Site C Clean Energy Project

Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b)

Task 2c – Site C Reservoir Tributaries Fish Population Indexing Survey

Construction Year 5 (2019)

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2019 Annual Report

Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c)

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Executive Summary

In accordance with Provincial Environmental Assessment Certificate Condition No. 7[1] and Federal Decision Statement Condition Nos. 8.4.3[2] and 8.4.4[3] for BC Hydro's Site C Clean Energy Project (the Project), BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP[4]). The Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b) represents one component of the FAHMFP that is designed to monitor the responses, using before and after comparisons, of target Peace River fish populations to the construction and operation of the Project. Target species include Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), and Rainbow Trout (*Oncorhynchus mykiss*) because these species spend portions of their life cycle in Peace River tributaries and migrate past the Project to fulfill their life history requirements.

Under the Site C Reservoir Tributaries Fish Population Indexing Survey (Task 2c of Mon-1b), annual surveys are conducted to monitor target fish species, and in 2019, population assessments were conducted in the Moberly River for Arctic Grayling, the Chowade River and Cypress and Fiddes creeks for Bull Trout, and in Colt, Farrell, and Kobes creeks for Rainbow Trout. Backpack electrofishing was the primary sampling method for all streams, except the Moberly River, where a combination of backpack electrofishing, small fish boat electroshocking, and angling were used. In 2019, field methods, target species, and sampled streams were identical to those employed in 2017 and 2018, with the addition of implanting radio telemetry tags into immature Bull Trout in the Chowade River and Cypress and Fiddes creeks, and into immature Rainbow Trout in Farrell Creek. Tissue and ageing structure samples were also collected from select species at some locations for genetic and microchemistry analyses in support of the FAHMFP; however, these samples were not analyzed as part of the current study.

The primary objective of the study was to monitor the above three species; however, a secondary objective for sampling in the Chowade River and Cypress Creek was to implant passive integrated transponder (PIT) tags into Bull Trout. Tagged Bull Trout will be monitored by PIT detector arrays installed in the Chowade River and Cypress Creek as part of the Peace River Bull Trout Spawning Assessment (Mon-1b, Task 2b). To increase the likelihood of deploying more PIT tags into Bull Trout, the upstream areas of these streams were specifically targeted as greater densities of immature Bull Trout were recorded in these areas during reconnaissance surveys conducted in 2016. Although multiple sites were sampled in the Chowade River and Cypress Creek, sampling in Fiddes Creek was limited to a section of the creek that was accessible by helicopter and assumed representative of Fiddes Creek.

Key results from the 2019 survey are summarized as follows:

[1] The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.

[2] "The plan shall include: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area."

[3] "The plan shall include: an approach to monitor and evaluate the effectiveness of mitigation or offsetting measures and to verify the accuracy of the predictions made during the environmental assessment on fish and fish habitat."

[4] Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/document-library/environmental-management-plans-and-reports.

Tributaries Targeting Bull Trout (Chowade River, Cypress and Fiddes creeks)

- Comparisons between the catch rate of Bull Trout captured in the Chowade River and Cypress Creek in 2017, 2018 and 2019 indicated a similar catch per unit effort (CPUE) for young of the year (YOY) fish in all study years, and a similar CPUE for immature fish in 2017 and 2019, but an approximately 50% lower CPUE for immature fish in 2018. The 2018 decline was attributed to higher water levels that reduced capture efficiency compared to the 2017 and 2019 studies.
- The CPUE of immature Bull Trout in Fiddes Creek decreased by approximately 50% each year from 2017 to 2019. A similar reduction in YOY CPUE was also recorded over the same period. This decrease in immature and YOY Bull Trout CPUE also corresponded to a decrease in Bull Trout redd abundance estimates from 2016 to 2018 as measured by Mon-1b, Task 2b.
- In total, 53 radio telemetry tags were deployed into immature Bull Trout in support of the FAHMFP. These tags were deployed into fish captured in the Chowade River (n = 12), Cypress Creek (n = 26), and Fiddes Creek (n = 15).
- With the inclusion of radio telemetry tag deployment as part of the 2019 study plan, very few ageing structures were collected from Bull Trout, as most of the large immature Bull Trout captured were considered potential candidates for radio tag implantation. With fewer structures to verify the age of larger immature fish, the length-at-age data collected in 2019 (i.e., dominantly age-0 and age-1 individuals) was uninformative and did not allow accurate estimates of growth rates.
- Consistent with results from 2017 and 2018, in 2019, Arctic Grayling were not recorded in the Chowade River or in Cypress or Fiddes creeks, and Rainbow Trout were rarely recorded.

Tributaries Targeting Rainbow Trout (Colt, Farrell, and Kobes creeks)

- YOY and immature Rainbow Trout were each recorded in Colt, Farrell, and Kobes creeks. The presence of YOY Rainbow Trout in these streams during the study period (i.e., August) indicates that Rainbow Trout likely used these streams for spawning during the preceding spring spawning season, although adult Rainbow Trout were rarely recorded in these streams in 2017, 2018 and 2019.
- In total, 15 radio telemetry tags were deployed into immature Rainbow Trout captured in Farrell Creek.
- Consistent with results from 2017 and 2018, in 2019, Arctic Grayling and Bull Trout were rarely recorded in Colt, Farrell, and Kobes creeks.

Tributaries Targeting Arctic Grayling (Moberly River)

- From 2016 to 2019, total Arctic Grayling catch in the Moberly River aligned with water levels, with lower catches recorded in 2017, when water levels were low, and higher catches recorded in 2018, 2019, and 2016, when water levels were incrementally higher in each of these years. This finding supports previous studies that determined that Arctic Grayling migrate downstream out of the Moberly River and into the Peace River earlier in low water years and likely undergo seasonal migrations in response to substantial changes in Moberly River discharge. Unpredictable and large fluctuations in Moberly River discharge during indexing studies were suspected to have a substantial effect on Arctic Grayling catch rates and potentially confound interpretation of study results related to this species.

Data collected from 2016 to 2019, and data to be collected in 2020, represent the baseline data associated with the Project. Data collected after river diversion, which is scheduled for fall 2020, will eventually allow testing of the management hypotheses identified for Mon-1b, Task 2c.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Description
EAC	Environmental Assessment Certificate
Project	Site C Clean Energy Project
FAHMFP	Fisheries and Aquatic Habitat Monitoring and Follow-up Program
Mon-1b	Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program
Task 2c	Site C Reservoir Tributaries Fish Population Indexing Survey
EIS	Environmental Impact Statement
Task 2b	Peace River Bull Trout Spawning Assessment
PIT	Passive Integrated Transponder
PCD	Peace Canyon Dam
Mon-2	Peace River Fish Community Monitoring Program
FL	Fork Length
HDX	Half-Duplex
Task 2a	Peace River Large Fish Indexing Survey
FDX	Full-Duplex
WLR	Water License Requirements
GMSMON-2	Peace River Fish Index
FIDQ	Fisheries Inventory Data Queries

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1.0 INTRODUCTION

In accordance with Provincial Environmental Assessment Certificate (EAC) Condition No. 7[5] and Federal Decision Statement Condition Nos. 8.4.3[6] and 8.4.4[7] for BC Hydro's Site C Clean Energy Project (the Project), BC Hydro developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP[8]). The Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b) represents one component of the FAHMFP that is designed to monitor Peace River fish populations that use tributaries in the future inundation zone of the Site C reservoir to fulfil portions of their life cycle. Most notably, these species include Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), and Rainbow Trout (*Oncorhynchus mykiss*). The Site C Reservoir Tributaries Fish Population Indexing Survey (Task 2c) is one component of Mon-1b that intends to monitor the populations of Arctic Grayling, Bull Trout, and Rainbow Trout that are known to spawn in Site C reservoir tributaries and how these populations are impacted by the construction and operation of the Project.

This report summarizes the 2019 findings of Task 2c. This is the fourth year of a multi-year study, and the results from 2019 (in addition to the data from the first three years of the study) will contribute to the baseline data prior to subsequent phases of Project construction (e.g., river diversion) and reservoir formation. These data will also help identify the most effective sampling locations and methods to employ during future study years. During Year 1 (2016), reconnaissance surveys were conducted and consisted of a broad spatial scope within each of the sampled tributaries (Golder 2017). Effort in Year 2 (Golder 2018) was focused on key areas that were identified during Year 1 surveys. Year 3 (Golder 2019) and Year 4 (the current year) largely repeated methods refined during Year 2 (Golder 2018).

1.1 Bull Trout

A key uncertainty identified in the Project's Environmental Impact Statement (EIS) relates to the movement of Peace River Bull Trout during and after construction of the Project, which in turn, influences the number of spawning Bull Trout expected to be present in the Halfway River[9]. The Halfway River is known to be an important watershed for spawning by Peace River Bull Trout (Putt et al. 2020; AMEC and LGL 2008a, 2008b, 2010a, 2010b; BC MELP 2000; Burrows et al. 2001; Pattenden et al. 1991). The objective of the Peace River Bull Trout Spawning Assessment (Mon-1b, Task 2b) is to monitor Bull Trout spawner and redd abundance in select tributaries of the Halfway River watershed to monitor the population's response to the construction and operation of the Project (Putt et al. 2020). The abundance of adult Bull Trout in the Halfway River watershed, as monitored under Task 2b, may be influenced by changes in the abundance of immature Bull Trout in tributaries of the Halfway River and by changes in the abundance of the Halfway River's resident Bull Trout population. Therefore, Task 2c is designed, in part, to monitor immature Bull Trout abundance in Halfway River tributaries to test Hypothesis #3 within the Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program:

H_3: Bull Trout juvenile abundance in the Halfway River will not decline relative to baseline estimates.

[5] The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.

[6] The plan shall include: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area.

7 The plan shall include: an approach to monitor and evaluate the effectiveness of mitigation or offsetting measures and to verify the accuracy of the predictions made during the environmental assessment on fish and fish habitat.

[8] Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/document-library/environmental-management-plans-and-reports.

[9] Site C Clean Energy Project Environmental Impact Statement, Volume 2, Appendix Q3.

Prior to 2016, a program dedicated to monitoring immature Bull Trout abundance in the Halfway River watershed had not previously been implemented, although incidental catches were noted during some studies (e.g., Mainstream 2009a, 2010, 2011a, 2013). Therefore, for the purposes of testing the above hypothesis, data collected during initial study years (i.e., 2016 through 2020) will serve as baseline data with which to compare against future study years.

A second objective of the current program was to deploy passive integrated transponder (PIT) tags into captured fish to allow the movements of these fish to be monitored using PIT detector arrays installed in the Chowade River and Cypress Creek (Appendix A, Figure A1) as a component of Task 2b in 2017 (Ramos-Espinoza et al. 2018), 2018 (Ramos-Espinoza et al. 2019), and 2019 (Putt et al. 2020). Having a thorough understanding of the movement patterns of both adult and immature Bull Trout in the study area will provide insight into this species life history characteristics and help address the above uncertainty. Most notably, movement data will help confirm the presence or absence of resident populations, the timing of both pre- and post-spawn movements by adults, the residence time of immature life stages, the timing of downstream immature dispersal, and the extent of skip-spawning by adults.

A third study objective in 2019 was the deployment of radio telemetry tags into immature Bull Trout (i.e., fish less than approximately 250 mm FL) to track their movements through the Site C Fish Movement Assessment (Mon-1b, Task 2d).

The portions of the Chowade River and Cypress and Fiddes creeks that were sampled in 2019 were selected based on locations sampled in previous studies where catches of Bull Trout were greatest (Golder 2017, 2018, 2019) and sections previously identified as important for spawning Bull Trout (Euchner and Mainstream 2013). Effort in 2017, 2018 and 2019 focused on the portions of each tributary where densities of immature Bull Trout were expected to be high and densities of Rainbow Trout were expected to be low. As such, a survey dedicated to monitoring Rainbow Trout was established in other locations.

1.2 Rainbow Trout

The Project's EIS identified uncertainties regarding the continued use of Maurice and Lynx creeks for spawning and rearing by Peace River Rainbow Trout populations. Sampling in Maurice Creek was not conducted under Task 2c during any survey year due to site access limitations associated with sampling crew safety and security. Sampling in Lynx Creek was not conducted under Task 2c during any survey year due to ongoing high turbidity levels[10] precluding fish sampling. Landslides in Lynx Creek have reduced the quality of Rainbow Trout spawning and rearing habitat through increased sediment deposition. Based on these factors, Maurice and Lynx creeks were not considered as candidate index streams for monitoring the long-term status of the Peace River Rainbow Trout population.

For the above reasons, prior to the 2017 survey, Farrell, Colt, and Kobes creeks were selected, in consultation with BC Hydro[11], as alternative tributaries to monitor local Rainbow Trout populations. The sites established in Farrell, Colt and Kobes creeks in 2017 were replicated in 2018 and 2019.

[10] The source of the high turbidity in Lynx Creek has been associated with an upstream landslide in Brenot Creek, a tributary to Lynx Creek.: https://hudsonshope.ca/district-office/public-works/water-services/water-advisories/.

[11] BC Hydro also reviewed with the Project's Fisheries and Aquatic Habitat Mitigation and Monitoring Technical Committee the streams to sample for Rainbow Trout.

Farrell Creek is a tributary that flows into the Peace River approximately 23.5 km downstream of Peace Canyon Dam (PCD). Sampling in Farrell Creek will test the hypothesis that Rainbow Trout from Site C reservoir will continue to spawn and rear upstream of the Site C reservoir inundation zone following reservoir formation. The presence of Young-of-the-Year (YOY) Rainbow Trout in Farrell Creek during summer surveys would be taken as confirmation that Rainbow Trout spawned in the system during the preceding spring spawning season. The subsequent detection of Rainbow Trout that were initially tagged as immature or YOY in Farrell Creek under other components of the FAHMFP will help determine if Rainbow Trout from the Peace River spawn in Farrell Creek. The movement of radio-tagged immature Rainbow Trout from Farrell Creek into the Peace River would provide additional support for this hypothesis.

Rainbow Trout populations in Kobes and Colt creeks were also assessed. Kobes Creek is a tributary to the Halfway River, flowing into the Halfway River at River Km 76, as measured upstream from the Halfway River's confluence with the Peace River. Colt Creek is a tributary to the Graham River, flowing into the Graham River at River Km 11.5, as measured upstream from the Graham River's confluence with the Halfway River. The Graham River flows into the Halfway River 90 km upstream from the Halfway River's confluence with the Peace River. Rainbow Trout data from Colt and Kobes creeks will be used to provide an index of relative Rainbow Trout abundance and to gather information regarding movements between sites and study years in the Halfway River watershed.

1.3 Arctic Grayling

The Project's EIS describes key uncertainties for the Peace River Arctic Grayling population upstream of the Project[12]. These include the species' ability to overwinter in the Moberly River and its response to the Project's creation of reservoir habitat. Sampling in the Moberly River under Task 2c in 2016, 2017, and 2018 were conducted to add to the existing baseline dataset (e.g., Mainstream 2013) to further describe the fish community located within and upstream of the Site C reservoir inundation zone and improve our understanding of the Moberly River Arctic Grayling population. The current study provides additional baseline data to test Hypothesis #5 from the Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program:

H_5: A self-sustained population of Arctic Grayling will remain in the Moberly River.

[12] Site C Clean Energy Project Environmental Impact Statement, Volume 2, Appendix Q3.

2.0 METHODS

The Site C Reservoir Tributary Fish Population Indexing Survey represents a before-after study design, with five years of data scheduled to be collected prior to river diversion (scheduled for fall 2020). An additional three years of data are scheduled to be collected during river diversion (2021 to 2023), with reservoir filling and operation commencing in fall 2023.

2.1 Study Area

The Task 2c study area includes tributaries that were previously identified as having key habitat for migratory Peace River Arctic Grayling, Bull Trout and Rainbow Trout populations (Appendix A, Figures A1 to A9). Sections of each tributary that were sampled depended on sampling logistics and the species-specific hypotheses being tested. Results of the three previous years (2016, 2017 and 2018) of the sampling program were used to guide sample site selection to focus on reaches and habitat types with higher densities of the target fish species. Target fish species within the tributaries sampled in 2019 are summarized in Table 1.

Table 1: Summary of target species by watershed for the Site C Reservoir Tributaries Fish Population Indexing Survey, 2019

Species	Watershed						
	Chowade River	Cypress Creek	Fiddes Creek	Colt Creek	Farrell Creek	Kobes Creek	Moberly River
Arctic Grayling	-	-	-	o	o	o	x[a]
Bull Trout	x	x	x	o	-	o	-
Rainbow Trout	o[b]	o	-	x	x	x	-

[a] "x" denotes main target species for the tributary.

[b] "o" denotes secondary target species for the tributary.

River Km values presented in this report were based on the Government of Canada's CanVec series of hydrograph features[13]. For each tributary, the different line segments of the same stream were merged into a single line feature. River Km 0.0 (i.e., the tributary's confluence) was set at the lowest elevation of the line feature, and 1 km intervals were established along the line feature using the Create Station Points tool (ArcGIS© extension ET GeoWizards).

[13] Available for download at https://open.canada.ca/data/en/dataset/9d96e8c9-22fe-4ad2-b5e8-94a6991b744b.

2.1.1 Tributaries Targeting Bull Trout

Tributaries sampled in 2019 included the Chowade River and Cypress and Fiddes creeks (Table 1). Sampling in the Chowade River was conducted between River Km 22.0 and River Km 51.1, as measured upstream from the Chowade River's confluence with the Halfway River (Appendix A, Figure A4). For the Chowade River, most sampling was conducted upstream of River Km 36, with the exception of two sites sampled near River Km 22 on 3 August, which was conducted specifically to capture additional large immature Bull Trout to implant with radio telemetry tags. For Cypress Creek, sampling was conducted between River Km 25.5 and River Km 41.7, as measured upstream from Cypress Creek's confluence with the Halfway River (Appendix A, Figure A3).
All sampling in 2019 within Fiddes Creek was conducted between River Km 4.8 and River Km 7.1 as measured upstream from the Fiddes Creek's confluence with the Halfway River (Appendix A, Figure A2).

UTMs of all site locations are provided in Appendix A, Table A1. Individual sites were selected based on aerial surveys conducted at the start of the program, allowing crews to identify potentially suitable habitats that were close to safe landing locations.

2.1.1.1 PIT Detector Arrays on Tributaries Targeting Bull Trout

In addition to the identification of recaptured fish within and among study years, fish implanted with PIT tags as part of the current program (Mon-1b, Task 2c) were also intended to be detected by the Chowade River and Cypress Creek PIT detector arrays installed as part of Mon-1b, Task 2b (Appendix A, Figure A1) (Putt et al. 2020). These arrays also detect fish captured and implanted with PIT tags deployed during surveys conducted as part of the Peace River Large Fish Indexing Survey (Mon-2, Task 2a; e.g., Golder and Gazey 2019) and potentially fish captured and implanted with PIT tags deployed under Offset Effectiveness Monitoring (Mon-2, Task 2d).

Each PIT detector array was equipped with an upstream and downstream antenna. If a fish was first detected by the upstream antenna and then by the downstream antenna, it was assumed that the fish was travelling in a downstream direction. Similarly, if a fish was first detected by the downstream antenna and then detected by the upstream antenna, it was assumed that the fish was travelling in an upstream direction.

2.1.2 Tributaries Targeting Rainbow Trout

Sample locations within Farrell Creek (Appendix A, Figure A7) were at locations previously established by Mainstream (2011a) and Golder (2018) to allow comparisons with historical data when possible. To maintain a consistent site-naming convention between tributaries within Task 2c, Mainstream Site FA03 was renamed FAC63.4, Site FA04 was renamed FAC65.7, and Site FA05 was renamed FAC102.1. UTMs of sample site locations are provided in Appendix A, Table A1.

Sample locations within Colt Creek (Appendix A, Figure A5) and Kobes Creek (Appendix A, Figure A6) were established in 2017 based on ease of access and the quality of fish habitat available (i.e., expected use by immature Rainbow Trout). These sample locations were replicated in 2018 and 2019. UTMs of sample site locations are provided in Appendix A, Table A1.

2.1.3 Moberly River

The Moberly River study area was approximately 123 km long and was defined as the portion of the Moberly River from the outlet of Moberly Lake (River Km 123 as measured upstream from the Moberly River's confluence with the Peace River) downstream to the Moberly River confluence (River Km 0.0; Appendix A, Figures A8 and A9).

For the Moberly River, previous baseline studies (e.g., Mainstream 2011b) had delineated river sections and these section breaks were implemented in 2019 to maintain consistency with these baseline datasets (Appendix A, Table A2). The habitat classifications delineated by Mainstream (2011b) were as follows:

1) Irregular meanders; frequent riffle complexes interspersed with extended runs with some flats; and

2) Tortuous meanders dominated by low water velocities; flats with few riffle sections.

2.2 Study Period

Overall, 30 days of sampling were conducted in 2019 (all watersheds combined; Table 2), with most sampling conducted from mid-July to early August. Previous studies had documented downstream migration of immature Bull Trout out of the Halfway River watershed in mid-August (R.L.&L. 1995); therefore, to facilitate capture of immature Bull Trout prior to the onset of their downstream migration, sampling in the Chowade River and Cypress Creek was conducted over 10 days between 18 July to 3 August. On 24 July, inclement weather reduced visibility and prevented the helicopter from accessing the Halfway River watershed, so sample efforts were instead conducted at Farrell Creek for Rainbow Trout. Overall, the Chowade River and Cypress Creek were sampled during the same approximate period as in 2018 (Golder 2019). One day of sampling was conducted in Fiddes Creek on 26 July.

Farrell, Kobes and Colt creeks were sampled over seven days between 24 July and 2 August (Table 2).

The Moberly River was sampled over 12 days from 22 July to 2 August (Table 2). Rather than aligning with historical surveys conducted on the Moberly River (e.g., Mainstream 2011b; Golder 2017) or a specific calendar date, the 2019 survey aligned with appropriate flow conditions for the sampling methods to increase the likelihood of encountering Arctic Grayling.

Three additional days of sampling were conducted on the Moberly River on 24 and 29 August, and 21 September specifically to collect tissue samples from small-bodied fish for potential genetic characterization in support of the Site C Small Fish Translocation Monitoring Program (Mon-15). Data from these surveys are not presented or discussed in this report.

Table 2: Sampling schedule by tributary for the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Tributary	Sample Dates	Number of Sampling Days
Chowade River	18 to 25 July; 3 August	5
Cypress Creek	21 to 28 July	5
Fiddes Creek	26 July	1
Farrell Creek	24 July; 1 and 2 August	3
Colt Creek	31 July to 1 August	2
Kobes Creek	29 and 30 July	2
Moberly River	22 July to 2 August	12

2.3 Discharge

Discharge data are not available for the Chowade River, or Colt, Cypress, Farrell, Fiddes or Kobes creeks. The Water Survey of Canada's Halfway River Above Graham River station (Station Number 07FA003) [14] is located approximately 0.5 km upstream of the Graham River's confluence with the Halfway River. Data from this station were considered representative of tributaries in the Halfway River drainage and the general region based on correlations of station data and Chowade River level logger data conducted by Putt et al. (2020).

Discharge data for the Moberly River are from the Water Survey of Canada's Moberly River station (Station Number 07FB008)[15], which is located approximately 2.5 km upstream of the North Monias Road Bridge near River Km 45.0 (Appendix A; Figure A9).

Unless stated otherwise, discharge values are daily average values presented in cubic metres per second (m^3/s).

2.4 Temperature

During the 2019 survey, water temperature data loggers were installed in Fiddes Creek on 3 August (Appendix A, Figure A2), Cypress Creek on 28 July (Appendix A, Figure A3), the Chowade River on 25 July (Appendix A, Figure A4), Colt Creek on 1 August, (Appendix A, Figure A5), Kobes Creek on 29 July (Appendix A, Figure A6), Farrell Creek on 2 August (Appendix A, Figure A7), and the Moberly River on 22 July (Appendix A; Figure A9). Onset® TidbiT® v2 temperature data loggers (Onset Computer Corporation, Bourne, MA, USA), with an accuracy ±0.2°C, were set to record temperatures every 15 minutes. Two loggers were deployed at each location. Each logger was deployed in a protective, perforated, aluminum housing and tied to a secure location on shore (e.g., riprap, tree, large boulder) with stainless steel cable. All loggers were left in place throughout the winter and will be downloaded in the summer of 2020; therefore, data from these loggers were not available for this report.

Spot measurements of water temperatures were obtained at all sample sites at the time of sampling using an OAKTON ECTestr® 11 pen (OAKTON Instruments, Vernon Hills, IL, USA) with an accuracy of ±0.5°C.

2.5 Fish Capture

2.5.1 Halfway River Watershed and Farrell Creek

Backpack electrofishing was used to capture fish in the Chowade River and Colt, Cypress, Farrell, Fiddes, and Kobes creeks. All sampling consisted of a single pass in open sites.

For the Chowade River and Cypress and Fiddes creeks, where Bull Trout were the primary target species, sites were in wadeable areas where immature Bull Trout densities were expected to be higher. These areas were generally located in side-channels or braided sections of the stream that had abundant physical cover, channel widths less than approximately 5 m, mean water depths less than approximately 0.6 m, and water velocities less than 1.0 m/s. Most sites established in the Chowade River and Cypress and Fiddes creeks were dominated by gravel and cobble substrates that resulted in abundant interstitial habitat. Most of the sites sampled in 2019 (98%) contained large or small woody debris. Terrestrial vegetation was less commonly identified as a habitat type in sites sampled in 2019 (65%) compared to sites sampled in 2018 (79%), due mainly to the higher water levels

[14] https://wateroffice.ec.gc.ca/report/real_t2ime_e.html?stn=07FA003.

[15] https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=07FB008.

observed in 2018. Habitat data collected at each site assessed in the Chowade River, and Cypress and Fiddes creeks are summarized in Appendix C, Table C1. Within each site, effort was also focused on areas where the capture of immature Bull Trout was expected to be greatest (e.g., crews focused additional effort around root wads or large boulders if they were present in a site). Backpack electrofishing sites ranged in length from approximately 50 to 500 m. Differences in water elevations and habitat suitability at specific locations between study years reduced the feasibility of repeatedly sampling the same locations year-over-year; however, in some situations, crews were able to sample the same locations as previous study years.

In Farrell, Colt and Kobes creeks, where Rainbow Trout were the primary target species, the sites sampled in 2019 were also sampled in 2017 and 2018. Three of the four sites (FAC63.4, FAC65.7, and FAC102.1) situated on Farrell Creek were previously sampled by Mainstream (2011b). All sites on Farrell, Colt and Kobes creeks were in mainstem high quality habitats that were conducive for backpack electrofishing, and where Rainbow Trout densities were expected to be high.

Backpack electrofishing was conducted with one person operating the electrofisher and one person netting fish. Captured fish were netted and transferred to 20 L buckets filled with water positioned on the shoreline along the length of the site. Smith-Root™ Model 12 and Model 12B backpack electrofishers (Smith-Root, Vancouver, WA, USA) were used, depending on the crew. Electrofisher settings were adjusted as needed to minimize injuries to fish while efficiently capturing the target size and species. Voltage ranged from 200 to 500 V, frequency was set at 60 Hz, and pulse width ranged from 2 to 4 ms.

Habitat variables recorded at each site (Table 3) in 2019 were consistent with previous study years (Golder 2018) and baseline studies (e.g., Mainstream 2011b) and were primarily collected to identify differences in sampling conditions and habitat types sampled within each study year and among study years (Appendix C, Table C1).

The type and amount of instream cover for fish were qualitatively estimated at all sites. Water velocities were visually estimated and categorized at each site as low (less than 0.5 m/s), medium (0.5 to 1.0 m/s), or high (greater than 1.0 m/s). Where water depths were adequate, water clarity was estimated using a “Secchi Bar” that was manufactured based on the description provided by Mainstream and Gazey (2014). Mean and maximum sample depths were visually estimated at each site.

Table 3: Habitat variables recorded at each site sampled as part of the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Variable	Description
Date	The date the site was sampled
Time	The time the site was sampled
Air Temp	Air temperature at the time of sampling (to the nearest 1°C)
Water Temp	Water temperature at the time of sampling (to the nearest 0.1°C)
Conductivity	Water conductivity at the time of sampling (to the nearest 10 µS/cm)
Secchi Bar Depth	The Secchi Bar depth recorded at the time of sampling (to the nearest 0.1 m)
Cloud Cover	A categorical ranking of cloud cover (Clear = 0-10% cloud cover; Partly Cloudy = 10-50% cloud cover; Mostly Cloudy = 50-90% cloud cover; Overcast = 90-100% cloud cover)
Weather	A general description of the weather at the time of sampling (e.g., comments regarding wind, rain, smoke, or fog)
Electrofisher Model	The model of electrofisher used during sampling
Percent	The estimated duty cycle (as a percent) used during sampling
Amperes	The average amperes used during sampling
Mode	The mode (AC or DC) and frequency (in Hz) of current used during sampling
Volts	The voltage (V) used during sampling
Length Sampled	The length of shoreline sampled (to the nearest 1 m)
Time Sampled	The duration of electrofisher operation (to the nearest 1 second)
Mean Depth	The mean water depth sampled (to the nearest 0.1 m)
Maximum Depth	The maximum water depth sampled (to the nearest 0.1 m)
Effectiveness	A categorical ranking of sampling effectiveness (1 = good; 2 = moderately good; 3 = moderately poor; 4 = poor)
Instream Velocity	A categorical ranking of water velocity (High = greater than 1.0 m/s; Medium = 0.5 to 1.0 m/s; Low = less than 0.5 m/s)
Instream Cover	The type (i.e., Interstices; Woody Debris; Cutbank; Turbulence; Flooded Terrestrial Vegetation; Aquatic Vegetation; Shallow Water; Deep Water) and amount (as a percent) of available cover
Crew	The field crew that conducted the sampling
Sample Comments	Any additional comments regarding the sample site or sampling conditions

2.5.2 Moberly River

The study plan for the Moberly River survey consisted of crews travelling by inflatable boats down the length of the Moberly River from Moberly Lake to the river's confluence with the Peace River. The six-person team worked as three separate crews: an angling crew, a small fish boat electroshocking crew, and a backpack electrofishing crew. The survey started at the North Monias Road Bridge (Appendix A, Figure A9), which is approximately

43.5 km upstream from the Moberly River's confluence. Crews travelled downstream sampling Sections MR-S7 through MR-S10. Once they reached the confluence (River Km 0.0), they travelled by truck to Moberly Lake Provincial Park (River Km 123.0), disembarked, and floated downstream to the North Monias Road Bridge sampling Sections MR-S1A, Sections MR-S1 through MR-S6, and the upstream portion of Section MR-S7. Water levels in the Moberly River generally decline over the late summer to fall period. As such, the lower sections (Sections MR-S7 to MR-S10), which are generally shallower and more braided, were sampled first while water levels were high enough to access side channel habitats. Sampling was conducted using small fish boat electroshocking, backpack electrofishing and angling.

Small fish boat electroshocking was conducted out of a white-water-style raft (Avon™ 13 Pathmaker; 4 m long by 1.75 m wide; AVON Marine, Port Moody, BC, Canada). Sites were located in main channel habitats where water depths were deep enough and channel widths were wide enough to allow the crew to effectively maneuver the boat. The raft was equipped with a Smith-Root™ 5.0 Generated Powered Pulsator (GPP 5.0; Smith-Root, Vancouver, WA, USA) and a generator contained in a waterproof tub. The electroshocker was connected to a cathode array curtain placed on the bow of the raft and two anode pole arrays extended approximately 1.5 m in front of the raft. The anode poles were angled between 20° and 40° off either side of the bow. While sampling, a single crew member was positioned at the bow of the boat. This crew member netted stunned fish and transferred them to a water-filled holding tank positioned behind the bow but in front of the oarsman. The netter attempted to capture all stunned fish, but priority was given to Arctic Grayling if more than one species was observed at the same time. The oarsman sat in an elevated chair behind the holding tank and maneuvered the boat with oars braced in oar locks. Electroshocker settings were adjusted at each site, depending on local conditions and the size and species of fish observed, to minimize injury to fish. The electroshocker was generally operated at 60 Hz pulsed direct current (PDC). The amperage was adjusted as needed to attain the desired response in fish, which was galvanotaxis (forced swimming) without immediate tetany. This response typically corresponded to an amperage of 2.0 to 3.0 A. Habitat conditions, as summarized in Table 3, were recorded at each site. Small fish boat electroshocking sites ranged between 50 to 1800 m in length. The above methods were similar to those employed during the 2017 to 2018 surveys (Golder 2018, 2019).

Backpack electrofishing was used in locations where water depths were shallow enough and water velocities were low enough to allow safe wading and efficient fish capture using this technique. These sites were often side channel or braided areas. Two different models of backpack electrofisher were used, a Smith-Root™ Model 12 and a Smith-Root™ Model LR24 (Smith-Root, Vancouver, WA, USA). Electrofisher settings were adjusted as needed to minimize injuries to fish while allowing efficient capture of the target size and species. Voltage ranged from 185 to 440 V, frequency ranged from 30 and 60 Hz, and pulse width ranged from 3 to 9 ms. Backpack electrofishing was conducted with one person operating the electrofisher and one person netting fish. Captured fish were netted and transferred to 20 L buckets of water set along the side of the sample site. Habitat conditions, as summarized in Table 3, were recorded at each site. Backpack electrofishing sites ranged in length from 40 to 200 m. The above methods were similar to those employed during the 2016 to 2018 surveys (Golder 2017, 2018, 2019).

Angling occurred at sites where fish were observed feeding on the surface of the water or in pools or other habitats that were difficult to sample using alternative capture methods. Both spin-casting and fly-fishing equipment were used, and the crew selected the equipment that they deemed most appropriate for the local conditions. To potentially increase the catch of target species, angling also occurred opportunistically while the

boats travelled between sites and any fish that were captured while in transit were processed. During each angling effort, total time spent angling was recorded and multiplied by the number of anglers to calculate total angling effort in hook-hours.

2.6 Fish Processing

All captured fish were identified to species, counted, weighed to the nearest 1 g, and measured for fork length (FL) to the nearest 1 mm. Total lengths (TL) were recorded for Burbot (*Lota lota*) and sculpin species to the nearest 1 mm. When catches of species other than Arctic Grayling, Bull Trout or Rainbow Trout exceeded 30 individuals per site, only the first 30 individuals of each species were measured; all other individuals were enumerated and released. Arctic Grayling, Burbot, Bull Trout and Rainbow Trout in good condition following processing were implanted with half-duplex (HDX) PIT tags (ISO 11784/11785 compliant) (Oregon RFID, Portland, OR, USA). Tags were implanted within the left axial muscle below the dorsal fin origin and oriented parallel with the anteroposterior axis of the fish. Tagging criteria are summarized as follows:

- Fish between 80 and 199 mm FL received 12 mm long HDX PIT tags (12.0 mm x 2.12 mm HDX+).
- Fish between 200 and 299 mm FL received 23 mm long HDX PIT tags (23.0 mm x 3.65 mm HDX+).
- Fish greater than 300 mm FL received 32 mm long HDX PIT tags (32.0 mm x 3.65 mm HDX+).

After processing, all fish were released at the downstream end of their capture site.

Scale samples were collected from all captured Arctic Grayling and Rainbow Trout. Scales were collected from above the lateral line and posterior to the dorsal fin. The first leading fin ray of the left pectoral fin was collected from all Bull Trout longer than 120 mm FL. To reduce stress, fin rays were not collected from Bull Trout selected to receive surgically implanted radio telemetry tags. Scale and fin ray samples were stored in appropriately labelled coin envelopes.

Small sections of fin tissue were collected from Arctic Grayling, Bull Trout and Rainbow Trout that the crew deemed large enough to not be adversely affected by the collection procedure. Tissue samples were also collected from Longnose Dace (*Rhinichthys cataractae*), Redside Shiner (*Richardsonius balteatus*) and Slimy Sculpin (*Cottus cognatus*) in the Moberly River to support the Site C Small Fish Translocation Monitoring Program (Mon-15). Samples were preserved in 95% non-denatured ethyl alcohol and provided to BC Hydro. The samples were not analyzed as part of the current study.

Both otoliths and fin rays were collected from Rainbow Trout, Arctic Grayling and Bull Trout that succumbed to sampling. These samples were not analyzed as part of the current study but were provided to BC Hydro.

2.7 Radio Telemetry Tag Deployment

Candidate fish selected for radio telemetry tag implantation were selected based on the health and vigor of the fish after the post-capture holding period. Fish that appeared stressed or unhealthy were excluded as potential candidates. The type and size of radio tag implanted was dependent on the weight of the fish, with the tag contributing no more than approximately 2% to the body weight of the fish. Fish with weights between 28.5 g and

75 g were implanted with NTF-3-2 Lotek telemetry tags (0.57 g in air; average estimated tag life = 185 days) (Lotek Wireless Inc. Newmarket, ON, Canada). Fish with weights between 75 g and 125 g were implanted with NTF-5-2 Lotek telemetry tags (1.5 g in air; average estimated tag life = 357 days).

A standard surgical record and tag deployment datasheet was used to document the handling, tagging, and release processes for each telemetry tagged fish. Data collected included the following:

- fish sample number and species;
- telemetry tag information (tag code, tag frequency, model number, serial number, etc.);
- Corresponding HDX PIT tag number;
- site of capture;
- water temperature at capture;
- fork length measured to nearest millimetre;
- weight measured to nearest gram;
- initials of the surgeon and the assistant;
- date of surgery;
- start and end time of anaesthetic bath;
- start and end time of surgery; and
- comments on health and post-surgery condition.

Each tag was activated with the Lotek tag activator and the tag code was verified with a Lotek SRX800 MD-4 receiver that was used to detect and decode the tag signal. Tags and all surgical instruments were placed in a 10% disinfectant solution (Super Germiphene™) for 10 minutes and then transferred to a rinse tray filled with distilled water prior to surgery. The surgeon wore nitrile gloves and rinsed them with isopropyl alcohol prior to surgery. To maintain the integrity of the fish's mucous layer, handling of the fish was kept to a minimum and when required, was done using nitrile gloves and a soft-mesh transfer net. An anaesthetic bath of 30 L of water with 50 PPM of clove oil was used to sedate the fish. The clove oil was mixed with 70% ethyl alcohol to achieve a 9:1 alcohol to clove oil ratio, which facilitated mixing the clove oil with the water. Only one fish was anaesthetized at a time. The level of sedation was constantly assessed by checking the ability of the fish to remain vertical in the anaesthetic bath water, the frequency of opercular movements, and tail twitch reflex responses.
Once anaesthetized, the fish was removed from the anaesthetic bath, weighed and measured, and placed ventral side up in a sponge-lined surgery tray. During the surgical procedure, a gravity feed water supply system was set up to continuously irrigate the gills with fresh river water.

The start of the incision location was anterior of the cloacal vent and slightly off the midline, posterior to the liver. Using #11 scalpel blade and rat-tooth forceps, an incision approximately 1.5 times the diameter of the radio telemetry tag was made through the abdominal wall. A catheter or stainless-steel cannula, appropriate for the radio telemetry tag's antenna diameter and the size of the fish, was inserted into the incision and directed along the body wall towards the fish's caudal fin. The cannula pierced the body wall approximately 3 cm away from the

incision and the ventral surface and angled back so that the antenna was in line with the fish. The antenna was pulled through the cannula and the tag was inserted into body cavity, tip first. Once inserted, a combination of gently pushing on the tag and pulling on the antenna was used to position the tag in the appropriate location. The cannula was removed, and the incision was stitched closed with two to three simple surgeon 2-1-1 interrupted stitches using Ethicon Vicryl Plus 4-0 braid sutures (Ethicon Inc., Somerville, NJ, US) with a round taper-point needle.

After the surgery, the fish was placed in a recovery bucket until they recovered and regained normal swimming behavior. During the recovery period, water temperature was monitored, and a small bubbler pump and airstone were used to aerate the water. Once recovered, the fish were released back into the mainstem of the river at a location in the midway between the upstream and downstream sample site boundaries. At release, tagged fish were monitored to ensure they actively swam to depth and did not remain in shallow water.

