bornite deposits. Additional recommendations include obtaining greater sample sizes for fish whole body element analysis and conducting fall aerial surveys.

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# APPENDIX 1. WATER QUALITY DATA FROM 2019

Only metals data used in fish whole body element analyses are shown. Acute and chronic water quality standards for aquatic life are shown for cadmium, copper, and zinc, which are dependent on water hardness. The cadmium sample highlighted in yellow were the only samples that exceeded the more stringent chronic aquatic life exposure limit.

| Site Location | Collection Date | Cadmium (ug/L) | Cadmium Acute Limit (ug/L) | Cadmium Chronic Limit (ug/L) | Copper (ug/L) | Copper Acute Limit (ug/L) | Copper Chronic Limit (ug/L) | Mercury (ng/L) | Selenium (ug/L) | TDS (mg/L) | Zinc (ug/L) | Zinc Acute Limit (ug/L) | Zinc Chronic Limit (ug/L) | Hardness CaCO3 (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper | 3/30/2019 | 0.025 | 3.120 | 0.340 | 0.273 | 20.556 | 13.167 | 0.831 | 0.382 | 198 | 5.000 | 171.728 | 173.133 | 157 |
| Ruby | 6/6/2019 | 0.025 | 2.346 | 0.274 | 0.527 | 15.582 | 10.242 | 0.677 | 0.596 | 147 | 5.000 | 133.853 | 134.948 | 117 |
| | 8/29/2019 | 0.025 | 2.676 | 0.301 | 0.287 | 17.706 | 11.500 | 0.736 | 0.391 | 165 | 5.000 | 150.159 | 151.387 | 134 |
| | 12/5/2019 | 0.025 | 3.160 | 0.339 | 0.370 | 20.803 | 13.311 | 2.190 | 0.536 | 198 | 5.000 | 173.580 | 175.000 | 159 |
| Lower | 3/30/2019 | 0.025 | 2.793 | 0.311 | 0.536 | 18.452 | 11.939 | 0.500 | 0.574 | 180 | 5.000 | 155.837 | 157.111 | 140 |
| Ruby | 6/22/2019 | 0.025 | 2.735 | 0.306 | 1.750 | 18.080 | 11.720 | 1.780 | 0.500 | 153 | 5.000 | 153.002 | 154.254 | 137 |
| | 9/2/2019 | 0.025 | 2.948 | 0.323 | 1.380 | 19.444 | 12.520 | 1.480 | 0.500 | 165 | 5.000 | 163.350 | 164.686 | 148 |
| | 12/9/2019 | 0.025 | 4.083 | 0.408 | 1.120 | 26.673 | 16.676 | 1.130 | 0.808 | 294 | 3.790 | 217.059 | 218.834 | 207 |
| Shungnak | 6/27/2019 | 0.239 | 1.562 | 0.205 | 1.440 | 10.506 | 7.163 | 0.671 | 0.341 | 124 | 19.300 | 93.903 | 94.671 | 77 |
| | 8/24/2019 | 0.369 | 1.778 | 0.225 | 2.160 | 11.914 | 8.029 | 0.544 | 0.393 | 75 | 29.000 | 105.151 | 106.012 | 88 |
| Upper | 4/1/2019 | 0.047 | 1.006 | 0.150 | 0.305 | 6.862 | 4.868 | 0.707 | 0.409 | 63 | 5.000 | 64.026 | 64.550 | 49 |
| Subarctic | 6/7/2019 | 0.018 | 0.543 | 0.096 | 0.250 | 3.777 | 2.833 | 1.940 | 0.500 | 23 | 5.000 | 37.425 | 37.731 | 26 |
| | 8/23/2019 | 0.018 | 0.946 | 0.143 | 0.247 | 6.466 | 4.612 | 0.500 | 0.500 | 51 | 5.000 | 60.689 | 61.185 | 46 |
| | 12/8/2019 | 0.025 | 1.086 | 0.158 | 0.203 | 7.389 | 5.206 | 0.733 | 0.500 | 67 | 5.000 | 68.428 | 68.988 | 53 |
| Lower | 6/7/2019 | 0.085 | 0.563 | 0.099 | 2.230 | 3.914 | 2.926 | 1.210 | 0.420 | 34 | 11.300 | 38.641 | 38.957 | 27 |
| Subarctic | 12/11/2019 | 0.063 | 1.026 | 0.152 | 0.655 | 6.994 | 4.953 | 2.020 | 0.620 | 65 | 7.830 | 65.132 | 65.664 | 50 |
| Lower | 6/11/2019 | 0.025 | 1.896 | 0.236 | 0.618 | 12.678 | 8.495 | 0.500 | 0.700 | 151 | 5.000 | 111.195 | 112.105 | 94 |
| Riley | 8/21/2019 | 0.025 | 2.307 | 0.271 | 0.602 | 15.331 | 10.092 | 1.440 | 0.593 | 143 | 5.000 | 131.912 | 132.991 | 115 |

