Site C Clean Energy Project

Peace River Fish Community Monitoring Program (Mon-2)

Task 2a – Peace River Large Fish Indexing Survey

Construction Year 3 (2017)

Dustin Ford, RPBio
Golder Associates Ltd.

David Roscoe, MSc
Golder Associates Ltd.

Gary Ash
Golder Associates Ltd.

Bill Gazey
W.J. Gazey Research

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REPORT

Peace River Large Fish Indexing Survey

2017 Investigations (Mon-2, Task 2a)

Submitted to:

Brent Mossop

BC Hydro
1111 West Georgia Street, 9th Floor
Vancouver, British Columbia, V6E 4G2
Canada

Submitted by:

Golder Associates Ltd.

201 Columbia Avenue Castlegar, British Columbia, V1N 1A8 Canada

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Executive Summary

Fish and fish habitat are valued components of the Peace River that are considered important by BC Hydro, Aboriginal groups, the public, the scientific community, and government agencies. The Site C Clean Energy Project (the Project), including Project construction, reservoir filling, and operation, could affect fish and fish habitat via three key pathways: changes to fish habitat (including nutrient concentrations and lower trophic biota), changes to fish health and fish survival, and changes to fish movement. These paths are examined in detail in Volume 2 of the Project's Environmental Impact Statement (EIS; BC Hydro 2013). The EIS makes both qualitative and quantitative predictions of fish production in the Peace River downstream of the Project. Quantitative predictions for the Peace River downstream of the Project relative to pre-project estimates include decreased biomass of Group 1 fishes (i.e., Burbot [*Lota lota*], Lake Trout [*Salvelinus namaycush*], Northern Pike [*Esox lucius*], Rainbow Trout [*Oncorhynchus mykiss*], and Walleye [*Sander vitreus*]) over the short- (10 years) and long-term (greater than 30 years), increased biomass of Group 2 fishes (i.e., Arctic Grayling [*Thymallus arcticus*], Bull Trout [*Salvelinus confluentus*], and Mountain Whitefish [*Prosopium williamsoni*]) over the short- and long-term, similar biomasses of Group 3 fishes (i.e., Kokanee [*Oncorhynchus nerka*] and Lake Whitefish [*Coregonus clupeaformis*]) over the short- and long-term, and decreased biomass of Group 4 fishes (i.e., Northern Pikeminnow [*Ptychocheilus oregonensis*], Suckers [all species combined], and all other small fish species) over the short- and long-term.

The objective of the Peace River Large Fish Indexing Survey (hereafter, Indexing Survey) is to validate EIS predictions and address uncertainties identified in the EIS regarding the Project's effects on fish in the Peace River, and to assess the effectiveness of fish and fish habitat mitigation measures. The status of the Indexing Survey's progress towards testing each of the applicable hypotheses listed in BC Hydro's Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP; BC Hydro 2015a) is presented in Table E1.

The Indexing Survey was initiated in 2015 and conducted annually (Golder and Gazey 2016, 2017). It is the continuation and expansion of two previous programs conducted using similar methods. These included BC Hydro's Large River Fish Indexing Program (2001–2007; P&E 2002; P&E and Gazey 2003; Mainstream and Gazey 2004–2008) and the Peace River Fish Index (2008–2014; Mainstream and Gazey 2009–2014; Golder and Gazey 2015).

In 2017, sampling for the Indexing Survey was conducted in six different sections of the Peace River mainstem located between Peace Canyon Dam (PCD) and the Many Islands area in Alberta. All large-bodied fish were monitored; however, the monitoring program focused on seven indicator species of most interest to regulatory agencies, comprising the following: Arctic Grayling, Bull Trout, Burbot, Goldeye (*Hiodon alosoides*), Mountain Whitefish, Rainbow Trout, and Walleye. Fish were sampled by boat electroshocking within nearshore habitats (less than approximately 2.0 m depth). Length, weight, and ageing structures were collected from all captured indicator species except Burbot. Depending of fish size and sample session, captured indicator species were marked with half-duplex (HDX) Passive Integrated Transponder (PIT) tags. For species with sufficient mark-recapture data, population abundance was estimated using a Bayes sequential model (conducted by W.J. Gazey Research). Other fish population metrics analyzed included survival, length-at-age, and body condition. These metrics were compared to results from 2002 to 2016 and to select environmental parameters. In 2017, these parameters were limited to Peace River discharge and water temperature values; however, the list

of parameters tested could be expanded during subsequent study years to include those deemed most likely to influence local fish populations (e.g., primary or secondary productivity, recreational angling pressure, water quality).