All fish sampling and tagging data for radio tagged fish were provided to LGL in support of the Site C Fish Movement Assessment (Mon-1b, Task 2d; LGL 2020).

2.8 Fish Ageing

All Arctic Grayling and Rainbow Trout were aged by scale analysis. Scales were aged by counting the number of growth annuli present on the fish scale following methods outlined in Mackay et al. (1990) and RISC (1997). Scales were temporarily mounted between two slides and examined using a trinocular microscope equipped with a digital camera. If needed, several scales were examined and the highest quality scale was photographed using the integrated 3.1-megapixel digital macro camera and saved as a JPEG-type picture file. All scales were examined independently by two experienced individuals (i.e., “agers”) and ages assigned. For each scale sample, the agers had access to the species and the date of capture but no other information about the sampled fish (e.g., fork length or capture history). If the two assigned ages did not agree, a third ager assigned an age. If two out of three agers agreed on the age, then this age was used for analysis. If two out of three agers did not agree on an age, then the sample was not used for analysis purposes. Where possible, the scale age estimates were then cross-checked with age estimates assigned based on fork lengths and the separation of modes in length-frequency histograms of all fish captured in each stream.

Bull Trout fin rays were aged by counting the number of growth annuli present on the sample following methods outlined in Mackay et al. (1990). Fin rays were coated in epoxy and allowed to dry. Once the epoxy dried, a rotary sectioning saw with a diamond blade (Buehler IsoMet Low Speed Saw; Lake Bluff, Illinois) was used to create multiple cross-sections of each fin ray sample. The rotary sectioning saw allowed the thickness of cross-sections to be set to specific widths, resulting in cross-sections of uniform thickness with more polished surfaces (which reduced sanding and preparation time), when compared to the jeweler’s saw (Gesswein Canada, Toronto, Canada) used prior to 2017. The cross-sections were permanently mounted on a microscope slide using a clear coat nail polish and examined using a digital microscope. If needed, several fin ray cross-sections were examined and the cross-section with the most visible annuli was used. All fin rays were examined independently by two experienced individuals using the same approach as detailed above for scales. Where possible, the fin ray age estimates were then cross-checked with age estimates assigned based on fork lengths and the separation of modes in length-frequency histograms of all fish captured in each stream.

2.9 Data Analysis

All data collected during field surveys were entered and stored in a custom MS-Access© database that conforms to BC Hydro's established Site C data standards. Data on field sheets were entered into an MS-Excel© spreadsheet, which were then verified by a second person before being uploaded to the database. Before data analysis, a Quality Control / Quality Assurance (QA/QC) review of the database was conducted to identify spurious data. The database QA/QC used histograms and bivariate plots to check the range and format of all variables. Once identified, outliers and spurious data were reviewed and either corrected or removed from the database. Additional post-collection error screening and data proofing were conducted using both Excel® and the statistical environment R, v. 3.6.1 (R Core Team 2019). Data analyses and tabular data summaries were performed in R. Graphical plots were produced in R using the package ggplot2 (Wickham 2009). Catch was summarized by sample method, species, life stage, watercourse, and section (where applicable) and presented in tabular format. Catch per unit effort (CPUE) for electrofishing was calculated by dividing the summed total number of fish in a tributary captured at all sites by the sum of effort at all sites. Sampling effort was measured in seconds of electrofisher operation, and CPUE was expressed as the number of fish per hour. Length of site was not used to represent sampling effort for CPUE because sampling in the Chowade River and Cypress Creek focused only on optimal habitats and the amount of habitat available and site length sampled was dependent on sampling conditions. Catch rate and CPUE are used interchangeably throughout the document.

Length-frequency histograms were plotted for the three target species (Bull Trout, Rainbow Trout and Arctic Grayling) by tributary. Length-frequency histograms were also plotted for Burbot and Mountain Whitefish (*Prosopium williamsoni*) for the Moberly River. Age-frequency histograms were plotted for Bull Trout for the combined catch from the Chowade River, and Cypress and Fiddes creeks, and for Rainbow Trout for the combined catch from Colt, Farrell and Kobes creeks. Length-at-age data were used to plot three-parameter von Bertalanffy growth curves for Arctic Grayling, Bull Trout, and Rainbow Trout (Pardo et al. 2013).

Fish were assigned a life stage of YOY, immature, or adult based on their body length. The maximum size of YOY was determined for each species based on the difference between the first and second modes in the species' length-frequency distribution. The immature life stage included fish larger than the YOY group up to 249 mm FL. Fish larger than 250 mm FL were classified as adult for all species. Although some individuals larger than 250 mm FL for some species were likely not mature adults and some individuals smaller than 250 mm FL for some species were likely mature adults, 250 mm FL was used as a consistent cut-off to summarize data by length-class. Backpack electrofishing was the only capture method used in the Halfway River watershed and Farrell Creek and is more effective at capturing small-bodied fish than large-bodied fish. As such, incidental catches of adult Bull Trout and adult Rainbow Trout were not considered reliable indicators of adult abundance in these streams.

3.0 RESULTS

Sampling conducted in tributaries of the Peace and Halfway rivers in 2019 was initiated in late July when a gradual decrease in the hydrograph in each drainage was expected. At the start of sampling, flows decreased gradually as expected; however, with the onset of heavy rain in late July and then again in August, flows increased substantially and negatively affected sampling due to increased turbidity and high water velocities. At peak flows, sampling was postponed until flows decreased enough to allow sampling to resume.

3.1 Tributaries Targeting Bull Trout

3.1.1.1 Halfway River Discharge and Temperature

An aerial reconnaissance of the study area in the Halfway River watershed and its tributaries was conducted on 17 July prior to the start of sampling. During the reconnaissance, the discharge in the Halfway River was approximately 40 m³/s and below the historical July mean monthly discharge level (89 m³/s; 1977-1995, 2012-2014) (Figure 1). During the subsequent sampling effort from 18 to 24 July, mean daily Halfway River discharge increased and ranged between 40 m^3/s and 82 m^3/s due to heavy rain. Discharge continued to increase and peaked on 25 July (112 m^3/s), at which point sampling ceased and was reinitiated on 1 August after water levels in the Halfway River drainage decreased. In August 2019, mean monthly discharge (87 m³/s) exceeded the historical August average[16] (50 m³/s) due to higher that expected precipitation in late August.

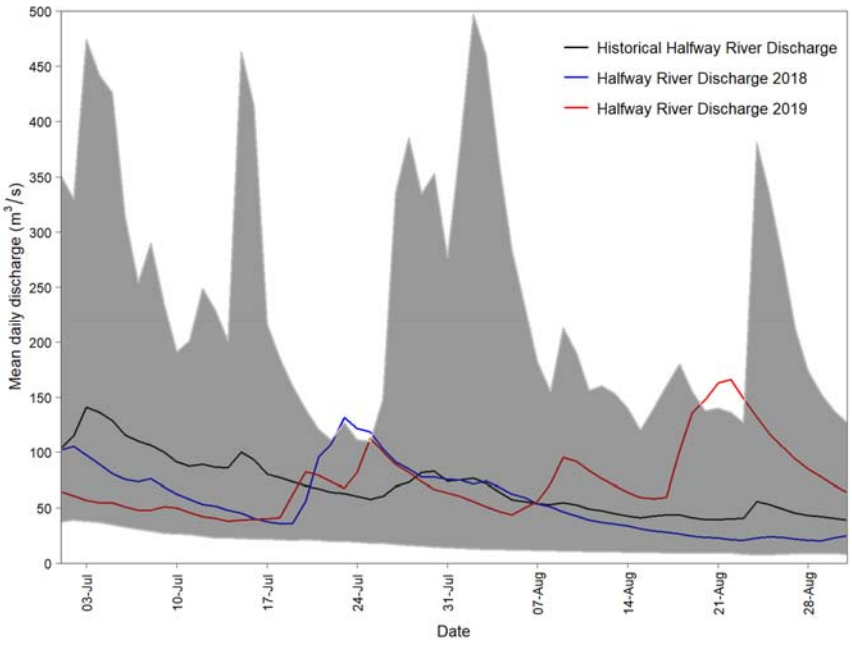

Figure 1: Mean daily discharge for the Halfway River at Water Survey of Canada gauging station 07FA003, 1 July to 31 August in 2018 and 2019 in comparison to historical mean daily discharge (black line; 1977-1995, 2012-2014) and mean daily minimum and maximum discharge (grey shading). Halfway River discharge data were not available for 2015 or 2017.

[16] https://wateroffice.ec.gc.ca/report/historical_e.html?mode=Graph&type=&stn=07FA003&dataType=Daily&parameterType=Flow&year=2014&y1Max=1&y1Min=1&y1Mean=1&scale=normal

Average water temperatures at the time of sampling were lower in the Chowade River (8.0°C), Cypress Creek (9.0°C), and Fiddes Creek (7.6°C) when compared to Colt Creek (10.1°C), Farrell Creek (15.2°C), and Kobes Creek (14.1°C) (Appendix C, Table C1).

3.1.2 Sample Effort

In total, 63 sites were surveyed in tributaries targeting Bull Trout, including 28 sites in the Chowade River, 31 sites in Cypress Creek, and 4 sites in Fiddes Creek. Approximately 26 hours of backpack electrofishing effort was conducted over 10,705 m of habitat. Total effort expended in Cypress Creek (12.2 hours) was greater than effort expended in the Chowade River (11.6 hours), with substantially less sample effort conducted in Fiddes Creek (2.1 hours) (Table 4). A detailed summary of effort is provided in Appendix B, Table B1.

Table 4: Summary of backpack electrofishing effort employed to target Bull Trout in Halfway River tributaries during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Tributary	Number of Sites	Electrofishing Effort (s)	Electrofishing Effort (h)	Length of Survey (m)
Chowade River	28	41,582	11.55	4,680
Cypress Creek	31	43,818	12.17	5,400
Fiddes Creek	4	7,570	2.10	625
Total	**63**	**92,970**	**25.82**	**10,705**

3.1.3 Catch and Life History

Of the 688 Bull Trout captured in the Chowade River and Cypress and Fiddes creeks combined (Appendix B, Table B4), 507 (74%) were new captures that were implanted with PIT tags; three were recaptures that were tagged in previous years (Table 5). All remaining Bull Trout were not tagged because they were either incidental mortalities (n = 6) or unhealthy (i.e., unlikely to survive the tagging process; n = 12), or too small to receive a PIT tag (i.e., less than 80 mm FL; n = 166). Of the three recaptured Bull Trout, one was tagged in 2017 in Cypress Creek and recaptured in 2019 in a site approximately 400 m downstream from its initial capture location. This fish measured 100 mm FL in 2017 and 210 mm FL in 2019. The two other recaptured Bull Trout were recaptured in Fiddes Creek. One Bull Trout was originally tagged in 2018 and recaptured in 2019 at the same site. This fish measured 121 mm FL in 2018 and was classified age-2. When it was recaptured, it was 147 mm FL. The second Bull Trout recaptured in Fiddes Creek was originally tagged in 2017 (81 mm FL; age-1), recaptured in 2018 (122 mm FL; age-2), and recaptured again in 2019 (155 mm FL; age-3). Both recapture events were within 100 m of its original capture site.

Bull Trout captured in the Chowade River, and Cypress and Fiddes creeks were similar in length (median fork length = 87, 90, and 86 mm FL, respectively) and weight (median weight = 8, 8, and 6 g, respectively; Figure 2). However, due to a higher catch proportion of large immature fish in Fiddes Creek compared to the other two tributaries, mean fork length (107 mm FL) and mean weight (19 g) in Fiddes Creek were notably higher compared to the Chowade River (83 mm FL; 8 g) and Cypress Creek (90 mm FL; 12 g).

Table 5: Number of fish caught and tagged by life stage, and corresponding CPUE (number of fish per hour), in the Chowade River and Cypress and Fiddes creeks recorded during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Species[a]	Life Stage[b]	Chowade River			Cypress Creek			Fiddes Creek			Total		
		# Caught	# Tagged	CPUE (#/h)	# Caught	# Tagged	CPUE (#/h)	# Caught	# Tagged	CPUE (#/h)	# Caught	# Tagged	CPUE (#/h)
Bull Trout	Adult	2	2	<1.0	-	-	-	-	-	-	2	2	<1.0
	Imm.[c]	299	261	25.8	210	200	17.2	51	47	24.3	560	508	21.7
	YOY	94	-	8.1	32	-	2.6	-	-	-	126	-	4.9
Rainbow Trout	Adult	9	9	<1.0	1	1	<1.0	-	-	-	10	10	<1.0
	Imm.	4	4	<1.0	-	-	-	-	-	-	4	4	<1.0
	YOY	-	-	-	-	-	-	-	-	-	-	-	-
Mountain Whitefish	Adult	-	-	-	-	-	-	-	-	-	-	-	-
	Imm.	-	-	-	2	-	<1.0	-	-	-	2	-	<1.0
	YOY	1	-	<1.0	-	-	<1.0	-	-	-	1	-	<1.0

[a] Table excludes 52 Slimy Sculpin captured in the Chowade River and 46 Slimy Sculpin captured in Cypress Creek.
[b] Life stage was assigned based on fork length. Fish were classified as adult when longer than 249 mm FL and immature when between 65 and 250 mm FL. The maximum size of YOY fish varied by species and location and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.
[c] Two immature Bull Trout that were captured and tagged in Cypress Creek were subsequently recaptured in other sites in Cypress Creek.

Two adult Bull Trout were captured and recorded in the Chowade River. One, captured on 3 August, was 542 mm FL and the second one, captured on 20 July, was 603 mm FL in length. These two fish were excluded from analyses. Adult Bull Trout were not recorded in Cypress or Fiddes creeks.

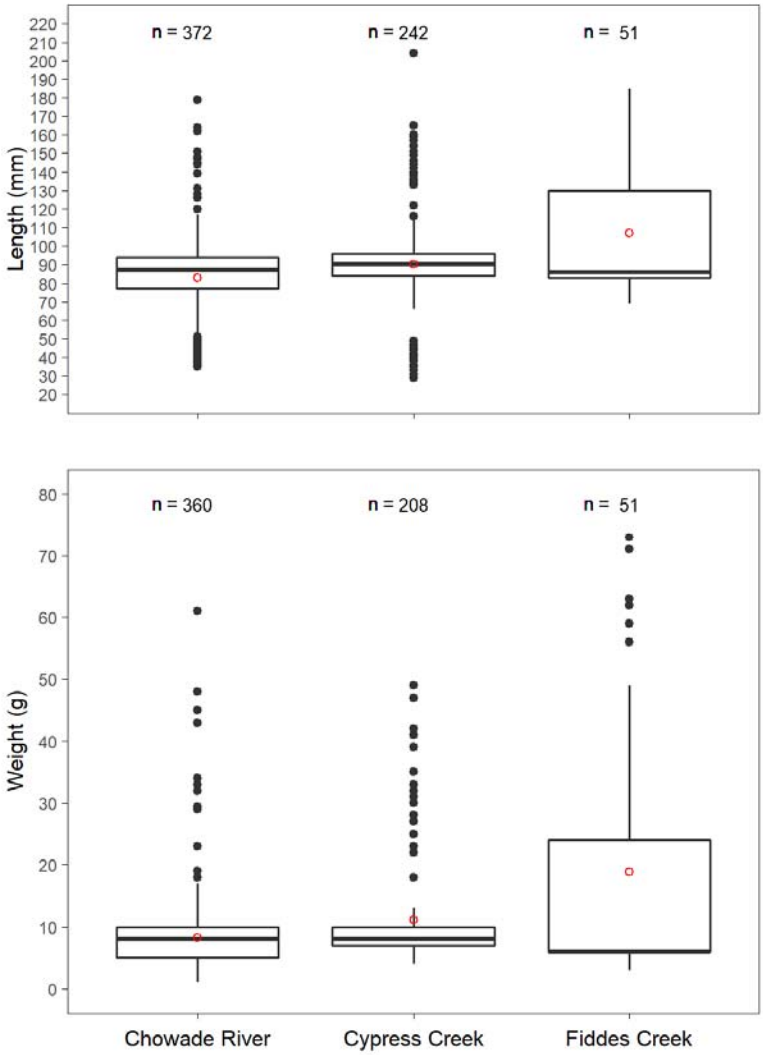

Figure 2: Fork length and weight data for Bull Trout captured in the Chowade River, and Cypress and Fiddes creeks in 2019, with the mean (red circle), median (heavy horizontal line), and upper and lower quartiles (i.e., 25th and 75th percentiles; lower and upper bounds of rectangle). Whiskers (vertical lines) extend from the upper/lower quartiles to the maximum/minimum value within 1.5 times the interquartile range. Data outside of 1.5 times the interquartile range ("outlying" values) are shown individually as points.

Bull Trout YOY (fish with lengths less than approximately 65 mm FL) were recorded in the Chowade River and Cypress Creek but not in Fiddes Creek. The CPUE of YOY Bull Trout was higher in the Chowade River (8.1 fish/h) than in Cypress Creek (2.6 fish/h; Table 5). The CPUEs of immature Bull Trout (fish with lengths larger than approximately 65 mm FL) were nearly identical in the Chowade River (25.8 fish/h) and Fiddes Creek (24.3 fish/h) and slightly lower in Cypress Creek (17.2 fish/h).

Length-frequency histograms for Bull Trout (Figure 3) show a mode between approximately 30 and 70 mm FL and between approximately 80 and 110 mm FL, which correspond to the age-0 (YOY) and age-1 cohorts, respectively. These two modes were evident in all three of the sampled tributaries. A third mode from

approximately 120 to 200 mm FL likely corresponds to age-2 and older fish. As a proportion of the total catch, Bull Trout larger than 120 mm FL were more common in Fiddes Creek and less common in the Chowade River and Cypress Creek.

Overall (all three streams combined), 99.7% of the Bull Trout captured in 2019 were less than 205 mm FL and when tagged, were implanted with a 12 mm PIT tag (*n* = 508). Two adult Bull Trout were implanted with 32 mm PIT tags. No 23 mm PIT tags were implanted into Bull Trout in 2019.

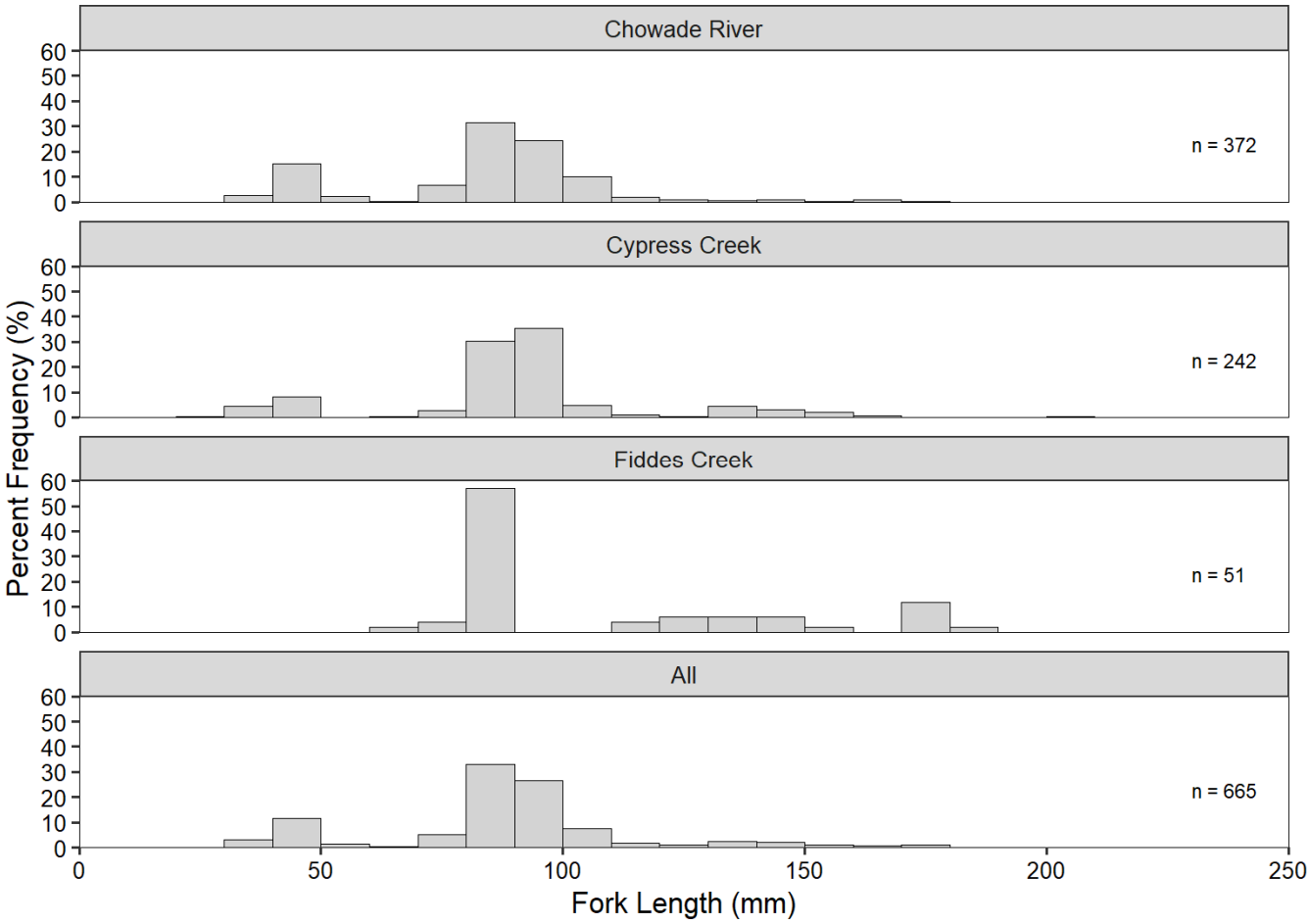

Figure 3: Length-frequency distribution for Bull Trout captured by backpack electrofishing in the Chowade River and Cypress and Fiddes creeks during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019. Analysis does not include the two adult (i.e., greater than 250 mm FL) Bull Trout captured in the Chowade River.

In 2019, fin rays were collected from Bull Trout with fork lengths greater than 120 mm that were not selected to receive surgically implanted radio telemetry tags (*n* = 8). Analyses supported 2018 results (Golder 2019), which indicated that the first annulus was not evident on fin rays, resulting in assigned ages that were one year younger than the true age of the fish. This result was further supported by length data from inter-year recaptured fish.

For these reasons, one year was added to each age assigned using fin rays. Of the eight Bull Trout aged using fin rays, seven were classified as age-1 and one was classified as age-3. An additional 601 Bull Trout were assigned ages of age-0 or age-1 based on their fork lengths (Figure 4 and Table 6). The low number of older Bull Trout in the catch was expected and can be attributed to two main reasons: 1) the study specifically targeted immature life stages through backpack electrofishing; and 2) most individuals migrate downstream and out of the study area by age-2 to age-3. A von Bertalanffy growth curve was generated for Bull Trout captured in 2019; however, due to the limited number of individuals older than age-1 (*n* = 1), the relationship was uninformative and is not presented.

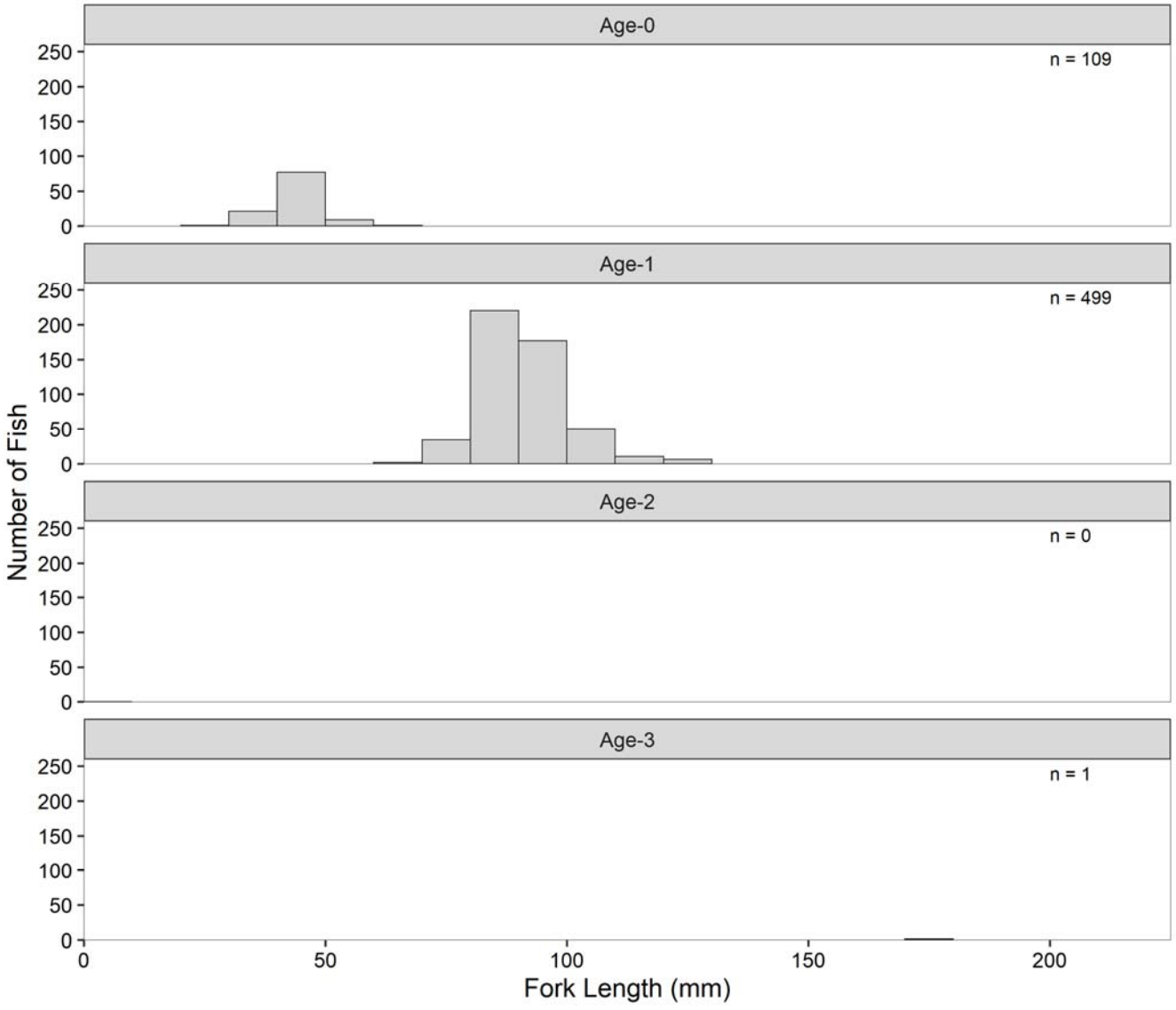

Figure 4: Age-frequency distribution for Bull Trout captured in the Chowade River and Cypress and Fiddes creeks combined, during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Table 6: Descriptive statistics of fork lengths by age for Bull Trout captured in the Chowade River and Cypress and Fiddes creeks during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019. Ages were assigned based on the fish's fork length and by fin ray analysis when possible.

Age	Chowade River			Cypress Creek			Fiddes Creek		
	Average FL ± SD (mm)	Range (mm)	*n*	Average FL ± SD (mm)	Range (mm)	*n*	Average FL ± SD (mm)	Range (mm)	*n*
0	45 ± 5	35 – 65	78	41 ± 5	29 – 49	32	-	-	-
1	91 ± 10	71 – 128	279	90 ± 8	66 – 122	183	84 ± 8	69 – 120	33
2	-	-	-	-	-	-	-	-	-
3	179	–	1	-	-	-	-	-	-

Thirteen Rainbow Trout were captured in the Chowade River in 2019. Of these 13, 9 were classified as adults with lengths that ranged between 293 and 468 mm FL. The remaining Rainbow Trout (*n* = 4) were classified as immature with lengths that ranged between 137 and 206 mm FL. PIT tags were implanted into all Rainbow Trout encountered. Scales were used to assign ages to 10 of the 13 Rainbow Trout, and the ages ranged between age-1 and age-7.

One adult Rainbow Trout was captured in Cypress Creek in 2019 and implanted with a PIT tag. It was 318 mm FL and was classified as age-4.

Rainbow Trout were not captured in Fiddes Creek.

Non-target species caught incidentally in 2019 included 98 Slimy Sculpin and 3 Mountain Whitefish. Mountain Whitefish were captured in the Chowade River (*n* = 1) and Cypress Creek (*n* = 2) but not in Fiddes Creek. Slimy Sculpin were captured in the Chowade River (*n* = 52) and Cypress Creek (*n* = 46) but not in Fiddes Creek.

3.1.4 Interannual Comparison

A comparison of immature and YOY Bull Trout CPUE in 2017, 2018 and 2019 indicated a similar trend in the CPUEs recorded in both the Chowade River and Cypress Creek (Figure 5). In the Chowade River, the CPUE of immature Bull Trout decreased from 26.1 fish/h in 2017 to 15.7 fish/h in 2018, followed by an increase to 25.9 fish/h in 2019. A similar trend was recorded in Cypress Creek, where the CPUE of immature Bull Trout decreased from 16.9 fish/h in 2017 to 8.6 fish/h in 2018, followed by an increase to 17.3 fish/h in 2019. In both tributaries, YOY CPUE did not vary substantially among years, with higher YOY CPUE recorded in the Chowade River compared to Cypress Creek.

In Fiddes Creek, the CPUE recorded for immature Bull Trout in 2017 and 2018 substantially exceeded levels recorded in the Chowade River and Cypress Creek, but consistently declined from a high in 2017 of 110.5 fish/h to a low of 24.4 fish/h in 2019. A reduction in CPUE of YOY Bull Trout was also evident, from relatively high levels in 2017 and 2018 to a complete absence of YOY in the 2019 catch.

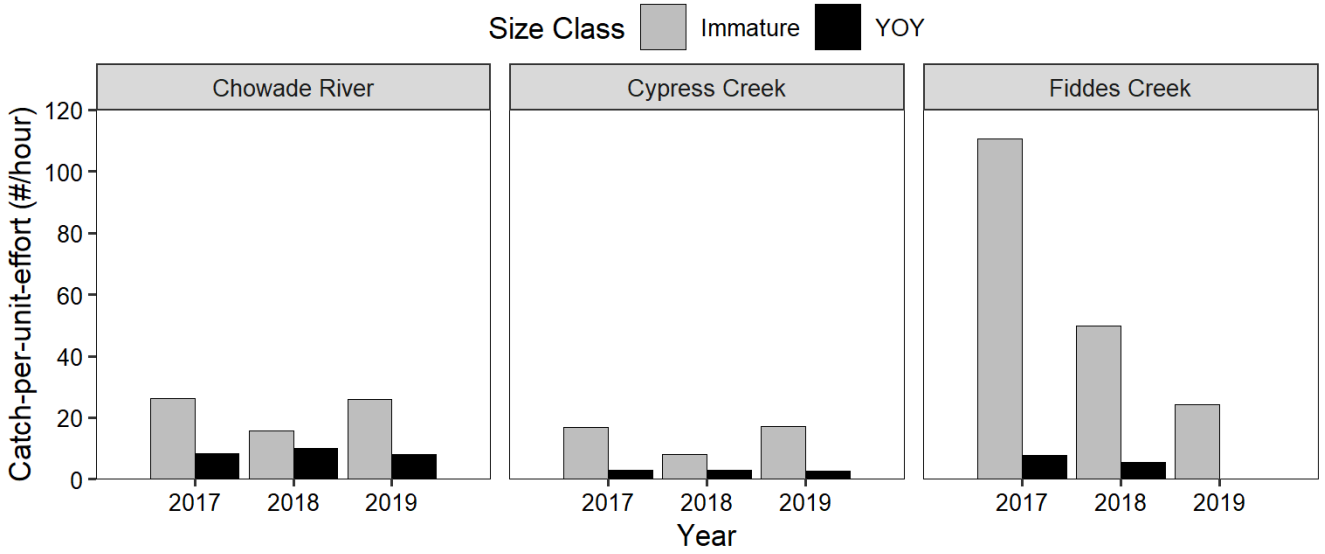

Figure 5: Interannual comparison of catch per unit effort (fish/h) for Bull Trout captured by backpack electrofishing in the Chowade River and Cypress and Fiddes creeks, during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2017, 2018, and 2019.

3.1.5 Summary of Movement Data

The summary below represents a compilation of movement data collected for fish initially tagged as part of Mon-2, Task 2a or Mon-1b, Task 2c and detected by either the Chowade River or Cypress Creek PIT detector arrays in 2019.

High water levels prevented the installation and operation of the array prior to 4 October. As such, the bulk of the expected Bull Trout migratory period was not monitored by the array in 2019. Between 4 October and 18 November 2019, 15 unique PIT tags were detected by the arrays (Putt et al. 2020). Movement of PIT-tagged fish between the Chowade River and Cypress Creek drainages was not detected in 2019.

HDX PIT tags were deployed in the Peace River from 2016 to 2019. However, some fish encountered during Mon-2, Task 2a surveys were implanted with Full Duplex (FDX) tags prior to 2016 and implanted with HDX tags during subsequent encounters. For these fish, their historical encounters based on their FDX tag are also included in the summaries.

3.1.5.1 Chowade River PIT Detector Array Summary

During the 2019 study period, 10 tags were detected by the Chowade River PIT detector array; these included six Bull Trout (Table 7), three Rainbow Trout (Table 8), and a Mountain Whitefish (Putt et al. 2020).

In total, 676 immature Bull Trout captured in the Chowade River have been implanted with PIT tags to date (Mon-1b, Task 2c), with 7 fish tagged in 2016, 206 fish in 2017, 202 fish in 2018, and 261 fish in 2019 (Table 5). In 2019, the Chowade River array detected four tagged immature Bull Trout. One was initially tagged in 2017,

one was initially tagged in 2018, and two were initially tagged in 2019. The direction of travel could not be determined for these immature Bull Trout as each one was detected by only one of the two antennas needed to determine direction of travel (i.e., detected at either the upstream or the downstream antenna but not both).

Table 7: Encounter history summary for Bull Trout detected by the Chowade River PIT detector array (Mon-1b, Task 2b) between 4 October and 18 November 2019. PIT detector array data summarized from Putt et al. (2020).

Tag Number	Encounter Date	Encounter Type	Program	Fork Length (mm)	Stream	River km[a]	Direction of Travel
900226000173046	29-Jul-17 31-Oct-19 22:58	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	95	Chowade River Chowade River	49.2 21.0	n/a[b] Unknown[c]
900226000255221	5-Aug-18 3-Nov-19 3:47	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	86	Chowade River Chowade River	39.7 21.0	n/a Unknown[c]
900226000294033	19-Jul-19 4-Oct-19 8:54	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	80	Chowade River Chowade River	46.3 21.0	n/a Unknown[d]
900226000294424	3-Aug-19 30-Oct-19 2:39	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	104	Chowade River Chowade River	22.0 21.0	n/a Unknown[d]
900230000074794	21-Jul-18 26-Oct-19 2:11	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	446	Chowade River Chowade River	36.5 21.0	n/a Upstream
900230000125563	20-Aug-16 8-Oct-19 5:12	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	418	Chowade River Chowade River	31.3 21.0	n/a Downstream
900228000349590	17-Sep-18 26-Oct-19	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	295	Peace River Chowade River	219.4 21.0	n/a Upstream

[a] River km values for the Chowade River are measured upstream from the Chowade River's confluence with the Halfway River. The Chowade River enters the Halfway River approximately 127 km upstream from the Halfway River's confluence with the Peace River. River Km values for the Peace River are measured downstream from WAC Bennett Dam (River Km 0.0).
[b] Not applicable.
[c] Direction could not be assigned; only detected on downstream antenna.
[d] Direction could not be assigned; only detected on upstream antenna.

Seventeen adult Bull Trout were initially captured in the Chowade River and implanted with PIT tags between 2016 and 2019 (10 fish in 2016, 2 fish in 2017, 3 fish in 2018, and 2 fish in 2019). In 2019, the Chowade River array detected two tagged adult Bull Trout: one initially tagged in 2016 and one initially tagged in 2018.

Bull Trout or Rainbow Trout initially tagged in the Peace River as part of the Peace River Large Fish Indexing Survey (Mon-2, Task 2a) were not detected at the Chowade River array in 2019. One tag (tag number 900228000349590) that was detected by the Chowade River array on multiple occasions on 26 October 2019 was implanted into a Mountain Whitefish on 17 September 2018 in the Peace River near Many Islands in Alberta (Golder and Gazey 2019), approximately 300 km downstream of the array. This amount of upstream movement is

atypical for a Mountain Whitefish. A probable explanation was that this Mountain Whitefish was ingested by a Bull Trout and the Bull Trout moved upstream during its seasonal spawning migration and was detected at the Chowade River array with the PIT tag from the Mountain Whitefish still in its digestive tract.

The direction of travel was determined for all three adult Bull Trout, or suspected adult Bull Trout, detected by the Chowade River array. Two were last detected moving upstream of the array and one last detected moving downstream of the array.

During sampling efforts in the Chowade River from 2016 to 2019, incidental captures included 87 Rainbow Trout that either had been previously PIT-tagged or were implanted with a PIT tag and released. Of those 87 fish, three were detected by the Chowade River array in 2019 (Table 8). These three adult Rainbow Trout were all initially tagged in 2016. Direction of travel was determined for two of the three fish detected; both were last detected moving downstream of the array. One of the three Rainbow Trout (tag number 900230000125079) detected by the Chowade River array in 2019 was also detected by the array in 2017 and another Rainbow Trout (tag number 900230000124295) detected in 2019 was also detected by the array in 2018 (Table 8).

Between 2016 and 2019, 564 Rainbow Trout were implanted with HDX PIT tags in the Peace River (Mon-2, Task 2a). None of these fish were detected by the Chowade River array in 2019.

Table 8: Encounter history summary for Rainbow Trout detected by the Chowade River PIT detector array (Mon-1b, Task 2b) between 4 October and 18 November 2019. PIT detector array data summarized from Putt et al. (2020).

Tag Number	Encounter Date	Encounter Type	Program	Fork Length (mm)	Stream	River km[a]	Direction of Travel
900228000635665	20-Aug-16 15-Oct-19 0:51	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	293	Chowade River Chowade River	30.8 21.0	n/a[b] Unknown[c]
900230000124295	19-Aug-16 19-Sep-18 3:20 4-Oct-19 23:54	Capture Array Detection Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b Mon-1b, Task 2b	324	Chowade River Chowade River Chowade River	48.9 21.0 21.0	n/a Upstream Downstream
900230000125079	19-Aug-2016 23-Sep-17 0:00 4-Oct-19 23:13	Capture Array Detection Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b Mon-1b, Task 2b	348	Chowade River Chowade River Chowade River	49.8 21.0 21.0	n/a Downstream Downstream

[a] River Km values for the Chowade River are measured upstream from the Chowade River's confluence with the Halfway River.
[b] Not applicable.
[c] Direction could not be assigned; only detected on downstream antenna.

3.1.5.2 Cypress Creek PIT Detector Array Summary

During the 2019 study period, seven tags were detected by the Cypress Creek PIT detector array; these included six Bull Trout (Table 9) and one Rainbow Trout (Table 10; Putt et al. 2020).

In total, 567 immature Bull Trout have been captured in Cypress Creek and implanted with PIT tags to date, with 28 fish tagged in 2016, 204 fish tagged in 2017, 136 fish tagged in 2018, and 199 fish tagged in 2019. In 2019, the Cypress Creek array detected five tagged immature Bull Trout. One Bull Trout was initially tagged in 2017,

two were initially tagged in 2018, and two were initially tagged in 2019. The direction of travel was determined for two of the five immature Bull Trout detected. Both of these fish were last detected moving downstream of the array.

Twenty-two adult Bull Trout captured in Cypress Creek have been implanted with PIT tags to date. Of those 22 fish, 14 were tagged in 2016, 3 were tagged in 2017, and 5 were tagged in 2018; adult Bull Trout were not captured in 2019. There were no detections of these 22 fish by the Cypress Creek array in 2019. One adult Bull Trout tagged and released in the Peace River in 2016 was detected by the Cypress Creek array in 2019 (Table 9).