# APPENDIX 2. LIST OF FISH RETAINED FOR WHOLE BODY ELEMENT ANALYSIS

| Sample ID | Stream | Site | Date Collected | Fish Spp[1] | Length (mm) | Weight (g) | Metals to be analyzed | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cu | Hg | Se | Cd | Zn |
| 071719RUBRWJ01 | Ruby | Fyke Mouth | 7/17/2019 | RW | 112 | 10.9 | x | x | x | x | x |
| 071719RUBRWJ02 | Ruby | Fyke Mouth | 7/17/2019 | RW | 94 | 6.3 | x | x | x | x | x |
| 071719RUBRWJ03 | Ruby | Fyke Mouth | 7/17/2019 | RW | 94 | 6.8 | x | x | x | x | x |
| 071719RUBRWJ04 | Ruby | Fyke Mouth | 7/17/2019 | RW | 93 | 6.2 | x | x | x | x | x |
| 071719RUBRWJ05 | Ruby | Fyke Mouth | 7/17/2019 | RW | 96 | 6.2 | x | x | x | x | x |
| 071719RUBRWJ06 | Ruby | Fyke Mouth | 7/17/2019 | RW | 95 | 7.2 | x | x | x | x | x |
| 071719RUBRWJ07 | Ruby | Fyke Mouth | 7/17/2019 | RW | 130 | 16.0 | x | x | x | x | x |
| 071719RUBRWJ08 | Ruby | Fyke Mouth | 7/17/2019 | RW | 98 | 6.6 | x | x | x | x | x |
| 071719RUBRWJ09 | Ruby | Fyke Mouth | 7/17/2019 | RW | 100 | 8.3 | x | x | x | x | x |
| 071719RUBRWJ10 | Ruby | Fyke Mouth | 7/17/2019 | RW | 98 | 8.0 | x | x | x | x | x |
| 071719RUBRWJ11 | Ruby | Fyke Mouth | 7/17/2019 | RW | 91 | 6.2 | x | x | x | x | x |
| 071719RUBRWJ12 | Ruby | Fyke Mouth | 7/17/2019 | RW | 97 | 6.3 | x | x | x | x | x |
| 071719RUBRWJ13 | Ruby | Fyke Mouth | 7/17/2019 | RW | 92 | 6.7 | x | x | x | x | x |
| 071719RUBRWJ14 | Ruby | Fyke Mouth | 7/17/2019 | RW | 99 | 8.3 | x | x | x | x | x |
| 071719RUBRWJ15 | Ruby | Fyke Mouth | 7/17/2019 | RW | 97 | 7.4 | x | x | x | x | x |
| | | | | | | | | | | | |
| 071819LRRDVJ01 | Red Rock | Lower | 7/18/2019 | DV | 118 | 18.0 | x | x | x | x | x |
| 071819LRRDVJ02 | Red Rock | Lower | 7/18/2019 | DV | 107 | 12.2 | x | x | x | x | x |
| 071819LRRDVJ03 | Red Rock | Lower | 7/18/2019 | DV | 125 | 18.7 | x | x | x | x | x |
| 071819LRRDVJ04 | Red Rock | Lower | 7/18/2019 | DV | 124 | 18.6 | x | x | x | x | x |
| 071819LRRDVJ05 | Red Rock | Lower | 7/18/2019 | DV | 114 | 14.6 | x | x | x | x | x |
| 071819LRRDVJ06 | Red Rock | Lower | 7/18/2019 | DV | 123 | 16.6 | x | x | x | x | x |
| 071819LRRDVJ07 | Red Rock | Lower | 7/18/2019 | DV | 104 | 10.4 | x | x | x | x | x |
| 071819LRRDVJ08 | Red Rock | Lower | 7/18/2019 | DV | 95 | 7.7 | x | x | x | x | x |
| 071819LRRDVJ09 | Red Rock | Lower | 7/18/2019 | DV | 116 | 14.9 | x | x | x | x | x |
| 071819LRRDVJ10 | Red Rock | Lower | 7/18/2019 | DV | 97 | 7.9 | x | x | x | x | x |
| 071819LRRDVJ11 | Red Rock | Lower | 7/18/2019 | DV | 133 | 23.8 | x | x | x | x | x |
| 071819LRRDVJ12 | Red Rock | Lower | 7/18/2019 | DV | 126 | 17.7 | x | x | x | x | x |
| 071819LRRDVJ13 | Red Rock | Lower | 7/18/2019 | DV | 107 | 11.3 | x | x | x | x | x |
| 071819LRRDVJ14 | Red Rock | Lower | 7/18/2019 | DV | 96 | 8.7 | x | x | x | x | x |
| 071819LRRDVJ15 | Red Rock | Lower | 7/18/2019 | DV | 105 | 10.6 | x | x | x | x | x |
| | | | | | | | | | | | |
| 071719LRUBSS01 | Ruby | Lower | 7/17/2019 | SS | 70 | 4.0 | x | x | x | x | x |
| 071719LRUBSS02 | Ruby | Lower | 7/18/2019 | SS | 74 | 4.7 | x | x | x | x | x |
| 071719LRUBSS03 | Ruby | Lower | 7/19/2019 | SS | 67 | 3.5 | x | x | x | x | x |
| 071719LRUBSS04 | Ruby | Lower | 7/20/2019 | SS | 66 | 3.5 | x | x | x | x | x |
| 071719LRUBSS05 | Ruby | Lower | 7/21/2019 | SS | 68 | 4.2 | x | x | x | x | x |
| 071719LRUBSS06 | Ruby | Lower | 7/22/2019 | SS | 66 | 3.9 | x | x | x | x | x |
| 071719LRUBSS07 | Ruby | Lower | 7/23/2019 | SS | 68 | 4.0 | x | x | x | x | x |
| 071719LRUBSS08 | Ruby | Lower | 7/24/2019 | SS | 62 | 3.4 | x | x | x | x | x |

| Sample ID | Stream | Site | Date Collected | Fish Spp[1] | Length (mm) | Weight (g) | Metals to be analyzed | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cu | Hg | Se | Cd | Zn |
| 071719LRUBSS09 | Ruby | Lower | 7/25/2019 | SS | 75 | 4.7 | x | x | x | x | x |
| 071719LRUBSS10 | Ruby | Lower | 7/26/2019 | SS | 70 | 3.8 | x | x | x | x | x |
| 071719LRUBSS11 | Ruby | Lower | 7/27/2019 | SS | 75 | 4.3 | x | x | x | x | x |
| 071719LRUBSS12 | Ruby | Lower | 7/28/2019 | SS | 74 | 4.2 | x | x | x | x | x |
| 071719LRUBSS13 | Ruby | Lower | 7/29/2019 | SS | 72 | 3.9 | x | x | x | x | x |
| 071719LRUBSS14 | Ruby | Lower | 7/30/2019 | SS | 67 | 3.0 | x | x | x | x | x |
| 071719LRUBSS15 | Ruby | Lower | 7/31/2019 | SS | 62 | 2.9 | x | x | x | x | x |
| | | | | | | | | | | | |
| 071719JAYDVJ01 | Jay | Airstrip | 7/17/2019 | DV | 92 | 6.6 | x | x | x | x | x |
| | | | | | | | | | | | |
| 071719LSADVJ01 | Subarctic | Lower | 7/17/2019 | DV | 124 | 18.0 | x | x | x | x | x |
| 071719LSADVJ02 | Subarctic | Lower | 7/17/2019 | DV | 116 | 14.5 | x | x | x | x | x |
| 071719LSADVJ03 | Subarctic | Lower | 7/17/2019 | DV | 108 | 12.0 | x | x | x | x | x |
| 071719LSADVJ04 | Subarctic | Lower | 7/17/2019 | DV | 93 | 7.8 | x | x | x | x | x |
| 071719LSADVJ05 | Subarctic | Lower | 7/17/2019 | DV | 129 | 18.3 | x | x | x | x | x |
| 071719LSADVJ06 | Subarctic | Lower | 7/17/2019 | DV | 123 | 17.3 | x | x | x | x | x |
| 071719LSADVJ07 | Subarctic | Lower | 7/17/2019 | DV | 109 | 14.0 | x | x | x | x | x |
| 071719LSADVJ08 | Subarctic | Lower | 7/17/2019 | DV | 95 | 8.0 | x | x | x | x | x |
| 071719LSADVJ09 | Subarctic | Lower | 7/17/2019 | DV | 104 | 9.2 | x | x | x | x | x |
| 071719LSADVJ10 | Subarctic | Lower | 7/17/2019 | DV | 93 | 7.9 | x | x | x | x | x |
| 071719LSADVJ11 | Subarctic | Lower | 7/17/2019 | DV | 100 | 10.0 | x | x | x | x | x |
| 071719LSADVJ12 | Subarctic | Lower | 7/17/2019 | DV | 93 | 7.9 | x | x | x | x | x |
| 071719LSADVJ13 | Subarctic | Lower | 7/17/2019 | DV | 112 | 12.4 | x | x | x | x | x |
| 071719LSADVJ14 | Subarctic | Lower | 7/17/2019 | DV | 110 | 13.2 | x | x | x | x | x |
| | | | | | | | | | | | |
| 071819RILSS01 | Riley | | 7/18/2019 | SS | 74 | 5.2 | x | x | x | x | x |
| 071819RILSS02 | Riley | | 7/18/2019 | SS | 70 | 3.9 | x | x | x | x | x |
| 071819RILSS03 | Riley | | 7/18/2019 | SS | 69 | 3.8 | x | x | x | x | x |
| 071819RILSS04 | Riley | | 7/18/2019 | SS | 70 | 4.3 | x | x | x | x | x |
| 071819RILSS06 | Riley | | 7/18/2019 | SS | 69 | 3.4 | x | x | x | x | x |
| 071819RILSS07 | Riley | | 7/18/2019 | SS | 81 | 6.7 | x | x | x | x | x |

[1] Dolly Varden (DV), slimy sculpin (SS), and round whitefish (RW)

# APPENDIX 3. RESULTS FOR WHOLE BODY ELEMENT ANALYSIS

Results used in this report are highlighted in yellow.