A synthesis model was populated with Mountain Whitefish mark-recapture data by W.J. Gazey Research. The age-structured stochastic model was developed by Gazey and Korman (2016) and was updated to include 2017 data in addition to historical data from 2002 to 2016. The model synthesised length-at-age, incremental growth from release-recapture occurrences, length-frequency, and mark-recapture data, and evaluated the consistency of assumed population dynamics with historical data. Demographic parameter estimates from the model were expected to be more accurate and precise than separate analyses (e.g., separate analyses of growth and abundance) because appropriate population dynamics and all available information were used by the model. The synthesis model provides an effective mechanism for monitoring the Mountain Whitefish population because new data may require alterations to the model to improve the fit to the data, which enhances knowledge of population dynamics. Additionally, the synthesis model can assist impact assessments through identification of parameters that can be reliably predicted or can identify additional data required to obtain reliable predictions.

Overall, results from 2017 indicate a stable fish population in the Peace River, with most metrics for most species falling within the ranges of values recorded during previous study years. Key results from the 2017 survey, which was conducted between 21 August and 4 October, as well as key trends observed over the 16-year monitoring period are summarized as follows:

- In 2017, water levels in the Peace River were within historical bounds (2002–2016) with the exception of an extended low flow period from mid-April to mid-July. During this time, flows were below average and either approached or attained historical minimum mean daily discharge levels. During the 2017 sample period, flows were consistently above the seasonal historical average and approached historical seasonal maximums on occasions. Overall, flows were relatively stable during the 2017 sample period and did not exhibit the large fluctuations that were recorded during the 2016 survey period.
- Arctic Grayling abundance in Section 3 was estimated at 309 individuals. Confidence intervals surrounding the estimate were wide (95% Highest Probability Density = 95 and 649 individuals). Abundance in other sections could not be determined. Overall, 2017 abundance was similar to recent study years (i.e., 2016), but lower than estimates generated in historical study years (i.e., 2007–2008).
- Catch rates for Arctic Grayling generally declined from approximately 15 fish/km/h in 2007 to 5 fish/km/h in 2014, a decline of approximately 66%. Rates increased to approximately 9 fish/km/h between 2014 and 2016, an increase of approximately 26%. Catch rates were similar in 2016 and 2017. The increase observed between 2014 and 2016 was likely spurred by strong recruitment from the 2014 brood year.
- Overall, neither Bull Trout population abundance estimates nor catch-per-unit-effort suggested significant or sustained changes in the abundance between 2002 and 2017.Population abundance estimates for Bull Trout were approximately 4.9 times higher in Section 3 (621 individuals) than in all other sections (average of 128 individuals). This pattern of distribution was not consistent with 2016 results; however, confidence intervals surrounding Bull Trout abundance estimates for Section 3 are generally wide and in 2017, ranged between 208 to 1239 individuals (95% Highest Probability Density).

- In 2017, Bull Trout body condition (0.984 K all sections combined) was lower than values recorded between 2002 and 2016 (1.033 K all sections and years combined). Condition is typically highest in Section 1 (1.072 K in 2017) when compared to all other sections (0.964 K in 2017 for all other sections combined).
- Both Arctic Grayling and Mountain Whitefish species exhibited length-at-age metrics in 2017 that were similar to 2002 to 2013 values. This suggests that the favourable growing conditions present in the Peace River study area from 2014 to 2016 were not present in 2017.
- Six Burbot were captured in 2017. Between 2002 and 2015, Burbot catch ranged between 0 and 6 individuals. The high number of Burbot recorded in 2016 (*n* = 37) was an anomaly and may have been due in part to higher water turbidity levels present during the 2016 survey period.
- Population abundance estimates for Largescale Sucker (*Catostomus macrocheilus*) in 2017 were 7282 for Section 3, 4090 for Section 6, and 829 for Section 7. All three estimates were uncertain due to wide confidence intervals, but were similar to estimates generated in 2015 and 2016 (i.e., the only other years this species was tagged).
- Longnose Sucker (*Catostomus catostomus*) population abundance estimates were similar in 2015, 2016, and 2017, suggesting a stable population over the long-term.
- Three Goldeye were captured during the 2017 survey. All three were adults based on their size and were recorded in Section 9 (i.e., near Many Islands in Alberta). Goldeye were not recorded prior to the 2015 survey, when 1 individual was captured. Eight individuals were captured in 2016. Goldeye are a seasonal resident to the study area. Their captures during the August-October study period is variable and dependant on the timing of the species' post-spawning downstream migration.
- Overall (all sections combined), the 2017 Mountain Whitefish population abundance was estimated at 55,113 individuals and was similar to 2016 for all sections except Section 6, which was substantially lower in 2017 (*n* = 6857) when compared to 2016 (*n* = 15,483). Overall (all years combined), the Mountain Whitefish population in the Peace River has been stable since 2002, with the exception of a notable increase in 2010 that was due to strong recruitment from the 2007 brood year.
- Results from the Mountain Whitefish synthesis model indicate that changes to electroshocker settings first implemented in 2014 have resulted in differences in selectivity for this species, with more small fish (i.e., fish less than 250 mm FL) and less large fish being caught from 2014 to 2017. Abundance estimates generated using the synthesis model were similar to estimates generated using the Bayes sequential model for most study years and sections. Generally, the synthesis model provided slightly higher estimates with more confidence. Recruitment estimates generated by the synthesis model were not precise and exhibited large variation among study years; however, estimates from the model may improve as additional years of data are added to the model.
- Fin rays were collected from all captured Northern Pike. Assigned ages based on these structures varied widely between analysts and were considered unreliable. Fin rays are not the preferred structure for ageing Northern Pike. Cleithra may be required to properly assess the age structure of the Northern Pike population in the study area. The collection of cleithra requires lethal sampling.