Table 9: Encounter history summary for Bull Trout detected by the Cypress Creek PIT detector array (Mon-1b, Task 2b) between 4 October and 18 November 2019. PIT detector array data summarized from Putt et al. (2020).

Tag Number	Encounter Date	Encounter Type	Program	Fork Length (mm)	Stream	River km[a]	Direction of Travel
900226000255673	9-Aug-18 11-Oct-19 21:51	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	97	Cypress Creek Cypress Creek	31.8 18.0	n/a[b] Unknown[c]
900226000294104	23-Jul-19 3-Nov-19 0:42	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	140	Cypress Creek Cypress Creek	41.6 18.0	n/a Unknown[d]
900226000294233	28-Jul-19 22-Oct-19 2:33	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	95	Cypress Creek Cypress Creek	27.3 18.0	n/a Unknown[c]
900226000980489	3-Aug-17 18-Nov-19 15:50	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	95	Cypress Creek Cypress Creek	35.2 18.0	n/a Downstream
900226000255672	8-Aug-18 12-Oct-19 15:36	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	126	Cypress Creek Cypress Creek	34.7 18.0	n/a Downstream
900230000126069	16-Sep-16 20-Sep-16 6-Oct-19 18:08	Capture Capture Array Detection	Mon-2, Task 2a Mon-2, Task 2a Mon-1b, Task 2b	472	Peace River Peace River Cypress Creek	114.2 114.1 18.0	n/a Upstream

[a] River Km values for Cypress Creek are measured upstream from the Cypress Creek's confluence with the Halfway River. Cypress Creek enters the Halfway River approximately 144 km upstream from the Halfway River's confluence with the Peace River. River Km values for the Peace River are measured downstream from WAC Bennett Dam (River Km 0.0).
[b] Not applicable.
[c] Direction could not be assigned; only detected on upstream antenna.
[d] Direction could not be assigned; only detected on downstream antenna.

One immature Rainbow Trout was detected by the Cypress Creek array in 2019. It was initially tagged and released in Cypress Creek in 2018 (Table 10). This fish was last detected moving upstream of the array.

Table 10: Encounter history summary for Rainbow Trout detected by the Cypress Creek PIT detector array (Mon-1b, Task 2b) between 4 October and 18 November 2019. PIT detector array data summarized from Putt et al. (2020).

Tag Number	Encounter Date	Encounter Type	Program	Fork Length (mm)	Stream	River km[a]	Direction of Travel
900226000980902	4-Aug-18 2-Nov-19 19:15	Capture Array Detection	Mon-1b, Task 2c Mon-1b, Task 2b	139	Cypress Creek Cypress Creek	18.8 18.0	n/a[b] Upstream

[a] River Km values for Cypress Creek are measured upstream from the Cypress Creek's confluence with the Halfway River. Cypress Creek enters the Halfway River approximately 144 km upstream from the Halfway River's confluence with the Peace River.
[b] Not applicable.

3.2 Tributaries Targeting Rainbow Trout

3.2.1 Sample Effort

In 2019, targeted sampling for Rainbow Trout was conducted at 22 index sites distributed between Farrell Creek (6 sites), Colt Creek (8 sites), and Kobes Creek (8 sites). Approximately 12 hours of backpack electrofishing effort were conducted over 4,893 m of habitat. A summary of backpack electrofishing effort by the number of sites surveyed, length of habitat sampled, and seconds of backpack electrofisher operation is provided for each tributary in Table 11 and in Appendix B, Table B1.

Table 11: Summary of backpack electrofishing effort employed in Halfway River tributaries and Farrell Creek during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Tributary	Number of Sites	Electrofishing Effort (s)	Electrofishing Effort (h)	Length of Survey (m)
Farrell Creek	6	13,088	3.6	1,265
Colt Creek	8	15,298	4.2	1,675
Kobes Creek	8	13,797	3.8	1,953
Total	**22**	**42,183**	**11.7**	**4,893**

3.2.2 Catch and Life History

Rainbow Trout were the primary target species for sampling conducted in Colt, Farrell, and Kobes creeks in 2019. The Rainbow Trout populations in Colt and Kobes creeks are suspected resident populations, while Farrell Creek is a suspected recruitment source for the Peace River Rainbow Trout population (Mainstream 2012). In 2019, only immature and YOY Rainbow Trout were captured in Colt Creek (*n* = 56), Farrell Creek (*n* = 92), and Kobes Creek (*n* = 79) (Table 12 and Appendix B, Table B5). Of the 227 Rainbow Trout captured in all three streams combined, 180 were implanted with PIT tags. None of the Rainbow Trout captured in 2019 were recaptures from a previous study year. Rainbow Trout that were not tagged were incidental mortalities (*n* = 36), unhealthy (i.e., unlikely to survive the tagging process; *n* = 29), and/or too small to receive a PIT tag (i.e., less than 80 mm FL; *n* = 18).

Table 12: Number of fish caught and tagged in Colt, Farrell, and Kobes creeks during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Species	Life Stage[a]	Colt Creek			Farrell Creek			Kobes Creek			Total		
		# Captured	# Tagged	CPUE (#/h)	# Captured	# Tagged	CPUE (#/h)	# Captured	# Tagged	CPUE (#/h)	# Captured	# Tagged	CPUE (#/h)
Target Species													
Arctic Grayling	Adult	-	-	-	-	-	-	-	-	-	-	-	-
	Imm.	-	-	-	-	-	-	-	-	-	-	-	-
	YOY	2	-	<1.0	-	-	-	-	-	-	2	-	<1.0
Bull Trout	Adult	-	-	-	-	-	-	-	-	-	-	-	-
	Imm.	5	5	1.2	-	-	-	-	-	-	5	5	<1.0
	YOY	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow Trout	Adult	-	-	-	-	-	-	-	-	-	-	-	-
	Imm.	50	46	11.8	90	64	24.8	73	70	19.1	213	180	18.2
	YOY	6	-	1.4	2	-	<1.0	6	-	1.6	14	-	1.2
Non-Target Species													
Lake Chub	All	-	-	-	58	-	16.0	35	-	9.1	93	-	8.0
Largescale Sucker	All	-	-	-	66	-	18.2	2	-	<1.0	68	-	5.8
Longnose Dace	All	16	-	3.8	58	-	16.0	50	-	13.1	124	-	10.6
Longnose Sucker	All	8	-	1.9	64	-	17.6	8	-	2.1	80	-	6.8
Mountain Whitefish	All	27	-	6.4		-	-	2	-	<1.0	29	-	2.5
Northern Pikeminnow	All	-	-	-	9	-	2.5	-	-	-	9	-	<1.0
Redside Shiner	All	-	-	-	64	-	17.6	11	-	2.9	75	-	6.4
Slimy Sculpin	All	31	-	7.3	88	-	24.2	103	-	26.9	222	-	19.0
Sucker Species	All	-	-	-	7	-	1.9	-	-	-	7	-	<1.0
Trout-perch	All	-	-	-	30	-	8.3	-	-	-	30	-	2.6

[a] Life stage was assigned based on fork length. Fish were classified as adult when longer than 249 mm FL and immature when between 50 and 250 mm FL. The maximum size of YOY fish varied by species and location and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

Rainbow Trout captured in Farrell and Kobes creeks were similar in length (median fork length = 119 and 116 mm FL, respectively) and weight (median weight = 21 and 28 g, respectively; Figure 6), whereas Rainbow Trout captured in Colt Creek were notably larger (median length = 127 mm FL; median weight = 44 g). Adult Rainbow Trout (i.e., fish greater than 249 mm FL) were not recorded in any of the three Rainbow Trout index streams sampled.

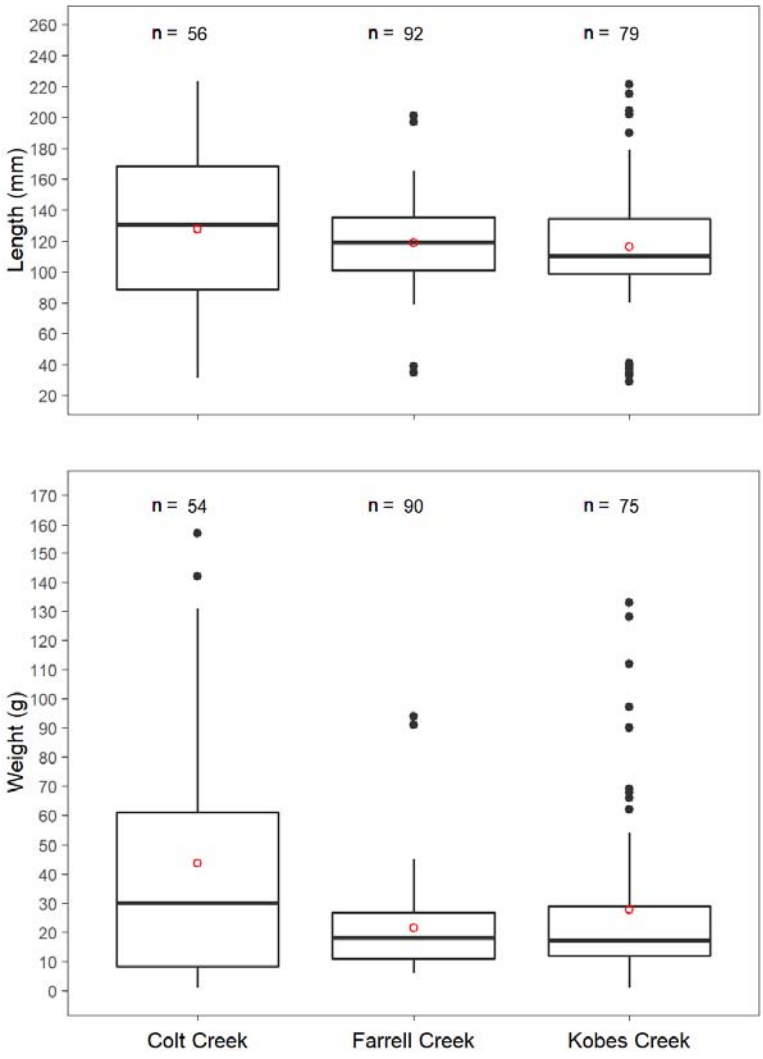

Figure 6: Fork length and weight data for Rainbow Trout captured in Colt, Farrell and Kobes creeks in 2019, with the mean (red circle), median (heavy horizontal line), and upper and lower quartiles (i.e., 25th and 75th percentiles; lower and upper bounds of rectangle). Whiskers (vertical lines) extend from the upper/lower quartiles to the maximum/minimum value within 1.5 times the interquartile range. Data outside of 1.5 times the interquartile range ("outlying" values) are shown individually as points.

The CPUE of immature Rainbow Trout varied substantially between Farrell Creek (24.8 fish/h), Kobes Creek (19.1 fish/h), and Colt Creek (11.8 fish/h; Table 12). The CPUE for YOY Rainbow Trout was low for all three tributaries, with slightly higher CPUEs recorded in Colt Creek (1.4 fish/h) and Kobes Creek (1.6 fish/h) compared to Farrell Creek (<1.0 fish/hour). YOY Rainbow Trout ranged in length between 29 and 41 mm FL and were not tagged due to their small size.

Length-frequency histograms for Rainbow Trout (Figure 7) show modes between approximately 20 and 50 mm FL (corresponding to age-0 [YOY] fish) and between approximately 70 and 120 mm FL (corresponding to age-1 fish). Based on length-frequency data, the length distributions of age-1 and age-2 Rainbow Trout overlapped (Figure 7). The average fork length of YOY Rainbow Trout (i.e., Rainbow Trout less than 50 mm FL) was slightly larger in Farrell Creek (average = 37 mm FL) and Kobes Creek (average = 36 mm FL) when compared to Colt Creek (average = 33 mm FL). The majority (203 of 227 fish or 89% of catch) of Rainbow Trout captured in Colt, Farrell and Kobes creeks in 2019 were between 30 mm and 180 mm FL, and this size range largely encompassed the age-0 through age-3 cohorts.

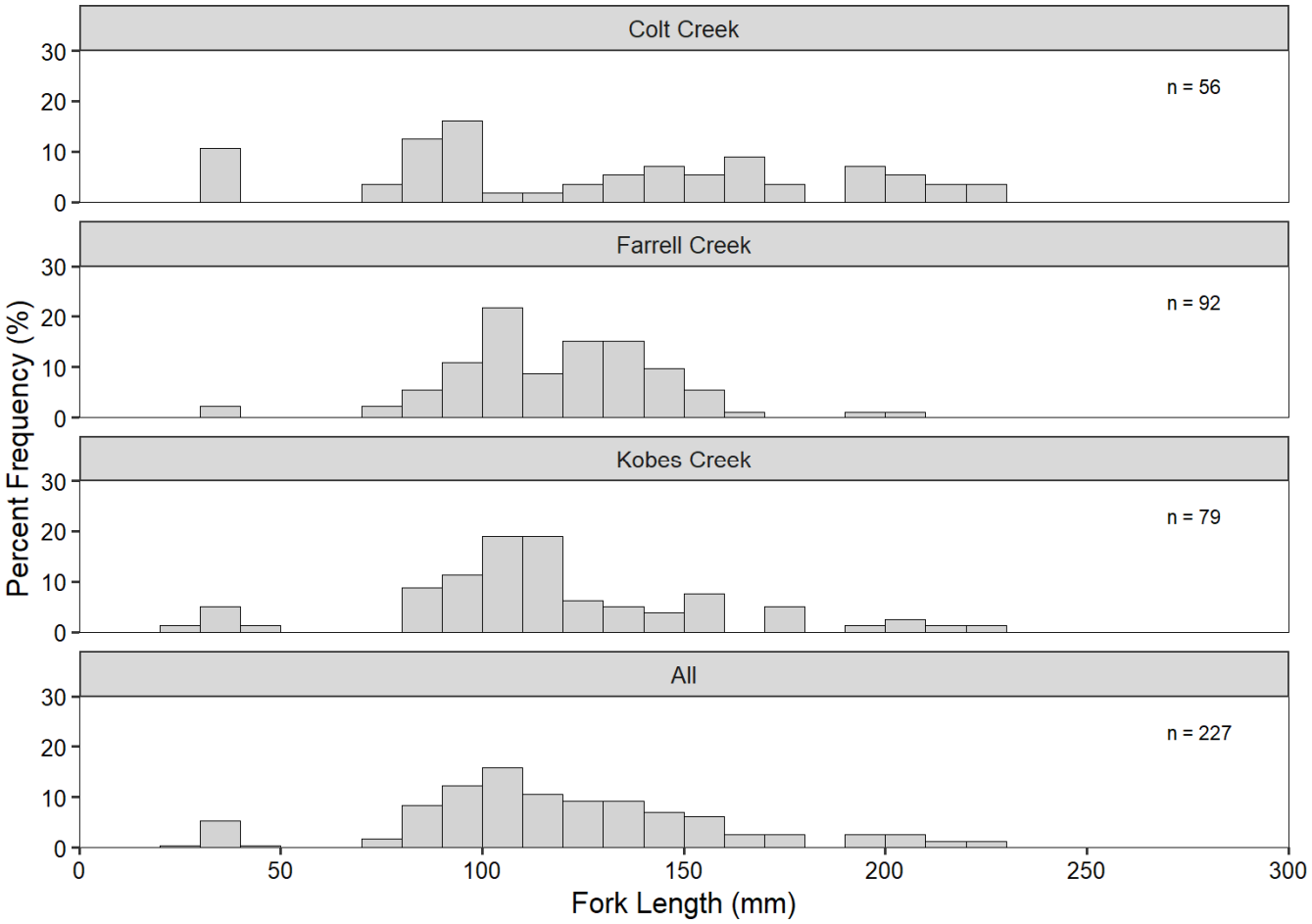

Figure 7: Length-frequency distribution for Rainbow Trout captured by backpack electrofishing in Colt, Farrell and Kobes creeks during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Ages were assigned to 202 of the 227 Rainbow Trout captured in 2019 (Table 13). These fish ranged in age from age-0 to age-4 and were included in all age-related analyses (Figure 8). Age estimates from the scale ageing structures typically did not agree with length frequency age modes due to inconsistent detection of the first annuli in the scale ageing structure. Rainbow Trout less than 51 mm FL were assumed to be age-0 (YOY) based on length alone. The age of Rainbow Trout age-1 and older were estimated from scale ageing structures and verified against the length frequency data (Figure 7). Length distributions overlapped for most of the individual age-classes (Figure 9) beginning at age-1. The resulting von Bertalanffy growth curve suggests that Rainbow Trout captured in Colt, Farrell and Kobes creeks exhibit rapid growth from age-0 to at least age-4 (Figure 10).

Table 13: Descriptive statistics of fork length by age for Rainbow Trout captured in Colt, Farrell, and Kobes creeks during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Age[a]	Colt Creek			Farrell Creek			Kobes Creek		
	Average FL ± SD	Range	*n*	Average FL ± SD	Range	*n*	Average FL ± SD	Range	*n*
0	33 ± 2	31 – 36	6	37 ± 3	35 – 39	2	36 ± 4	29 – 41	6
1	90 ± 7	76 – 103	22	98 ± 10	79 – 117	34	104 ± 13	80 – 134	50
2	145 ± 17	114 – 172	17	128 ± 10	109 – 146	32	147 ± 14	126 – 177	13
3	193 ± 20	165 - 223	10	161 ± 28	136 – 201	4	195 ± 18	173 - 221	6
4	213 ± 7	207 - 220	3	-	-	-	215	–	1

[a] Age-0 fish were assigned ages based on fork lengths alone; ages were not validated using scale samples.

Two Arctic Grayling, measuring 50 and 52 mm FL, were captured in Colt Creek. These fish were classified as age-0 based on scale samples. Arctic Grayling were not captured in Farrell or Kobes creeks.

Five Bull Trout were captured in Colt Creek and measured between 141 and 218 mm. Three Bull Trout were classified as age-3 based on fin ray samples and two Bull Trout were classified as age-2 based on their size. All five of the Bull Trout captured in Colt Creek were implanted with PIT tags. Bull Trout were not captured in Farrell or Kobes creeks.

Non-target fish species captured in Colt, Farrell and Kobes creeks in 2019, in declining order of abundance, included Slimy Sculpin (*n* = 222), Longnose Dace (*n* = 124), Lake Chub (*Couesius plumbeus*; *n* = 93), Longnose Sucker (*Catostomus catostomus*; *n* = 80), Redside Shiner (*n* = 75), Largescale Sucker (*Catostomus macrocheilus*; *n* = 68), Trout-perch (*Percopsis omiscomaycus*, *n* = 30), Mountain Whitefish (*n* = 29), Northern Pikeminnow (*Ptychocheilus oregonensis*; *n* = 9), and unidentified sucker species (*n* = 7) (Table 12). Mountain Whitefish were the only non-target salmonid species encountered and were recorded in Colt and Kobes creeks but were not recorded in Farrell Creek. Lengths of captured Mountain Whitefish ranged between 104 and 251 mm FL.

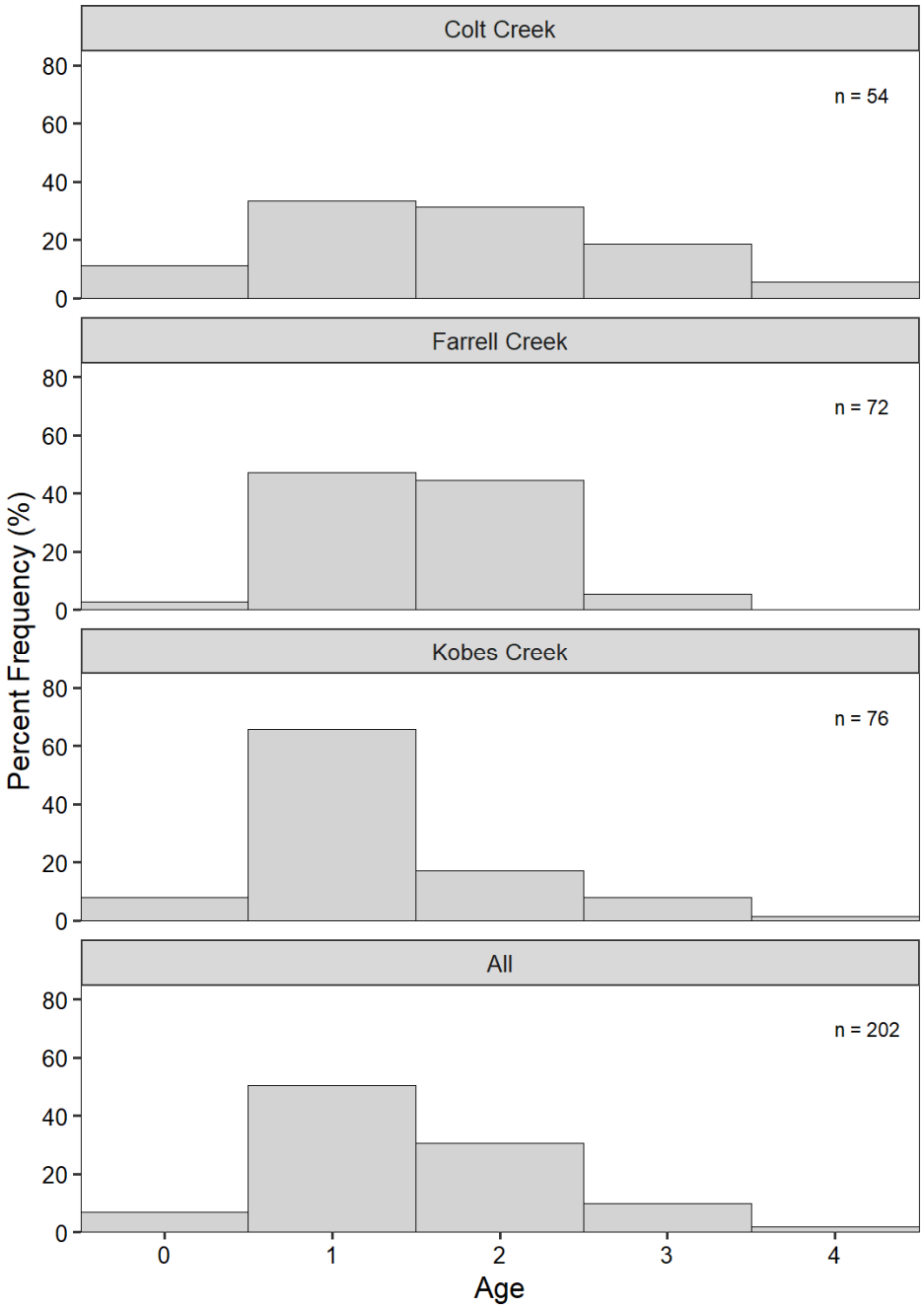

Figure 8: Age-frequency distribution for Rainbow Trout captured in Colt, Farrell, and Kobes creeks combined during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

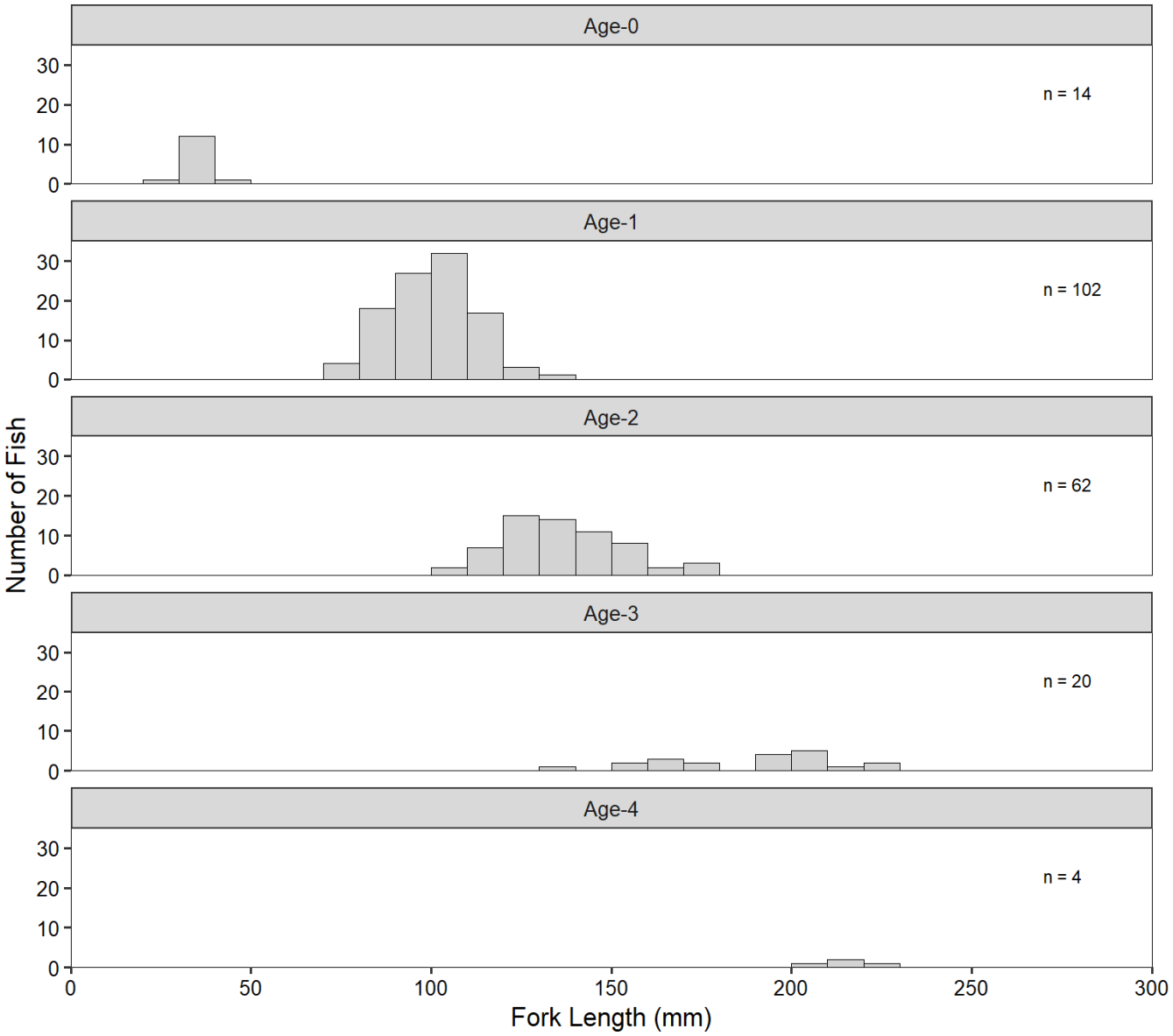

Figure 9: **Length-frequency by age-class for Rainbow Trout captured in Colt, Farrell, and Kobes creeks combined during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019. All fish less than 50 mm FL were assigned an age of age-0.**

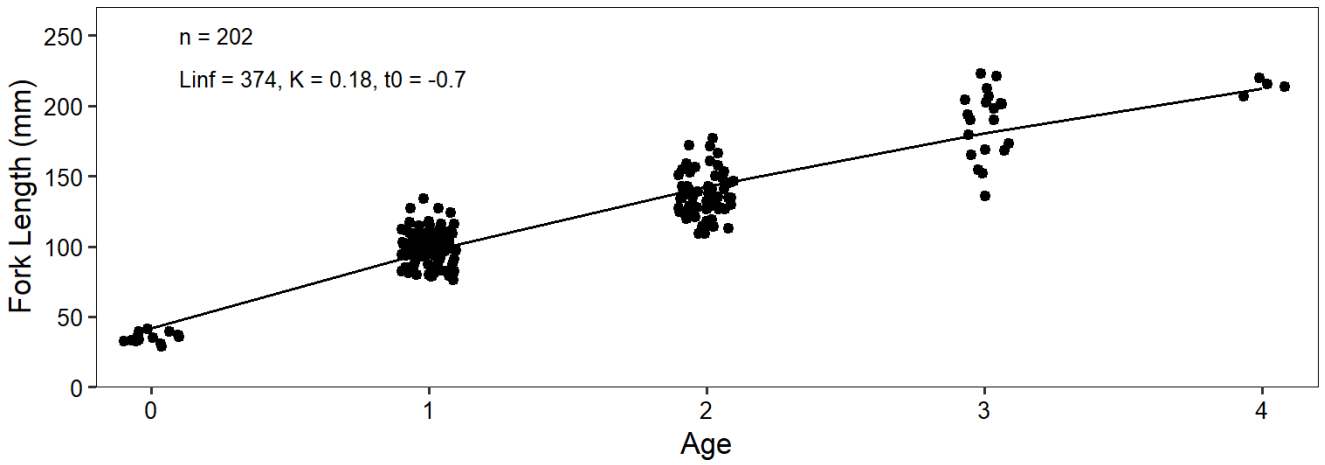

Figure 10: von Bertalanffy growth curve for Rainbow Trout captured in Colt, Farrell, and Kobes creeks combined during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

3.2.3 Interannual Comparison

The CPUE of immature Rainbow Trout in Colt Creek was higher in 2019 (11.8 fish/h) than in 2018 (8.3 fish/h), but both years were substantially lower than the CPUE recorded in 2017 (29.1 fish/h; Figure 11). A similar change in immature Rainbow Trout CPUE was also noted in Kobes Creek, with high CPUE recorded in 2017 (25.9 fish/h), low CPUE recorded in 2018 (10.6 fish/h), and intermediate CPUE 2019 (18.1 fish/h). Farrell Creek differed from both Colt and Kobes creeks in that a substantially higher immature Rainbow Trout CPUE was recorded in 2019 (24.8 fish/h) compared to 2018 (8.2 fish/h) and 2017 (9.6 fish/h).

A comparison of YOY Rainbow Trout CPUE in 2019 indicated similar catch rates for the YOY cohort in Colt Creek (1.4 fish/h) and Kobes Creek (1.6 fish/h), but lower catch rate in Farrell Creek (0.6 fish/h). Compared to previous study years, YOY Rainbow Trout CPUE has remained similar in Colt Creek, but has decreased in both Farrell and Kobes creeks from previous highs recorded in 2017 (Farrell Creek CPUE = 6.97 fish/h; Kobes Creek CPUE = 3.75 fish/h; Figure 11).

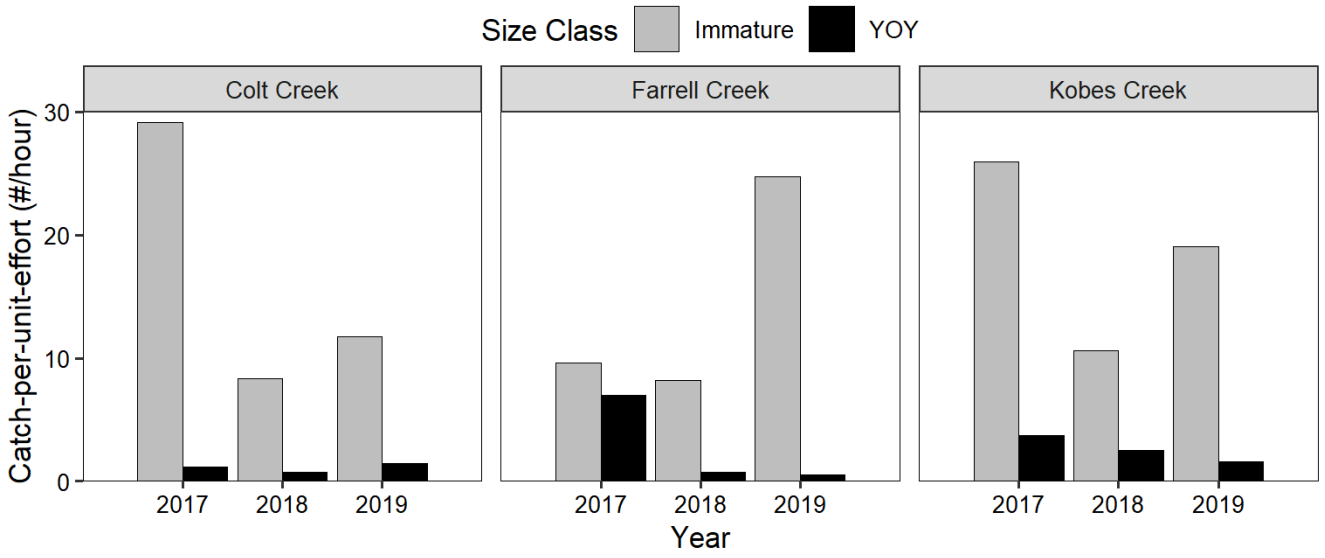

Figure 11: Interannual comparison of catch per unit effort (fish/h) for Rainbow Trout captured by backpack electrofishing in the Colt, Farrell and Kobes creeks during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2017, 2018 and 2019.

3.3 Moberly River

3.3.1 Discharge and Temperature

Based on historic mean monthly discharge values recorded between 2001 to 2015, Moberly River discharge typically decreases from July to September (Water Survey of Canada Station 07FB008; Figure 12). Over the 2017 to 2019 study period, Moberly River sample effort has been conducted earlier in each subsequent year as the study design was modified to target specific discharges. In 2017, the field program was conducted from 30 August to 8 September when mean discharge was 1.1 m³/s and ranged between 0.8 and 1.4 m³/s. In 2018, the field program was conducted from 13 August to 1 September when mean discharge was 10.9 m³/s and ranged between 5.7 and 17.2 m³/s. During the 2019 field program, which was conducted from 22 July to 2 August, mean discharge was 11.1 m³/s and ranged between 9.0 and 12.3 m³/s (Figure 12).

During the 2019 study period, water temperatures in the Moberly River ranged between 16.1°C and 23.4°C (mean = 18.5°C) and generally declined over the study period (Appendix C, Table C1).

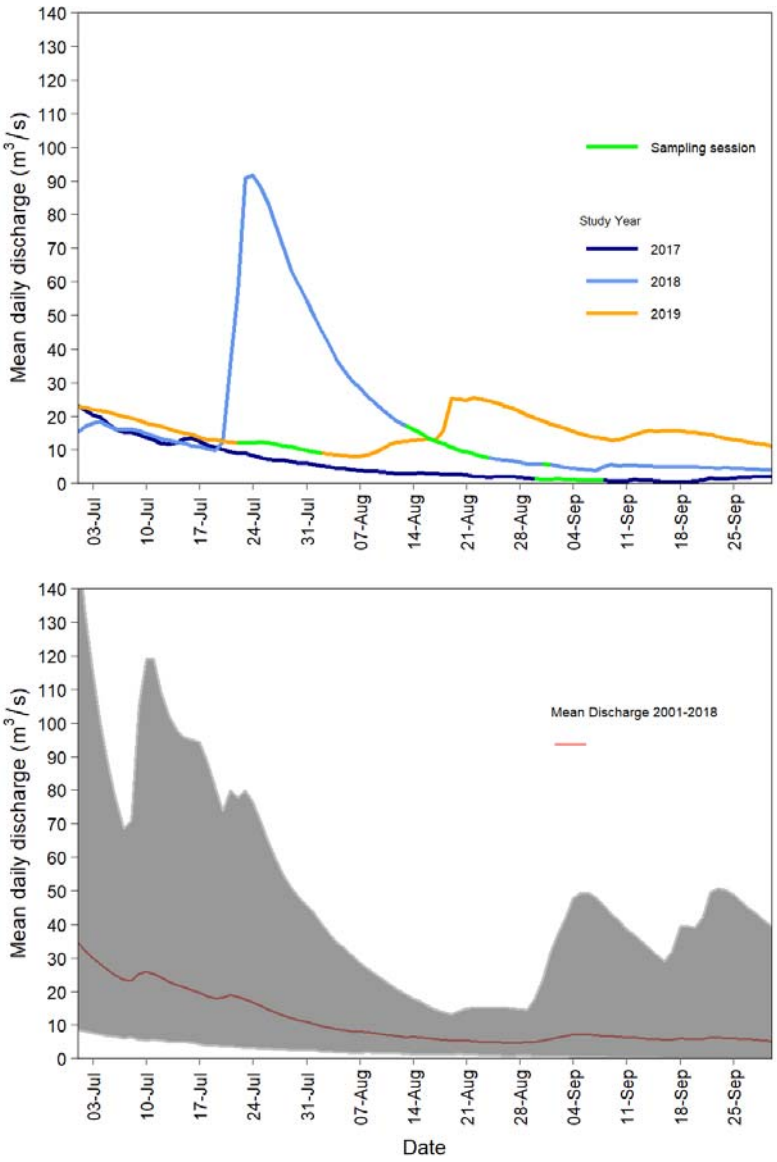

Figure 12: Moberly River sample sessions (green lines) in 2017, 2018, and 2019 in relation to mean daily discharge values as recorded at the Water Survey of Canada gauging station 07FB008 from 1 July to 30 September of each study year (top plot), and the historic average mean daily discharge (red line; bottom plot) and minimum and maximum mean daily discharge values (shaded area; bottom plot) from 2001 to 2018.

3.3.2 Sample Effort

The 2019 boat-based sampling program conducted sampling at 42 backpack electrofishing sites and 61 boat electrofishing sites over 11 sections of the Moberly River. In total, 54.32 angler-hours of angling effort was conducted at 74 angling sites (Table 14)[17]. A summary of effort employed during the Moberly River survey by section is provided in Appendix B, Tables B1 to B3.

Table 14: Summary of sampling effort employed in the Moberly River by section during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Section	Backpack Electrofishing			Small Boat Electroshocking			Angling	
	Number of Sites	Effort (s)	Effort (m)	Number of Sites	Effort (s)	Effort (m)	Number of Sites	Effort (h)
MR-S1A	8	4,671	669	10	4,365	5,829	10	19.5
MR-S1	1	252	72	3	2,527	3,188	3	2.1
MR-S2	-	-	-	2	2,298	2,780	5	3.4
MR-S3	1	488	70	3	2,774	3,161	3	2.4
MR-S4	3	1,212	218	4	2,565	3,511	6	3.4
MR-S5	2	1,167	222	5	4,211	6,294	3	3.3
MR-S6	2	639	123	3	2,974	4,067	4	4.6
MR-S7	5	2,642	580	10	5,728	7,704	12	5.0
MR-S8	6	3,327	750	8	3,981	6,831	9	1.8
MR-S9	4	1,346	380	5	2,734	4,965	7	1.9
MR-S10	10	11,189	1,377	8	4,277	6,642	12	7.0
Total	**42**	**26,933**	**4,461**	**61**	**38,434**	**54,972**	**74**	**54.3**

3.3.3 Catch and Life History

In total, 36 Arctic Grayling were captured in the Moberly River in 2019. Life history and capture data are provided in Appendix B; Table B7. The majority of Arctic Grayling were captured in Section MR-S1A (67%); the remaining 12 Arctic Grayling were captured in Sections MR-S1, MR-S2, MR-S6, MR-S7, and MR-S10. Angling (spin casting or fly fishing) captured the majority of the Arctic Grayling (64%). The remaining Arctic Grayling were captured by small fish boat electroshocking (25%) and backpack electrofishing (11%).

[17] To increase potential catch of target species, angling also occurred opportunistically while the boats were travelling between sites and any fish captured while in transit were processed. The level of effort in this opportunistic sampling is not included in the effort summaries below.

On 23 July, two Bull Trout were captured in Section MR-S7 of the Moberly River by small fish boat electroshocking. One individual (325 mm FL, 374 g) was captured near River Km 37.9. The second Bull Trout (231 mm FL, 241 g) was captured near River Km 32.4. Both fish were implanted with PIT tags. Rainbow Trout were not recorded in the Moberly River in 2019.

Non-target species comprised the majority of the Moberly River catch (all methods combined) and included, in declining order of abundance, Mountain Whitefish (*n* = 655), Longnose Sucker (*n* = 279), Longnose Dace (*n* = 276), Redside Shiner (*n* = 107), Northern Pikeminnow (*n* = 68), Burbot (*n* = 53), Slimy Sculpin (*n* = 48), Largescale Sucker (*n* = 44), White Sucker (*Catostomus commersonii*; *n* = 13), Northern Pike (*n* = 11), Lake Chub (*n* = 9), unidentified sucker species (*n* = 7), Prickly Sculpin (*Cottus asper*; n = 4), Trout-Perch (*n* = 1), and Walleye (*Sander vitreus*; *n* = 1). Species composition by section is presented in Appendix B, Table B6. CPUE was not calculated for the Moberly River because of the various capture methods used and the low catch of target species. A summary of catch by capture method for FAHMFP indicator species is provided in Table 15.