## Round Whitefish

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071719RUBRWJ01 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.13 | 0.575 | 0.01 | 0.044 | 0.05 | 22.6 |
| 071719RUBRWJ02 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.094 | 0.01 | 0.047 | 0.06 | 21.2 |
| 071719RUBRWJ03 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.094 | 0.01 | 0.047 | 0.06 | 21.2 |
| 071719RUBRWJ04 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.090 | 0.01 | 0.045 | 0.06 | 22.1 |
| 071719RUBRWJ05 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.01 | 0.050 | 0.01 | 0.050 | 0.05 | 19.9 |
| 071719RUBRWJ06 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.05 | 0.316 | 0.01 | 0.063 | 0.06 | 15.8 |
| 071719RUBRWJ07 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.135 | 0.01 | 0.045 | 0.05 | 22.3 |
| 071719RUBRWJ08 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.104 | 0.01 | 0.052 | 0.05 | 19.2 |
| 071719RUBRWJ09 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.01 | 0.048 | 0.01 | 0.048 | 0.05 | 21 |
| 071719RUBRWJ10 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.093 | 0.01 | 0.046 | 0.05 | 21.6 |
| 071719RUBRWJ11 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.093 | 0.01 | 0.047 | 0.06 | 21.5 |
| 071719RUBRWJ12 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.105 | 0.01 | 0.053 | 0.05 | 19 |
| 071719RUBRWJ13 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.096 | 0.01 | 0.048 | 0.06 | 20.8 |
| 071719RUBRWJ14 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.06 | 0.260 | 0.01 | 0.043 | 0.06 | 23.1 |
| 071719RUBRWJ15 | Ruby | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.100 | 0.01 | 0.050 | 0.05 | 20.1 |
| 071719RUBRWJ01 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.654867257 | 0.2 | 0.884955752 | 0.4 | 22.6 |
| 071719RUBRWJ02 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.830188679 | 0.2 | 0.943396226 | 0.5 | 21.2 |
| 071719RUBRWJ03 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.830188679 | 0.2 | 0.943396226 | 0.5 | 21.2 |
| 071719RUBRWJ04 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 3.167420814 | 0.2 | 0.904977376 | 0.5 | 22.1 |
| 071719RUBRWJ05 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.512562814 | 0.2 | 1.005025126 | 0.4 | 19.9 |
| 071719RUBRWJ06 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 3.797468354 | 0.2 | 1.265822785 | 0.5 | 15.8 |
| 071719RUBRWJ07 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.4 | 1.793721973 | 0.2 | 0.896860987 | 0.4 | 22.3 |
| 071719RUBRWJ08 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.604166667 | 0.2 | 1.041666667 | 0.4 | 19.2 |
| 071719RUBRWJ09 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.380952381 | 0.2 | 0.952380952 | 0.4 | 21 |
| 071719RUBRWJ10 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.314814815 | 0.2 | 0.925925926 | 0.4 | 21.6 |
| 071719RUBRWJ11 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.4 | 1.860465116 | 0.2 | 0.930232558 | 0.5 | 21.5 |
| 071719RUBRWJ12 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 3.157894737 | 0.2 | 1.052631579 | 0.4 | 19 |
| 071719RUBRWJ13 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 3.365384615 | 0.2 | 0.961538462 | 0.4 | 20.8 |
| 071719RUBRWJ14 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.164502165 | 0.2 | 0.865800866 | 0.5 | 23.1 |
| 071719RUBRWJ15 | Ruby | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.487562189 | 0.2 | 0.995024876 | 0.4 | 20.1 |
| 071719RUBRWJ01 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0342 | 0.151327434 | 0.002 | 0.008849558 | 0.01 | 22.6 |
| 071719RUBRWJ02 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0267 | 0.125943396 | 0.00196 | 0.009245283 | 0.0098 | 21.2 |
| 071719RUBRWJ03 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0234 | 0.110377358 | 0.00187 | 0.008820755 | 0.00935 | 21.2 |
| 071719RUBRWJ04 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.146 | 0.660633484 | 0.00194 | 0.008778281 | 0.0097 | 22.1 |
| 071719RUBRWJ05 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0173 | 0.086934673 | 0.00196 | 0.009849246 | 0.0098 | 19.9 |
| 071719RUBRWJ06 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0174 | 0.110126582 | 0.00185 | 0.011708861 | 0.00925 | 15.8 |
| 071719RUBRWJ07 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0256 | 0.114798206 | 0.00181 | 0.008116592 | 0.00905 | 22.3 |
| 071719RUBRWJ08 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0225 | 0.1171875 | 0.00177 | 0.00921875 | 0.00885 | 19.2 |
| 071719RUBRWJ09 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.023 | 0.10952381 | 0.00189 | 0.009 | 0.00945 | 21 |

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071719RUBRWJ10 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0193 | 0.089351852 | 0.00183 | 0.008472222 | 0.00915 | 21.6 |
| 071719RUBRWJ11 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0205 | 0.095348837 | 0.00196 | 0.009116279 | 0.0098 | 21.5 |
| 071719RUBRWJ12 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0214 | 0.112631579 | 0.00178 | 0.009368421 | 0.0089 | 19 |
| 071719RUBRWJ13 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0237 | 0.113942308 | 0.00196 | 0.009423077 | 0.0098 | 20.8 |
| 071719RUBRWJ14 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0343 | 0.148484848 | 0.0019 | 0.008225108 | 0.0095 | 23.1 |
| 071719RUBRWJ15 | Ruby | 7/17/2019 | Mercury | M7473 CVAAS | 0.0213 | 0.105970149 | 0.00175 | 0.008706468 | 0.00875 | 20.1 |
| 071719RUBRWJ01 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.8 | 3.539823009 | 0.02 | 0.088495575 | 0.05 | 22.6 |
| 071719RUBRWJ02 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.78 | 3.679245283 | 0.02 | 0.094339623 | 0.06 | 21.2 |
| 071719RUBRWJ03 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.81 | 3.820754717 | 0.02 | 0.094339623 | 0.06 | 21.2 |
| 071719RUBRWJ04 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.88 | 3.981900452 | 0.02 | 0.090497738 | 0.06 | 22.1 |
| 071719RUBRWJ05 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.71 | 3.567839196 | 0.02 | 0.100502513 | 0.05 | 19.9 |
| 071719RUBRWJ06 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.74 | 4.683544304 | 0.02 | 0.126582278 | 0.06 | 15.8 |
| 071719RUBRWJ07 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.75 | 3.3632287 | 0.02 | 0.0896861 | 0.05 | 22.3 |
| 071719RUBRWJ08 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.76 | 3.958333333 | 0.02 | 0.104166667 | 0.05 | 19.2 |
| 071719RUBRWJ09 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 1.06 | 5.047619048 | 0.02 | 0.095238095 | 0.05 | 21 |
| 071719RUBRWJ10 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 1.05 | 4.861111111 | 0.02 | 0.092592593 | 0.05 | 21.6 |
| 071719RUBRWJ11 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.77 | 3.581395349 | 0.02 | 0.093023256 | 0.06 | 21.5 |
| 071719RUBRWJ12 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 1.02 | 5.368421053 | 0.02 | 0.105263158 | 0.05 | 19 |
| 071719RUBRWJ13 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.74 | 3.557692308 | 0.02 | 0.096153846 | 0.06 | 20.8 |
| 071719RUBRWJ14 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.71 | 3.073593074 | 0.02 | 0.086580087 | 0.06 | 23.1 |
| 071719RUBRWJ15 | Ruby | 7/17/2019 | Selenium | M6020B ICP-MS | 0.65 | 3.233830846 | 0.02 | 0.099502488 | 0.05 | 20.1 |
| 071719RUBRWJ01 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 22.4 | 99.11504425 | 0.8 | 3.539823009 | 2 | 22.6 |
| 071719RUBRWJ02 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 18 | 84.90566038 | 1 | 4.716981132 | 2 | 21.2 |
| 071719RUBRWJ03 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 22 | 103.7735849 | 1 | 4.716981132 | 2 | 21.2 |
| 071719RUBRWJ04 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 16.5 | 74.66063348 | 0.9 | 4.07239819 | 2 | 22.1 |
| 071719RUBRWJ05 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 15.7 | 78.89447236 | 0.8 | 4.020100503 | 2 | 19.9 |
| 071719RUBRWJ06 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 13.5 | 85.44303797 | 0.9 | 5.696202532 | 2 | 15.8 |
| 071719RUBRWJ07 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 17.7 | 79.37219731 | 0.8 | 3.587443946 | 2 | 22.3 |
| 071719RUBRWJ08 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 16.1 | 83.85416667 | 0.8 | 4.166666667 | 2 | 19.2 |
| 071719RUBRWJ09 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 19.8 | 94.28571429 | 0.8 | 3.80952381 | 2 | 21 |
| 071719RUBRWJ10 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 14.6 | 67.59259259 | 0.9 | 4.166666667 | 2 | 21.6 |
| 071719RUBRWJ11 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 15 | 69.76744186 | 1 | 4.651162791 | 2 | 21.5 |
| 071719RUBRWJ12 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 18.1 | 95.26315789 | 0.8 | 4.210526316 | 2 | 19 |
| 071719RUBRWJ13 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 26.1 | 125.4807692 | 0.9 | 4.326923077 | 2 | 20.8 |
| 071719RUBRWJ14 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 22 | 95.23809524 | 1 | 4.329004329 | 2 | 23.1 |
| 071719RUBRWJ15 | Ruby | 7/17/2019 | Zinc | M6020B ICP-MS | 17.5 | 87.06467662 | 0.8 | 3.980099502 | 2 | 20.1 |