- The Rainbow Trout catch in 2017 (*n* = 122) was similar to 2015 (*n* = 129), but lower than 2016 (*n* = 186). Rainbow Trout are more common in downstream sections, which have only been sampled since 2015. Additional years of data are required to adequately identify long-term trends for this species.
- In 2017, Walleye abundance was estimated at 1299 individuals for Section 7 and 2150 individuals for Section 6. Confidence intervals were wide around both estimates. Insufficient data prevented the generation of abundance estimates for Walleye during all prior study years; therefore, long-term trends in abundance could not be assessed.
- In its current form, the program is unlikely to yield high enough catches to produce estimates of absolute abundance that are precise enough to detect changes over time for Burbot, Goldeye, Northern Pike, Rainbow Trout, Walleye, and White Sucker (*Catostomus commersonii*).

Data collected from 2002 to 2017 represent the baseline, pre-Project state of the Peace River fish community. Management hypotheses will be statistically tested after the river diversion phase of Project construction (i.e., after 2020).

Table E1: Status of Peace River Large Fish Indexing Survey hypotheses after Year 3 (Mon-2, Task 2a).

Mon-2 Management Question	Management Hypotheses Relevant to Task 2a	Year 3 (2017) Status
How does the Project affect fish in the Peace River between the Project and the Many Islands area in Alberta during the short (10 years after Project operations begin) and longer (30 years after Project operations begin) term?	**H_1:** Post-Project total fish biomass in the Peace River between the Project and the Many Islands area in Alberta will be less than pre-Project conditions (current = 37.42 t; at 10 years of operations = 30.78 t; >30 years of operations = 30.79 t).	The hypothesis has not been tested. Methodologies employed under Task 2a have been similar to those employed during pre-Project baseline studies. Data collected to date are consistent with baseline data and should allow comparisons between pre-Project data and data collected during construction and operation. Biomass estimates of less common species (e.g., Lake Trout, Burbot, Lake Whitefish) will be less certain, due to the wide credibility of abundance estimates, but consistent with pre-Project estimates.
	H_2: Post-Project harvestable fish biomass in the Peace River between the Project and the Many Islands area in Alberta will be greater than pre-Project estimates of harvestable fish biomass (current = 13.93 t; at 10 years of operations = 18.77 t; >30 years of operations = 18.78 t).	The hypothesis has not been tested. Methodologies employed under Task 2a have been similar to those employed during pre-Project baseline studies. Data collected to date are consistent with baseline data and should allow comparisons between pre-Project data and data collected during construction and operation. Biomass estimates of less common harvestable species (e.g., Lake Trout, Burbot, Lake Whitefish) will be less certain, due to the wide credibility of abundance estimates, but consistent with pre-Project estimates.
	H_3: Post-Project biomass of each fish species in the Peace River between the Project and the Many Islands area in Alberta will be consistent with biomass estimates in the EIS.	The hypothesis has not been tested. Methodologies employed under Task 2a have been similar to those employed during pre-Project baseline studies. Data collected to date are consistent with baseline data and should allow comparisons between pre-Project data and data collected during construction and operation for most fish species. It is unlikely that the survey, in its current format, will generate estimates that are precise enough to detect population-level changes of less common indicator species, most notably Burbot and Goldeye.