Table 15: Number of FAHMFP indicator species fish caught and tagged in the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Species	Life Stage[a]	Angling		Backpack Electrofishing		Small Fish Boat Electroshocking		Total	
		Number Caught	Number Tagged	Number Caught	Number Tagged	Number Caught	Number Tagged	**Number Caught**	**Number Tagged**
Arctic Grayling	Adult	2	2	1	1	4	4	**7**	**7**
	Immature	21	20	-	-	4	4	**25**	**24**
	YOY	-	-	3	1	1	1	**4**	**2**
Bull Trout	Adult	-	-	-	-	1	1	**1**	**1**
	Immature	-	-	-	-	1	1	**1**	**1**
Burbot	Adult	-	-	1	1	-	-	**1**	**1**
	Immature	-	-	41	35	5	5	**46**	**40**
	YOY	-	-	5	3	1	1	**6**	**4**
Mountain Whitefish	Adult	7	-	2	-	151	-	**160**	**-**
	Immature	2	-	1	-	405	-	**408**	**-**
	YOY	-	-	4	-	83	-	**87**	**-**
Walleye	Adult	-	-	-	-	1	1	**1**	**1**

[a] Life stage was assigned based on fork length. Fish were classified as adult when longer than 249 mm FL and immature when between approximately 60 and 250 mm FL. The maximum size of YOY fish varied by species and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

Small fish boat electroshocking caught more fish than all other methods for most species and life stages. The exception was immature Arctic Grayling, which were highly susceptible to capture by angling (i.e., 21 of the 25 immature Arctic Grayling captured in 2019 were captured by angling).

Arctic Grayling length-frequency data indicate that a wide range of size classes use the Moberly River (Figure 13). The length-frequency histogram suggested a mode representing YOY Arctic Grayling at approximately 80 mm FL, age-1 fish at approximately 165 mm FL, age-2 fish at approximately 225 mm FL, and age-3 and older fish beginning at approximately 270 mm FL.

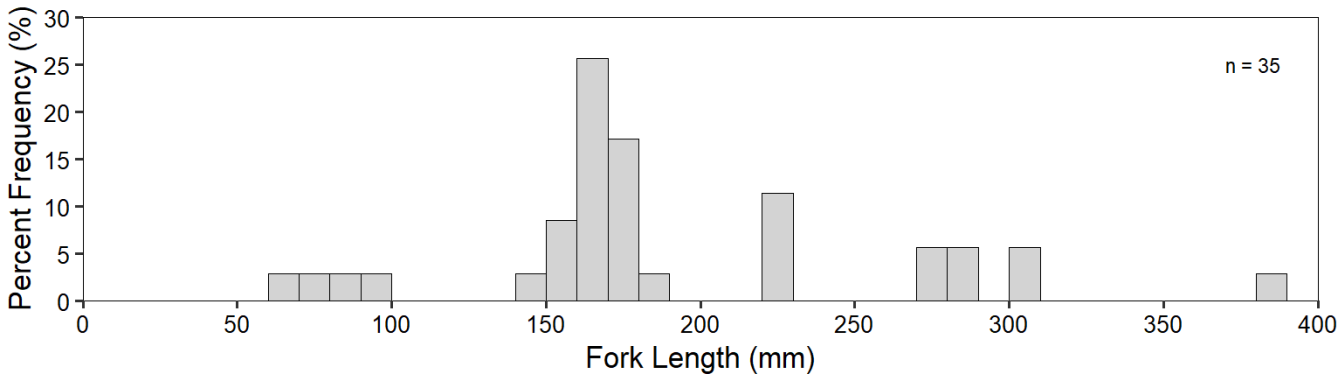

Figure 13: Length-frequency distribution for Arctic Grayling captured in the Moberly River (all capture methods combined) during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Age was assigned to 35 of the 36 Arctic Grayling captured in 2019 and ranged from age-0 to age-4. Age data supported the age assignments based on length-frequency modes detailed above. The resulting von Bertalanffy growth curve suggests that Arctic Grayling in the Moberly River exhibit rapid growth from age-0 to at least age-3 (Figure 14).

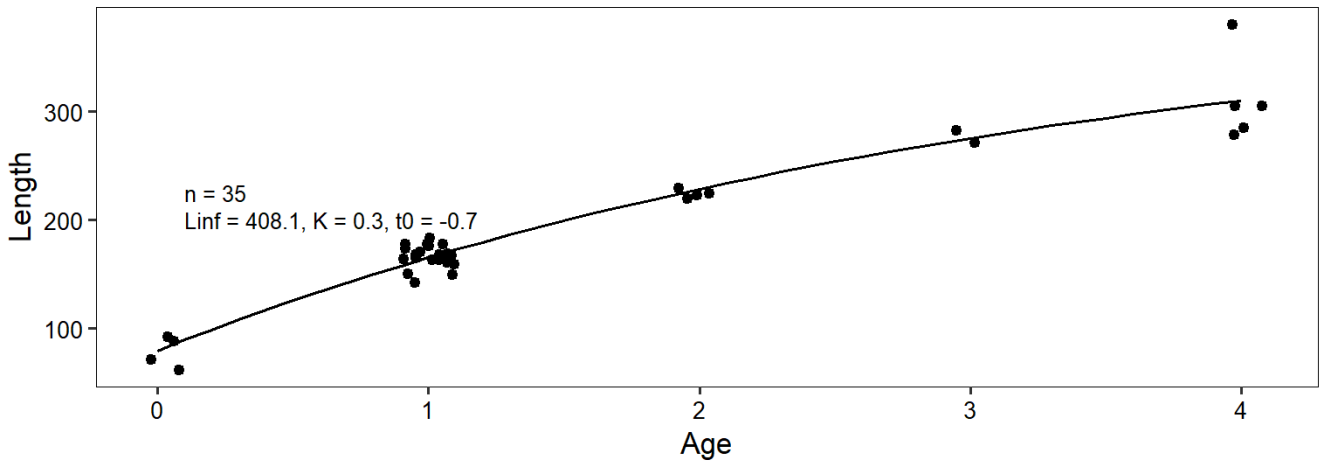

Figure 14: von Bertalanffy growth curve for Arctic Grayling captured in the Moberly River (all capture methods combined) during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

The length-frequency histogram for Burbot, a FAHMFP indicator species, suggests a mode representing age-1 fish from 100 to 170 mm in Total Length (TL) and a mode suggesting age-2 fish from 180 to 220 mm TL (Figure 15). Burbot less than 100 mm TL, which dominated the 2018 catch and corresponds to age-0 cohort (Golder 2019), were not recorded in 2019.

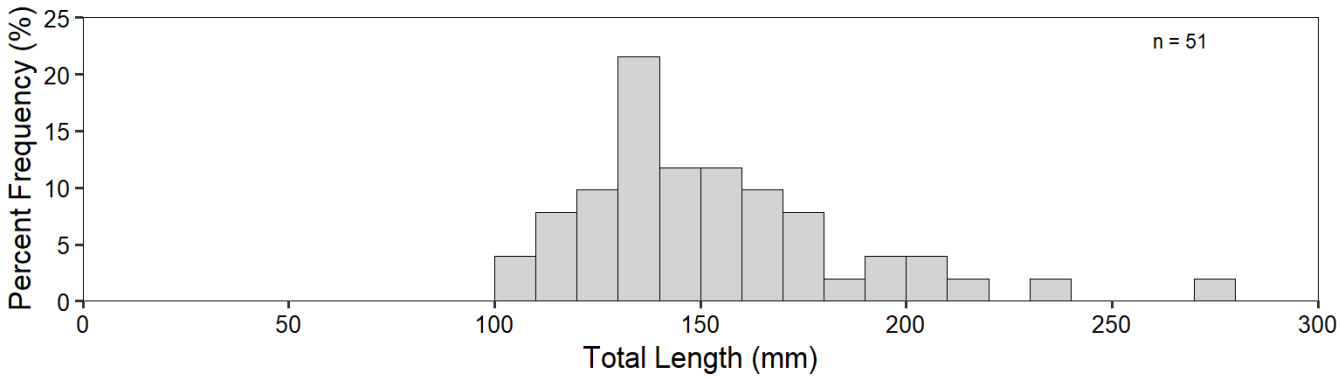

Figure 15: Length-frequency distribution for Burbot captured in the Moberly River (all capture methods combined) during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

The length-frequency histogram for Mountain Whitefish suggests a mode representing age-0 fish at approximately 75 mm FL, age-1 fish at approximately 140 mm FL, and age-2 fish at approximately 185 mm FL (Figure 16). Distinct modes were not evident in the histogram beyond approximately 210 mm FL. These fish likely represent age-3 and older individuals.

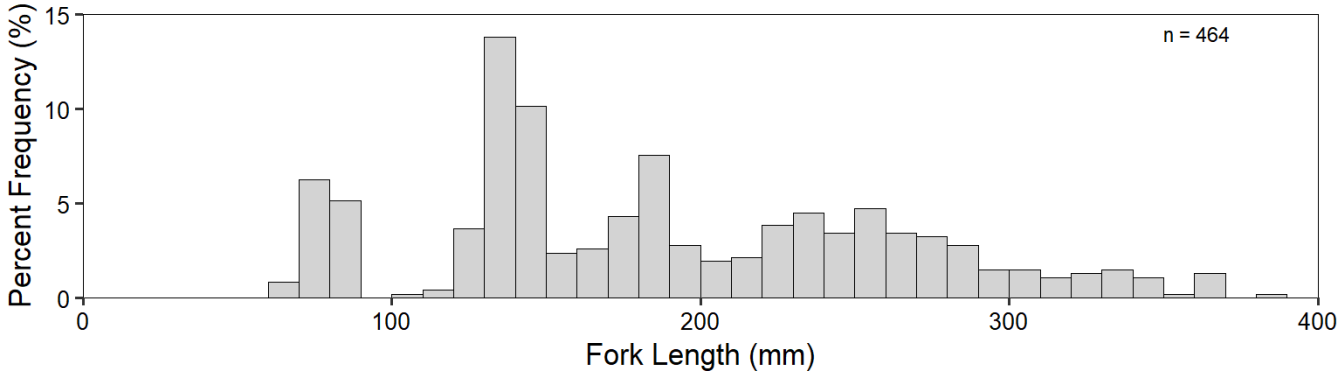

Figure 16: Length-frequency distribution for Mountain Whitefish captured in the Moberly River (all capture methods combined) during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

3.4 Radio Telemetry Tag Deployment

In 2019, 53 radio telemetry tags were implanted into immature Bull Trout captured in the Chowade River and Cypress and Fiddes creeks (Table 16). All were model NTF-3-2 radio telemetry tags, with the exception of two model NTF-5-2 tags implanted into immature Bull Trout in Fiddes Creek. The majority of the tags (83% or 44 of 53 tags) were deployed during the Chowade River and Cypress and Fiddes creeks surveys conducted between 18 and 28 July; however, eight additional tags were deployed into immature Bull Trout in the Chowade River during a supplementary tagging program conducted on 3 August.

Fifteen model NTF-3-2 radio telemetry tags were deployed into Rainbow Trout in Farrell Creek on 1 and 2 August.

Table 16: Summary of radio telemetry tags implanted as part of the Site C Reservoir Tributary Fish Population Indexing Survey, 2019.

	Bull Trout			Rainbow Trout
Deployment Date	**Chowade River**	**Cypress Creek**	**Fiddes Creek**	**Farrell Creek**
18-Jul	2	-	-	-
19-Jul	2	-	-	-
21-Jul	-	2	-	-
22-Jul	-	6	-	-
23-Jul	-	12	-	-
26-Jul	-	-	15	-
27-Jul	-	3	-	-
28-Jul	-	3	-	-
01-Aug	-	-	-	7
02-Aug	-	-	-	8
03-Aug	8	-	-	-
Total	**12**	**26**	**15**	**15**

Bull Trout implanted with radio telemetry tags in Fiddes Creek (median length of 155 mm FL) were larger than fish implanted with radio telemetry tags in the Chowade River (median length of 146 mm FL) and Cypress Creek (median length of 141 cm FL; Figure 17). Similarly, the weight of fish captured in Fiddes Creek (median weight of 49 g) was also higher than in the Chowade River (median = 34 g) and Cypress Creek (median = 32 g).
Radio telemetry tag weight as a percent of total body weight (i.e., tag burden) ranged from 0.6% to 3.2%, with median tag burden below 2% for all systems (Figure 17).

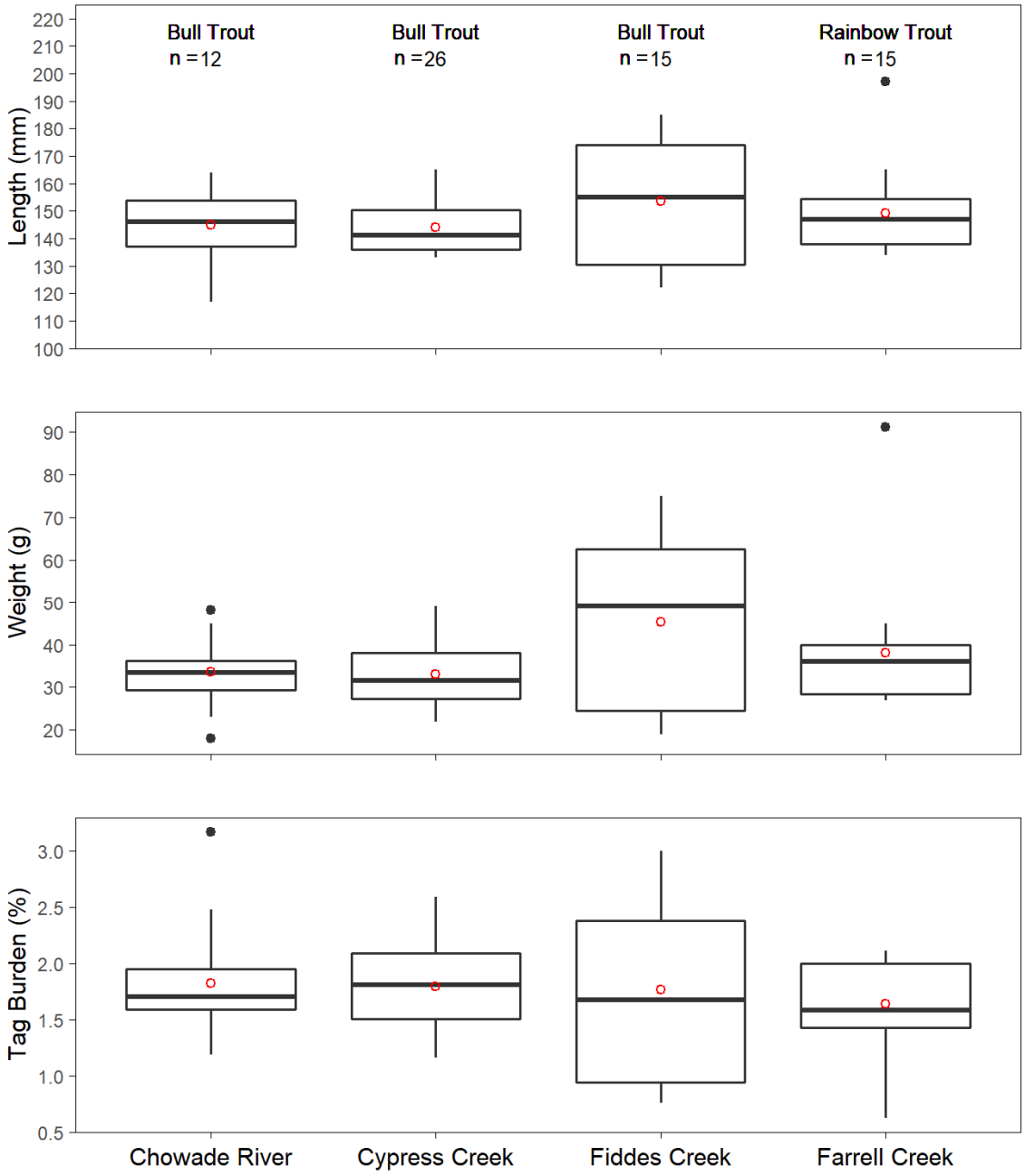

Figure 17: **Lengths, weights, and tag burden as a percent of body weight of Bull Trout and Rainbow Trout implanted with radio telemetry tags in the Chowade River, and Cypress, Fiddes, and Farrell creeks in 2019, with the mean (red circle), median (heavy horizontal line), and upper and lower quartiles (i.e., 25th and 75th percentiles; lower and upper bounds of rectangle). Whiskers (vertical lines) extend from the upper/lower quartiles to the maximum/minimum value within 1.5 times the interquartile range. Data outside of 1.5 times the interquartile range ("outlying" values) are shown individually as points.**

3.5 Genetic and Microchemistry Tissue Sample Collection

Small pieces of fin tissue were collected from 36 Arctic Grayling, 518 Bull Trout and 125 Rainbow Trout (Table 17) in 2019. Tissue samples were also collected from Longnose Dace (*Rhinichthys cataractae*), Redside Shiner and Slimy Sculpin in the Moberly River in support of the Site C Small Fish Translocation Monitoring (Mon-15). All tissue samples were preserved in 95% non-denatured ethyl alcohol and provided to BC Hydro for long-term storage. These samples were not analyzed as part of the current study.

Table 17: Summary of genetic samples collected as part of the Site C Reservoir Tributary Fish Population Indexing Survey, 2019.

Location	Arctic Grayling	Bull Trout	Rainbow Trout
Chowade River	-	254	2
Cypress Creek	-	206	-
Fiddes Creek	-	51	-
Colt Creek	1	5	50
Kobes Creek	-	-	73
Moberly River	35	2	-
Total	**36**	**518**	**125**

During the tributary assessment, two immature Bull Trout and 33 Rainbow Trout succumbed to sampling. These fish were retained and ageing structures (otoliths, scales, and/or fin rays) were collected from each fish (Table 18). These samples were stored and provided to the Peace River Large Fish Indexing Survey (Mon-2, Task 2a) for potential microchemistry analysis.

Table 18: Summary of microchemistry samples collected as part of the Site C Reservoir Tributary Fish Population Indexing Survey, 2019.

Location	Bull Trout	Rainbow Trout
Chowade River	-	1[a]
Cypress Creek	1	-
Fiddes Creek	1	-
Colt Creek	-	4
Kobes Creek	-	5
Farrell Creek	-	23[a]
Moberly River	-	-
Total	**2**	**33**

[a] Otoliths were collected; fin rays were not collected.

4.0 DISCUSSION

The 2019 study was the fourth year of a multi-year monitoring program. The principal objective of the program is to collect data from Peace River fish populations that use tributaries situated within the future inundation zone of the Site C reservoir to fulfil portions of their life cycles. These data will be used to monitor population-level responses to the construction and operation of the Project. As with the previous survey years, the secondary objective in 2019 was to deploy PIT tags into fish to allow their movements to be monitored by other components of the FAHMFP. In addition to PIT tags, radio telemetry tags were surgically implanted into select immature Bull Trout and immature Rainbow Trout in 2019. The movements of these fish will also be monitored under other components of the FAHMFP.

4.1 Tributaries Targeting Bull Trout

The 2019 study design was developed to capture and tag immature Bull Trout in identified Halfway River tributaries. The study design was unchanged from 2017 to 2019 and is based on results of the 2016 reconnaissance study design (Golder 2017) and input by the Site C Fisheries and Aquatic Habitat Mitigation and Monitoring Technical Committee (BC Hydro 2017). The study design is intended to produce high catch rates of immature Bull Trout that are large enough (greater than 80 mm FL) to receive PIT tags.

As described in the FAHMFP, immature Bull Trout tagged as part of the current study that are subsequently encountered at the PIT detector arrays in the Chowade River and Cypress Creek will be considered offspring of a migratory Bull Trout population. Further, if these same tagged fish are recaptured in the Peace River as part of the Peace River Large Fish Indexing Survey (Mon-2, Task 2a) or are detected in the temporary and permanent upstream fish passage facilities at Site C (Site C Fishway Effectiveness Monitoring Program; Mon-13), they will be considered offspring of the Peace River Bull Trout population. Combined, this information will further our understanding of resident and migrant Bull Trout populations in Halfway River tributaries. The PIT detector arrays will also monitor the upstream migrations of these same fish in subsequent years when they return to the Halfway River watershed as adults to spawn. As such, these data could potentially be used to estimate annual transition probabilities between life stages (i.e., immature to subadult, subadult to adult) and adult survival rates.

Bycatch of adult Bull Trout, which were not a target life stage for this study, was reduced substantially by conducting sampling in late July rather than in late August as was done during the 2016 reconnaissance study. In 2016, 25 adult Bull Trout were captured in the Chowade River and Cypress Creek combined (Golder 2017). From 2017 to 2019 combined, only seven adult Bull Trout were encountered in the Chowade River and Cypress Creek. In 2019, two adult Bull Trout were captured in the Chowade River and adult Bull Trout were not captured in Cypress Creek. Any modifications to the study design that reduce interactions with adult Bull Trout during their spawning or migration periods immediately prior to spawning will reduce the potential for negative effects of electrofishing on these fish.

The CPUE of immature Bull Trout in the Chowade River and Cypress Creek in 2019 (25.9 and 17.3 fish/h, respectively) and 2017 (26.1 and 16.9 fish/h, respectively) was substantially higher compared to 2018 (15.7 and 8.2 fish/h, respectively). The reduction in CPUE recorded in 2018 was likely due to higher flows and reduced capture efficiency compared to 2017 and 2019. Alternatively, given that the amount of habitat sampled in 2018 (Chowade River = 6,286 m; Cypress Creek = 9,778 m) was approximately equal to or higher that the length of

habitat sampled in 2017 (Chowade River = 6,455 m; Cypress Creek = 7,735 m) and 2019 (Chowade River = 4,680 m; Cypress Creek = 5,400 m), potentially, overall habitat quality was also reduced and/or fish densities were lower in 2018 compared to 2017 and 2019.

In Fiddes Creek, the CPUE of immature Bull Trout decreased from 110.5 fish/h in 2017, to 49.9 fish/h in 2018, to 24.4 fish/h in 2019. A similar reduction in the CPUE of YOY Bull Trout was also recorded in the tributary over the same time period. These reductions in Bull Trout CPUE corresponded to a decrease in the redd abundance estimated in each year preceding the indexing study, with redd abundance estimates of 107 redds in 2016, 63 redds in 2017, and 46 redds in 2018 (Ramos-Espinoza et al. 2019). This corresponding decrease in both Bull Trout CPUE and redd abundance estimates provide support for the assumption that the change in CPUE recorded during the indexing studies reflected a change in the overall Bull Trout population within Fiddes Creek and was not an artefact of sampling or sampling conditions. Additional data recorded in future studies will determine whether a strong correlative relationship between independent estimates of Bull Trout CPUE and redd abundance exists.

Fork lengths were used to assign ages of age-0 or age-1 to most Bull Trout less than approximately 120 mm FL. The number of fin rays available for ageing was substantially lower in 2019 compared to previous study years. To reduce stress, fin rays were not collected from fish that were selected to receive a radio telemetry tag and fewer larger immature Bull Trout were captured in 2019 (n = 60) compared to previous study years (e.g., 117 fish in 2018). Both of these factors contributed to the low number of fin rays available for ageing in 2019 (n = 8). With few fish assigned ages over age-1 (n = 1), growth related analyses were uninformative for Bull Trout.

The modifications to the study design, first implemented in 2017 (Golder 2018), were designed to increase the capture of immature Bull Trout by sampling the upper reaches of tributaries in high gradient habitats with low water temperatures preferred by Bull Trout (BC Hydro 2017). Incidental catch of other species, such as Arctic Grayling and Rainbow Trout, occurs each year; however, year to year changes in the catch rates of these species should not be considered indicative of changes to the overall populations within each tributary.

The continuation of consistent sampling methods, combined with systematic sampling efforts under similar flow conditions at select index sites, will provide more informative inter-year comparisons of CPUE and fish life history metrics during future study years.

4.1.1 Movement Data

4.1.1.1 Bull Trout

Movement data from recaptured fish, the PIT detector arrays, and radio telemetry surveys (commenced in 2019; LGL 2020) will ultimately be used to monitor the magnitude, direction and seasonal variability in fish movements in response to the construction and operation of the Project. Depending on the species, these data will provide insight into spawning frequency (i.e., the prevalence of skip-spawning), the timing and duration of pre-spawning migrations and kelting, travel extent, age of first maturity, the timing and duration of downstream dispersal patterns of immature fishes, as well as the age of downstream dispersal, and immature to adult survival rates. Movement data from Bull Trout will be used in the Bull Trout Integrated Population Model currently being developed under the FAHMFP (ESSA in prep.).

Based on length and age data, immature Bull Trout in the Chowade River and Cypress Creek likely migrate downstream to the Peace River at age-2 or age-3 (R.L.&L. 1995). To date, evidence of substantial outmigration by immature Bull Trout is not supported by array data from the Chowade River or Cypress Creek. However, the operation of both PIT detector arrays is constrained to low flow periods in the late summer and fall and outmigration may occur at other times of the year (e.g., spring freshet, early summer) and therefore go undetected. Potentially, the limited outmigration data may also be an artefact of limited detection efficiencies by the arrays, particularly during high flow conditions, of the 12 mm HDX tag, the most common tag size implanted in immature Bull Trout. Based on range testing, the effective detection range of the 12 mm HDX tag is limited to approximately the lower 60% portion of the thalweg over the arrays (Ramos-Espinoza et al. 2019). Under high flow conditions, particularly at night when fish tend to move and daily peak flows occur, fish may be more surface-oriented and be carried in the thalweg above and outside the detection range of the antennas.

A Mountain Whitefish measuring 295 mm FL that was tagged on 17 September 2018 in the Peace River near the Many Islands area in Alberta was detected on multiple occasions at the Chowade River array in October 2019. This fish was likely ingested by an adult Bull Trout after it was implanted with a PIT tag and the movements associated with this tag likely represent the migratory movements of a spawning adult Bull Trout. The evacuation rates of ingested PIT tags likely depends on a variety of variables, including the predator and prey species involved, the body size of each individual, and environmental conditions (e.g., water temperatures). Based on mark-recapture data collected during the Peace River Large Fish Indexing Survey (e.g., Golder and Gazey 2019) the frequency that Bull Trout ingest previously PIT tagged prey fish is expected to be very low.

4.1.1.2 Rainbow Trout

The frequent inter-year detections of Rainbow Trout that were initially tagged in the Chowade River and Cypress Creek and the lack of detections in either stream of Rainbow Trout that were initially tagged in the Peace River suggest that the Chowade River and Cypress Creek Rainbow Trout populations are isolated from the Peace River Rainbow Trout population and likely to be unaffected by the development of the Project. However, additional years of mark-recapture and radio telemetry data coupled with genetic characterization and microchemistry assessments are needed to confirm this hypothesis.

4.2 Tributaries Targeting Rainbow Trout

Sampling in Farrell Creek was intended to replace sampling in Maurice and Lynx creeks for the reasons detailed in Section 1.2. Data from Farrell Creek will be used to test the Mon-1b hypothesis regarding Peace River Rainbow Trout continuing to spawn and rear in tributaries of the Site C reservoir upstream of the inundation zone. YOY Rainbow Trout (i.e., fish less than 50 mm FL) were recorded at one of the six sites in 2019 and at two of the six sites sampled 2017 and 2018, while immature Rainbow Trout (i.e., fish between 50 and 249 mm FL) were recorded in all sites during the previous three study years. These data indicated that Rainbow Trout use Farrell Creek for spawning and rearing; however, uncertainty remains as to whether these fish are part of a local resident population or are part of a migratory Peace River population. Between 2017 and 2019, 142 Rainbow Trout were tagged in Farrell Creek. None of these fish have been recaptured in the Peace River under other components of the FAHMFP. Conversely, none of the 930 Rainbow Trout that were tagged (both HDX and FDX tags combined) in the Peace River between 2009 and 2019 (Golder and Gazey 2019) were recaptured in Farrell Creek. Recapturing a Rainbow Trout in the Peace River that originated in Farrell Creek or recapturing a Rainbow Trout

that was initially tagged in the Peace River would provide insight into life history patterns of this species in the Peace Region. Continued sampling in Farrell Creek using methods similar to those used from 2017 to 2019 is expected to yield results capable of testing the Mon-1b hypothesis. The analysis of genetic samples collected from Rainbow Trout captured in the Peace River and Farrell Creek will provide additional insight into their life history patterns.

Sampling in Colt and Kobes creeks is intended to collect additional baseline data for Rainbow Trout within the Halfway River watershed. Data collected as part of these surveys will not be used to specifically test any hypotheses under the FAHMFP, but will contribute to the regional Rainbow Trout dataset and contribute to our understanding of any potential changes to Rainbow Trout populations in Peace River tributaries and the Site C reservoir. YOY and immature Rainbow Trout were recorded in both tributaries in 2017, 2018 and 2019, indicating that both systems are used for spawning and rearing by this species. Adult Rainbow Trout were not recorded in either system during any study year, however the presence of YOY Rainbow Trout in early August could be viewed as evidence that mature spawning adults were present in the system the previous spring. The lack of adult Rainbow Trout in the catch from 2017 to 2019 could partially be due to the capture method used (backpack electrofishing only) and the timing of sampling, as adult Rainbow Trout may have moved downstream after spawning in the spring and prior to the initiation of sampling in July.

For Farrell Creek, the number of immature Rainbow Trout encountered and their catch rates in 2019 were approximately three times higher than the values recorded in 2017 and 2018. The number and catch rates for YOY Rainbow Trout were similar in 2019 when compared to 2018, which were both substantially lower compared to 2017. The lower catch rates of YOY Rainbow Trout in Farrell Creek may have been due to the higher water levels at the time of sampling (i.e., this size class may have been closer to shore or in shallower water and therefore were not captured in the same habitat preferred by immature Rainbow Trout).

Length-frequency distributions and catch rates for Rainbow Trout in Farrell Creek from 2017 to 2019 were similar to those recorded by Mainstream in 2010 (Mainstream 2011a). Length-frequency data indicate that most of the YOY Rainbow Trout recorded in 2010 were between 60 and 70 mm FL. Data from 2017 to 2019 indicate that most of the YOY Rainbow Trout were between 30 and 40 mm FL. The difference in size is likely due to the differences in the two survey periods: mid-September in 2010 and early August in 2017 to 2019. These data may indicate that YOY Rainbow Trout grow substantially during the first growing season. Maintaining consistent study periods across study years will be important to monitor changes to annual growth and length-at-age.

4.3 Moberly River

Sampling for Arctic Grayling in the Moberly River in 2019 supplemented the baseline data collected from 2008 to 2011 (Mainstream 2009a, 2009b, 2010, 2011b, 2013) and 2016 to 2018 (Golder 2017, 2018, 2019). In 2019, Arctic Grayling catch was higher than all previous FAHMFP study years with the exception of 2016. In total, 36 Arctic Grayling were captured during the 2019 survey, which included 7 adults, 25 immature fish, and 4 YOY. The higher Arctic Grayling catch in 2019 may, in part, be due to Moberly River discharge levels at the time of sampling. To date, sampling under the FAHMFP has included one reconnaissance year (2016) and three study years (2017 to 2019), with each being conducted under substantially different environmental conditions (Table 19).

Table 19: Total number of Arctic Grayling captured on the Moberly River during each study year in relation to mean river discharge and mean and maximum water temperature at the time of sampling.

Study Year	Sample Period	Mean Discharge (m^3/s)	Mean Water Temperature (°C)	Maximum Water Temperature (°C)	Arctic Grayling Catch (Number of Fish)
2016	8 – 18 Sep	35.1	13.2	14.9	105
2017	30 Aug – 8 Sep	1.1	15.8	18.8	2
2018	13 – 31 Aug	10.9	17.9	20.4	8
2019	22 Jul – 2 Aug	11.1	18.4	23.4	36

Sampling was conducted at historically high water levels in mid-September in 2016, at historically low water levels in early September in 2017, at more typical water levels in mid-August in 2018 and mid-July in 2019. Over these four study years, higher Arctic Grayling catches have occurred in years with higher water levels. This result is supported by Mainstream (2012) who hypothesized that Arctic Grayling spawn in the spring and migrate downstream and out of the Moberly River over the summer as water levels decline. Sampling the Moberly River prior to the decline in freshet flows may increase the possibility of capturing Arctic Grayling; however, the timing of freshet flows in the Moberly River is variable. Furthermore, the Moberly River valley is susceptible to rain events that can result in quick and substantial changes in Moberly River water levels. As an example, water levels in the Moberly River increased from 12 to 91 m^3/s over a three-day period between 20 and 23 July 2018, and data from the Water Survey of Canada indicate that variable flows like these, whether from freshet or rain events, can occur in the Moberly River anytime between early May and late August (a four month period)[18]. The Moberly River's incised channel, high bank instability, large volume of woody debris, and high water turbidity levels reduces the feasibility of safely and effectively sampling this river at high water levels; therefore, sampling cannot commence until after water levels begin to decline. Due to the dynamic nature of the Moberly River's hydrograph between May and August, it will be difficult to consistently align sampling with ideal conditions or to consistent conditions across study years. During some study years, ideal water levels may not occur prior to the Arctic Grayling population migrating downstream and out of the study area.

Under the FAHFMP, the number of Arctic Grayling encountered in the Moberly River has ranged between a low of two fish in 2017 and a high of 105 fish in 2016. The number of Arctic Grayling encountered in the Moberly River during baseline studies was also variable, ranging from a low of six fish in both 2008 and 2011 (Mainstream 2009a, 2013) to a high of 106 fish in 2009 (Mainstream 2010). The sample methods and the level of effort employed has varied among all studies. The inconsistent and irregular timing of Moberly River water levels will continue to influence Arctic Grayling catch rates and present logistical sampling challenges.

One adult and one immature Bull Trout were recorded in the Moberly River in 2019. Both Bull Trout were captured in Section MR-S7 approximately 38 km upstream of the confluence. At the time of capture, the water temperature of the Moberly River was 20°C. Bull Trout are a cold-water species (Mainstream 2012) and typically prefer water temperatures below 15°C (McPhail 2007). A review of the BC Ministry of Environment's Fisheries Inventory Data

[18] https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=07FB008.

Queries (FIDQ[19]) identified seven observations of Bull Trout in the Moberly River within the inundation zone of the Site C reservoir and one observation near River Km 44.0 (i.e., approximately 2 km upstream of the North Monias Road bridge). The FIDQ also noted Bull Trout observations in Moberly Lake and in the Moberly River upstream of Moberly Lake. During the current program (2016 to 2019), six Bull Trout were recorded; three within the Site C reservoir inundation zone and three between River Km 32 and 38. Fork lengths of captured Bull Trout have ranged between 213 and 420 mm. Whether the Bull Trout encountered in the Moberly River are resident or are migrating between the Moberly River and the Peace River is unknown; however, it is apparent that Bull Trout abundance in the Moberly River is low.

Non-target fish species recorded in the Moberly River in 2019 were similar to those recorded during previous study years. Prickly Sculpin and Walleye were recorded in 2019 and 2017 but not recorded in 2016 or 2018. Finescale Dace (*Chrosomus neogaeus*), Flathead Chub (*Platygobio gracilis*), and Kokanee (*Oncorhynchus nerka*) were recorded in the Moberly River in 2016 but were not recorded in 2017 through 2019. All six of these species were captured in low numbers during the years they were recorded. Their presence or absence in the catch in a particular study year is not likely indicative of a true change in species richness or diversity.

4.4 Radio Telemetry Tagging

In 2019, 53 suitable immature Bull Trout were captured in the Chowade River, and Cypress and Fiddes creeks and implanted with radio telemetry tags for monitoring under the Site C Fish Movement Assessment (Mon-1b, Task 2d; LGL 2020). Substantially higher CPUEs are typically recorded in Fiddes Creek relative to the Chowade River and Cypress Creek. During future study years, more immature Bull Trout could be caught and implanted with radio telemetry tags for the same amount of effort if that effort focused on Fiddes Creek.

Monitoring the movements of the 15 immature Rainbow Trout that were implanted with radio telemetry tags in Farrell Creek will potentially assist in determining whether these populations are residents to Farrell Creek or if some component of their life history includes downstream movement into the Peace River.

[19] http://a100.gov.bc.ca/pub/fidq/viewSingleWaterbody.do.

5.0 CLOSURE

We trust the information contained in this report is sufficiently detailed for your review purposes. Please do not hesitate to contact us should you have any questions or require clarification.

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APPENDIX A

Maps and UTM Locations

Table A1 Locations of sites sampled during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

River	Upstream River Km[a]	Site Name	Sample Method	Upstream UTM[b]			Downstream UTM[b]		
				Zone	Easting	Northing	Zone	Easting	Northing
Chowade River	51.1	CHR-EF-051.1-2019-07-18	Backpack Electrofishing	10V	492653	6284575	10V	492823	6284577
	50.0	CHR-EF-050.0-2019-07-18	Backpack Electrofishing	10V	492708	6284625	10V	492918	6284671
	49.4	CHR-EF-049.4-2019-08-03	Backpack Electrofishing	10V	494194	6284187	10V	494340	6284209
	49.2	CHR-EF-049.2-2019-07-18	Backpack Electrofishing	10V	494381	6284139	10V	494570	6284110
	49.2	CHR-EF-049.2-2019-08-03	Backpack Electrofishing	10V	494349	6284208	10V	494508	6284070
	49.0	CHR-EF-049.0-2019-07-18	Backpack Electrofishing	10V	494468	6284199	10V	494594	6284107
	48.2	CHR-EF-048.2-2019-07-19	Backpack Electrofishing	10V	495219	6284035	10V	495310	6283917
	48.0	CHR-EF-048.0-2019-07-19	Backpack Electrofishing	10V	495244	6283895	10V	495392	6283810
	46.8	CHR-EF-046.8-2019-07-19	Backpack Electrofishing	10V	496384	6283555	10V	496615	6283599
	46.5	CHR-EF-046.5-2019-07-19	Backpack Electrofishing	10V	497324	6283609	10V	497378	6283585
	46.4	CHR-EF-046.4-2019-07-19	Backpack Electrofishing	10V	497340	6283552	10V	497429	6283571
	46.3	CHR-EF-046.3-2019-07-19	Backpack Electrofishing	10V	496713	6283461	10V	496889	6283442
	44.2	CHR-EF-044.2-2019-07-20	Backpack Electrofishing	10V	498558	6283889	10V	498700	6283774
	44.1	CHR-EF-044.1-2019-07-20	Backpack Electrofishing	10V	498723	6283613	10V	498790	6283546
	44.0	CHR-EF-044.0-2019-07-20	Backpack Electrofishing	10V	498758	6283780	10V	498814	6283660
	43.9	CHR-EF-043.9-2019-07-20	Backpack Electrofishing	10V	498784	6283684	10V	498830	6283575
	43.5	CHR-EF-043.5-2019-07-25	Backpack Electrofishing	10V	498985	6283385	10V	499117	6283381
	43.4	CHR-EF-043.4-2019-07-25	Backpack Electrofishing	10V	499006	6283342	10V	499098	6283331
	42.4	CHR-EF-042.4-2019-08-03	Backpack Electrofishing	10V	497550	6283591	10V	497659	6283629
	42.3	CHR-EF-042.3-2019-08-03	Backpack Electrofishing	10V	497610	6283597	10V	497636	6283670
	41.6	CHR-EF-041.6-2019-07-25	Backpack Electrofishing	10V	499942	6282865	10V	499980	6282767
	41.5	CHR-EF-041.5-2019-07-25	Backpack Electrofishing	10V	499955	6282741	10V	500041	6282658
	39.7	CHR-EF-039.7-2019-07-20	Backpack Electrofishing	10V	501557	6282312	10V	501793	6282194
	39.2	CHR-EF-039.2-2019-07-20	Backpack Electrofishing	10V	501816	6282205	10V	501912	6282398
	37.2	CHR-EF-037.2-2019-07-20	Backpack Electrofishing	10V	503201	6281735	10V	503318	6281698
	36.9	CHR-EF-036.9-2019-07-20	Backpack Electrofishing	10V	503262	6281875	10V	503367	6281824
	22.4	CHR-EF-022.4-2019-08-03	Backpack Electrofishing	10V	512850	6284455	10V	512952	6284515
	22.0	CHR-EF-022.0-2019-08-03	Backpack Electrofishing	10V	512859	6284597	10V	513013	6284582
Colt Creek	30.4	COC-EF-030.4-2019-07-31	Backpack Electrofishing	10V	521151	6258239	10V	521237	6258383
	30.2	COC-EF-030.2-2019-07-31	Backpack Electrofishing	10V	521238	6258382	10V	521400	6258497
	29.0	COC-EF-029.0-2019-07-31	Backpack Electrofishing	10V	522229	6259004	10V	522350	6259123
	28.8	COC-EF-028.8-2019-07-31	Backpack Electrofishing	10V	522348	6259132	10V	522546	6259150
	14.9	COC-EF-014.9-2019-08-01	Backpack Electrofishing	10V	531805	6260325	10V	532002	6260312
	14.1	COC-EF-014.1-2019-08-01	Backpack Electrofishing	10V	531634	6260261	10V	531807	6260336
	3.2	COC-EF-003.2-2019-07-31	Backpack Electrofishing	10V	538058	6258663	10V	538278	6258624
	3.0	COC-EF-003.0-2019-07-31	Backpack Electrofishing	10V	538263	6258617	10V	538397	6258520
Cypress Creek	41.7	CYC-EF-041.7-2019-07-23	Backpack Electrofishing	10V	495300	6302269	10V	495294	6302461
	41.6	CYC-EF-041.6-2019-07-23	Backpack Electrofishing	10V	495306	6302303	10V	495207	6302391
	41.4	CYC-EF-041.4-2019-07-23	Backpack Electrofishing	10V	495613	6302547	10V	495762	6302661
	41.3	CYC-EF-041.3-2019-07-23	Backpack Electrofishing	10V	495656	6302608	10V	495730	6302695
	40.8	CYC-EF-040.8-2019-07-23	Backpack Electrofishing	10V	495832	6302816	10V	495777	6302883
	40.7	CYC-EF-040.7-2019-07-23	Backpack Electrofishing	10V	495762	6302899	10V	495818	6302945
	40.2	CYC-EF-040.2-2019-07-22	Backpack Electrofishing	10V	496151	6303060	10V	496013	6302970

[a] Upstream River Km of each site as measured upstream from the stream's confluence.