*MDL = Method Detection Limit
**PQL = Practical Quantitation Limit

## Dolly Varden

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071819LRRDVJ01 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.172 | 0.792626728 | 0.007 | 0.032258065 | 0.04 | 21.7 |
| 071819LRRDVJ02 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.23 | 1.050228311 | 0.01 | 0.0456621 | 0.05 | 21.9 |
| 071819LRRDVJ03 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.183 | 0.884057971 | 0.008 | 0.038647343 | 0.04 | 20.7 |
| 071819LRRDVJ04 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.17 | 0.714285714 | 0.01 | 0.042016807 | 0.05 | 23.8 |
| 071819LRRDVJ05 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.156 | 0.746411483 | 0.008 | 0.038277512 | 0.04 | 20.9 |
| 071819LRRDVJ06 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.34 | 1.504424779 | 0.01 | 0.044247788 | 0.05 | 22.6 |
| 071819LRRDVJ07 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.36 | 1.773399015 | 0.01 | 0.049261084 | 0.06 | 20.3 |
| 071819LRRDVJ08 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.41 | 1.961722488 | 0.01 | 0.04784689 | 0.06 | 20.9 |
| 071819LRRDVJ09 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.168 | 0.727272727 | 0.009 | 0.038961039 | 0.04 | 23.1 |
| 071819LRRDVJ10 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.31 | 1.435185185 | 0.01 | 0.046296296 | 0.06 | 21.6 |
| 071819LRRDVJ11 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.2 | 0.816326531 | 0.01 | 0.040816327 | 0.05 | 24.5 |
| 071819LRRDVJ12 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.1 | 0.434782609 | 0.01 | 0.043478261 | 0.06 | 23 |
| 071819LRRDVJ13 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.26 | 1.160714286 | 0.01 | 0.044642857 | 0.06 | 22.4 |
| 071819LRRDVJ14 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.27 | 1.23853211 | 0.01 | 0.04587156 | 0.05 | 21.8 |
| 071819LRRDVJ15 | LRR | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.21 | 1.014492754 | 0.01 | 0.048309179 | 0.05 | 20.7 |
| 071819LRRDVJ01 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 0.7 | 3.225806452 | 0.1 | 0.460829493 | 0.3 | 21.7 |
| 071819LRRDVJ02 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1.4 | 6.392694064 | 0.2 | 0.913242009 | 0.4 | 21.9 |
| 071819LRRDVJ03 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1 | 4.830917874 | 0.1 | 0.483091787 | 0.3 | 20.7 |
| 071819LRRDVJ04 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1.1 | 4.621848739 | 0.2 | 0.840336134 | 0.4 | 23.8 |
| 071819LRRDVJ05 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 0.9 | 4.306220096 | 0.1 | 0.4784689 | 0.3 | 20.9 |
| 071819LRRDVJ06 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1.2 | 5.309734513 | 0.2 | 0.884955752 | 0.4 | 22.6 |
| 071819LRRDVJ07 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1.5 | 7.389162562 | 0.2 | 0.985221675 | 0.5 | 20.3 |
| 071819LRRDVJ08 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 2.3 | 11.00478469 | 0.2 | 0.956937799 | 0.5 | 20.9 |
| 071819LRRDVJ09 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 0.8 | 3.463203463 | 0.1 | 0.432900433 | 0.4 | 23.1 |
| 071819LRRDVJ10 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1.8 | 8.333333333 | 0.2 | 0.925925926 | 0.4 | 21.6 |
| 071819LRRDVJ11 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1 | 4.081632653 | 0.2 | 0.816326531 | 0.4 | 24.5 |
| 071819LRRDVJ12 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1 | 4.347826087 | 0.2 | 0.869565217 | 0.5 | 23 |
| 071819LRRDVJ13 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1 | 4.464285714 | 0.2 | 0.892857143 | 0.5 | 22.4 |
| 071819LRRDVJ14 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 1.1 | 5.04587156 | 0.2 | 0.917431193 | 0.4 | 21.8 |
| 071819LRRDVJ15 | LRR | 7/18/2019 | Copper | M6020B ICP-MS | 4.8 | 23.1884058 | 0.2 | 0.966183575 | 0.4 | 20.7 |
| 071819LRRDVJ01 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0167 | 0.076959 | 0.00165 | 0.007604 | 0.00825 | 21.7 |
| 071819LRRDVJ02 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0168 | 0.076712 | 0.00189 | 0.00863 | 0.00945 | 21.9 |
| 071819LRRDVJ03 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.00891 | 0.043043 | 0.00194 | 0.009372 | 0.0097 | 20.7 |
| 071819LRRDVJ04 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0148 | 0.062185 | 0.0019 | 0.007983 | 0.0095 | 23.8 |
| 071819LRRDVJ05 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0153 | 0.073206 | 0.0019 | 0.009091 | 0.0095 | 20.9 |
| 071819LRRDVJ06 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0258 | 0.114159 | 0.00172 | 0.007611 | 0.0086 | 22.6 |
| 071819LRRDVJ07 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0176 | 0.0867 | 0.00178 | 0.008768 | 0.0089 | 20.3 |
| 071819LRRDVJ08 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0135 | 0.064593 | 0.00169 | 0.008086 | 0.00845 | 20.9 |
| 071819LRRDVJ09 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0183 | 0.079221 | 0.00174 | 0.007532 | 0.0087 | 23.1 |
| 071819LRRDVJ10 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0107 | 0.049537 | 0.00183 | 0.008472 | 0.00915 | 21.6 |
| 071819LRRDVJ11 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0201 | 0.082041 | 0.00179 | 0.007306 | 0.00895 | 24.5 |
| 071819LRRDVJ12 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0146 | 0.063478 | 0.0019 | 0.008261 | 0.0095 | 23 |

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071819LRRDVJ13 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0126 | 0.05625 | 0.00191 | 0.008526786 | 0.00955 | 22.4 |
| 071819LRRDVJ14 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0154 | 0.070642202 | 0.00167 | 0.00766055 | 0.00835 | 21.8 |
| 071819LRRDVJ15 | LRR | 7/18/2019 | Mercury | M7473 CVAAS | 0.0103 | 0.049758454 | 0.00178 | 0.008599034 | 0.0089 | 20.7 |
| 071819LRRDVJ01 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.76 | 3.502304147 | 0.01 | 0.046082949 | 0.04 | 21.7 |
| 071819LRRDVJ02 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.77 | 3.515981735 | 0.02 | 0.091324201 | 0.05 | 21.9 |
| 071819LRRDVJ03 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.72 | 3.47826087 | 0.02 | 0.096618357 | 0.04 | 20.7 |
| 071819LRRDVJ04 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.88 | 3.697478992 | 0.02 | 0.084033613 | 0.05 | 23.8 |
| 071819LRRDVJ05 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.89 | 4.258373206 | 0.02 | 0.09569378 | 0.04 | 20.9 |
| 071819LRRDVJ06 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 1.1 | 4.867256637 | 0.02 | 0.088495575 | 0.05 | 22.6 |
| 071819LRRDVJ07 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.91 | 4.482758621 | 0.03 | 0.147783251 | 0.06 | 20.3 |
| 071819LRRDVJ08 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.84 | 4.019138756 | 0.02 | 0.09569378 | 0.06 | 20.9 |
| 071819LRRDVJ09 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 1.04 | 4.502164502 | 0.02 | 0.086580087 | 0.04 | 23.1 |
| 071819LRRDVJ10 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.81 | 3.75 | 0.02 | 0.092592593 | 0.06 | 21.6 |
| 071819LRRDVJ11 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 1.22 | 4.979591837 | 0.02 | 0.081632653 | 0.05 | 24.5 |
| 071819LRRDVJ12 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.65 | 2.826086957 | 0.02 | 0.086956522 | 0.06 | 23 |
| 071819LRRDVJ13 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 1.1 | 4.910714286 | 0.02 | 0.089285714 | 0.06 | 22.4 |
| 071819LRRDVJ14 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 1.16 | 5.321100917 | 0.02 | 0.091743119 | 0.05 | 21.8 |
| 071819LRRDVJ15 | LRR | 7/18/2019 | Selenium | M6020B ICP-MS | 0.79 | 3.816425121 | 0.02 | 0.096618357 | 0.05 | 20.7 |
| 071819LRRDVJ01 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 24.4 | 112.4423963 | 0.6 | 2.764976959 | 1 | 21.7 |
| 071819LRRDVJ02 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 33.6 | 153.4246575 | 0.9 | 4.109589041 | 2 | 21.9 |
| 071819LRRDVJ03 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 35.2 | 170.0483092 | 0.6 | 2.898550725 | 2 | 20.7 |
| 071819LRRDVJ04 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 31.6 | 132.7731092 | 0.8 | 3.361344538 | 2 | 23.8 |
| 071819LRRDVJ05 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 34.2 | 163.6363636 | 0.6 | 2.870813397 | 2 | 20.9 |
| 071819LRRDVJ06 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 34.8 | 153.9823009 | 0.8 | 3.539823009 | 2 | 22.6 |
| 071819LRRDVJ07 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 49 | 241.3793103 | 1 | 4.926108374 | 3 | 20.3 |
| 071819LRRDVJ08 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 50 | 239.2344498 | 0.9 | 4.306220096 | 2 | 20.9 |
| 071819LRRDVJ09 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 36.5 | 158.008658 | 0.7 | 3.03030303 | 2 | 23.1 |
| 071819LRRDVJ10 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 31.2 | 144.4444444 | 0.9 | 4.166666667 | 2 | 21.6 |
| 071819LRRDVJ11 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 34.6 | 141.2244898 | 0.8 | 3.265306122 | 2 | 24.5 |
| 071819LRRDVJ12 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 24.1 | 104.7826087 | 0.9 | 3.913043478 | 2 | 23 |
| 071819LRRDVJ13 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 35 | 156.25 | 0.9 | 4.017857143 | 2 | 22.4 |
| 071819LRRDVJ14 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 49.9 | 228.8990826 | 0.8 | 3.669724771 | 2 | 21.8 |
| 071819LRRDVJ15 | LRR | 7/18/2019 | Zinc | M6020B ICP-MS | 34.9 | 168.5990338 | 0.8 | 3.8647343 | 2 | 20.7 |
| 071719JAYDVJ01 | JAY | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.19 | 0.892018779 | 0.01 | 0.04694836 | 0.060 | 21.3 |
| 071719JAYDVJ01 | JAY | 7/17/2019 | Copper | M6020B ICP-MS | 2.1 | 9.85915493 | 0.2 | 0.93896714 | 0.400 | 21.3 |
| 071719JAYDVJ01 | JAY | 7/17/2019 | Mercury | M7473 CVAAS | 0.0346 | 0.14122449 | 0.0008 | 0.00326531 | 0.002 | 21.3 |
| 071719JAYDVJ01 | JAY | 7/17/2019 | Selenium | M6020B ICP-MS | 1.19 | 5.58685446 | 0.02 | 0.09389671 | 0.060 | 21.3 |
| 071719JAYDVJ01 | JAY | 7/17/2019 | Zinc | M6020B ICP-MS | 28.6 | 134.2723005 | 0.9 | 4.22535211 | 2.000 | 21.3 |
| 071719LSADVJ01 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.13 | 0.546218487 | 0.01 | 0.042016807 | 0.05 | 23.8 |
| 071719LSADVJ02 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.12 | 0.515021459 | 0.01 | 0.042918455 | 0.05 | 23.3 |
| 071719LSADVJ03 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.151 | 0.695852535 | 0.009 | 0.041474654 | 0.05 | 21.7 |
| 071719LSADVJ04 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.275 | 1.175213675 | 0.009 | 0.038461538 | 0.04 | 23.4 |
| 071719LSADVJ05 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.207 | 0.877118644 | 0.009 | 0.038135593 | 0.05 | 23.6 |