[b] NAD83.

continued…

Table A1 Continued.

River	Upstream River Km[a]	Site Name	Sample Method	Upstream UTM[b]			Downstream UTM[b]		
				Zone	Easting	Northing	Zone	Easting	Northing
Cypress Creek	40.1	CYC-EF-040.1-2019-07-22	Backpack Electrofishing	10V	496070	6303005	10V	496160	6303067
	35.6	CYC-EF-035.6-2019-07-22	Backpack Electrofishing	10V	498807	6303750	10V	498979	6303848
	35.5	CYC-EF-035.5-2019-07-22	Backpack Electrofishing	10V	498861	6303719	10V	498995	6303836
	34.6	CYC-EF-034.6-2019-07-22	Backpack Electrofishing	10V	499355	6503851	10V	499595	6304004
	34.5	CYC-EF-034.5-2019-07-22	Backpack Electrofishing	10V	499464	6303923	10V	499586	6304053
	33.2	CYC-EF-033.2-2019-07-27	Backpack Electrofishing	10V	500022	6304614	10V	500175	6304758
	33.1	CYC-EF-033.1-2019-07-27	Backpack Electrofishing	10V	500141	6304637	10V	500186	6304756
	32.6	CYC-EF-032.6-2019-07-21	Backpack Electrofishing	10V	500390	6304851	10V	500532	6304938
	32.5	CYC-EF-032.5-2019-07-21	Backpack Electrofishing	10V	500523	6304903	10V	500628	6305106
	31.1	CYC-EF-031.1-2019-07-21	Backpack Electrofishing	10V	501322	6305680	10V	501411	6305789
	31.0	CYC-EF-031.0-2019-07-21	Backpack Electrofishing	10V	501459	6305740	10V	501443	6305771
	30.7	CYC-EF-030.7-2019-07-21	Backpack Electrofishing	10V	501598	6305710	10V	501830	6305570
	29.5	CYC-EF-029.5-2019-07-27	Backpack Electrofishing	10V	502646	6305478	10V	502823	6305499
	29.4	CYC-EF-029.4-2019-07-27	Backpack Electrofishing	10V	502805	6305501	10V	502650	6305482
	29.2	CYC-EF-029.2-2019-07-21	Backpack Electrofishing	10V	502903	6305530	10V	503112	6305513
	29.0	CYC-EF-029.0-2019-07-21	Backpack Electrofishing	10V	503150	6305425	10V	502997	6305417
	28.4	CYC-EF-028.4-2019-07-27	Backpack Electrofishing	10V	503610	6305488	10V	503823	6305293
	28.1	CYC-EF-028.1-2019-07-27	Backpack Electrofishing	10V	503873	6305198	10V	503816	6305232
	27.4	CYC-EF-027.4-2019-07-28	Backpack Electrofishing	10V	504538	6305127	10V	504716	6305051
	27.3	CYC-EF-027.3-2019-07-28	Backpack Electrofishing	10V	504633	6305038	10V	504722	6305082
	26.3	CYC-EF-026.3-2019-07-28	Backpack Electrofishing	10V	505334	6304424	10V	505390	6304545
	26.2	CYC-EF-026.2-2019-07-28	Backpack Electrofishing	10V	505321	6304438	10V	505362	6304547
	25.6	CYC-EF-025.6-2019-07-28	Backpack Electrofishing	10V	505773	6304383	10V	505813	6304429
	25.5	CYC-EF-025.5-2019-07-28	Backpack Electrofishing	10V	505761	6304384	10V	505814	6304438
Farrell Creek	102.1	FAC-EF-102.1-2019-07-24	Backpack Electrofishing	10V	560972	6238330	10V	560892	6238244
	101.7	FAC-EF-101.7-2019-07-24	Backpack Electrofishing	10V	561016	6238345	10V	561045	6238124
	65.7	FAC-EF-065.7-2019-08-02	Backpack Electrofishing	10V	573215	6238266	10V	573010	6238384
	65.5	FAC-EF-065.5-2019-08-02	Backpack Electrofishing	10V	573010	6238384	10V	573010	6238446
	63.3	FAC-EF-063.3-2019-08-01	Backpack Electrofishing	10V	572209	6239771	10V	572376	6239986
	63.0	FAC-EF-063.0-2019-08-01	Backpack Electrofishing	10V	572379	6239982	10V	572498	6240098
Fiddes Creek	7.1	FIC-EF-007.1-2019-07-26	Backpack Electrofishing	10V	479593	6310834	10V	479686	6310881
	7.0	FIC-EF-007.0-2019-07-26	Backpack Electrofishing	10V	479836	6311013	10V	479678	6310882
	5.2	FIC-EF-005.2-2019-07-26	Backpack Electrofishing	10V	480371	6312410	10V	480325	6312553
	4.8	FIC-EF-004.8-2019-07-26	Backpack Electrofishing	10V	480290	6312625	10V	480325	6312547
Kobes Creek	55.5	KOC-EF-055.5-2019-07-30	Backpack Electrofishing	10V	544251	6243088	10V	544239	6243291
	55.3	KOC-EF-055.3-2019-07-30	Backpack Electrofishing	10V	544083	6243440	10V	544232	6243293
	46.8	KOC-EF-046.8-2019-07-30	Backpack Electrofishing	10V	543234	6248127	10V	543323	6248297
	46.5	KOC-EF-046.5-2019-07-30	Backpack Electrofishing	10V	543330	6248301	10V	543403	6248508
	40.6	KOC-EF-040.6-2019-07-29	Backpack Electrofishing	10V	543959	6252090	10V	544125	6252307
	40.2	KOC-EF-040.2-2019-07-29	Backpack Electrofishing	10V	544130	6252319	10V	544060	6252510
	11.7	KOC-EF-011.7-2019-07-29	Backpack Electrofishing	10V	555148	6256353	10V	555241	6256147
	11.5	KOC-EF-011.5-2019-07-29	Backpack Electrofishing	10V	555234	6256194	10V	555402	6256097
Moberly River	119.7	MOR-AG-119.7-2019-07-28	Angling	10U	587818	6189273			
	119.6	MOR-ES-119.6-2019-07-28	Small Fish Boat Electroshocking	10U	587767	6189258	10U	588276	6189479

[a] Upstream River Km of each site as measured upstream from the stream's confluence.

[b] NAD83.

continued…

Table A1 Continued.

River	Upstream River Km[a]	Site Name	Sample Method	Upstream UTM[b]			Downstream UTM[b]		
				Zone	Easting	Northing	Zone	Easting	Northing
Moberly River	119.5	MOR-EF-119.5-2019-07-28	Backpack Electrofishing	10U	587847	6189218	10U	587809	6189257
	119.1	MOR-AG-119.1-2019-07-28	Angling	10U	588275	6189483			
	119.1	MOR-EF-119.1-2019-07-29	Backpack Electrofishing	10U	588380	6189273	10U	588415	6189290
	119.1	MOR-AG-119.1-2019-07-29	Angling	10U	588275	6189483			
	119.1	MOR-ES-119.1-2019-07-29	Small Fish Boat Electroshocking	10U	588327	6189499	10U	588547	6189956
	119.0	MOR-AG-119.0-2019-07-29	Angling	10U	588294	6189508	10U	588369	6189497
	118.9	MOR-AG-118.9-2019-07-29	Angling	10U	588369	6189497	10U	588490	6190246
	118.7	MOR-EF-118.7-2019-07-29	Backpack Electrofishing	10U	588752	6189492	10U	588733	6189589
	118.5	MOR-ES-118.5-2019-07-29	Small Fish Boat Electroshocking	10U	588547	6189956	10U	588377	6190776
	118.1	MOR-AG-118.1-2019-07-29	Angling	10U	588490	6190246	10U	588520	6190368
	117.9	MOR-EF-117.9-2019-07-29	Backpack Electrofishing	10U	588602	6190201	10U	588623	6190284
	117.7	MOR-ES-117.7-2019-07-29	Small Fish Boat Electroshocking	10U	588361	6190783	10U	588482	6191158
	117.2	MOR-AG-117.2-2019-07-29	Angling	10U	588456	6190705	10U	588659	6191204
	117.0	MOR-ES-117.0-2019-07-29	Small Fish Boat Electroshocking	10U	588482	6191158	10U	588593	6191149
	116.8	MOR-EF-116.8-2019-07-29	Backpack Electrofishing	10U	588570	6190950	10U	588623	6190993
	116.8	MOR-AG-116.8-2019-07-29	Angling	10U	588659	6190705	10U	588682	6191226
	116.7	MOR-ES-116.7-2019-07-29	Small Fish Boat Electroshocking	10U	588667	6191211	10U	588799	6191286
	116.5	MOR-EF-116.5-2019-07-29	Backpack Electrofishing	10U	588651	6190989	10U	588737	6191038
	116.3	MOR-ES-116.3-2019-07-29	Small Fish Boat Electroshocking	10U	588793	6191303	10U	589182	6191711
	115.9	MOR-ES-115.9-2019-07-29	Small Fish Boat Electroshocking	10U	589182	6191711	10U	589466	6192353
	115.8	MOR-AG-115.8-2019-07-29	Angling	10U	589187	6191593	10U	589194	6191922
	115	MOR-ES-115.0-2019-07-30	Small Fish Boat Electroshocking	10U	589454	6192370	10U	589209	6192954
	114.5	MOR-EF-114.5-2019-07-29	Backpack Electrofishing	10U	589334	6192718	10U	589299	6192749
	114.5	MOR-EF-114.5-2019-07-30	Backpack Electrofishing	10U	589334	6192718	10U	589299	6192749
	114.5	MOR-AG-114.5-2019-07-30	Angling	10U	589231	6192780	10U	589202	6192954
	114.3	MOR-ES-114.3-2019-07-30	Small Fish Boat Electroshocking	10U	589223	6192936	10U	589160	6193912
	105	MOR-ES-105.0-2019-07-30	Small Fish Boat Electroshocking	10U	590138	6198294	10U	590468	6198657
	104.7	MOR-AG-104.7-2019-07-30	Angling	10U	590474	6198426	10U	590548	6198464
	104.6	MOR-AG-104.6-2019-07-30	Angling	10U	590548	6198464	10U	591378	6199963
	103.7	MOR-EF-103.7-2019-07-30	Backpack Electrofishing	10U	590718	6198522	10U	590768	6198463
	103.6	MOR-ES-103.6-2019-07-30	Small Fish Boat Electroshocking	10U	590818	6198745	10U	590623	6199208
	103	MOR-ES-103.0-2019-07-30	Small Fish Boat Electroshocking	10U	590631	6199210	10U	591455	6200077
	100.7	MOR-AG-100.7-2019-07-30	Angling	10U	591315	6200188	10U	591218	6200747
	98.8	MOR-AG-098.8-2019-07-30	Angling	10U	591021	6200975	10U	590594	6200826
	94.8	MOR-AG-094.8-2019-07-30	Angling	10U	589113	6200908	10U	588626	6202592
	88.9	MOR-ES-088.9-2019-07-30	Small Fish Boat Electroshocking	10U	586511	6203405	10U	587180	6204051
	87.5	MOR-ES-087.5-2019-07-31	Small Fish Boat Electroshocking	10U	587185	6204051	10U	587956	6204340
	87.3	MOR-AG-087.3-2019-07-30	Angling	10U	587172	6204057	10U	587197	6204016
	87.3	MOR-AG-087.3-2019-07-31	Angling	10U	587172	6204057	10U	587197	6204016
	87.2	MOR-AG-087.2-2019-07-31	Angling	10U	587197	6204016	10U	589063	6205091
	84.5	MOR-ES-084.5-2019-07-31	Small Fish Boat Electroshocking	10U	589399	6205363	10U	589557	6206093
	84.1	MOR-AG-084.1-2019-07-31	Angling	10U	589402	6205370	10U	589431	6206482
	81.6	MOR-EF-081.6-2019-07-31	Backpack Electrofishing	10U	589566	6206298	10U	589598	6206314
	80.2	MOR-ES-080.2-2019-07-31	Small Fish Boat Electroshocking	10U	589951	6206871	10U	590427	6207599

[a] Upstream River Km of each site as measured upstream from the stream's confluence.

[b] NAD83.

continued…

Table A1 Continued.

River	Upstream River Km[a]	Site Name	Sample Method	Upstream UTM[b]			Downstream UTM[b]		
				Zone	Easting	Northing	Zone	Easting	Northing
Moberly River	80.2	MOR-AG-080.2-2019-07-31	Angling	10U	589811	6206871	10U	590427	6207607
	75.9	MOR-AG-075.9-2019-07-31	Angling	10V	590717	6209050	10V	590763	6210062
	72.5	MOR-ES-072.5-2019-07-31	Small Fish Boat Electroshocking	10V	590845	6210930	10V	591004	6211311
	71.3	MOR-AG-071.3-2019-07-31	Angling	10V	591050	6210985	10V	591050	6211395
	68.7	MOR-AG-068.7-2019-07-31	Angling	10V	593569	6211532	10V	594472	6211147
	68.4	MOR-ES-068.4-2019-07-31	Small Fish Boat Electroshocking	10V	593723	6211411	10V	594441	6211117
	65.7	MOR-AG-065.7-2019-08-01	Angling	10V	594284	6212166	10V	594399	6212089
	65.6	MOR-ES-065.6-2019-08-01	Small Fish Boat Electroshocking	10V	594421	6212015	10V	594543	6211600
	65.2	MOR-EF-065.2-2019-08-01	Backpack Electrofishing	10V	594405	6211607	10V	594479	6211620
	64.8	MOR-ES-064.8-2019-08-01	Small Fish Boat Electroshocking	10V	594571	6211585	10V	594850	6211673
	64.7	MOR-AG-064.7-2019-08-01	Angling	10V	594646	6211754			
	64.5	MOR-EF-064.5-2019-08-01	Backpack Electrofishing	10V	594803	6211629	10V	594872	6211604
	64.4	MOR-ES-064.4-2019-08-01	Small Fish Boat Electroshocking	10V	594848	6211639	10V	595212	6212028
	63.4	MOR-AG-063.4-2019-08-01	Angling	10V	595036	6211937	10V	595133	6212287
	62.4	MOR-EF-062.4-2019-08-01	Backpack Electrofishing	10V	595224	6212429	10V	595152	6212411
	61.9	MOR-AG-061.9-2019-08-01	Angling	10V	594872	6213011			
	60.8	MOR-ES-060.8-2019-08-01	Small Fish Boat Electroshocking	10V	595500	6213353	10V	596284	6214717
	58.3	MOR-AG-058.3-2019-08-01	Angling	10V	596361	6215381	10V	596330	6215581
	58.2	MOR-ES-058.2-2019-08-01	Small Fish Boat Electroshocking	10V	596347	6215408	10V	597284	6215201
	57.8	MOR-AG-057.8-2019-08-01	Angling	10V	596498	6215597	10V	598708	6215491
	57.5	MOR-EF-057.5-2019-08-01	Backpack Electrofishing	10V	596727	6215358	10V	596873	6215297
	56.6	MOR-ES-056.6-2019-08-01	Small Fish Boat Electroshocking	10V	597284	6215201	10V	598402	6215560
	55.0	MOR-ES-055.0-2019-08-01	Small Fish Boat Electroshocking	10V	598726	6215481	10V	598442	6214932
	54.8	MOR-AG-054.8-2019-08-01	Angling	10V	598838	6215181	10V	598732	6214114
	53.4	MOR-EF-053.4-2019-08-01	Backpack Electrofishing	10V	598578	6214100	10V	598559	6214006
	51.9	MOR-ES-051.9-2019-08-01	Small Fish Boat Electroshocking	10V	599320	6214929	10V	599265	6215457
	51.0	MOR-AG-051.0-2019-08-02	Angling	10V	599267	6215492			
	51.0	MOR-ES-051.0-2019-08-02	Small Fish Boat Electroshocking	10V	599264	6215495	10V	599884	6216459
	50.7	MOR-AG-050.7-2019-08-02	Angling	10V	599216	6215832	10V	600605	6217106
	50.6	MOR-AG-050.6-2019-08-02	Angling	10V	599216	6215832			
	50.6	MOR-EF-050.6-2019-08-02	Backpack Electrofishing	10V	599327	6215792	10V	599362	6215828
	49.2	MOR-ES-049.2-2019-08-02	Small Fish Boat Electroshocking	10V	599917	6216460	10V	600580	6217188
	47.9	MOR-ES-047.9-2019-08-02	Small Fish Boat Electroshocking	10V	600634	6217231	10V	601300	6217224
	47.8	MOR-EF-047.8-2019-08-02	Backpack Electrofishing	10V	600716	6216938	10V	600706	6217013
	47.8	MOR-AG-047.8-2019-08-02	Angling	10V	600776	6217251	10V	601920	6217742
	45.9	MOR-AG-045.9-2019-08-02	Angling	10V	601920	6217742			
	45.7	MOR-AG-045.7-2019-08-02	Angling	10V	601920	6217742	10V	603447	6217895
	45.6	MOR-ES-045.6-2019-08-02	Small Fish Boat Electroshocking	10V	602142	6217855	10V	602867	6217806
	44.6	MOR-EF-044.6-2019-08-02	Backpack Electrofishing	10V	602836	6217576	10V	602957	6217555
	44.2	MOR-AG-044.2-2019-07-22	Angling	10V	603821	6217947	10V	603887	6217964
	43.1	MOR-ES-043.1-2019-07-22	Small Fish Boat Electroshocking	10V	603442	6217890	10V	603833	6217913
	42.7	MOR-EF-042.7-2019-07-22	Backpack Electrofishing	10V	603836	6217943	10V	603891	6217991
	42.7	MOR-AG-042.7-2019-07-22	Angling	10V	604431	6218217	10V	604461	6218719
	41.9	MOR-ES-041.9-2019-07-22	Small Fish Boat Electroshocking	10V	604406	6218633	10V	605212	6218876

[a] Upstream River Km of each site as measured upstream from the stream's confluence.

[b] NAD83.

continued…

Table A1 Continued.

River	Upstream River Km[a]	Site Name	Sample Method	Upstream UTM[b]			Downstream UTM[b]		
				Zone	Easting	Northing	Zone	Easting	Northing
Moberly River	41.0	MOR-AG-041.0-2019-07-22	Angling	10V	605213	6218897			
	40.8	MOR-EF-040.8-2019-07-23	Backpack Electrofishing	10V	606241	6219985	10V	606277	6220021
	39.8	MOR-ES-039.8-2019-07-22	Small Fish Boat Electroshocking	10V	605212	6218876	10V	605992	6219783
	39.2	MOR-AG-039.2-2019-07-23	Angling	10V	605733	6219528			
	38.1	MOR-ES-038.1-2019-07-23	Small Fish Boat Electroshocking	10V	606261	6220238	10V	606510	6220981
	38.0	MOR-AG-038.0-2019-07-23	Angling	10V	606584	6221032	10V	606605	6221077
	37.9	MOR-ES-037.9-2019-07-23	Small Fish Boat Electroshocking	10V	606540	6221212	10V	606564	6221296
	37.5	MOR-AG-037.5-2019-07-23	Angling	10V	606520	6221234	10V	606601	6221655
	37.5	MOR-EF-037.5-2019-07-23	Backpack Electrofishing	10V	606877	6222070	10V	606769	6222219
	36.9	MOR-ES-036.9-2019-07-23	Small Fish Boat Electroshocking	10V	606602	6221346	10V	606574	6221673
	36.7	MOR-AG-036.7-2019-07-23	Angling	10V	606959	6221943			
	35.9	MOR-ES-035.9-2019-07-23	Small Fish Boat Electroshocking	10V	606820	6221898	10V	606771	6222143
	35.0	MOR-AG-035.0-2019-07-23	Angling	10V	607692	6222850			
	34.7	MOR-AG-034.7-2019-07-23	Angling	10V	607889	6222724	10V	607924	6222750
	33.5	MOR-EF-033.5-2019-07-23	Backpack Electrofishing	10V	608290	6223416	10V	608341	6223393
	32.4	MOR-ES-032.4-2019-07-23	Small Fish Boat Electroshocking	10V	607402	6222344	10V	608345	6223421
	31.8	MOR-AG-031.8-2019-07-23	Angling	10V	608176	6223524	10V	608849	6223652
	31.6	MOR-ES-031.6-2019-07-23	Small Fish Boat Electroshocking	10V	608983	6224003	10V	609792	6224162
	27.2	MOR-AG-027.2-2019-07-24	Angling	10V	610329	6225211	10V	610871	6226041
	27.0	MOR-ES-027.0-2019-07-24	Small Fish Boat Electroshocking	10V	609476	6224922	10V	610439	6225529
	26.5	MOR-EF-026.5-2019-07-24	Backpack Electrofishing	10V	610417	6225711	10V	610464	6225768
	25.8	MOR-AG-025.8-2019-07-24	Angling	10V	610980	6226209	10V	611600	6226671
	25.8	MOR-ES-025.8-2019-07-24	Small Fish Boat Electroshocking	10V	611007	6226307	10V	611880	6226988
	25.4	MOR-EF-025.4-2019-07-24	Backpack Electrofishing	10V	611222	6226213	10V	611350	6226250
	25.0	MOR-AG-025.0-2019-07-24	Angling	10V	611481	6226765	10V	611438	6226797
	24.1	MOR-AG-024.1-2019-07-24	Angling	10V	611872	6227025			
	23.9	MOR-ES-023.9-2019-07-24	Small Fish Boat Electroshocking	10V	611921	6227211	10V	612219	6227018
	23.4	MOR-ES-023.4-2019-07-24	Small Fish Boat Electroshocking	10V	612357	6227075	10V	613285	6227674
	23.0	MOR-AG-023.0-2019-07-24	Angling	10V	612281	6226957	10V	612294	6227000
	22.5	MOR-AG-022.5-2019-07-24	Angling	10V	612175	6227133			
	22.3	MOR-EF-022.3-2019-07-24	Backpack Electrofishing	10V	613787	6227788	10V	613839	6227858
	22.2	MOR-ES-022.2-2019-07-24	Small Fish Boat Electroshocking	10V	613299	6227654	10V	613975	6227854
	22.1	MOR-EF-022.1-2019-07-24	Backpack Electrofishing	10V	613847	6227849	10V	613998	6227846
	21.2	MOR-ES-021.2-2019-07-25	Small Fish Boat Electroshocking	10V	614108	6227909	10V	614771	6228008
	21.1	MOR-EF-021.1-2019-07-25	Backpack Electrofishing	10V	614138	6227910	10V	614126	6227820
	20.1	MOR-AG-020.1-2019-07-25	Angling	10V	614312	6227941	10V	614794	6227996
	20.0	MOR-ES-020.0-2019-07-25	Small Fish Boat Electroshocking	10V	615008	6227959	10V	615220	6228461
	19.5	MOR-EF-019.5-2019-07-25	Backpack Electrofishing	10V	615722	6228580	10V	615835	6228559
	19.0	MOR-AG-019.0-2019-07-25	Angling	10V	615156	6228388	10V	615383	6228537
	18.5	MOR-ES-018.5-2019-07-25	Small Fish Boat Electroshocking	10V	615808	6228603	10V	616387	6228740
	18.0	MOR-AG-018.0-2019-07-25	Angling	10V	616137	6228702	10V	616265	6228718
	17.7	MOR-AG-017.7-2019-07-25	Angling	10V	616414	6229009	10V	616431	6228919
	17.7	MOR-ES-017.7-2019-07-25	Small Fish Boat Electroshocking	10V	616464	6228737	10V	616855	6229030
	16.5	MOR-AG-016.5-2019-07-25	Angling	10V	617061	6228944			

[a] Upstream River Km of each site as measured upstream from the stream's confluence.

[b] NAD83.

continued…

Table A1 Concluded.

River	Upstream River Km[a]	Site Name	Sample Method	Upstream UTM[b]			Downstream UTM[b]		
				Zone	Easting	Northing	Zone	Easting	Northing
Moberly River	16.2	MOR-ES-016.2-2019-07-25	Small Fish Boat Electroshocking	10V	617119	6228717	10V	617971	6228705
	16.0	MOR-EF-016.0-2019-07-25	Backpack Electrofishing	10V	617221	6228563	10V	617329	6228570
	15.9	MOR-EF-015.9-2019-07-25	Backpack Electrofishing	10V	617338	6228507	10V	617419	6228553
	15.0	MOR-AG-015.0-2019-07-25	Angling	10V	617334	6228498			
	15.0	MOR-ES-015.0-2019-07-26	Small Fish Boat Electroshocking	10V	618113	6228708	10V	619037	6228648
	14.8	MOR-AG-014.8-2019-07-26	Angling	10V	618182	6228815	10V	618996	6228684
	14.4	MOR-EF-014.4-2019-07-26	Backpack Electrofishing	10V	618417	6228899	10V	618483	6228880
	13.9	MOR-AG-013.9-2019-07-26	Angling	10V	619126	6228631	10V	619524	6228419
	13.7	MOR-ES-013.7-2019-07-26	Small Fish Boat Electroshocking	10V	619206	6228653	10V	619692	6228370
	13.6	MOR-EF-013.6-2019-07-26	Backpack Electrofishing	10V	619204	6228629	10V	619297	6228685
	13.1	MOR-AG-013.1-2019-07-26	Angling	10V	619524	6228419	10V	619654	6228372
	13.0	MOR-ES-013.0-2019-07-26	Small Fish Boat Electroshocking	10V	619692	6228370	10V	620499	6228083
	12.7	MOR-AG-012.7-2019-07-26	Angling	10V	619967	6228350	10V	620560	6228060
	12.0	MOR-ES-012.0-2019-07-26	Small Fish Boat Electroshocking	10V	620588	6228054	10V	621497	6227863
	11.5	MOR-AG-011.5-2019-07-26	Angling	10V	620922	6228301	10V	621522	6227792
	10.8	MOR-AG-010.8-2019-07-26	Angling	10V	621522	6227792			
	10.8	MOR-ES-010.8-2019-07-26	Small Fish Boat Electroshocking	10V	621493	6227861	10V	622109	6228144
	9.9	MOR-ES-009.9-2019-07-26	Small Fish Boat Electroshocking	10V	622312	6228170	10V	622834	6227955
	9.4	MOR-AG-009.4-2019-07-26	Angling	10V	622698	6228010	10V	622794	6227977
	9.1	MOR-ES-009.1-2019-07-26	Small Fish Boat Electroshocking	10V	622848	6227843	10V	622979	6227535
	8.8	MOR-AG-008.8-2019-07-26	Angling	10V	623117	6227422	10V	623206	6227474
	8.6	MOR-EF-008.6-2019-07-26	Backpack Electrofishing	10V	623047	6227503	10V	623150	6227487
	8.5	MOR-ES-008.5-2019-07-26	Small Fish Boat Electroshocking	10V	623236	6227473	10V	624143	6227383
	8.4	MOR-EF-008.4-2019-07-26	Backpack Electrofishing	10V	623186	6227481	10V	623248	6227450
	8.2	MOR-AG-008.2-2019-07-26	Angling	10V	623440	6227292			
	7.5	MOR-AG-007.5-2019-07-26	Angling	10V	623730	6227459			
	7.3	MOR-AG-007.3-2019-07-26	Angling	10V	623952	6227446			
	7.1	MOR-AG-007.1-2019-07-26	Angling	10V	624284	6227395	10V	624306	6227418
	6.9	MOR-AG-006.9-2019-07-26	Angling	10V	624515	6227420	10V	613181	6227511
	6.9	MOR-ES-006.9-2019-07-26	Small Fish Boat Electroshocking	10V	624495	6227311	10V	625674	6227902
	5.2	MOR-ES-005.2-2019-07-26	Small Fish Boat Electroshocking	10V	625681	6227919	10V	626166	6228383
	3.9	MOR-AG-003.9-2019-07-27	Angling	10V	626192	6228381	10V	627446	6229361
	3.8	MOR-EF-003.8-2019-07-26	Backpack Electrofishing	10V	626175	6228495	10V	626166	6228383
	3.8	MOR-EF-003.8-2019-07-26	Backpack Electrofishing	10V	626175	6228495	10V	626166	6228383
	3.7	MOR-ES-003.7-2019-07-27	Small Fish Boat Electroshocking	10V	626170	6228382	10V	626501	6228534
	3.5	MOR-EF-003.5-2019-07-27	Backpack Electrofishing	10V	626307	6228465	10V	626432	6228454
	3.4	MOR-EF-003.4-2019-07-27	Backpack Electrofishing	10V	626418	6228626	10V	626452	6228479
	1.5	MOR-AG-001.5-2019-07-27	Angling	10V	627723	6229492	10V	627750	6229530
	1.5	MOR-EF-001.5-2019-08-29[c]	Backpack Electrofishing	10V	627846	6229895	10V	627945	6229887
	1.4	MOR-AG-001.4-2019-07-27	Angling	10V	627781	6229575	10V	627757	6229724
	1.4	MOR-EF-001.4-2019-09-21[c]	Backpack Electrofishing	10V	627511	6229383	10V	627688	6239450
	1.0	MOR-EF-001.0-2019-09-21[c]	Backpack Electrofishing	10V	627782	6229727	10V	627882	6229585
	0.5	MOR-EF-000.5-2019-08-21[c]	Backpack Electrofishing	10V	628215	6230182	10V	628271	6230206

[a] Upstream River Km of each site as measured upstream from the stream's confluence.

Concluded.

[b] NAD83.

[c] Synoptic sampling only to collect genetic samples from small-bodied fish.

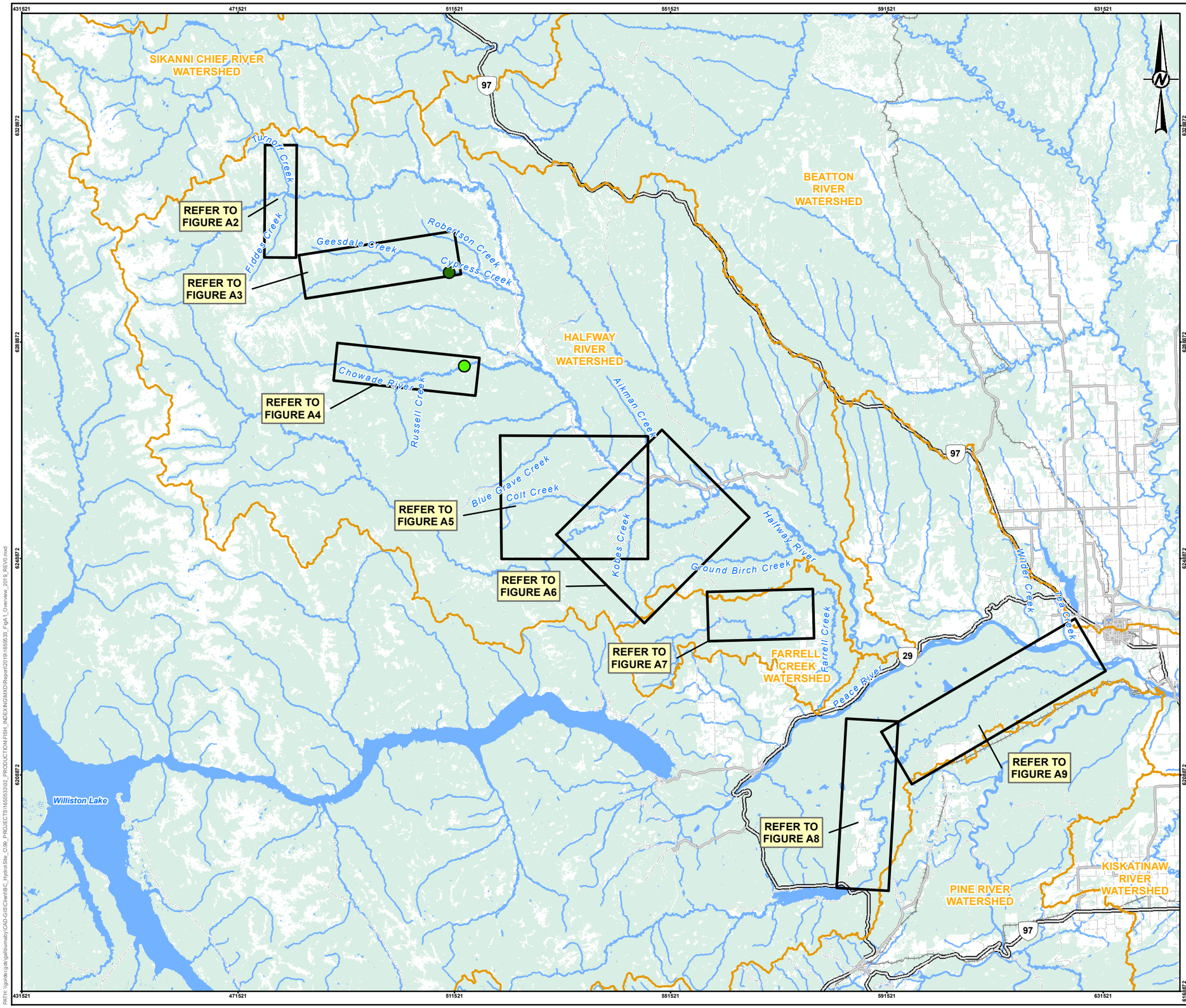
Table A2 Location information for Moberly River sections sampled during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

River	Section	Habitat Type	Length (km)	River Km[a]	Upstream UTM[b]			River Km[a]	Downstream UTM[b]		
					Zone	Easting	Northing		Zone	Easting	Northing
Moberly River	MR-S1A	Irregular Meanders[a]	5.9	119.6	10U	587890	6189345	113.8	10U	589439	6193416
	MR-S1	Tortuous Meanders	4.5	105.1	10U	590194	6198180	100.6	10U	591248	6200259
	MR-S2	Tortuous Meanders	16.5	100.6	10U	591248	6200259	84.1	10U	589031	6204822
	MR-S3	Tortuous Meanders	12.0	84.1	10U	589407	6205349	72.2	10V	591076	6210858
	MR-S4	Tortuous Meanders	11.3	72.2	10V	591076	6210858	60.9	10V	595402	6213268
	MR-S5	Tortuous Meanders	9.0	60.9	10V	595402	6213268	51.9	10V	599325	6214944
	MR-S6	Tortuous Meanders	4.3	51.9	10V	599325	6214944	47.6	10V	600924	6217136
	MR-S7	Irregular meandering; Braided; Frequently Confined	18.2	47.6	10V	600924	6217136	29.5	10V	609657	6224625
	MR-S8	Irregular meandering; Braided; Frequently Confined	11.4	29.5	10V	609657	6224625	18.0	10V	616182	6228657
	MR-S9	Irregular meandering; Braided; Frequently Confined	5.4	18.0	10V	616182	6228657	12.6	10V	619999	6228240
	MR-S10	Irregular meandering; Braided; Frequently Confined	12.6	12.6	10V	619999	6228240	0.0	10V	628556	6230023

[a] River Km as measured upstream from the Moberly River confluence.

[b] NAD83.

[c] Habitat types and section breaks for the Moberly River were established by Mainstream (2011b).