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071719LSADVJ06 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.1 | 0.438596491 | 0.01 | 0.044 | 0.05 | 22.8 |
| 071719LSADVJ07 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.11 | 0.466101695 | 0.01 | 0.042 | 0.05 | 23.6 |
| 071719LSADVJ08 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.07 | 0.309734513 | 0.01 | 0.044 | 0.06 | 22.6 |
| 071719LSADVJ09 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.06 | 0.255319149 | 0.01 | 0.043 | 0.05 | 23.5 |
| 071719LSADVJ10 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.16 | 0.692640693 | 0.01 | 0.043 | 0.06 | 23.1 |
| 071719LSADVJ11 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.128 | 0.556521739 | 0.008 | 0.035 | 0.04 | 23 |
| 071719LSADVJ12 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.109 | 0.475982533 | 0.009 | 0.039 | 0.05 | 22.9 |
| 071719LSADVJ13 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.085 | 0.357142857 | 0.009 | 0.038 | 0.04 | 23.8 |
| 071719LSADVJ14 | LSA | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.1 | 0.4048583 | 0.01 | 0.04048583 | 0.05 | 24.7 |
| 071719LSADVJ01 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 1.4 | 5.882352941 | 0.2 | 0.840336134 | 0.4 | 23.8 |
| 071719LSADVJ02 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.9 | 3.862660944 | 0.2 | 0.858369099 | 0.4 | 23.3 |
| 071719LSADVJ03 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.9 | 4.147465438 | 0.1 | 0.460829493 | 0.4 | 21.7 |
| 071719LSADVJ04 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 1.7 | 7.264957265 | 0.1 | 0.427350427 | 0.3 | 23.4 |
| 071719LSADVJ05 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 2.2 | 9.322033898 | 0.1 | 0.423728814 | 0.4 | 23.6 |
| 071719LSADVJ06 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.9 | 3.947368421 | 0.2 | 0.877192982 | 0.4 | 22.8 |
| 071719LSADVJ07 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 1.3 | 5.508474576 | 0.2 | 0.847457627 | 0.4 | 23.6 |
| 071719LSADVJ08 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 1.1 | 4.867256637 | 0.2 | 0.884955752 | 0.5 | 22.6 |
| 071719LSADVJ09 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 2.978723404 | 0.2 | 0.85106383 | 0.4 | 23.5 |
| 071719LSADVJ10 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 1.1 | 4.761904762 | 0.2 | 0.865800866 | 0.4 | 23.1 |
| 071719LSADVJ11 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 1.9 | 8.260869565 | 0.1 | 0.434782609 | 0.3 | 23 |
| 071719LSADVJ12 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.9 | 3.930131004 | 0.1 | 0.436681223 | 0.4 | 22.9 |
| 071719LSADVJ13 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.9 | 3.781512605 | 0.1 | 0.420168067 | 0.3 | 23.8 |
| 071719LSADVJ14 | LSA | 7/17/2019 | Copper | M6020B ICP-MS | 0.9 | 3.643724696 | 0.2 | 0.809716599 | 0.4 | 24.7 |
| 071719LSADVJ01 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0147 | 0.061765 | 0.00176 | 0.007395 | 0.0088 | 23.8 |
| 071719LSADVJ02 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.00847 | 0.036352 | 0.00189 | 0.008112 | 0.00945 | 23.3 |
| 071719LSADVJ03 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0128 | 0.058986 | 0.00193 | 0.008894 | 0.00965 | 21.7 |
| 071719LSADVJ04 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0114 | 0.048718 | 0.00184 | 0.007863 | 0.0092 | 23.4 |
| 071719LSADVJ05 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0109 | 0.046186 | 0.00187 | 0.007924 | 0.00935 | 23.6 |
| 071719LSADVJ06 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0121 | 0.05307 | 0.00181 | 0.007939 | 0.00905 | 22.8 |
| 071719LSADVJ07 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0129 | 0.054661 | 0.00181 | 0.007669 | 0.00905 | 23.6 |
| 071719LSADVJ08 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.00914 | 0.040442 | 0.00197 | 0.008717 | 0.00985 | 22.6 |
| 071719LSADVJ09 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0155 | 0.065957 | 0.00196 | 0.00834 | 0.0098 | 23.5 |
| 071719LSADVJ10 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0115 | 0.049784 | 0.00194 | 0.008398 | 0.0097 | 23.1 |
| 071719LSADVJ11 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0117 | 0.05087 | 0.00182 | 0.007913 | 0.0091 | 23 |
| 071719LSADVJ12 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0108 | 0.047162 | 0.00196 | 0.008559 | 0.0098 | 22.9 |
| 071719LSADVJ13 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0101 | 0.042437 | 0.00189 | 0.007941 | 0.00945 | 23.8 |
| 071719LSADVJ14 | LSA | 7/17/2019 | Mercury | M7473 CVAAS | 0.0166 | 0.067206 | 0.0019 | 0.007692 | 0.0095 | 24.7 |
| 071719LSADVJ01 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.62 | 6.806722689 | 0.02 | 0.084033613 | 0.05 | 23.8 |
| 071719LSADVJ02 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.24 | 5.321888412 | 0.02 | 0.08583691 | 0.05 | 23.3 |
| 071719LSADVJ03 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.24 | 5.714285714 | 0.02 | 0.092165899 | 0.05 | 21.7 |
| 071719LSADVJ04 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.3 | 5.555555556 | 0.02 | 0.085470085 | 0.04 | 23.4 |
| 071719LSADVJ05 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.28 | 5.423728814 | 0.02 | 0.084745763 | 0.05 | 23.6 |
| 071719LSADVJ06 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.52 | 6.666666667 | 0.02 | 0.087719298 | 0.05 | 22.8 |

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071719LSADVJ07 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.24 | 5.254237288 | 0.02 | 0.084745763 | 0.05 | 23.6 |
| 071719LSADVJ08 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.07 | 4.734513274 | 0.02 | 0.088495575 | 0.06 | 22.6 |
| 071719LSADVJ09 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 0.95 | 4.042553191 | 0.02 | 0.085106383 | 0.05 | 23.5 |
| 071719LSADVJ10 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.56 | 6.753246753 | 0.02 | 0.086580087 | 0.06 | 23.1 |
| 071719LSADVJ11 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.13 | 4.913043478 | 0.02 | 0.086956522 | 0.04 | 23 |
| 071719LSADVJ12 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.2 | 5.240174672 | 0.02 | 0.087336245 | 0.05 | 22.9 |
| 071719LSADVJ13 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.6 | 6.722689076 | 0.02 | 0.084033613 | 0.04 | 23.8 |
| 071719LSADVJ14 | LSA | 7/17/2019 | Selenium | M6020B ICP-MS | 1.53 | 6.194331984 | 0.02 | 0.08097166 | 0.05 | 24.7 |
| 071719LSADVJ01 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 38.3 | 160.9243697 | 0.8 | 3.361344538 | 2 | 23.8 |
| 071719LSADVJ02 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 31.3 | 134.3347639 | 0.8 | 3.433476395 | 2 | 23.3 |
| 071719LSADVJ03 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 20.9 | 96.31336406 | 0.7 | 3.225806452 | 2 | 21.7 |
| 071719LSADVJ04 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 22 | 94.01709402 | 0.7 | 2.991452991 | 2 | 23.4 |
| 071719LSADVJ05 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 22.9 | 97.03389831 | 0.7 | 2.966101695 | 2 | 23.6 |
| 071719LSADVJ06 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 33.2 | 145.6140351 | 0.8 | 3.50877193 | 2 | 22.8 |
| 071719LSADVJ07 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 32.9 | 139.4067797 | 0.8 | 3.389830508 | 2 | 23.6 |
| 071719LSADVJ08 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 26 | 115.0442478 | 1 | 4.424778761 | 2 | 22.6 |
| 071719LSADVJ09 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 23.8 | 101.2765957 | 0.8 | 3.404255319 | 2 | 23.5 |
| 071719LSADVJ10 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 42.1 | 182.2510823 | 0.9 | 3.896103896 | 2 | 23.1 |
| 071719LSADVJ11 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 30.1 | 130.8695652 | 0.6 | 2.608695652 | 2 | 23 |
| 071719LSADVJ12 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 29.4 | 128.3842795 | 0.7 | 3.056768559 | 2 | 22.9 |
| 071719LSADVJ13 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 42.1 | 176.8907563 | 0.7 | 2.941176471 | 2 | 23.8 |
| 071719LSADVJ14 | LSA | 7/17/2019 | Zinc | M6020B ICP-MS | 53.3 | 215.7894737 | 0.8 | 3.238866397 | 2 | 24.7 |