LEGEND

- CHOWADE RIVER PIT DETECTOR ARRAY
- CYPRESS CREEK PIT DETECTOR ARRAY
- MAJOR WATERSHED

BASEMAP FEATURE

- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- WATERBODY
- RESIDENTIAL AREA
- WOODED AREA

0 15 30

1:700,000 KILOMETRES

REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATERSHED DATA OBTAINED FROM THE GOVERNMENT OF BRITISH COLUMBIA
3. BASEDATA SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESR I JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c) STUDY AREA, 2019

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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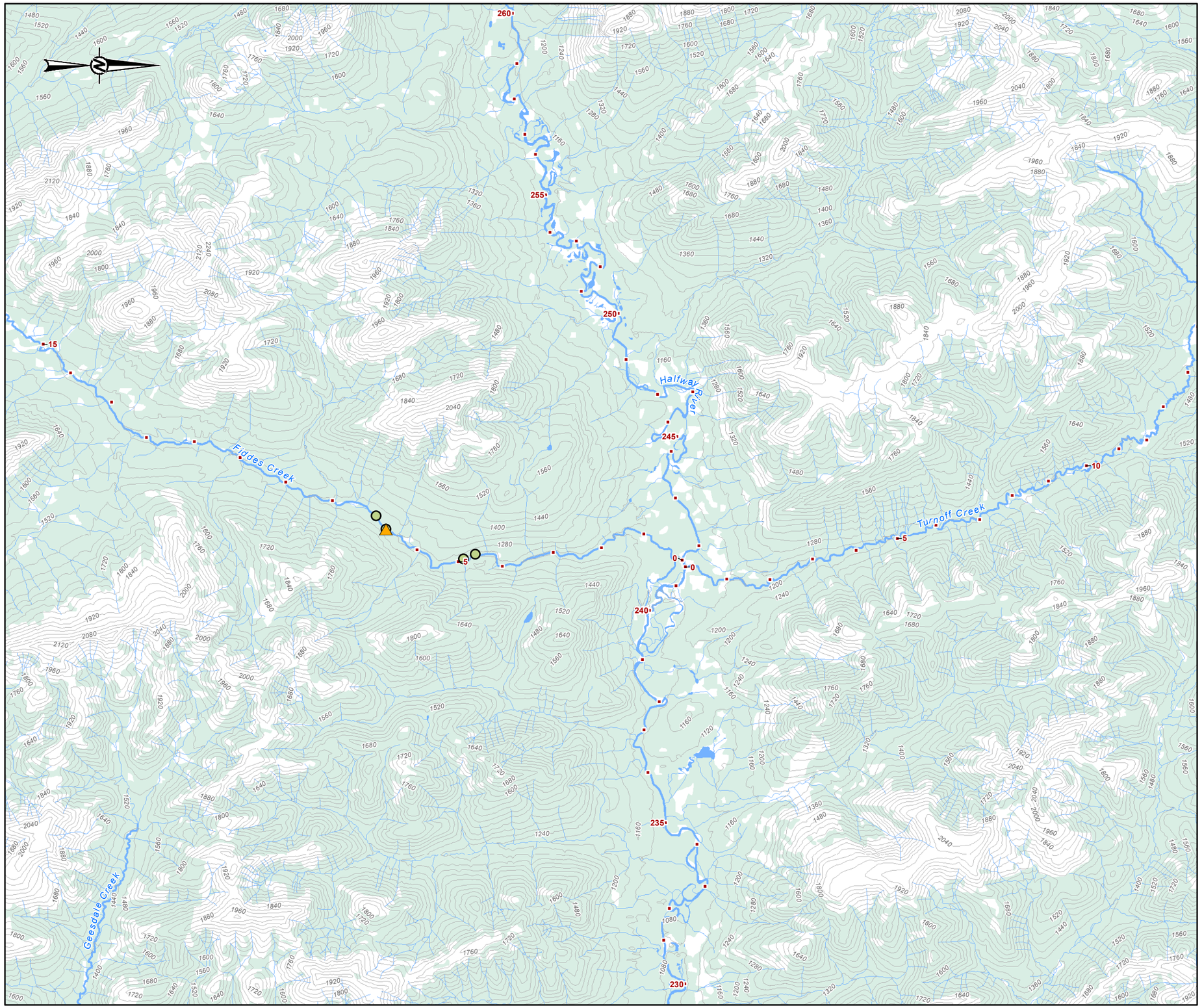


LEGEND

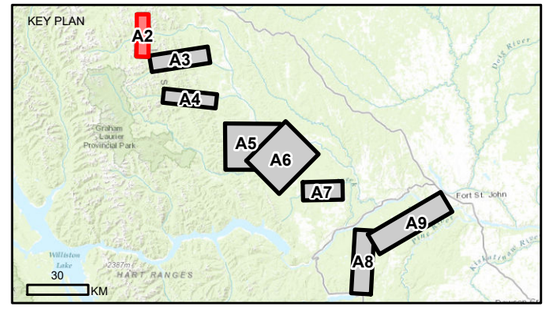
- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS

UPSTREAM EXTENT OF EACH SAMPLE SITE

- BACKPACK ELECTROFISHING

BASEMAP FEATURE

- CONTOUR (100m)
- WATERCOURSE
- WATERBODY
- WOODED AREA



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REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATERSHED DATA OBTAINED FROM THE GOVERNMENT OF BRITISH COLUMBIA
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c), FIDDES CREEK STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
19121769	2O	0	**A2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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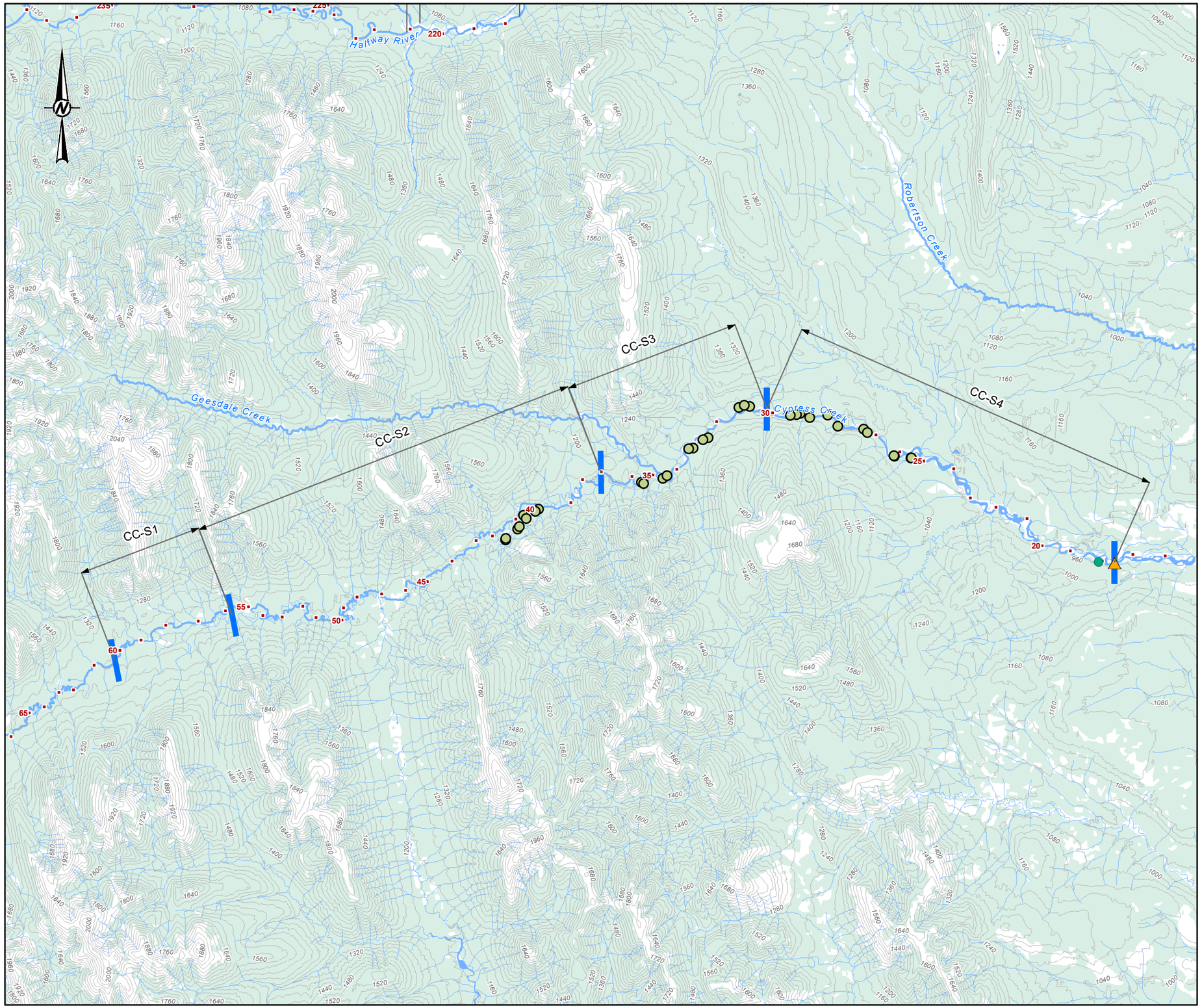


LEGEND

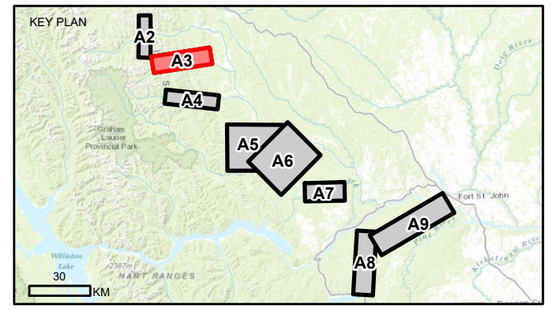
- CHOWADE RIVER PIT DETECTOR ARRAY
- CYPRESS CREEK PIT DETECTOR ARRAY
- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS

UPSTREAM EXTENT OF EACH SAMPLE SITE

- BACKPACK ELECTROFISHING
- SECTION BREAK

BASEMAP FEATURE

- CONTOUR (20 m)
- WATERCOURSE
- WATERBODY
- WOODED AREA



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REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY
(Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) CYPRESS CREEK STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2019-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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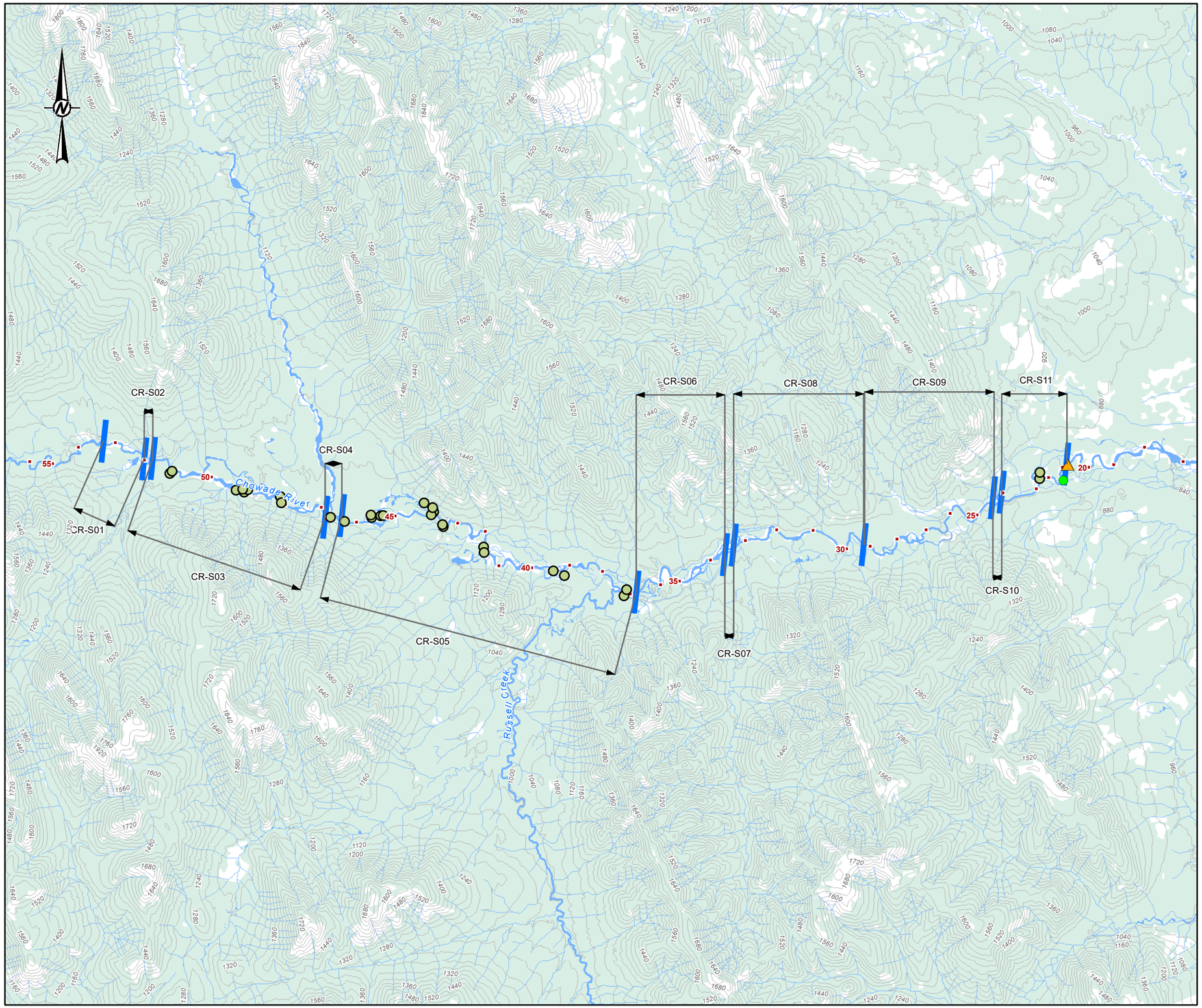


LEGEND

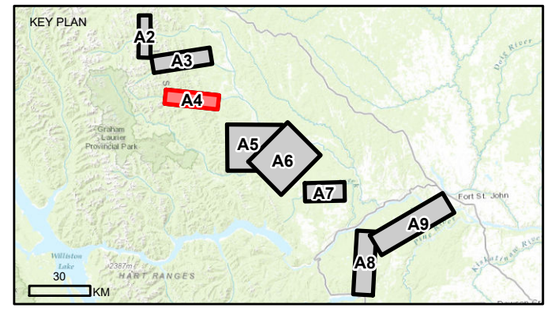
- CHOWADE RIVER PIT DETECTOR ARRAY
- CYPRESS CREEK PIT DETECTOR ARRAY
- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS

UPSTREAM EXTENT OF EACH SAMPLE SITE

- BACKPACK ELECTROFISHING
- SECTION BREAK

BASEMAP FEATURE

- CONTOUR (20 m)
- WATERCOURSE
- WATERBODY
- WOODED AREA



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REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY
(Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) CHOWADE RIVER STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2019-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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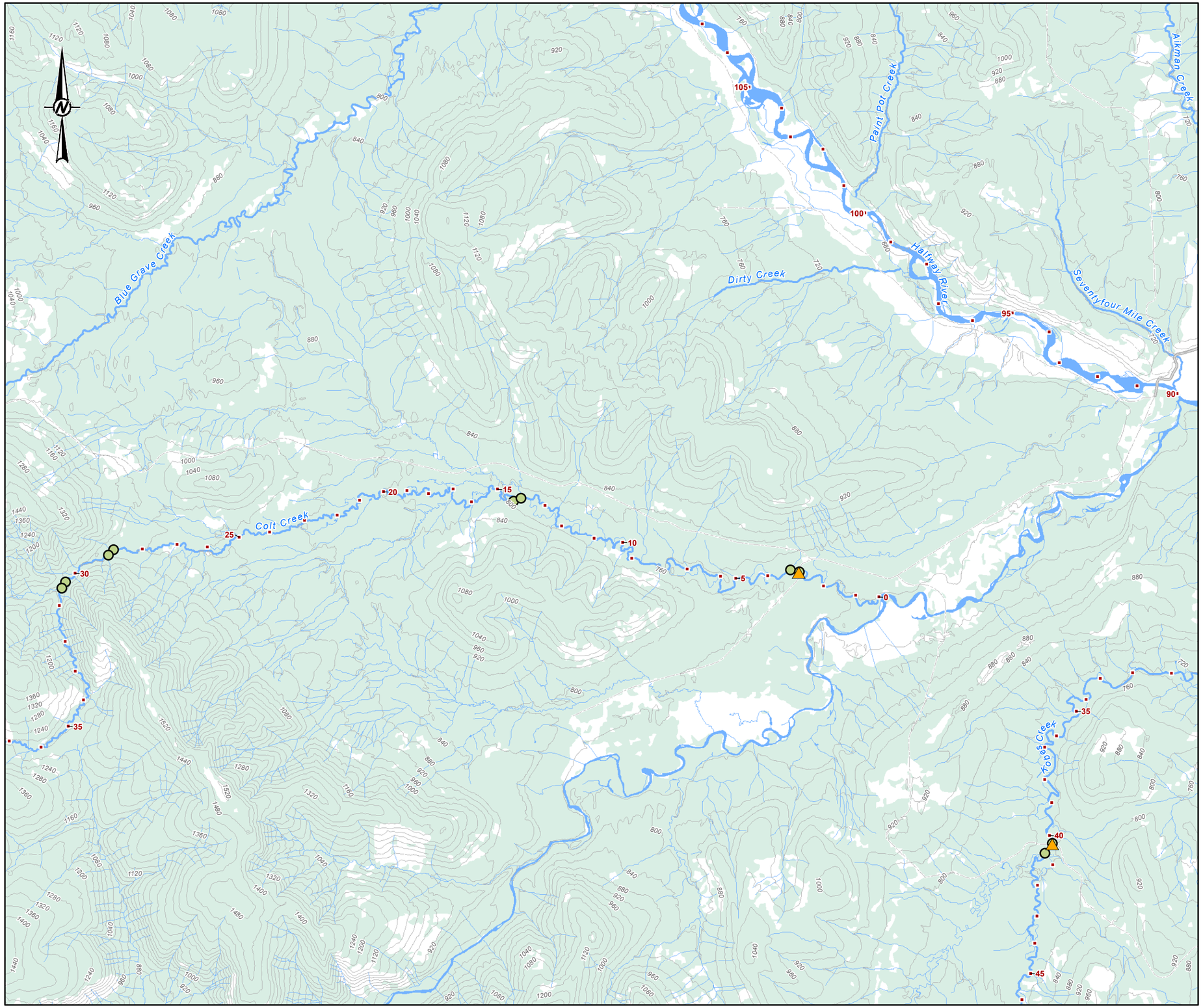


LEGEND

- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS

UPSTREAM EXTENT OF EACH SAMPLE SITE

- BACKPACK ELECTROFISHING

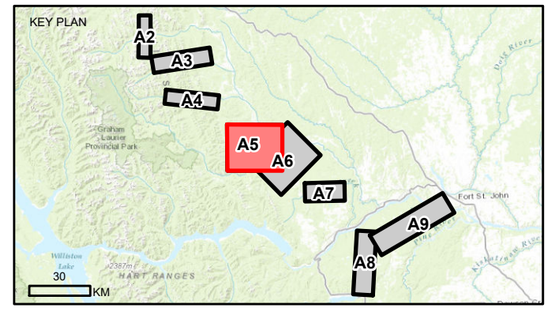
BASEMAP FEATURE

- CONTOUR (100m)

[CANVEC] Roads [LIGHT]

BASEMAP FEATURE

- MAJOR ROAD
- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA



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1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) COLT CREEK STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
19121769	2O	0	**A5**

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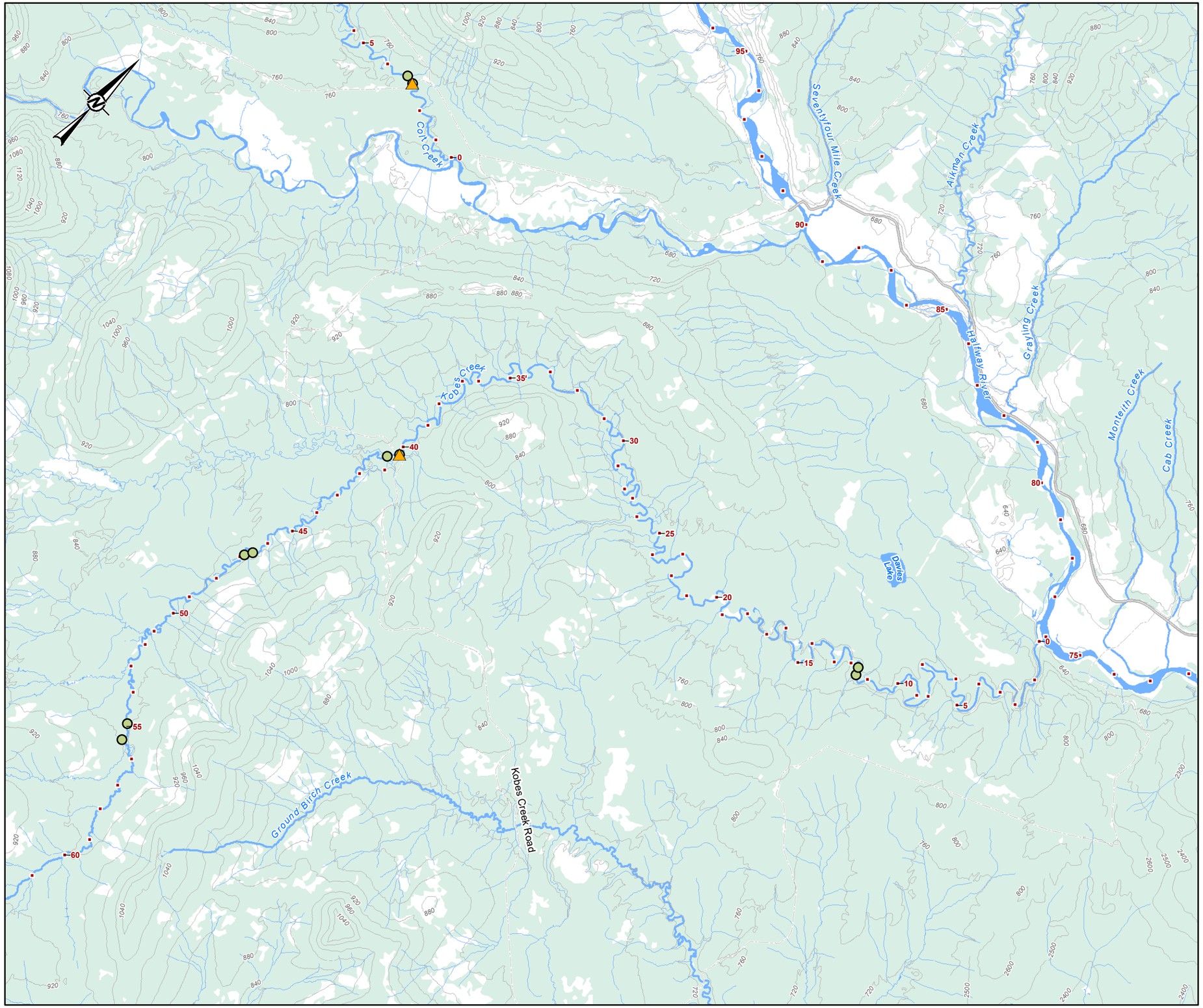


LEGEND

- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS

UPSTREAM EXTENT OF EACH SAMPLE SITE

- BACKPACK ELECTROFISHING

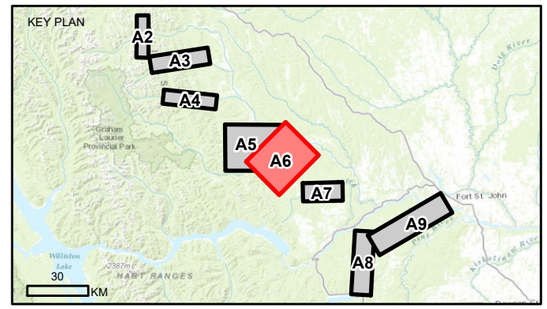
BASEMAP FEATURE

- CONTOUR (100m)

[CANVEC] Roads [LIGHT]

BASEMAP FEATURE

- MAJOR ROAD
- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA



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1:90,000 METRES

REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) KOBES CREEK STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
19121769	2O	0	**A6**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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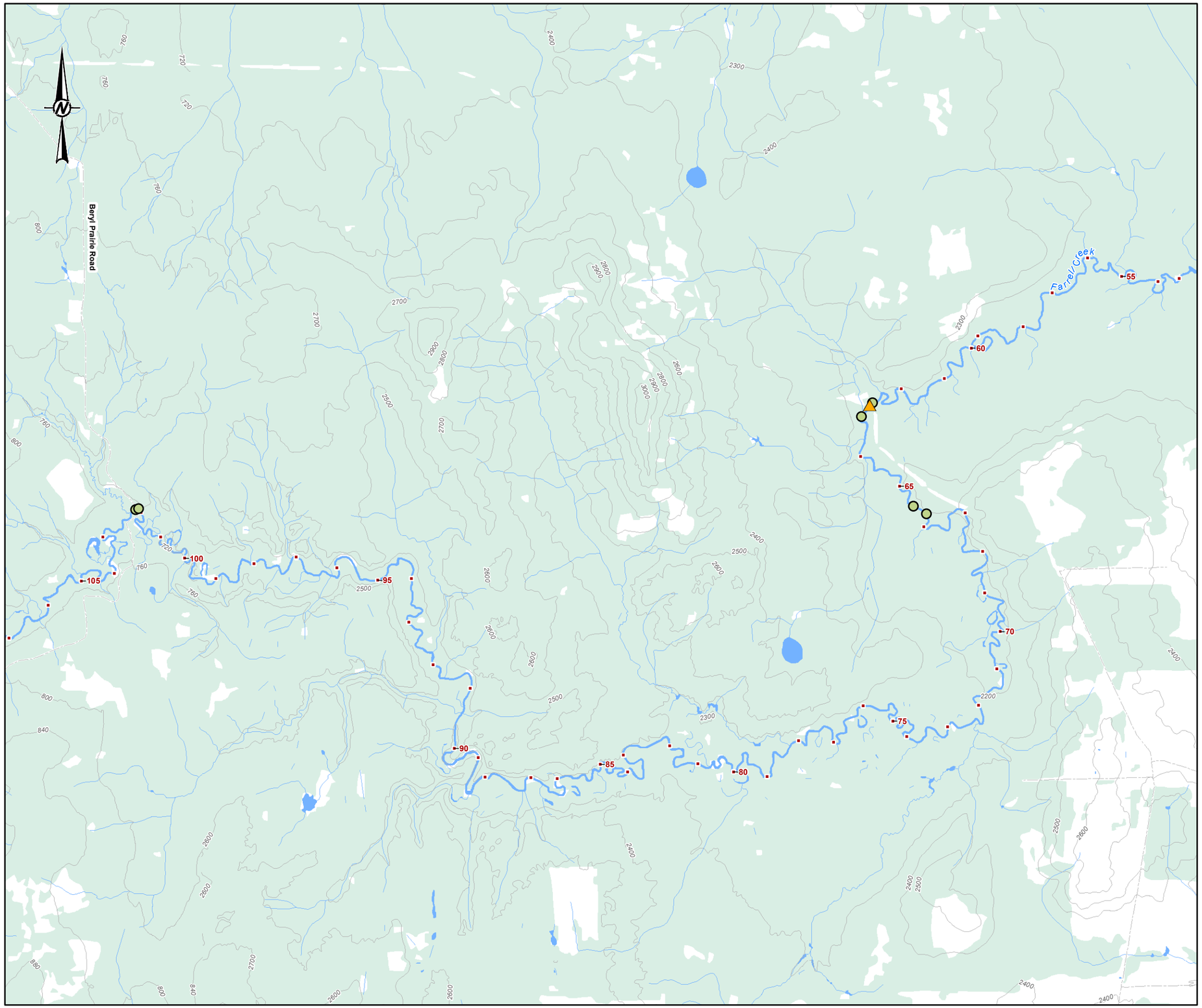


LEGEND

- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS

UPSTREAM EXTENT OF EACH SAMPLE SITE

- BACKPACK ELECTROFISHING

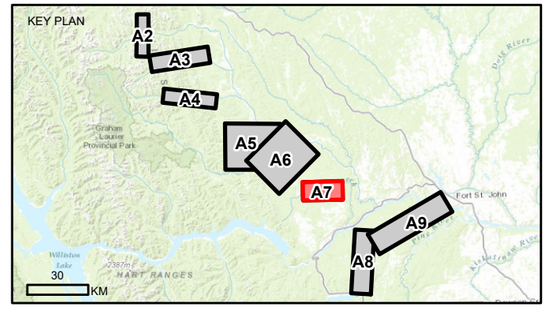
BASEMAP FEATURE

- CONTOUR (100m)

[CANVEC] Roads [LIGHT]

BASEMAP FEATURE

- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA



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REFERENCES

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2. WATERSHED DATA OBTAINED FROM THE GOVERNMENT OF BRITISH COLUMBIA
3. BASEDATA SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESR I JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) FARRELL CREEK STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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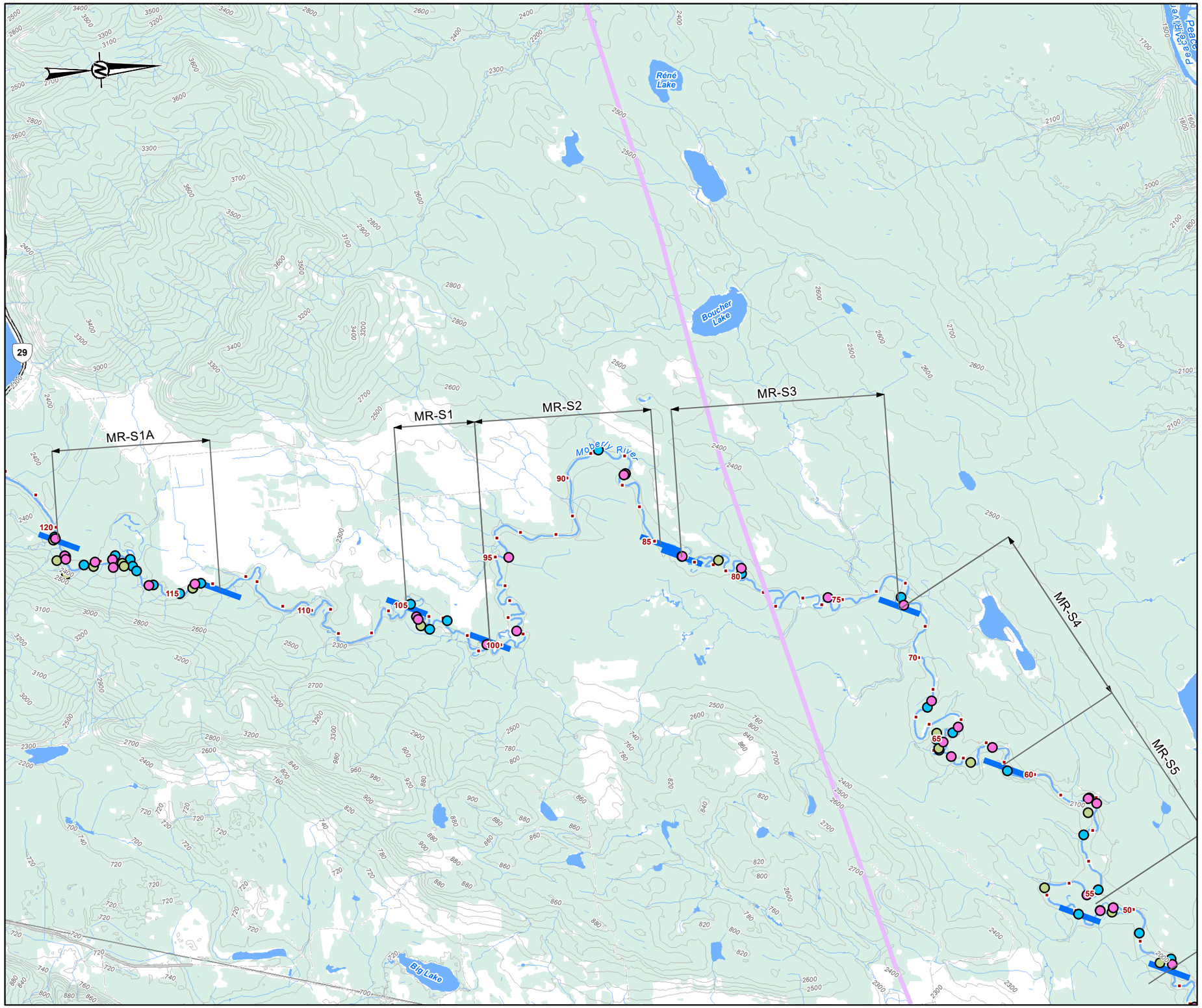


LEGEND

- RIVER KILOMETRE POSTS
- SECTION BREAK

SAMPLE METHOD

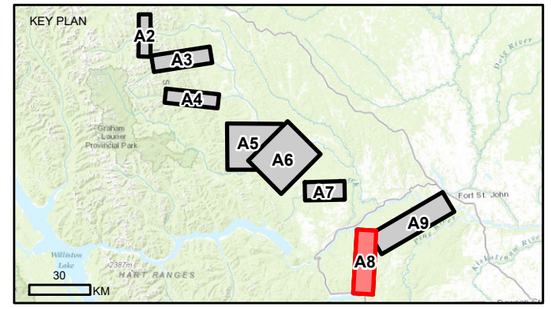
- ANGLING
- BACKPACK ELECTROFISHING
- SMALL FISH BOAT ELECTROFISHING

BASEMAP FEATURE

- CONTOUR (20 m)
- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA

TRANSMISSION LINE RIGHT OF WAY (ROW)

- BC HYDRO EXISTING ROW



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REFERENCES

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PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) MOBERLY RIVER STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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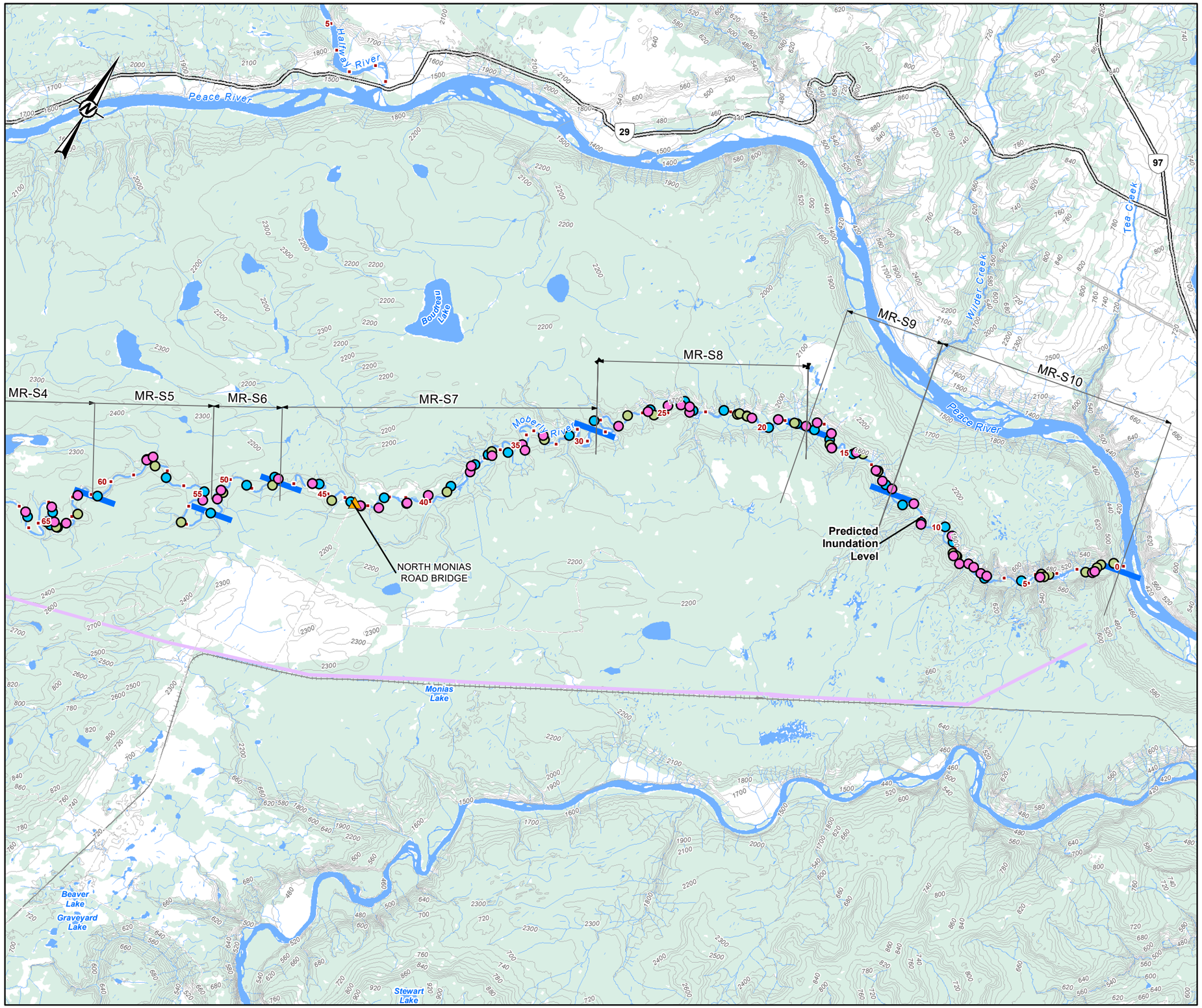

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- TEMPERATURE LOGGER
- RIVER KILOMETRE POSTS
- SECTION BREAK

SAMPLE METHOD

- ANGLING
- BACKPACK ELECTROFISHING
- SMALL FISH BOAT ELECTROFISHING

BASEMAP FEATURE

- CONTOUR (20 m)
- HIGHWAY
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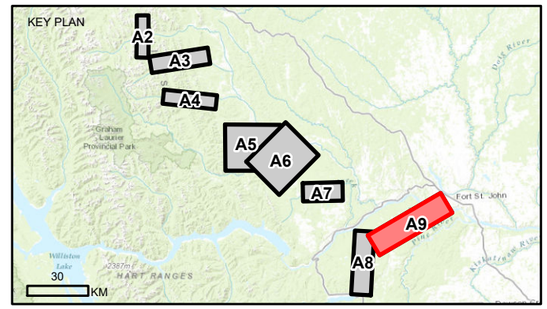
- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA

TRANSMISSION LINE RIGHT OF WAY (ROW)

- BC HYDRO EXISTING ROW



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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) MOBERLY RIVER STUDY AREA, 2019.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-12-31
DESIGNED	DB
PREPARED	MH
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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APPENDIX B

Catch and Effort Data

Table B1 **Summary of backpack electrofishing sites sampled during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.**

River	Section[a]	River Km[b]	Site Name	Sample Date	Sample Length (m)	Sample Time (s)
Chowade River		51.1	CHR-EF-051.1-2019-07-18	18-Jul-2019	200	1109
		50.0	CHR-EF-050.0-2019-07-18	18-Jul-2019	215	2272
		49.4	CHR-EF-049.4-2019-08-03	3-Aug-2019	200	1657
		49.2	CHR-EF-049.2-2019-07-18	18-Jul-2019	225	1723
		49.2	CHR-EF-049.2-2019-08-03	3-Aug-2019	200	1666
		49.0	CHR-EF-049.0-2019-07-18	18-Jul-2019	160	1673
		48.2	CHR-EF-048.2-2019-07-19	19-Jul-2019	150	996
		48.0	CHR-EF-048.0-2019-07-19	19-Jul-2019	200	1324
		46.8	CHR-EF-046.8-2019-07-19	19-Jul-2019	235	1391
		46.5	CHR-EF-046.5-2019-07-19	19-Jul-2019	60	555
		46.4	CHR-EF-046.4-2019-07-19	19-Jul-2019	125	727
		46.3	CHR-EF-046.3-2019-07-19	19-Jul-2019	210	1539
		44.2	CHR-EF-044.2-2019-07-20	20-Jul-2019	165	1839
		44.1	CHR-EF-044.1-2019-07-20	20-Jul-2019	95	1036
		44.0	CHR-EF-044.0-2019-07-20	20-Jul-2019	135	958
		43.9	CHR-EF-043.9-2019-07-20	20-Jul-2019	135	1859
		43.5	CHR-EF-043.5-2019-07-25	25-Jul-2019	120	1878
		43.4	CHR-EF-043.4-2019-07-25	25-Jul-2019	120	1858
		42.4	CHR-EF-042.4-2019-08-03	3-Aug-2019	130	1796
		42.3	CHR-EF-042.3-2019-08-03	3-Aug-2019	160	1255
		41.6	CHR-EF-041.6-2019-07-25	25-Jul-2019	115	1673
		41.5	CHR-EF-041.5-2019-07-25	25-Jul-2019	125	1352
		39.7	CHR-EF-039.7-2019-07-20	20-Jul-2019	400	1983
		39.2	CHR-EF-039.2-2019-07-20	20-Jul-2019	220	1645
		37.2	CHR-EF-037.2-2019-07-20	20-Jul-2019	135	877
		36.9	CHR-EF-036.9-2019-07-20	20-Jul-2019	130	591
		22.4	CHR-EF-022.4-2019-08-03	3-Aug-2019	165	2167
		22.0	CHR-EF-022.0-2019-08-03	3-Aug-2019	150	2183
Chowade River Total					**4,680**	**41,582**
Cypress Creek		41.7	CYC-EF-041.7-2019-07-23	23-Jul-2019	300	1936
		41.6	CYC-EF-041.6-2019-07-23	23-Jul-2019	125	1774
		41.4	CYC-EF-041.4-2019-07-23	23-Jul-2019	200	1408
		41.3	CYC-EF-041.3-2019-07-23	23-Jul-2019	115	1435
		40.8	CYC-EF-040.8-2019-07-23	23-Jul-2019	90	757
		40.7	CYC-EF-040.7-2019-07-23	23-Jul-2019	100	861
		40.2	CYC-EF-040.2-2019-07-22	22-Jul-2019	165	1486
		40.1	CYC-EF-040.1-2019-07-22	22-Jul-2019	110	1305

[a] only applicable to Moberly River sites.

continued…

[b] as measured upstream from the stream's confluence.

Table B1 Continued.

River	Section[a]	River Km[b]	Site Name	Sample Date	Sample Length (m)	Sample Time (s)
Cypress Creek		35.6	CYC-EF-035.6-2019-07-22	22-Jul-2019	200	1644
		35.5	CYC-EF-035.5-2019-07-22	22-Jul-2019	190	1594
		34.6	CYC-EF-034.6-2019-07-22	22-Jul-2019	400	1134
		34.5	CYC-EF-034.5-2019-07-22	22-Jul-2019	175	1671
		33.2	CYC-EF-033.2-2019-07-27	27-Jul-2019	235	1193
		33.1	CYC-EF-033.1-2019-07-27	27-Jul-2019	145	1490
		32.6	CYC-EF-032.6-2019-07-21	21-Jul-2019	165	1094
		32.5	CYC-EF-032.5-2019-07-21	21-Jul-2019	210	1417
		31.1	CYC-EF-031.1-2019-07-21	21-Jul-2019	140	636
		31.0	CYC-EF-031.0-2019-07-21	21-Jul-2019	50	242
		30.7	CYC-EF-030.7-2019-07-21	21-Jul-2019	300	2598
		29.5	CYC-EF-029.5-2019-07-27	27-Jul-2019	185	1296
		29.4	CYC-EF-029.4-2019-07-27	27-Jul-2019	155	1232
		29.2	CYC-EF-029.2-2019-07-21	21-Jul-2019	250	1984
		29.0	CYC-EF-029.0-2019-07-21	21-Jul-2019	210	1168
		28.4	CYC-EF-028.4-2019-07-27	27-Jul-2019	320	2942
		28.1	CYC-EF-028.1-2019-07-27	27-Jul-2019	100	645
		27.4	CYC-EF-027.4-2019-07-28	28-Jul-2019	225	2816
		27.3	CYC-EF-027.3-2019-07-28	28-Jul-2019	100	1348
		26.3	CYC-EF-026.3-2019-07-28	28-Jul-2019	150	2100
		26.2	CYC-EF-026.2-2019-07-28	28-Jul-2019	120	1402
		25.6	CYC-EF-025.6-2019-07-28	28-Jul-2019	70	424
		25.5	CYC-EF-025.5-2019-07-28	28-Jul-2019	100	786
Cypress Creek Total					**5,400**	**43,818**
Fiddes Creek		7.1	FIC-EF-007.1-2019-07-26	26-Jul-2019	125	1760
		7.0	FIC-EF-007.0-2019-07-26	26-Jul-2019	200	2401
		5.2	FIC-EF-005.2-2019-07-26	26-Jul-2019	200	2224
		4.8	FIC-EF-004.8-2019-07-26	26-Jul-2019	100	1185
Fiddes Creek Total					**625**	**7,570**
Colt Creek		30.4	COC-EF-030.4-2019-07-31	31-Jul-2019	200	2237
		30.2	COC-EF-030.2-2019-07-31	31-Jul-2019	200	1505
		29.0	COC-EF-029.0-2019-07-31	31-Jul-2019	200	3069
		28.8	COC-EF-028.8-2019-07-31	31-Jul-2019	200	1076
		14.9	COC-EF-014.9-2019-08-01	1-Aug-2019	200	821
		14.1	COC-EF-014.1-2019-08-01	1-Aug-2019	225	1936
		3.2	COC-EF-003.2-2019-07-31	31-Jul-2019	200	828
		3.0	COC-EF-003.0-2019-07-31	31-Jul-2019	250	3826
Colt Creek Total					**1,675**	**15,298**

[a] only applicable to Moberly River sites.

[b] as measured upstream from the stream's confluence.

continued…

Table B1 Continued.

River	Section[a]	River Km[b]	Site Name	Sample Date	Sample Length (m)	Sample Time (s)
Farrell Creek		102.1	FAC-EF-102.1-2019-07-24	24-Jul-2019	160	2775
		101.7	FAC-EF-101.7-2019-07-24	24-Jul-2019	220	2717
		65.7	FAC-EF-065.7-2019-08-02	2-Aug-2019	210	989
		65.5	FAC-EF-065.5-2019-08-02	2-Aug-2019	200	2735
		63.3	FAC-EF-063.3-2019-08-01	1-Aug-2019	275	2712
		63.0	FAC-EF-063.0-2019-08-01	1-Aug-2019	200	1160
Farrell Creek Total					**1,265**	**13,088**
Kobes Creek		55.5	KOC-EF-055.5-2019-07-30	30-Jul-2019	203	1986
		55.3	KOC-EF-055.3-2019-07-30	30-Jul-2019	200	867
		46.8	KOC-EF-046.8-2019-07-30	30-Jul-2019	250	2785
		46.5	KOC-EF-046.5-2019-07-30	30-Jul-2019	200	1152
		40.6	KOC-EF-040.6-2019-07-29	29-Jul-2019	500	2506
		40.2	KOC-EF-040.2-2019-07-29	29-Jul-2019	200	1135
		11.7	KOC-EF-011.7-2019-07-29	29-Jul-2019	200	1999
		11.5	KOC-EF-011.5-2019-07-29	29-Jul-2019	200	1367
Kobes Creek Total					**1,953**	**13,797**
Moberly River	MR-S1A	119.5	MOR-EF-119.5-2019-07-28	28-Jul-2019	45	414
	MR-S1A	119.1	MOR-EF-119.1-2019-07-29	29-Jul-2019	40	413
	MR-S1A	118.7	MOR-EF-118.7-2019-07-29	29-Jul-2019	104	563
	MR-S1A	117.9	MOR-EF-117.9-2019-07-29	29-Jul-2019	110	534
	MR-S1A	116.8	MOR-EF-116.8-2019-07-29	29-Jul-2019	60	274
	MR-S1A	116.5	MOR-EF-116.5-2019-07-29	29-Jul-2019	122	826
	MR-S1A	114.5	MOR-EF-114.5-2019-07-29	29-Jul-2019	98	1008
	MR-S1A	114.5	MOR-EF-114.5-2019-07-30	30-Jul-2019	90	639
	MR-S1	103.7	MOR-EF-103.7-2019-07-30	30-Jul-2019	72	252
	MR-S3	81.6	MOR-EF-081.6-2019-07-31	31-Jul-2019	70	488
	MR-S4	65.2	MOR-EF-065.2-2019-08-01	1-Aug-2019	75	76
	MR-S4	64.5	MOR-EF-064.5-2019-08-01	1-Aug-2019	71	573
	MR-S4	62.4	MOR-EF-062.4-2019-08-01	1-Aug-2019	72	563
	MR-S5	57.5	MOR-EF-057.5-2019-08-01	1-Aug-2019	122	628
	MR-S5	53.4	MOR-EF-053.4-2019-08-01	1-Aug-2019	100	539
	MR-S6	50.6	MOR-EF-050.6-2019-08-02	2-Aug-2019	56	336
	MR-S6	47.8	MOR-EF-047.8-2019-08-02	2-Aug-2019	67	303
	MR-S7	44.6	MOR-EF-044.6-2019-08-02	2-Aug-2019	120	398
	MR-S7	42.7	MOR-EF-042.7-2019-07-22	22-Jul-2019	100	508
	MR-S7	40.8	MOR-EF-040.8-2019-07-23	23-Jul-2019	100	326
	MR-S7	37.5	MOR-EF-037.5-2019-07-23	23-Jul-2019	200	990
	MR-S7	33.5	MOR-EF-033.5-2019-07-23	23-Jul-2019	60	420
	MR-S8	26.5	MOR-EF-026.5-2019-07-24	24-Jul-2019	100	512

[a] only applicable to Moberly River sites.

[b] as measured upstream from the stream's confluence.

continued…

Table B1 Concluded.

River	Section[a]	River Km[b]	Site Name	Sample Date	Sample Length (m)	Sample Time (s)
Moberly River	MR-S8	25.4	MOR-EF-025.4-2019-07-24	24-Jul-2019	130	1113
	MR-S8	22.3	MOR-EF-022.3-2019-07-24	24-Jul-2019	100	398
	MR-S8	22.1	MOR-EF-022.1-2019-07-24	24-Jul-2019	150	448
	MR-S8	21.1	MOR-EF-021.1-2019-07-25	25-Jul-2019	150	428
	MR-S8	19.5	MOR-EF-019.5-2019-07-25	25-Jul-2019	120	428
	MR-S9	16.0	MOR-EF-016.0-2019-07-25	25-Jul-2019	110	365
	MR-S9	15.9	MOR-EF-015.9-2019-07-25	25-Jul-2019	90	217
	MR-S9	14.4	MOR-EF-014.4-2019-07-26	26-Jul-2019	70	430
	MR-S9	13.6	MOR-EF-013.6-2019-07-26	26-Jul-2019	110	334
	MR-S10	8.6	MOR-EF-008.6-2019-07-26	26-Jul-2019	120	296
	MR-S10	8.4	MOR-EF-008.4-2019-07-26	26-Jul-2019	70	321
	MR-S10	3.8	MOR-EF-003.8-2019-07-26	26-Jul-2019	110	355
	MR-S10	3.8	MOR-EF-003.8-2019-07-26	26-Jul-2019	110	470
	MR-S10	3.5	MOR-EF-003.5-2019-07-27	27-Jul-2019	130	290
	MR-S10	3.4	MOR-EF-003.4-2019-07-27	27-Jul-2019	150	445
	MR-S10	1.5	MOR-EF-001.5-2019-08-29[c]	29-Aug-2019	100	2386
	MR-S10	1.4	MOR-EF-001.4-2019-09-21[c]	21-Sep-2019	187	1015
	MR-S10	1.0	MOR-EF-001.0-2019-09-21[c]	21-Sep-2019	200	1483
	MR-S10	0.5	MOR-EF-000.5-2019-08-21[c]	21-Aug-2019	200	4128
Moberly River Total					**4,461**	**26,933**
Grand Total					**20,059**	**162,086**

[a] Only applicable to Moberly River sites.

[b] As measured upstream from the stream's confluence.

[c] Synoptic site which was only sampled to collect genetic samples from small-bodied fish. Habitat data were not recorded.

Table B2 Summary of angling sites sampled in the Moberly River during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

River	Section	River Km[a]	Site Name	Sample Date	Number of Rods	Time (min)	Angler-Minutes
Moberly River	MR-S1A	119.7	MOR-AG-119.7-2019-07-28	28-Jul-2019	1	34	34
	MR-S1A	119.1	MOR-AG-119.1-2019-07-28	28-Jul-2019	2	50	100
	MR-S1A	119.1	MOR-AG-119.1-2019-07-29	29-Jul-2019	2	96	192
	MR-S1A	119.0	MOR-AG-119.0-2019-07-29	29-Jul-2019	1	50	50
	MR-S1A	118.9	MOR-AG-118.9-2019-07-29	29-Jul-2019	1	40	40
	MR-S1A	118.1	MOR-AG-118.1-2019-07-29	29-Jul-2019	2	65	130
	MR-S1A	117.2	MOR-AG-117.2-2019-07-29	29-Jul-2019	1	26	26
	MR-S1A	116.8	MOR-AG-116.8-2019-07-29	29-Jul-2019	2	59	118
	MR-S1A	115.8	MOR-AG-115.8-2019-07-29	29-Jul-2019	2	135	270
	MR-S1A	114.5	MOR-AG-114.5-2019-07-30	30-Jul-2019	2	105	210
	MR-S1	104.7	MOR-AG-104.7-2019-07-30	30-Jul-2019	2	16	32
	MR-S1	104.6	MOR-AG-104.6-2019-07-30	30-Jul-2019	1	80	80
	MR-S1	100.7	MOR-AG-100.7-2019-07-30	30-Jul-2019	1	15	15
	MR-S2	98.8	MOR-AG-098.8-2019-07-30	30-Jul-2019	1	15	15
	MR-S2	94.8	MOR-AG-094.8-2019-07-30	30-Jul-2019	1	40	40
	MR-S2	87.3	MOR-AG-087.3-2019-07-30	30-Jul-2019	1	28	28
	MR-S2	87.3	MOR-AG-087.3-2019-07-31	31-Jul-2019	1	62	62
	MR-S2	87.2	MOR-AG-087.2-2019-07-31	31-Jul-2019	1	61	61
	MR-S3	84.1	MOR-AG-084.1-2019-07-31	31-Jul-2019	1	67	67
	MR-S3	80.2	MOR-AG-080.2-2019-07-31	31-Jul-2019	1	53	53
	MR-S3	75.9	MOR-AG-075.9-2019-07-31	31-Jul-2019	1	21	21
	MR-S4	71.3	MOR-AG-071.3-2019-07-31	31-Jul-2019	1	30	30
	MR-S4	68.7	MOR-AG-068.7-2019-07-31	31-Jul-2019	1	20	20
	MR-S4	65.7	MOR-AG-065.7-2019-08-01	1-Aug-2019	2	27	54
	MR-S4	64.7	MOR-AG-064.7-2019-08-01	1-Aug-2019	2	9	18
	MR-S4	63.4	MOR-AG-063.4-2019-08-01	1-Aug-2019	1	35	35
	MR-S4	61.9	MOR-AG-061.9-2019-08-01	1-Aug-2019	2	23	46
	MR-S5	58.3	MOR-AG-058.3-2019-08-01	1-Aug-2019	2	46	92
	MR-S5	57.8	MOR-AG-057.8-2019-08-01	1-Aug-2019	1	56	56
	MR-S5	54.8	MOR-AG-054.8-2019-08-01	1-Aug-2019	1	49	49
	MR-S6	51.0	MOR-AG-051.0-2019-08-02	2-Aug-2019	2	30	60
	MR-S6	50.7	MOR-AG-050.7-2019-08-02	2-Aug-2019	1	65	65
	MR-S6	50.6	MOR-AG-050.6-2019-08-02	2-Aug-2019	2	60	120
	MR-S6	47.8	MOR-AG-047.8-2019-08-02	2-Aug-2019	1	30	30
	MR-S7	45.9	MOR-AG-045.9-2019-08-02	2-Aug-2019	2	15	30
	MR-S7	45.7	MOR-AG-045.7-2019-08-02	2-Aug-2019	1	30	30
	MR-S7	44.2	MOR-AG-044.2-2019-07-22	22-Jul-2019	2	10	20
	MR-S7	42.7	MOR-AG-042.7-2019-07-22	22-Jul-2019	1	15	15

…continued.

[a] As measured upstream from the Moberly River's confluence with the Peace River.

Table B2 Concluded.

River	Section	River Km[a]	Site Name	Sample Date	Number of Rods	Time (min)	Angler-Minutes
Moberly River	MR-S7	41.0	MOR-AG-041.0-2019-07-22	22-Jul-2019	2	7	14
	MR-S7	39.2	MOR-AG-039.2-2019-07-23	23-Jul-2019	1	14	14
	MR-S7	38.0	MOR-AG-038.0-2019-07-23	23-Jul-2019	1	11	11
	MR-S7	37.5	MOR-AG-037.5-2019-07-23	23-Jul-2019	1	17	17
	MR-S7	36.7	MOR-AG-036.7-2019-07-23	23-Jul-2019	2	39	78
	MR-S7	35.0	MOR-AG-035.0-2019-07-23	23-Jul-2019	1	2	2
	MR-S7	34.7	MOR-AG-034.7-2019-07-23	23-Jul-2019	2	25	50
	MR-S7	31.8	MOR-AG-031.8-2019-07-23	23-Jul-2019	1	17	17
	MR-S8	27.2	MOR-AG-027.2-2019-07-24	24-Jul-2019	1	34	34
	MR-S8	25.8	MOR-AG-025.8-2019-07-24	24-Jul-2019	1	22	22
	MR-S8	25.0	MOR-AG-025.0-2019-07-24	24-Jul-2019	1	4	4
	MR-S8	24.1	MOR-AG-024.1-2019-07-24	24-Jul-2019	1	13	13
	MR-S8	23.0	MOR-AG-023.0-2019-07-24	24-Jul-2019	1	10	10
	MR-S8	22.5	MOR-AG-022.5-2019-07-24	24-Jul-2019	1	6	6
	MR-S8	20.1	MOR-AG-020.1-2019-07-25	25-Jul-2019	1	3	3
	MR-S8	19.0	MOR-AG-019.0-2019-07-25	25-Jul-2019	2	8	16
	MR-S9	18.0	MOR-AG-018.0-2019-07-25	25-Jul-2019	1	10	10
	MR-S9	17.7	MOR-AG-017.7-2019-07-25	25-Jul-2019	1	10	10
	MR-S9	16.5	MOR-AG-016.5-2019-07-25	25-Jul-2019	1	3	3
	MR-S9	15.0	MOR-AG-015.0-2019-07-25	25-Jul-2019	1	5	5
	MR-S9	14.8	MOR-AG-014.8-2019-07-26	26-Jul-2019	1	13	13
	MR-S9	13.9	MOR-AG-013.9-2019-07-26	26-Jul-2019	1	17	17
	MR-S9	13.1	MOR-AG-013.1-2019-07-26	26-Jul-2019	2	18	36
	MR-S9	12.7	MOR-AG-012.7-2019-07-26	26-Jul-2019	1	20	20
	MR-S10	11.5	MOR-AG-011.5-2019-07-26	26-Jul-2019	1	36	36
	MR-S10	10.8	MOR-AG-010.8-2019-07-26	26-Jul-2019	1	51	51
	MR-S10	9.4	MOR-AG-009.4-2019-07-26	26-Jul-2019	1	10	10
	MR-S10	8.8	MOR-AG-008.8-2019-07-26	26-Jul-2019	2	15	30
	MR-S10	8.2	MOR-AG-008.2-2019-07-26	26-Jul-2019	1	2	2
	MR-S10	7.5	MOR-AG-007.5-2019-07-26	26-Jul-2019	1	23	23
	MR-S10	7.3	MOR-AG-007.3-2019-07-26	26-Jul-2019	1	4	4
	MR-S10	7.1	MOR-AG-007.1-2019-07-26	26-Jul-2019	1	4	4
	MR-S10	6.9	MOR-AG-006.9-2019-07-26	26-Jul-2019	1	20	20
	MR-S10	3.9	MOR-AG-003.9-2019-07-27	27-Jul-2019	1	34	34
	MR-S10	1.5	MOR-AG-001.5-2019-07-27	27-Jul-2019	2	27	54
	MR-S10	1.4	MOR-AG-001.4-2019-07-27	27-Jul-2019	2	76	152
Total							**3,259**

[a] As measured upstream from the Moberly River's confluence with the Peace River.

Table B3 **Summary of small fish boat electroshocking sites sampled during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.**

River	Section	River Km[a]	Site Name	Sample Date	Sample Length (m)	Sample Time (s)
Moberly River	MR-S1A	119.6	MOR-ES-119.6-2019-07-28	28-Jul-2019	600	384
	MR-S1	119.1	MOR-ES-119.1-2019-07-29	29-Jul-2019	800	447
	MR-S2	118.5	MOR-ES-118.5-2019-07-29	29-Jul-2019	836	507
	MR-S3	117.7	MOR-ES-117.7-2019-07-29	29-Jul-2019	542	334
	MR-S3	117.0	MOR-ES-117.0-2019-07-29	29-Jul-2019	100	85
	MR-S4	116.7	MOR-ES-116.7-2019-07-29	29-Jul-2019	160	71
	MR-S4	116.3	MOR-ES-116.3-2019-07-29	29-Jul-2019	241	480
	MR-S4	115.9	MOR-ES-115.9-2019-07-29	29-Jul-2019	700	567
	MR-S4	115.0	MOR-ES-115.0-2019-07-30	30-Jul-2019	750	592
	MR-S5	114.3	MOR-ES-114.3-2019-07-30	30-Jul-2019	1100	898
	MR-S5	105.0	MOR-ES-105.0-2019-07-30	30-Jul-2019	1000	804
	MR-S5	103.6	MOR-ES-103.6-2019-07-30	30-Jul-2019	588	624
	MR-S5	103.0	MOR-ES-103.0-2019-07-30	30-Jul-2019	1600	1099
	MR-S5	88.9	MOR-ES-088.9-2019-07-30	30-Jul-2019	1320	1248
	MR-S6	87.5	MOR-ES-087.5-2019-07-31	31-Jul-2019	1460	1050
	MR-S6	84.5	MOR-ES-084.5-2019-07-31	31-Jul-2019	1060	1040
	MR-S6	80.2	MOR-ES-080.2-2019-07-31	31-Jul-2019	1240	1166
	MR-S6	72.5	MOR-ES-072.5-2019-07-31	31-Jul-2019	861	568
	MR-S7	68.4	MOR-ES-068.4-2019-07-31	31-Jul-2019	951	638
	MR-S8	65.6	MOR-ES-065.6-2019-08-01	1-Aug-2019	700	483
	MR-S9	64.8	MOR-ES-064.8-2019-08-01	1-Aug-2019	590	382
	MR-S10	64.4	MOR-ES-064.4-2019-08-01	1-Aug-2019	1270	1062
	MR-S11	60.8	MOR-ES-060.8-2019-08-01	1-Aug-2019	1800	1192
	MR-S12	58.2	MOR-ES-058.2-2019-08-01	1-Aug-2019	1590	1048
	MR-S13	56.6	MOR-ES-056.6-2019-08-01	1-Aug-2019	1250	713
	MR-S14	55.0	MOR-ES-055.0-2019-08-01	1-Aug-2019	784	645
	MR-S15	51.9	MOR-ES-051.9-2019-08-01	1-Aug-2019	870	613
	MR-S16	51.0	MOR-ES-051.0-2019-08-02	2-Aug-2019	1800	1191
	MR-S17	49.2	MOR-ES-049.2-2019-08-02	2-Aug-2019	1380	784
	MR-S18	47.9	MOR-ES-047.9-2019-08-02	2-Aug-2019	887	999
	MR-S19	45.6	MOR-ES-045.6-2019-08-02	2-Aug-2019	1030	612
	MR-S20	43.1	MOR-ES-043.1-2019-07-22	22-Jul-2019	473	364
	MR-S21	41.9	MOR-ES-041.9-2019-07-22	22-Jul-2019	953	810
	MR-S22	39.8	MOR-ES-039.8-2019-07-22	22-Jul-2019	1400	1050
	MR-S23	38.1	MOR-ES-038.1-2019-07-23	23-Jul-2019	950	529
	MR-S24	37.9	MOR-ES-037.9-2019-07-23	23-Jul-2019	50	272
	MR-S7	36.9	MOR-ES-036.9-2019-07-23	23-Jul-2019	328	257

…continued.

[a] As measured upstream from the Moberly River's confluence with the Peace River.

Table B3 **Concluded.**

River	Section	River Km[a]	Site Name	Sample Date	Sample Length (m)	Sample Time (s)
Moberly River	MR-S8	35.9	MOR-ES-035.9-2019-07-23	23-Jul-2019	350	303
	MR-S9	32.4	MOR-ES-032.4-2019-07-23	23-Jul-2019	970	698
	MR-S10	31.6	MOR-ES-031.6-2019-07-23	23-Jul-2019	1200	833
	MR-S11	27.0	MOR-ES-027.0-2019-07-24	24-Jul-2019	1220	732
	MR-S12	25.8	MOR-ES-025.8-2019-07-24	24-Jul-2019	1400	906
	MR-S13	23.9	MOR-ES-023.9-2019-07-24	24-Jul-2019	400	255
	MR-S14	23.4	MOR-ES-023.4-2019-07-24	24-Jul-2019	1220	607
	MR-S15	22.2	MOR-ES-022.2-2019-07-24	24-Jul-2019	741	405
	MR-S16	21.2	MOR-ES-021.2-2019-07-25	25-Jul-2019	700	390
	MR-S17	20.0	MOR-ES-020.0-2019-07-25	25-Jul-2019	500	371
	MR-S15	18.5	MOR-ES-018.5-2019-07-25	25-Jul-2019	650	315
	MR-S13	17.7	MOR-ES-017.7-2019-07-25	25-Jul-2019	800	453
	MR-S14	16.2	MOR-ES-016.2-2019-07-25	25-Jul-2019	1100	677
	MR-S15	15.0	MOR-ES-015.0-2019-07-26	26-Jul-2019	1150	576
	MR-S16	13.7	MOR-ES-013.7-2019-07-26	26-Jul-2019	805	474
	MR-S6	13.0	MOR-ES-013.0-2019-07-26	26-Jul-2019	1110	554
	MR-S7	12.0	MOR-ES-012.0-2019-07-26	26-Jul-2019	1222	743
	MR-S7	10.8	MOR-ES-010.8-2019-07-26	26-Jul-2019	760	492
	MR-S7	9.9	MOR-ES-009.9-2019-07-26	26-Jul-2019	615	351
	MR-S9	9.1	MOR-ES-009.1-2019-07-26	26-Jul-2019	360	254
	MR-S10	8.5	MOR-ES-008.5-2019-07-26	26-Jul-2019	1080	668
	MR-S10	6.9	MOR-ES-006.9-2019-07-26	26-Jul-2019	1400	924
	MR-S10	5.2	MOR-ES-005.2-2019-07-26	26-Jul-2019	690	359
	MR-S10	3.7	MOR-ES-003.7-2019-07-27	27-Jul-2019	515	486
Moberly River Total					**54,972**	**38,434**

[a] As measured upstream from the Moberly River's confluence with the Peace River.

Table B4 Number of fish caught and observed by backpack electrofishing and their frequency of occurrence in the Chowade River and Cypress and Fiddes creeks during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Species	Life Stage	River						All Rivers	
		Chowade River		Cypress Creek		Fiddes Creek			
		n	%[b]	n	%[b]	n	%[b]	n	%[b]
Target Species									
Arctic Grayling	Adult								
	Immature								
	YOY								
All Arctic Grayling		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0**
Bull Trout	Adult	2	<1					2	<1
	Immature	299	64.9	210	72.2	51	100.0	560	69.7
	YOY	94	20.4	32	11.0			126	15.7
All Bull Trout		**395**	**85.7**	**242**	**83.2**	**51**	**100.0**	**688**	**85.7**
Rainbow Trout	Adult	9	2.0	1	<1			10	1.2
	Immature	4	0.9					4	<1
	YOY								
All Rainbow Trout		**13**	**2.8**	**1**	**<1**	**0**	**0.0**	**14**	**1.7**
Target Species Subtotal		**408**	**88.5**	**243**	**83.5**	**51**	**100.0**	**702**	**87.4**
Non-Target Species									
Mountain Whitefish	All	1	<1	2	0.7			3	<1
Slimy Sculpin	All	52	11.3	46	15.8			98	12.2
Non-Target Species Subtotal		**53**	**11.5**	**48**	**16.5**	**0**	**0.0**	**101**	**12.6**
All species		**461**	**100.0**	**291**	**100.0**	**51**	**100.0**	**803**	**100.0**

[a] Percent composition of the total catch.

Table B5 Number of fish caught and observed by backpack electrofishing and their frequency of occurrence in Colt, Farrell, and Kobes creeks during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

Species	Life Stage	River						All Rivers	
		Colt Creek		Farrell Creek		Kobes Creek			
		n	%[b]	n	%[b]	n	%[b]	n	%[b]
Target Species									
Arctic Grayling	Adult								
	Immature								
	YOY	2	1.4					2	<1
All Arctic Grayling		**2**	**1.4**	**0**	**0.0**	**0**	**0.0**	**2**	**<1**
Bull Trout	Adult								
	Immature	5	3.4					5	0.5
	YOY								
All Bull Trout		**5**	**3.4**	**0**	**0.0**	**0**	**0.0**	**5**	**0.5**
Rainbow Trout	Adult								
	Immature	50	34.5	90	16.8	73	25.2	213	21.9
	YOY	6	4.1	2	<1	6	2.1	14	1.4
All Rainbow Trout		**56**	**38.6**	**92**	**17.2**	**79**	**27.2**	**227**	**23.4**
Target Species Subtotal		**63**	**43.4**	**92**	**17.2**	**79**	**27.2**	**234**	**24.1**
Non-Target Species									
Lake Chub	All			58	10.8	35	12.1	93	9.6
Largescale Sucker	All			66	12.3	2	0.7	68	7.0
Longnose Dace	All	16	11.0	58	10.8	50	17.2	124	12.8
Longnose Sucker	All	8	5.5	64	11.9	8	2.8	80	8.2
Mountain Whitefish	All	27	18.6			2	0.7	29	3.0
Northern Pikeminnow	All			9	1.7			9	0.9
Redside Shiner	All			64	11.9	11	3.8	75	7.7
Slimy Sculpin	All	31	21.4	88	16.4	103	35.5	222	22.9
Sucker Unidentified	All			7	1.3			7	0.7
Trout-perch	All			30	5.6			30	3.1
Non-Target Species Subtotal		**82**	**56.6**	**444**	**82.8**	**211**	**72.8**	**737**	**75.9**
All species		**145**	**100.0**	**536**	**100.0**	**290**	**100.0**	**971**	**100.0**

[a] Percent composition of the total catch.

Table B6 **Number of fish caught and observed and their frequency of occurrence for all sample methods combined in sampled sections of the Moberly River during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.**

Species	Section																				All Sections	
	1A		1		2		3		4		5		6		7		8		9		10			
	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]
Arctic Grayling	24	8.4	1	2.7	2	2.9							2	1.8	4	1.4					3	1.4	36	2.2
Bull Trout															2	0.7							2	<1
Burbot	10	3.5	1	2.7			5	8.5	4	3.1	2	2.0	3	2.7	15	5.4	6	2.6	2	1.9	5	2.4	53	3.3
Lake Chub															1	<1	2	0.9			6	2.9	9	0.6
Largescale Sucker	1	<1													3	1.1	9	3.8	16	15.0	15	7.2	44	2.7
Longnose Dace	22	7.7	1	2.7	4	5.8	11	18.6	39	30.7	8	8.1	15	13.5	37	13.3	69	29.5	29	27.1	41	19.8	276	17.1
Longnose Sucker	26	9.1	8	21.6	21	30.4	14	23.7	24	18.9	16	16.2	17	15.3	77	27.7	41	17.5	9	8.4	26	12.6	279	17.3
Mountain Whitefish	169	59.1	23	62.2	32	46.4	23	39.0	34	26.8	68	68.7	62	55.9	102	36.7	68	29.1	25	23.4	49	23.7	655	40.6
Northern Pike	3	1.0			2	2.9			1	0.8	1	1.0	3	2.7	1	<1							11	0.7
Northern Pikeminnow	1	<1													20	7.2	10	4.3	12	11.2	25	12.1	68	4.2
Prickly Sculpin															4	1.4							4	<1
Redside Shiner	14	4.9			4	5.8	1	1.7					3	2.7	11	4.0	27	11.5	14	13.1	33	15.9	107	6.6
Slimy Sculpin	13	4.5					2	3.4	24	18.9	2	2.0	3	2.7	1	<1	2	0.9			1	<1	48	3.0
Sucker Unidentified			2	5.4			3	5.1													2	1.0	7	<1
Trout-perch	1	<1																					1	<1
Walleye																					1	<1	1	<1
White Sucker	2	0.7	1	2.7	4	5.8			1	0.8	2	2.0	3	2.7									13	0.8
All species	**286**	**17.7**	**37**	**2.3**	**69**	**4.3**	**59**	**3.7**	**127**	**7.9**	**99**	**6.1**	**111**	**6.9**	**278**	**17.2**	**234**	**14.5**	**107**	**6.6**	**207**	**12.8**	**1614**	**100.0**

[a] Percent composition of the total catch.

Table B7 **Capture and life history information for Arctic Grayling caught in the Moberly River during Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.**

Capture Date	Method	Section	River km[a]	Fork Length (mm	Weight (g)	Age	Tagged
23-Jul-19	Small Fish Boat Electroshocker	S7	37.9	278	240	4	Yes
23-Jul-19	Small Fish Boat Electroshocker	S7	37.9	380		4	Yes
23-Jul-19	Small Fish Boat Electroshocker	S7	37.9	305	308	4	Yes
23-Jul-19	Small Fish Boat Electroshocker	S7	37.9	285	259	4	Yes
26-Jul-19	Backpack Electrofishing	S10	8.4	92	11	0	Yes
26-Jul-19	Backpack Electrofishing	S10	3.8	71	4	0	No
27-Jul-19	Backpack Electrofishing	S10	3.4	62	3	0	No
28-Jul-19	Small Fish Boat Electroshocker	S1A	119.6	160	50	1	Yes
28-Jul-19	Small Fish Boat Electroshocker	S1A	119.6	142	36	1	Yes
28-Jul-19	Small Fish Boat Electroshocker	S1A	119.6	167	57	1	Yes
28-Jul-19	Angling	S1A	119.1	229	138	2	Yes
28-Jul-19	Angling	S1A	119.1	-[b]			No
29-Jul-19	Angling	S1A	119.1	174	64	1	Yes
29-Jul-19	Angling	S1A	119.1	150	42	1	Yes
29-Jul-19	Angling	S1A	119.1	164	52	1	Yes
29-Jul-19	Angling	S1A	119.1	170	57	1	Yes
29-Jul-19	Angling	S1A	119.1	169	47	1	Yes
29-Jul-19	Small Fish Boat Electroshocker	S1A	119.1	223	161	2	Yes
29-Jul-19	Angling	S1A	118.1	165	51	1	Yes
29-Jul-19	Angling	S1A	116.8	163	52	1	Yes
29-Jul-19	Angling	S1A	116.8	168	63	1	Yes
29-Jul-19	Angling	S1A	116.8	159	53	1	Yes
29-Jul-19	Angling	S1A	116.8	220	133	2	Yes
29-Jul-19	Angling	S1A	115.8	283	278	3	Yes
29-Jul-19	Angling	S1A	115.8	177	66	1	Yes
29-Jul-19	Angling	S1A	115.8	163	56	1	Yes
29-Jul-19	Angling	S1A	115.8	183	75	1	Yes
29-Jul-19	Backpack Electrofishing	S1A	114.5	305	369	4	Yes
30-Jul-19	Angling	S1A	114.5	178	66	1	Yes
30-Jul-19	Angling	S1A	114.5	178	64	1	Yes
30-Jul-19	Angling	S1A	114.5	176	63	1	Yes
30-Jul-19	Angling	S1	104.6	224	132	2	Yes
30-Jul-19	Angling	S2	87.3	271	216	3	Yes
31-Jul-19	Angling	S2	87.2	150	41	1	Yes
02-Aug-19	Angling	S6	50.6	168	63	1	Yes
02-Aug-19	Small Fish Boat Electroshocker	S6	49.2	88	7	0	Yes

[a]River Km values for the Moberly River are measured upstream from the Moberly River's confluence with the Peace River.

[b]Fish escaped prior to measuring for length.