*MDL = Method Detection Limit
**PQL = Practical Quantitation Limit

**Slimy Sculpin**

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071819RILSS01 | RIL | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.08 | 0.350877193 | 0.01 | 0.04385965 | 0.05 | 22.8 |
| 071819RILSS02 | RIL | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.05 | 0.214592275 | 0.01 | 0.04291845 | 0.06 | 23.3 |
| 071819RILSS03 | RIL | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.05 | 0.219298246 | 0.01 | 0.04385965 | 0.06 | 22.8 |
| 071819RILSS04 | RIL | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.12 | 0.49382716 | 0.01 | 0.04115226 | 0.06 | 24.3 |
| 071819RILSS06 | RIL | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.12 | 0.515021459 | 0.01 | 0.04291845 | 0.06 | 23.3 |
| 071819RILSS07 | RIL | 7/18/2019 | Cadmium | M6020B ICP-MS | 0.04 | 0.173913043 | 0.01 | 0.04347826 | 0.06 | 23 |
| 071819RILSS01 | RIL | 7/18/2019 | Copper | M6020B ICP-MS | 0.7 | 3.070175439 | 0.2 | 0.87719298 | 0.4 | 22.8 |
| 071819RILSS02 | RIL | 7/18/2019 | Copper | M6020B ICP-MS | 0.7 | 3.004291845 | 0.2 | 0.8583691 | 0.5 | 23.3 |
| 071819RILSS03 | RIL | 7/18/2019 | Copper | M6020B ICP-MS | 0.8 | 3.50877193 | 0.2 | 0.87719298 | 0.5 | 22.8 |
| 071819RILSS04 | RIL | 7/18/2019 | Copper | M6020B ICP-MS | 0.8 | 3.29218107 | 0.2 | 0.82304527 | 0.5 | 24.3 |
| 071819RILSS06 | RIL | 7/18/2019 | Copper | M6020B ICP-MS | 1.7 | 7.296137339 | 0.2 | 0.8583691 | 0.5 | 23.3 |
| 071819RILSS07 | RIL | 7/18/2019 | Copper | M6020B ICP-MS | 0.6 | 2.608695652 | 0.2 | 0.86956522 | 0.5 | 23 |
| 071819RILSS01 | RIL | 7/18/2019 | Mercury | M7473 CVAAS | 0.0456 | 0.2 | 0.00186 | 0.008158 | 0.0093 | 22.8 |
| 071819RILSS02 | RIL | 7/18/2019 | Mercury | M7473 CVAAS | 0.053 | 0.227468 | 0.00182 | 0.007811 | 0.0091 | 23.3 |
| 071819RILSS03 | RIL | 7/18/2019 | Mercury | M7473 CVAAS | 0.0615 | 0.269737 | 0.00197 | 0.00864 | 0.00985 | 22.8 |
| 071819RILSS04 | RIL | 7/18/2019 | Mercury | M7473 CVAAS | 0.0607 | 0.249794 | 0.00176 | 0.007243 | 0.0088 | 24.3 |
| 071819RILSS06 | RIL | 7/18/2019 | Mercury | M7473 CVAAS | 0.0486 | 0.208584 | 0.00196 | 0.008412 | 0.0098 | 23.3 |
| 071819RILSS07 | RIL | 7/18/2019 | Mercury | M7473 CVAAS | 0.0536 | 0.233043 | 0.00192 | 0.008348 | 0.0096 | 23 |
| 071819RILSS01 | RIL | 7/18/2019 | Selenium | M6020B ICP-MS | 1.8 | 7.894736842 | 0.02 | 0.0877193 | 0.05 | 22.8 |
| 071819RILSS02 | RIL | 7/18/2019 | Selenium | M6020B ICP-MS | 1.43 | 6.137339056 | 0.02 | 0.08583691 | 0.06 | 23.3 |
| 071819RILSS03 | RIL | 7/18/2019 | Selenium | M6020B ICP-MS | 1.07 | 4.692982456 | 0.02 | 0.0877193 | 0.06 | 22.8 |
| 071819RILSS04 | RIL | 7/18/2019 | Selenium | M6020B ICP-MS | 1.51 | 6.21399177 | 0.03 | 0.12345679 | 0.06 | 24.3 |
| 071819RILSS06 | RIL | 7/18/2019 | Selenium | M6020B ICP-MS | 1.24 | 5.321888412 | 0.02 | 0.08583691 | 0.06 | 23.3 |
| 071819RILSS07 | RIL | 7/18/2019 | Selenium | M6020B ICP-MS | 1.23 | 5.347826087 | 0.02 | 0.08695652 | 0.06 | 23 |
| 071819RILSS01 | RIL | 7/18/2019 | Zinc | M6020B ICP-MS | 26.1 | 114.4736842 | 0.8 | 3.50877193 | 2 | 22.8 |
| 071819RILSS02 | RIL | 7/18/2019 | Zinc | M6020B ICP-MS | 34.1 | 146.3519313 | 0.9 | 3.86266094 | 2 | 23.3 |
| 071819RILSS03 | RIL | 7/18/2019 | Zinc | M6020B ICP-MS | 35 | 153.5087719 | 1 | 4.38596491 | 2 | 22.8 |
| 071819RILSS04 | RIL | 7/18/2019 | Zinc | M6020B ICP-MS | 37 | 152.2633745 | 1 | 4.11522634 | 3 | 24.3 |
| 071819RILSS06 | RIL | 7/18/2019 | Zinc | M6020B ICP-MS | 31 | 133.0472103 | 1 | 4.29184549 | 2 | 23.3 |
| 071819RILSS07 | RIL | 7/18/2019 | Zinc | M6020B ICP-MS | 25.4 | 110.4347826 | 0.9 | 3.91304348 | 2 | 23 |
| 071719LRUBSS01 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.092592593 | 0.01 | 0.0462963 | 0.05 | 21.6 |
| 071719LRUBSS02 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | | 0.040983607 | 0.01 | 0.04098361 | 0.05 | 24.4 |
| 071719LRUBSS03 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.127659574 | 0.01 | 0.04255319 | 0.06 | 23.5 |
| 071719LRUBSS04 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.082644628 | 0.01 | 0.04132231 | 0.06 | 24.2 |
| 071719LRUBSS05 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.04 | 0.174672489 | 0.01 | 0.04366812 | 0.06 | 22.9 |
| 071719LRUBSS06 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.118577075 | 0.01 | 0.03952569 | 0.05 | 25.3 |
| 071719LRUBSS07 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.077821012 | 0.01 | 0.03891051 | 0.06 | 25.7 |
| 071719LRUBSS08 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.130434783 | 0.01 | 0.04347826 | 0.06 | 23 |
| 071719LRUBSS09 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.012 | 0.054054054 | 0.009 | 0.04054054 | 0.05 | 22.2 |
| 071719LRUBSS10 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.12244898 | 0.01 | 0.04081633 | 0.05 | 24.5 |
| 071719LRUBSS11 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.128755365 | 0.01 | 0.04291845 | 0.06 | 23.3 |
| 071719LRUBSS12 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.06 | 0.265486726 | 0.01 | 0.04424779 | 0.06 | 22.6 |
| 071719LRUBSS13 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.087336245 | 0.01 | 0.04366812 | 0.06 | 22.9 |