APPENDIX C

Habitat Data

Table C1 Habitat variables measured during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2019.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Chowade River	51.1	CHR-EF-051.1-2019-07-18	18-Jul-2019	5.4	440	Bottom	Medium	0.2	0.5	Gravel	Cobble	25	1	5		4			65	
	50.0	CHR-EF-050.0-2019-07-18	18-Jul-2019	5.4	440	Bottom	Low	0.25	0.4	Gravel	Cobble	40	5	10	5	5	5	15	10	5
	49.4	CHR-EF-049.4-2019-08-03	3-Aug-2019	8.8	350	>2.0	Low	0.75	1.5	Gravel	Silt	4	40	20	10	1	3	2		20
	49.2	CHR-EF-049.2-2019-07-18	18-Jul-2019	6.6	340	Bottom	Medium	0.3	2	Cobble	Gravel	40	2	8	1	4			45	
	49.2	CHR-EF-049.2-2019-08-03	3-Aug-2019	8.8	350	Bottom	Medium	0.2	0.5	Cobble	Gravel	50	5	10		10				25
	49.0	CHR-EF-049.0-2019-07-18	18-Jul-2019	5.4	440	Bottom	Low	0.2	0.4	Gravel	Cobble	40	5	5	5	5	5	25	5	5
	48.2	CHR-EF-048.2-2019-07-19	19-Jul-2019	6.5	350	Bottom	Medium	0.3	0.6	Cobble	Gravel	25	10	5	10	20	5	10	10	5
	48.0	CHR-EF-048.0-2019-07-19	19-Jul-2019	6.0	440	Bottom	Low	0.2	0.7	Gravel	Sand	35	5	15	5				39	1
	46.8	CHR-EF-046.8-2019-07-19	19-Jul-2019	6.7	330	Bottom	Medium	0.3	0.5	Cobble	Boulder	45	5	5	5	5	10	15	5	5
	46.5	CHR-EF-046.5-2019-07-19	19-Jul-2019	9.1	310	Bottom	Medium	0.3	0.4	Cobble	Sand	20	20	30		30				10
	46.4	CHR-EF-046.4-2019-07-19	19-Jul-2019	6.7	450	Bottom	Low	0.3	1.1	Gravel	Cobble	10	10	5	5			5	45	20
	46.3	CHR-EF-046.3-2019-07-19	19-Jul-2019	7.1	440	Bottom	Medium	0.3	0.6	Cobble	Sand	60		15		5			20	
	44.2	CHR-EF-044.2-2019-07-20	20-Jul-2019	8.9	320	Bottom	Low	0.2	0.6	Cobble	Gravel	50	5	10	3	15	5	10		2
	44.1	CHR-EF-044.1-2019-07-20	20-Jul-2019	8.9	340	Bottom	Low	0.25	0.6	Cobble	Sand	20	20	15	10	10	5	5	5	10
	44.0	CHR-EF-044.0-2019-07-20	20-Jul-2019	8.9	340	Bottom	Medium	0.5	1.1	Gravel	Cobble	5	10	15	5		5		45	15
	43.9	CHR-EF-043.9-2019-07-20	20-Jul-2019	8.9	230	Bottom	Medium	0.2	0.5	Gravel	Sand	25	10	10	1		4		50	
	43.5	CHR-EF-043.5-2019-07-25	25-Jul-2019	7.6	310	Bottom	Medium	0.3	0.6	Cobble	Gravel	20	30	5	5	25	5			10
	43.4	CHR-EF-043.4-2019-07-25	25-Jul-2019	7.6	310	Bottom	Medium	0.4	0.7	Sand	Gravel	20	10	10	5	5	15		30	5
	42.4	CHR-EF-042.4-2019-08-03	3-Aug-2019	8.3	340	Bottom	Medium	0.4	1.6	Cobble	Gravel	5	30	25	15					25
	42.3	CHR-EF-042.3-2019-08-03	3-Aug-2019	9.2	330	Bottom	Low	0.4	1	Silt	Gravel	15	30	20	30	5				
	41.6	CHR-EF-041.6-2019-07-25	25-Jul-2019	8.8	310	Bottom	Low	0.3	0.5	Sand	Gravel	20	20	15					40	5
	41.5	CHR-EF-041.5-2019-07-25	25-Jul-2019	8.8	310	Bottom	Low	0.3	1	Gravel	Cobble	30	15	10	5	5	5	5	10	15
	39.7	CHR-EF-039.7-2019-07-20	20-Jul-2019	8.9	340	Bottom	Low	0.3	1	Cobble	Sand	25	15	10	4		3	1	50	2

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Chowade River	39.2	CHR-EF-039.2-2019-07-20	20-Jul-2019	8.9	340	Bottom	Low	0.2	0.4	Gravel	Cobble	10	20	20	5		5		30	10
	37.2	CHR-EF-037.2-2019-07-20	20-Jul-2019	7.1	450	Bottom	Medium	0.5	0.7	Gravel	Cobble	55	8	10	20		2			5
	36.9	CHR-EF-036.9-2019-07-20	20-Jul-2019	8.2	340	Bottom	Medium	0.4	0.7	Cobble	Gravel	20	25	20	5	10	5	10		5
	22.4	CHR-EF-022.4-2019-08-03	3-Aug-2019	11.3	340	Bottom	Medium	0.4	2.1	Gravel	Cobble	5	40	30		5				20
	22.0	CHR-EF-022.0-2019-08-03	3-Aug-2019	11.3	340	>2.0	Low	0.8	1.7	Silt	Gravel		30	30	10					30
Cypress Creek	41.7	CYC-EF-041.7-2019-07-23	23-Jul-2019	10.3	360	Bottom	Medium	0.3	1	Cobble	Sand	20	10	5	1	4			50	10
	41.6	CYC-EF-041.6-2019-07-23	23-Jul-2019	10.3	360	Bottom	Medium	0.45	1	Sand	Cobble	15	35	20		10		5		15
	41.4	CYC-EF-041.4-2019-07-23	23-Jul-2019	9.3	360	Bottom	Medium	0.4	1	Cobble	Sand	20	10	15	1	5	10	5	24	10
	41.3	CYC-EF-041.3-2019-07-23	23-Jul-2019	9.3	360	Bottom	Medium	0.3	1	Cobble	Gravel	30	25	15	2	5	3	10		10
	40.8	CYC-EF-040.8-2019-07-23	23-Jul-2019	10.3	360	Bottom	Medium	0.4	1	Cobble	Sand	Not recorded								
	40.7	CYC-EF-040.7-2019-07-23	23-Jul-2019	10.3	360	Bottom	Medium	0.3	0.6	Cobble	Silt	30	10	10	3	5	2		40	
	40.2	CYC-EF-040.2-2019-07-22	22-Jul-2019	9.8	370	Bottom	Medium	0.4	0.7	Cobble	Gravel	35	5	10	5	10	1		30	4
	40.1	CYC-EF-040.1-2019-07-22	22-Jul-2019	9.8	370	Bottom	Medium	0.3	1	Cobble	Gravel	30	20	10	5	10	3	2	5	15
	35.6	CYC-EF-035.6-2019-07-22	22-Jul-2019	10.3	370	Bottom	Medium	0.3	0.6			10	30	10	20	20		5	3	2
	35.5	CYC-EF-035.5-2019-07-22	22-Jul-2019	10.3	370	Bottom	Medium	0.3	0.5	Cobble	Sand	30	3	7	10	5	4		40	1
	34.6	CYC-EF-034.6-2019-07-22	22-Jul-2019	8.8	360	Bottom	Medium	0.3	0.7	Cobble	Sand	55	2	3	1	5	3	1	25	5
	34.5	CYC-EF-034.5-2019-07-22	22-Jul-2019	6.9	220	Bottom	Medium	0.3	0.5	Cobble	Gravel	10	20	10	10	10	10	5	10	15
	33.2	CYC-EF-033.2-2019-07-27	27-Jul-2019	6.4	280	1.00	Medium	0.4	0.6	Cobble	Gravel	40	2	3		25	5		20	5
	33.1	CYC-EF-033.1-2019-07-27	27-Jul-2019	6.3	280	1.00	Low	0.15	0.65	Cobble	Gravel	30	10	10	10	5	20		5	10
	32.6	CYC-EF-032.6-2019-07-21	21-Jul-2019	10.4	300	Bottom	Medium	0.3	0.5	Cobble	Gravel	20	15	10	5	30	5	5	10	
	32.5	CYC-EF-032.5-2019-07-21	21-Jul-2019	10.4	300	Bottom	Medium	0.3	0.7	Cobble	Gravel	50	5	5	1	10	2		25	2
	31.1	CYC-EF-031.1-2019-07-21	21-Jul-2019	10.2	310	Bottom	Low	0.2	0.4	Silt	Sand	5	10	5				2	75	3
	31.0	CYC-EF-031.0-2019-07-21	21-Jul-2019	10.2	310	Bottom	Medium	0.35	0.45	Cobble	Gravel	85	5					2	5	3

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Cypress Creek	30.7	CYC-EF-030.7-2019-07-21	21-Jul-2019	10.2	310	Bottom	Low	0.3	0.4	Cobble	Silt	50	2	3		4	1		40	
	29.5	CYC-EF-029.5-2019-07-27	27-Jul-2019	7.2	280	1.00	High	0.4	0.5	Cobble	Sand	30	5	5		20	20		20	
	29.4	CYC-EF-029.4-2019-07-27	27-Jul-2019	7.2	280	Bottom	High	0.25	0.45	Cobble	Sand	30	5	5		10	30		15	5
	29.2	CYC-EF-029.2-2019-07-21	21-Jul-2019	8.3	310	Bottom	Medium	0.3	0.5	Cobble	Gravel	55	1	5	1	4	5		29	
	29.0	CYC-EF-029.0-2019-07-21	21-Jul-2019	8.3	310	Bottom	Low	0.2	0.45	Cobble	Silt	35	5	20	5	10	5	5	10	5
	28.4	CYC-EF-028.4-2019-07-27	27-Jul-2019	7.5	280	1.00	Medium	0.4	1	Sand	Cobble	20	5	10		15	5	15	25	5
	28.1	CYC-EF-028.1-2019-07-27	27-Jul-2019	7.5	288	0.75	Low	0	0	Sand	Cobble	10	30	10	5		20			25
	27.4	CYC-EF-027.4-2019-07-28	28-Jul-2019	7.2	290	0.75	Low	0.3	0.5	Cobble	Silt	76	2	2			20			
	27.3	CYC-EF-027.3-2019-07-28	28-Jul-2019	7.2	290	Bottom	Low	0.2	0.65	Cobble	Gravel	20	10	5	5	20	20		20	
	26.3	CYC-EF-026.3-2019-07-28	28-Jul-2019	9.0	290	Bottom	Medium	0.3	1.5	Silt	Gravel	5	10	10	1	5	15	15	29	10
	26.2	CYC-EF-026.2-2019-07-28	28-Jul-2019	9.0	290	0.75	Medium	0.15	0.8	Cobble	Gravel	20	30	15			30			5
	25.6	CYC-EF-025.6-2019-07-28	28-Jul-2019	10.0	290	1.00	Low	0	0	Cobble	Silt	20	35	20		5	10			10
	25.5	CYC-EF-025.5-2019-07-28	28-Jul-2019	10.0	290	1.00	Medium	0.3	0.5	Gravel	Cobble	20	5	1			20		50	4
Fiddes Creek	7.1	FIC-EF-007.1-2019-07-26	26-Jul-2019	8.5	340	Bottom	Medium	0.35	0.65	Cobble	Boulder	50	15	5	2	20		3		5
	7.0	FIC-EF-007.0-2019-07-26	26-Jul-2019	8.5	340	Bottom	Medium	0.3	0.5	Cobble	Boulder	48	1	1	1	40			9	
	5.2	FIC-EF-005.2-2019-07-26	26-Jul-2019	6.6	350	Bottom	High	0.4	0.6	Cobble	Boulder	35	3	2	10	35			10	5
	4.8	FIC-EF-004.8-2019-07-26	26-Jul-2019	6.6	350	Bottom	Medium	0.25	0.55	Cobble	Gravel	50			2	35		3		10
Colt Creek	30.4	COC-EF-030.4-2019-07-31	31-Jul-2019	6.8	270	Bottom	Medium	0	0.4	Cobble	Boulder	60	3	2	10	10	5		10	
	30.2	COC-EF-030.2-2019-07-31	31-Jul-2019	6.8	270		Medium	0.3	0.4	Cobble	Gravel	45	5	10	5	5	10		10	20
	29.0	COC-EF-029.0-2019-07-31	31-Jul-2019	7.9	270	Bottom	High	0.3	0.7	Cobble	Boulder	70	2	3	4	15	5			1
	28.8	COC-EF-028.8-2019-07-31	31-Jul-2019	7.9	270		Medium	0.3	0.5	Cobble	Gravel	60	5	5	5	5	5		10	5
	14.9	COC-EF-014.9-2019-08-01	1-Aug-2019	10.7	210		Medium	0.2	0.8	Gravel	Cobble	50	5	10	5		5		10	20
	14.1	COC-EF-014.1-2019-08-01	1-Aug-2019	10.7	210	Bottom	Low	0.4	0.8	Cobble	Gravel	70	5	5	5		4		10	1
	3.2	COC-EF-003.2-2019-07-31	31-Jul-2019	14.8	220		Medium	0.2	0.8	Cobble	Gravel	50	5	5	5		5		20	10
	3.0	COC-EF-003.0-2019-07-31	31-Jul-2019	14.8	220	Bottom	Medium	0.35	1	Cobble	Gravel	35	15	15	10	5	10		5	5

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

…continued.

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Farrell Creek	102.1	FAC-EF-102.1-2019-07-24	24-Jul-2019	15.3	230		Low	0.6	1	Sand	Gravel	20	10	10	5				15	40
	101.7	FAC-EF-101.7-2019-07-24	24-Jul-2019	15.3	230	0.15	Low	0.35	0.7	Sand	Gravel	30	20	15	5	5	5	5	5	10
	65.7	FAC-EF-065.7-2019-08-02	2-Aug-2019	14.3	330		Low	0.5	0.9	Silt	Sand	15	5	5			5			70
	65.5	FAC-EF-065.5-2019-08-02	2-Aug-2019	14.3	330	1.00	Low	0.6	1.2	Sand	Gravel	5	10	10	5				10	60
	63.3	FAC-EF-063.3-2019-08-01	1-Aug-2019	16.1	330	Bottom	Low	0.3	0.5	Cobble	Silt	70	2	1	1				25	1
	63.0	FAC-EF-063.0-2019-08-01	1-Aug-2019	16.1	330		Low	0.3	1	Silt	Cobble	45	5	5	5				10	40
Kobes Creek	55.5	KOC-EF-055.5-2019-07-30	30-Jul-2019	10.2	70	Bottom		0.3	0.6	Cobble	Gravel	48	8	2	1		2		39	
	55.3	KOC-EF-055.3-2019-07-30	30-Jul-2019	10.0	40		Low	0.2	0.6	Gravel	Cobble		40	25	5		5			25
	46.8	KOC-EF-046.8-2019-07-30	30-Jul-2019	14.4	90	1.00	Medium	0.3	1	Cobble	Gravel	35	10	10	10		20		5	10
	46.5	KOC-EF-046.5-2019-07-30	30-Jul-2019	14.4	90		Low	0.2	0.4	Gravel	Cobble	55	10	5	5		5		10	10
	40.6	KOC-EF-040.6-2019-07-29	29-Jul-2019	15.6	120	Bottom	Medium	0.5	1.1	Cobble	Sand	55	5	5	5		1	1	18	10
	40.2	KOC-EF-040.2-2019-07-29	29-Jul-2019	15.6	120		Low	0.3	1	Cobble	Silt	60	5	5	5		10		10	5
	11.7	KOC-EF-011.7-2019-07-29	29-Jul-2019	16.4	140		Low	0.3	0.8	Silt	Cobble	60	1	1			8		29	1
	11.5	KOC-EF-011.5-2019-07-29	29-Jul-2019	16.4	140	0.50	Low	0.5	1.25	Silt	Gravel	0	20		5				15	60
Moberly River	119.7	MOR-AG-119.7-2019-07-28	28-Jul-2019			1.50	Medium	0.9	1.1	cobble	gravel	10	45	20			5			20
	119.6	MOR-ES-119.6-2019-07-28	28-Jul-2019	17.4	170	1.00	Low	0.6	1.2	gravel	cobble	80	10			10				
	119.5	MOR-EF-119.5-2019-07-28	28-Jul-2019	16.1	230	1.00	Low	0.25	0.6	gravel	sand	70		20		10				
	119.1	MOR-AG-119.1-2019-07-28	28-Jul-2019			1.50	Medium	0.3	1.2	gravel	cobble	40	30	10		10				10
	119.1	MOR-EF-119.1-2019-07-29	29-Jul-2019	16.4	160			0.5	1	gravel	silt	20	80							
	119.1	MOR-AG-119.1-2019-07-29	29-Jul-2019	16.4	160	1.50	Low	0.3	1.2	gravel	cobble	70	10							20
	119.1	MOR-ES-119.1-2019-07-29	29-Jul-2019	17.4	170	1.50	Medium	0.4	1	Boulder	cobble	70	20			10				
	119.0	MOR-AG-119.0-2019-07-29	29-Jul-2019	16.5		1.50	Medium	0.6	1.1	gravel	cobble	20	30	10						40
	118.9	MOR-AG-118.9-2019-07-29	29-Jul-2019	16.5		1.50	Medium	0.4	1			40	30						10	20
	118.7	MOR-EF-118.7-2019-07-29	29-Jul-2019	16.4	160	1.50	Low	0.6	0.9	gravel	cobble	50	20	10		20				
	118.5	MOR-ES-118.5-2019-07-29	29-Jul-2019	17.4	170	1.50	Medium	0.6	1.2	cobble	boulder	70	20			10				

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	118.1	MOR-AG-118.1-2019-07-29	29-Jul-2019	16.5		1.50	Medium	0.5	1.5	gravel	cobble	40	30	10						20
	117.9	MOR-EF-117.9-2019-07-29	29-Jul-2019	17.4	160	1.50	Low	0.4	0.8	cobble	gravel	60	20	10		10				
	117.7	MOR-ES-117.7-2019-07-29	29-Jul-2019	17.4	170	1.50	Medium	0.6	1.5	cobble	gravel	30	20			10				40
	117.2	MOR-AG-117.2-2019-07-29	29-Jul-2019	16.5		1.50	Medium	0.6	1.7	cobble	gravel	40	30	10						20
	117	MOR-ES-117.0-2019-07-29	29-Jul-2019	17.4	170	1.50	Low	0.7	2	gravel	cobble	10	90							
	116.8	MOR-EF-116.8-2019-07-29	29-Jul-2019	17.4	160	1.50		0.3	0.6	gravel	sand	20	80							
	116.8	MOR-AG-116.8-2019-07-29	29-Jul-2019	16.5		1.50	Low	0.4	1.8	gravel	cobble	80	10	10						
	116.7	MOR-ES-116.7-2019-07-29	29-Jul-2019	17.9	170	2.00	Medium	0.4	0.8	cobble	gravel	34	33	33						
	116.5	MOR-EF-116.5-2019-07-29	29-Jul-2019	16.4	160	1.50	Low	0.4	1	gravel	sand	40	20	20		20				
	116.3	MOR-ES-116.3-2019-07-29	29-Jul-2019	17.9	170	2.00	Low	0.7	1.5	gravel	cobble	50	50							
	115.9	MOR-ES-115.9-2019-07-29	29-Jul-2019	17.9	170	2.00		0.7	1.5	silt	gravel	10	80							10
	115.8	MOR-AG-115.8-2019-07-29	29-Jul-2019	17.0		1.50	Medium	0.5	1.9	gravel	cobble	70								30
	115	MOR-ES-115.0-2019-07-30	30-Jul-2019	18.0	170	2.00	Medium	0.8	1.5	silt	gravel	20	70	10						
	114.5	MOR-EF-114.5-2019-07-29	29-Jul-2019	18.3	160	1.50		0.5	1	gravel	sand	55	20	10			15			
	114.5	MOR-EF-114.5-2019-07-30	30-Jul-2019	16.7	160	1.50	Low			gravel	sand	50	20	10		20				
	114.5	MOR-AG-114.5-2019-07-30	30-Jul-2019	16.7	160	1.50	Medium	0.5	1.5	sand	gravel	10	30			5	5	5	25	20
	114.3	MOR-ES-114.3-2019-07-30	30-Jul-2019	18.4	160	2.00	Low	0.5	2	silt	cobble	30	40	10						20
	105.0	MOR-ES-105.0-2019-07-30	30-Jul-2019	18.4	160	1.50		1.3	2.5	silt	cobble	10	70							20
	104.7	MOR-AG-104.7-2019-07-30	30-Jul-2019	16.7		1.50	Low	1	2	gravel	sand	40					10			50
	104.6	MOR-AG-104.6-2019-07-30	30-Jul-2019	16.7		1.50	Medium	1	3	gravel	cobble	30	20							50
	103.7	MOR-EF-103.7-2019-07-30	30-Jul-2019	18.3	160	1.50				gravel	sand	75	15			10				
	103.6	MOR-ES-103.6-2019-07-30	30-Jul-2019	18.4	160	1.50	Low	1.3	3	silt	Organics		50							50
	103.0	MOR-ES-103.0-2019-07-30	30-Jul-2019	18.4	160	1.50	Low	1.1	3	silt	Organics	10	30							60
	100.7	MOR-AG-100.7-2019-07-30	30-Jul-2019			1.10	Low	0.6	2.5	gravel	sand	5	20	10		5		5	5	50
	98.8	MOR-AG-098.8-2019-07-30	30-Jul-2019			1.00	Low	2	3.5	Silt	Sand		15	15						70
	94.8	MOR-AG-094.8-2019-07-30	30-Jul-2019	16.5		1.00	Low	1.5	3	Sand	Silt		20							80

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	88.9	MOR-ES-088.9-2019-07-30	30-Jul-2019	18.4	160	1.50	Low	0.5	1.5	Cobble	Silt	35	30			5				30
	98.8	MOR-AG-098.8-2019-07-30	30-Jul-2019			1.00	Low	-	-	Silt	Sand		15	15						70
	94.8	MOR-AG-094.8-2019-07-30	30-Jul-2019	16.5		1.00	Low	-	-	Sand	Silt		20							80
	88.9	MOR-ES-088.9-2019-07-30	30-Jul-2019	18.4	160	1.50	Low	-	-	Cobble	Silt	35	30			5				30
	87.5	MOR-ES-087.5-2019-07-31	31-Jul-2019	16.8	170	2.00	Medium	0.4	1	Cobble	Gravel	30	45	5					20	
	87.3	MOR-AG-087.3-2019-07-30	30-Jul-2019	16.7		1.00	Low	0.5	1.2	Gravel	Sand	100								
	87.3	MOR-AG-087.3-2019-07-31	31-Jul-2019	16.5		0.90	Low	0.5	1.3	Gravel	Sand	70								30
	87.2	MOR-AG-087.2-2019-07-31	31-Jul-2019			1.00	Medium	0.4	1.5	Gravel	Cobble	20	20	10		10			35	5
	84.5	MOR-ES-084.5-2019-07-31	31-Jul-2019	16.7	170	1.00	Low	0.9	2	Cobble	Gravel	25	40	10					20	5
	84.1	MOR-AG-084.1-2019-07-31	31-Jul-2019	16.5		1.00	Medium	0.7	3	Gravel	Sand	45	10	5						40
	81.6	MOR-EF-081.6-2019-07-31	31-Jul-2019	18.0	160		Low	0.3	0.8	Gravel	Silt	10		75					15	
	80.2	MOR-ES-080.2-2019-07-31	31-Jul-2019	16.8	170	1.50		1.3	2.5	Cobble	Gravel	40	30	10					20	
	80.2	MOR-AG-080.2-2019-07-31	31-Jul-2019			1.30	Medium	0.4	1.8	Cobble	Boulder	25	30	10		10		5	20	
	75.9	MOR-AG-075.9-2019-07-31	31-Jul-2019	16.5			Low	1.2	4	Sand	Cobble	5	5							90
	72.5	MOR-ES-072.5-2019-07-31	31-Jul-2019	19.2	170	2.00	Medium	0.6	1.7	Cobble	Gravel	30	30	30					10	
	71.3	MOR-AG-071.3-2019-07-31	31-Jul-2019	16.5		1.00	Medium	0.6	1.2	Sand	Cobble	Not recorded								
	68.7	MOR-AG-068.7-2019-07-31	31-Jul-2019	16.5		0.60		-	-	Gravel	Cobble	70	5						5	20
	68.4	MOR-ES-068.4-2019-07-31	31-Jul-2019	17.1	170	1.00	Medium	0.6	1.5	Cobble	Gravel	30	30	30					10	
	65.7	MOR-AG-065.7-2019-08-01	1-Aug-2019	16.4	170	1.00	Medium	0.5	1.2	Cobble	Sand	80							10	10
	65.6	MOR-ES-065.6-2019-08-01	1-Aug-2019	16.4	170	1.20	Medium	0.4	2.5	Silt	Gravel	25	40	10					10	15
	65.2	MOR-EF-065.2-2019-08-01	1-Aug-2019	16.4	170	1.00	Medium	0.4	0.8	Gravel	Cobble	90				10				
	64.8	MOR-ES-064.8-2019-08-01	1-Aug-2019	16.4	170	1.20	Medium	0.7	2	Cobble	Silt	25	15	5		20			20	15
	64.7	MOR-AG-064.7-2019-08-01	1-Aug-2019	16.5		1.00	Medium	0.4	0.8	Cobble	Gravel	90	5	5						
	64.5	MOR-EF-064.5-2019-08-01	1-Aug-2019	16.5	170	1.00	Medium	0.4	1	Cobble	Gravel	80				20				
	64.4	MOR-ES-064.4-2019-08-01	1-Aug-2019	16.4	170	1.20		1.5	2.5	Silt	Gravel	10	50	10		10			10	10
	63.4	MOR-AG-063.4-2019-08-01	1-Aug-2019	16.5		1.00		0.7	2.5	Gravel	Sand	60	5	5						30

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	62.4	MOR-EF-062.4-2019-08-01	1-Aug-2019	17.8	170	1.00	Medium	0.3	0.7	Gravel	Cobble	75				25				
	61.9	MOR-AG-061.9-2019-08-01	1-Aug-2019	16.5		1.00		0.3	0.7	Cobble	Gravel	100								
	60.8	MOR-ES-060.8-2019-08-01	1-Aug-2019	16.4	170	1.20	Medium	0.3	1.2	Boulder	Cobble	70	10			10				10
	58.3	MOR-AG-058.3-2019-08-01	1-Aug-2019	16.5		1.00	Medium	0.9	1.5			70								30
	58.2	MOR-ES-058.2-2019-08-01	1-Aug-2019	16.4	170	1.20	Medium	0.4	1.5	Boulder	Silt	80	10							10
	57.8	MOR-AG-057.8-2019-08-01	1-Aug-2019	18.0		1.00	Medium	0.8	2	Cobble	Sand	60	5	5					10	20
	57.5	MOR-EF-057.5-2019-08-01	1-Aug-2019	18.5	170	1.00	Medium	0.7	1.2	Gravel	Cobble	40	10			30	10			10
	56.6	MOR-ES-056.6-2019-08-01	1-Aug-2019			1.40	Medium	0.4	1.7	Cobble	Boulder	70	20							10
	55.0	MOR-ES-055.0-2019-08-01	1-Aug-2019	18.5	170	1.40	Low	0.5	1	Cobble	Boulder	80	20							
	54.8	MOR-AG-054.8-2019-08-01	1-Aug-2019	18.0		0.90	Low	0.6	1.9	Cobble	Gravel	80	5							15
	53.4	MOR-EF-053.4-2019-08-01	1-Aug-2019	18.1	170	1.00	Medium	0.6	1.6	Gravel	Cobble	40	10			20	20			10
	51.9	MOR-ES-051.9-2019-08-01	1-Aug-2019	16.4	170	1.20	Medium	0.6	1.3	Cobble	Silt	50	25	5		10			5	5
	51.0	MOR-AG-051.0-2019-08-02	2-Aug-2019	16.4		1.20	Low	0.5	1	Gravel	Cobble	30	30						20	20
	51.0	MOR-ES-051.0-2019-08-02	2-Aug-2019	16.2	170	1.20	Medium	-	-	Silt	Cobble	35	15	15		15			10	10
	50.7	MOR-AG-050.7-2019-08-02	2-Aug-2019	16.5		1.10	Medium	0.7	1.7	Gravel	Cobble	70	5	5			5			15
	50.6	MOR-AG-050.6-2019-08-02	2-Aug-2019			1.20	Low	0.4	1.2	Gravel	Cobble	50	20						30	
	50.6	MOR-EF-050.6-2019-08-02	2-Aug-2019	16.2	170	1.00	Medium	0.3	0.6	Gravel	Cobble	60	10	5		10	15			
	49.2	MOR-ES-049.2-2019-08-02	2-Aug-2019	16.2	170	1.20	Medium	0.5	2	Cobble	Gravel	50	10	5		20			10	5
	47.9	MOR-ES-047.9-2019-08-02	2-Aug-2019	16.4	170	1.20	Medium	-	-	Cobble	Gravel	70	10			10				10
	47.8	MOR-EF-047.8-2019-08-02	2-Aug-2019	16.4	170	1.00	Medium	-	-	Gravel	Cobble	40	10	10		20	20			
	47.8	MOR-AG-047.8-2019-08-02	2-Aug-2019			1.50	Medium	0.5	2	Cobble	Boulder	20	15			15			30	20
	45.9	MOR-AG-045.9-2019-08-02	2-Aug-2019			1.50	Medium	0.6	1.5	Gravel	Cobble	30		10		5			35	20
	45.7	MOR-AG-045.7-2019-08-02	2-Aug-2019			2.00	Medium	0.75	2	Cobble	Gravel	30	30			20			10	10
	45.6	MOR-ES-045.6-2019-08-02	2-Aug-2019	16.7	170	1.40	Medium	1.2	3	Cobble	Boulder	50	20			10				20
	44.6	MOR-EF-044.6-2019-08-02	2-Aug-2019	16.4	170		Medium	0.5	1	Gravel	Cobble	55	10	15	5	10	5			

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	44.2	MOR-AG-044.2-2019-07-22	22-Jul-2019	19.0		1.00	Medium	1	2	Silt	Gravel	95		5						
	43.1	MOR-ES-043.1-2019-07-22	22-Jul-2019	21.0		0.85	Medium	0.6	1	Silt	Cobble		10		50	5	30			5
	42.7	MOR-EF-042.7-2019-07-22	22-Jul-2019	22.5	170		Low	0.25	0.5	Silt	Cobble	90		10						
	42.7	MOR-AG-042.7-2019-07-22	22-Jul-2019	19.0		0.75	Medium	0.8	2			80	5	5			10			
	41.9	MOR-ES-041.9-2019-07-22	22-Jul-2019	22.5	170	1.00	Medium	0.5	1.5	Cobble	Gravel	80	5		5	5	5			
	41.0	MOR-AG-041.0-2019-07-22	22-Jul-2019	19.0		0.75	Low	1.8	3	Sand	Cobble		5							95
	40.8	MOR-EF-040.8-2019-07-23	23-Jul-2019	21.0	170		Low	0.2	0.5	Gravel	Silt	40	25	20					15	
	39.8	MOR-ES-039.8-2019-07-22	22-Jul-2019	22.5	170	1.00	Medium	0.45	-	Cobble	Gravel	70	10		10	5	5			
	39.2	MOR-AG-039.2-2019-07-23	23-Jul-2019	18.0			Low	0.8	2	Gravel	Sand	20	50	20						10
	38.1	MOR-ES-038.1-2019-07-23	23-Jul-2019	20.0	170	1.00	Medium	0.35	1.2	Cobble	Gravel	65	20		10	5				
	38.0	MOR-AG-038.0-2019-07-23	23-Jul-2019	18.0		0.50	Low	0.5	1.5	Gravel	Sand	30	50	20						
	37.9	MOR-ES-037.9-2019-07-23	23-Jul-2019	20.0	170	1.00	Medium	1	2	Silt	Cobble		20			10	10			60
	37.5	MOR-AG-037.5-2019-07-23	23-Jul-2019	18.0		0.50	Medium	0.5	2	Silt	Cobble		50	30						20
	37.5	MOR-EF-037.5-2019-07-23	23-Jul-2019	23.4	170		Low	-	-	Cobble	Silt	85	4	10			1			
	36.9	MOR-ES-036.9-2019-07-23	23-Jul-2019	20.0	170	1.00	Medium	0.4	0.9	Cobble	Gravel	10	50				20			20
	36.7	MOR-AG-036.7-2019-07-23	23-Jul-2019	18.0			Medium	1	3	Gravel	Sand		10		10					80
	35.9	MOR-ES-035.9-2019-07-23	23-Jul-2019	21.0	170	0.50	Medium	1	3	Cobble	Silt	5	25		20	10	10			30
	35.0	MOR-AG-035.0-2019-07-23	23-Jul-2019	19.0		0.50	Medium	0.5	1	Cobble	Sand	100								
	34.7	MOR-AG-034.7-2019-07-23	23-Jul-2019	19.0		0.80	Medium	1.2	2.5	Cobble	Gravel			10		20				70
	33.5	MOR-EF-033.5-2019-07-23	23-Jul-2019	21.0	170		Low	0.3	0.6	Gravel	Silt	75	25							
	32.4	MOR-ES-032.4-2019-07-23	23-Jul-2019	21.0	170	1.00	Medium	0.4	1	Cobble	Boulder	10	40		20	10				20
	31.8	MOR-AG-031.8-2019-07-23	23-Jul-2019	18.0		0.50	Medium	1	2	Cobble	Sand	75	15	10						
	31.6	MOR-ES-031.6-2019-07-23	23-Jul-2019	20.0	170	0.50		0.5	3	Gravel	Cobble	10	30		30	10	10			10
	27.2	MOR-AG-027.2-2019-07-24	24-Jul-2019	19.0		0.40	High	0.7	1.2	Cobble	Gravel	75	5	5					10	5
	27.0	MOR-ES-027.0-2019-07-24	24-Jul-2019	21.5	170	0.30	Medium	0.4	0.8	Silt	Boulder		40			20				40
	26.5	MOR-EF-026.5-2019-07-24	24-Jul-2019	21.0	170		Low	0.3	0.5	Cobble	Silt	90	5	5						

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	25.8	MOR-AG-025.8-2019-07-24	24-Jul-2019	19.0		0.40	Medium	0.8	1.4	Sand	Cobble	75	5	5		5			10	
	25.8	MOR-ES-025.8-2019-07-24	24-Jul-2019	21.5	170	0.30		0.4	0.8	Cobble	Boulder	20	30		20	10	20			
	25.4	MOR-EF-025.4-2019-07-24	24-Jul-2019				Low	0.1	0.4	Gravel	Silt	80	10	10						
	25.0	MOR-AG-025.0-2019-07-24	24-Jul-2019			0.50	Medium	0.8	2	Sand	Cobble	40				30				30
	24.1	MOR-AG-024.1-2019-07-24	24-Jul-2019	22.0		0.40	Medium	1.3	2	Cobble	Sand	30				35				35
	23.9	MOR-ES-023.9-2019-07-24	24-Jul-2019	21.5	170	0.30	Medium	0.45	1	Cobble	Gravel	20	40			5				35
	23.4	MOR-ES-023.4-2019-07-24	24-Jul-2019	21.5	170	0.30	Medium	0.4	1	Cobble	Gravel	20	50			10				20
	23.0	MOR-AG-023.0-2019-07-24	24-Jul-2019	19.0		0.40	Medium	1.3	2.5	Sand	Gravel		50	30						20
	22.5	MOR-AG-022.5-2019-07-24	24-Jul-2019	19.0		0.40	Low	1.3	1.8	Sand	Cobble		80	10		10				
	22.3	MOR-EF-022.3-2019-07-24	24-Jul-2019	21.0	170		Low	0.3	0.6	Silt	Gravel	65	10	20	5					
	22.2	MOR-ES-022.2-2019-07-24	24-Jul-2019	21.5	170	0.30	Medium	0.35	0.7	Cobble	Gravel	10	60			10				20
	22.1	MOR-EF-022.1-2019-07-24	24-Jul-2019	21.0	170		Low	0.2	0.4	Gravel	Silt	40	20	30	10					
	21.2	MOR-ES-021.2-2019-07-25	25-Jul-2019	18.5	170	0.60	Medium	0.25	0.4	Gravel	Cobble	60	40							
	21.1	MOR-EF-021.1-2019-07-25	25-Jul-2019	18.3	170		Low	0.2	0.6	Gravel	Silt	40	20	40						
	20.1	MOR-AG-020.1-2019-07-25	25-Jul-2019			0.70	Medium	0.8	1.2	Cobble	Gravel	65	25							10
	20	MOR-ES-020.0-2019-07-25	25-Jul-2019	18.5	170	0.60	Medium	0.25	0.5	Gravel	Cobble	80	10				10			
	19.5	MOR-EF-019.5-2019-07-25	25-Jul-2019	20.5	180		Low	0.4	0.7	Gravel	Silt	69	25		1		5			
	19	MOR-AG-019.0-2019-07-25	25-Jul-2019	20.0		0.50	Low	0.9	1.3	Gravel	Sand	25	25	15		5	10			20
	18.5	MOR-ES-018.5-2019-07-25	25-Jul-2019	18.5	170	0.40	Medium	0.3	0.8	Cobble	Silt	40	30							30
	18	MOR-AG-018.0-2019-07-25	25-Jul-2019	20.0		0.60	Low	1	1.7	Gravel	Sand	30	30	10						30
	17.7	MOR-AG-017.7-2019-07-25	25-Jul-2019	20.0		0.50	Medium	0.6	1	Cobble	Gravel	80	20							
	17.7	MOR-ES-017.7-2019-07-25	25-Jul-2019	18.5	170	0.40	Medium	0.35	0.6	Cobble	Gravel	20	40							40
	16.5	MOR-AG-016.5-2019-07-25	25-Jul-2019	20.0		0.50	Low	0.4	1	Sand	Gravel	20	80							
	16.2	MOR-ES-016.2-2019-07-25	25-Jul-2019	18.5	170	0.40		0.3	0.75	Cobble	Gravel	40	30	10		10				10
	16	MOR-EF-016.0-2019-07-25	25-Jul-2019	22.1	180		Low	0.3	0.5			80		5			15			
	15.9	MOR-EF-015.9-2019-07-25	25-Jul-2019	22.1	180		Low	0.2	0.8	Silt	Gravel	50	20	20						10

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Continued.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	15	MOR-AG-015.0-2019-07-25	25-Jul-2019	20.0		0.50	Low	0.6	1.1	Sand	Gravel		70							30
	15	MOR-ES-015.0-2019-07-26	26-Jul-2019			0.60		0.4	1.2	Boulder	Cobble	50	30			10	10			
	14.8	MOR-AG-014.8-2019-07-26	26-Jul-2019	19.0		0.60	Medium	0.5	0.7	Gravel	Sand	65	30	5						
	14.4	MOR-EF-014.4-2019-07-26	26-Jul-2019	18.3	180		Low	0.25	0.8	Cobble	Silt	90	8	1	1					
	13.9	MOR-AG-013.9-2019-07-26	26-Jul-2019	20.0		0.50	Medium	0.4	0.9			70	15	5					5	5
	13.7	MOR-ES-013.7-2019-07-26	26-Jul-2019			0.40	Medium	0.3	1	Gravel	Cobble	50	20				10			20
	13.6	MOR-EF-013.6-2019-07-26	26-Jul-2019	19.9	180		Low	0.4	0.8			30	20	30	10					10
	13.1	MOR-AG-013.1-2019-07-26	26-Jul-2019	19.0		0.50	Medium	0.5	1	Gravel	Cobble	65	5			10				20
	13	MOR-ES-013.0-2019-07-26	26-Jul-2019			0.40	Medium	-	-	Boulder	Gravel	60	10			10				20
	12.7	MOR-AG-012.7-2019-07-26	26-Jul-2019	18.0		0.50	Medium	0.5	1	Cobble	Sand	50	10			20				20
	12	MOR-ES-012.0-2019-07-26	26-Jul-2019			0.40	Medium	0.35	0.8	Gravel	Cobble	60	10			10	20			
	11.5	MOR-AG-011.5-2019-07-26	26-Jul-2019	19.0		0.50	Medium	0.4	1	Sand	Cobble	75	10	10						5
	10.8	MOR-AG-010.8-2019-07-26	26-Jul-2019	20.0		0.60		0.9	1.7	Sand	Gravel		5			10				85
	10.8	MOR-ES-010.8-2019-07-26	26-Jul-2019	20.0		0.40	Medium	0.3	1.5	Cobble	Boulder	70	10			10				10
	9.9	MOR-ES-009.9-2019-07-26	26-Jul-2019			0.40	Medium	0.3	1.3	Cobble	Boulder	50	20							30
	9.4	MOR-AG-009.4-2019-07-26	26-Jul-2019	20.0		0.50	Medium	0.4	0.9	Gravel	Sand	70	5	5					10	10
	9.1	MOR-ES-009.1-2019-07-26	26-Jul-2019			0.40	Medium	0.25	0.75	Cobble	Boulder	80	10	10						
	8.8	MOR-AG-008.8-2019-07-26	26-Jul-2019	20.0		0.50	High	0.8	1.4	Gravel	Sand	40	30			10				20
	8.6	MOR-EF-008.6-2019-07-26	26-Jul-2019	21.0	180		Low	0.1	0.6	Gravel	Silt	40	20	20			10			10
	8.5	MOR-ES-008.5-2019-07-26	26-Jul-2019			0.40	Medium	0.4	2	Cobble	Gravel	70	20							10
	8.4	MOR-EF-008.4-2019-07-26	26-Jul-2019	21.0	180		Low	0.1	0.3	Gravel	Silt	90	5	5						
	8.2	MOR-AG-008.2-2019-07-26	26-Jul-2019	20.0		0.40	Low	0.7	1	Sand	Cobble				20				40	40
	7.5	MOR-AG-007.5-2019-07-26	26-Jul-2019	20.0		0.40	Medium	0.5	0.9	Cobble	Gravel	70	10							20
	7.3	MOR-AG-007.3-2019-07-26	26-Jul-2019	20.0		0.40	High	0.7	1.2	Cobble	Gravel	30				30				40
	7.1	MOR-AG-007.1-2019-07-26	26-Jul-2019	20.0		0.40	Low	0.6	1.3	Gravel	Sand		40	10						50
	6.9	MOR-AG-006.9-2019-07-26	26-Jul-2019	20.0		0.40	Medium	0.6	1.5	Gravel	Sand	30	10	10		10			10	30
	6.9	MOR-ES-006.9-2019-07-26	26-Jul-2019	20.0		0.40	Medium	0.4	1.5	Cobble	Boulder	50	20				10			20
	5.2	MOR-ES-005.2-2019-07-26	26-Jul-2019	20.0		0.40	Medium	0.4	1.2	Cobble	Gravel	60	20			10				10

…continued.

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C1 Concluded.

River	River Km	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Mean Water Depth (m)	Maximum Water Depth (m)	Substrate		Cover Type - Percent of Available Cover (%)								
										Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
	3.9	MOR-AG-003.9-2019-07-27	27-Jul-2019	19.0		0.50	Medium	0.4	1	Cobble	Sand	Not recorded								
	3.8	MOR-EF-003.8-2019-07-26	26-Jul-2019	20.1	190	0.40	Low	0.3	0.8	Cobble	Silt	60	40							
	3.8	MOR-EF-003.8-2019-07-26	26-Jul-2019	19.0	190	0.40	Low	0.3	0.8	Cobble	Silt	60	40							
	3.7	MOR-ES-003.7-2019-07-27	27-Jul-2019	18.0		0.50	Medium	0.5	1.4	Gravel	Cobble	50	30			10				10
	3.5	MOR-EF-003.5-2019-07-27	27-Jul-2019	19.0	190		Low	0.3	0.5	Silt	Gravel		20	20			60			
	3.4	MOR-EF-003.4-2019-07-27	27-Jul-2019	17.4	190		Low	0.2	0.5	Gravel	Silt		50	50						
	1.5	MOR-AG-001.5-2019-07-27	27-Jul-2019	19.0		0.50	Low	0.4	0.7	Gravel	Sand		60	10					10	20
	1.5	MOR-EF-001.5-2019-08-29	29-Aug-2019[b]	15.5	180	Bottom	Low	0.2	0.3	Cobble	Gravel	40	10	10		10			30	
	1.4	MOR-AG-001.4-2019-07-27	27-Jul-2019	19.0		0.50	Medium	0.6	1.3	Gravel	Cobble	100								
	1.4	MOR-EF-001.4-2019-09-21	21-Sep-2019[b]	12.8	180	Bottom	High	0.2	0.5			40	3	2		5			50	
	1	MOR-EF-001.0-2019-09-21	21-Sep-2019[b]		180		Medium	0.2	0.6			30	10	10		20			30	
	0.5	MOR-EF-000.5-2019-08-21	21-Aug-2019[b]	14.7	180		Medium	0.6	1	Cobble	Gravel	60	10	5		25				

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

[b] Sampling conducted to collect genetic samples in support of other Site C FAHMFP components.

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