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071719LRUBSS14 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.02 | 0.084745763 | 0.01 | 0.04237288 | 0.06 | 23.6 |
| 071719LRUBSS15 | LRUB | 7/17/2019 | Cadmium | M6020B ICP-MS | 0.03 | 0.11627907 | 0.01 | 0.03875969 | 0.06 | 25.8 |
| 071719LRUBSS01 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.777777778 | 0.2 | 0.92592593 | 0.4 | 21.6 |
| 071719LRUBSS02 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.049180328 | 0.2 | 0.81967213 | 0.4 | 24.4 |
| 071719LRUBSS03 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 2.978723404 | 0.2 | 0.85106383 | 0.5 | 23.5 |
| 071719LRUBSS04 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.479338843 | 0.2 | 0.82644628 | 0.4 | 24.2 |
| 071719LRUBSS05 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.183406114 | 0.2 | 0.87336245 | 0.5 | 22.9 |
| 071719LRUBSS06 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.371541502 | 0.2 | 0.79051383 | 0.4 | 25.3 |
| 071719LRUBSS07 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.33463035 | 0.2 | 0.77821012 | 0.5 | 25.7 |
| 071719LRUBSS08 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.608695652 | 0.2 | 0.86956522 | 0.5 | 23 |
| 071719LRUBSS09 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.702702703 | 0.1 | 0.45045045 | 0.4 | 22.2 |
| 071719LRUBSS10 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.040816327 | 0.2 | 0.81632653 | 0.4 | 24.5 |
| 071719LRUBSS11 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 3.004291845 | 0.2 | 0.8583691 | 0.5 | 23.3 |
| 071719LRUBSS12 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 3.097345133 | 0.2 | 0.88495575 | 0.5 | 22.6 |
| 071719LRUBSS13 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.5 | 2.183406114 | 0.2 | 0.87336245 | 0.4 | 22.9 |
| 071719LRUBSS14 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.7 | 2.966101695 | 0.2 | 0.84745763 | 0.5 | 23.6 |
| 071719LRUBSS15 | LRUB | 7/17/2019 | Copper | M6020B ICP-MS | 0.6 | 2.325581395 | 0.2 | 0.7751938 | 0.5 | 25.8 |
| 071719LRUBSS01 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.106 | 0.490741 | 0.00193 | 0.008935 | 0.00965 | 21.6 |
| 071719LRUBSS02 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0511 | 0.209426 | 0.00177 | 0.007254 | 0.00885 | 24.4 |
| 071719LRUBSS03 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0973 | 0.414043 | 0.00188 | 0.008 | 0.0094 | 23.5 |
| 071719LRUBSS04 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0677 | 0.279752 | 0.0019 | 0.007851 | 0.0095 | 24.2 |
| 071719LRUBSS05 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0521 | 0.227511 | 0.00172 | 0.007511 | 0.0086 | 22.9 |
| 071719LRUBSS06 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0555 | 0.219368 | 0.00174 | 0.006877 | 0.0087 | 25.3 |
| 071719LRUBSS07 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0814 | 0.316732 | 0.00166 | 0.006459 | 0.0083 | 25.7 |
| 071719LRUBSS08 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0621 | 0.27 | 0.00181 | 0.00787 | 0.00905 | 23 |
| 071719LRUBSS09 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.058 | 0.261261 | 0.00195 | 0.008784 | 0.00975 | 22.2 |
| 071719LRUBSS10 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0852 | 0.347755 | 0.00176 | 0.007184 | 0.0088 | 24.5 |
| 071719LRUBSS11 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0807 | 0.346352 | 0.00191 | 0.008197 | 0.00955 | 23.3 |
| 071719LRUBSS12 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0593 | 0.262389 | 0.00186 | 0.00823 | 0.0093 | 22.6 |
| 071719LRUBSS13 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0824 | 0.359825 | 0.00199 | 0.00869 | 0.00995 | 22.9 |
| 071719LRUBSS14 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.0935 | 0.396186 | 0.00199 | 0.008432 | 0.00995 | 23.6 |
| 071719LRUBSS15 | LRUB | 7/17/2019 | Mercury | M7473 CVAAS | 0.105 | 0.406977 | 0.00194 | 0.007519 | 0.0097 | 25.8 |
| 071719LRUBSS01 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.87 | 4.027777778 | 0.02 | 0.09259259 | 0.05 | 21.6 |
| 071719LRUBSS02 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 1.7 | 6.967213115 | 0.02 | 0.08196721 | 0.05 | 24.4 |
| 071719LRUBSS03 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.92 | 3.914893617 | 0.02 | 0.08510638 | 0.06 | 23.5 |
| 071719LRUBSS04 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 1.23 | 5.082644628 | 0.02 | 0.08264463 | 0.06 | 24.2 |
| 071719LRUBSS05 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.74 | 3.231441048 | 0.02 | 0.08733624 | 0.06 | 22.9 |
| 071719LRUBSS06 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 1.39 | 5.494071146 | 0.02 | 0.07905138 | 0.05 | 25.3 |
| 071719LRUBSS07 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.95 | 3.696498054 | 0.02 | 0.07782101 | 0.06 | 25.7 |
| 071719LRUBSS08 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.94 | 4.086956522 | 0.02 | 0.08695652 | 0.06 | 23 |
| 071719LRUBSS09 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.72 | 3.243243243 | 0.02 | 0.09009009 | 0.05 | 22.2 |
| 071719LRUBSS10 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.68 | 2.775510204 | 0.02 | 0.08163265 | 0.05 | 24.5 |
| 071719LRUBSS11 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.71 | 3.0472103 | 0.02 | 0.08583691 | 0.06 | 23.3 |

| Sample ID | Site | Collection Date | Analyte | Method | Wet Wt. Result (mg/Kg) | Dry Wt. Result (mg/Kg) | MDL* (mg/Kg) | Dry Wt. MDL (mg/Kg) | PQL** (mg/Kg) | % Solid |
|---|---|---|---|---|---|---|---|---|---|---|
| 071719LRUBSS12 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.77 | 3.407079646 | 0.02 | 0.08849558 | 0.06 | 22.6 |
| 071719LRUBSS13 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 1.23 | 5.371179039 | 0.02 | 0.08733624 | 0.06 | 22.9 |
| 071719LRUBSS14 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 0.78 | 3.305084746 | 0.02 | 0.08474576 | 0.06 | 23.6 |
| 071719LRUBSS15 | LRUB | 7/17/2019 | Selenium | M6020B ICP-MS | 1.56 | 6.046511628 | 0.03 | 0.11627907 | 0.06 | 25.8 |
| 071719LRUBSS01 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 38.5 | 178.2407407 | 0.8 | 3.7037037 | 2 | 21.6 |
| 071719LRUBSS02 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 24 | 98.36065574 | 0.8 | 3.27868852 | 2 | 24.4 |
| 071719LRUBSS03 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 47.5 | 202.1276596 | 0.9 | 3.82978723 | 2 | 23.5 |
| 071719LRUBSS04 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 34.8 | 143.8016529 | 0.9 | 3.71900826 | 2 | 24.2 |
| 071719LRUBSS05 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 35 | 152.8384279 | 1 | 4.36681223 | 2 | 22.9 |
| 071719LRUBSS06 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 27.4 | 108.3003953 | 0.8 | 3.16205534 | 2 | 25.3 |
| 071719LRUBSS07 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 29 | 112.8404669 | 1 | 3.89105058 | 2 | 25.7 |
| 071719LRUBSS08 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 39.6 | 172.173913 | 0.9 | 3.91304348 | 2 | 23 |
| 071719LRUBSS09 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 32.7 | 147.2972973 | 0.7 | 3.15315315 | 2 | 22.2 |
| 071719LRUBSS10 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 33.9 | 138.3673469 | 0.8 | 3.26530612 | 2 | 24.5 |
| 071719LRUBSS11 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 27.2 | 116.7381974 | 0.9 | 3.86266094 | 2 | 23.3 |
| 071719LRUBSS12 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 27.1 | 119.9115044 | 0.9 | 3.98230088 | 2 | 22.6 |
| 071719LRUBSS13 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 26 | 113.5371179 | 0.9 | 3.930131 | 2 | 22.9 |
| 071719LRUBSS14 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 45 | 190.6779661 | 1 | 4.23728814 | 2 | 23.6 |
| 071719LRUBSS15 | LRUB | 7/17/2019 | Zinc | M6020B ICP-MS | 26 | 100.7751938 | 1 | 3.87596899 | 3 | 25.8 |

*MDL = Method Detection Limit
**PQL = Practical Quantitation Limit