Mon-2 Management Question	Management Hypotheses Relevant to Task 2a	Year 3 (2017) Status
	H_4: Changes in post-Project fish community composition in the Peace River between the Project and the Many Islands area in Alberta will be consistent with EIS predictions.	The hypothesis has not been tested. To date, diversity profiles show distinct differences in fish community structure between sample sections and in its current format, the survey is expected to provide data capable of testing this hypothesis.
	H_5: The fish community can support angling effort that is similar to baseline conditions.	The hypothesis has not been tested. The survey, in its current format, is expected to generate species abundance estimates of harvestable fish species. These estimates, in conjunction with angling pressure data generated by the Peace River Creel Survey (Mon-2, Task 2c) will be used to test the hypothesis.
	H_6: Indicator fish species will use the Site C offset habitat areas in the Peace River between the Project and the Many Islands area in Alberta for rearing, feeding, and/or spawning as shown in Table 2.	The hypothesis has not been tested and is not expected to be tested under this program. Data collected from offset areas and adjacent areas under this survey are provided to Site C Offset Effectiveness Monitoring for analysis and interpretation. This hypothesis will be tested as part of Site C Offset Effectiveness Monitoring.

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Brian Lucko	Grande Prairie, AB
Adrian Meinke	Grande Prairie, AB

The following employees of **GOLDER ASSOCIATES LTD.** contributed to the collection of data and preparation of this report:

Dustin Ford, RPBio	Project Manager/Author	Shawn Redden, RPBio	Project Director
Gary Ash	Editor	Paul Grutter, RPBio	Senior Fisheries Biologist/Coauthor
Dana Schmidt, RPBio	Senior Fisheries Biologist	David Roscoe	Biologist
Demitria Burgoon	Biologist	Kent Nuspl	Biologist
Kevin Little	Biologist	Sima Usvyatsov	Biological Scientist
Natasha Audy	Biological Technician	Eztiaan Groenewald	Biological Technician
Chris King	Biological Technician	Geoff Sawatzky	Biological Technician
Corby Shurgot	Biological Technician	Jack Yurko	Field Technician
Sean Hollis	Biological Technician	Chloe Denny	GIS Technician
Carrie McAllister	Project Coordinator	Ron Giles	Warehouse Manager (Castlegar)
Devin Dickson	Warehouse Manager (Fort St. John)		

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Description
Project	Site C Clean Energy Project
EIS	Environmental Impact Statement
EAC	Environmental Assessment Certificate
Indexing Survey	Peace River Large Fish Indexing Survey
Mon-2	Peace River Fish Community Monitoring Program
FAHMFP	Fisheries and Aquatic Habitat Monitoring and Follow-up Program
PCD	Peace Canyon Dam
WLR	Water License Requirements
PUP	Park Use Permit
GPP	Generator Powered Pulsator
SIA	Stable Isotope Analysis
DELT	Deformities, Erosion, Lesions, and Tumor
HDX	Half-Duplex
FDX	Full-Duplex
PIT	Passive Integrated Transponder
CJS	Cormack-Jolly-Seber
AIC	Akaike's Information Criterion
ADMB	AD Model Builder
HPD	Highest Probability Density
HSD	Honest Significant Difference

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1.0 INTRODUCTION

Potential effects of the Site C Clean Energy Project (the Project) on fish[1] and fish habitat[2] are described in Volume 2 of the Project's Environmental Impact Statement (EIS) as follows[3]:

> The Project has the potential to affect fish habitat in two ways. The Project may destroy fish habitat by placing a permanent physical structure on that habitat, or the Project may alter fish habitat by changing the physical or chemical characteristics of that habitat in such a way as to make it unusable by fish. Destruction or alteration of important habitats may be critical to the sustainability of a species population.
>
> The Project may affect fish health and survival. It may cause direct mortality of fish or indirect mortality of fish by changing system productivity, food resource type and abundance, and environmental conditions on which fish depend (e.g., water temperature).
>
> The Project may affect fish movement by physically blocking upstream and downstream migration of fish or by causing water velocities that exceed the swimming capabilities of fish, which results in hindered or blocked upstream migration of fish. Blocked or hindered fish movement has consequences to the species population. Fish may not be able to access important habitats in a timely manner or not at all (e.g., spawning habitats). Blocked fish movement may result in genetic fragmentation of the population.

Condition No. 7 of the Project's Provincial Environmental Assessment Certificate (EAC), Schedule B states the following:

> The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program [FAHMFP] 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 [Qualified Environmental Professional] or FLNRO [BC Ministry of Forests, Lands and Natural Resource Operations], to assess the need to adjust those measures to adequately mitigate the Project's effects.

Furthermore, the Project's Federal Decision Statement states that a plan should be developed that addresses the following:

> Condition No. 8.4.3: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area (LAA); and
>
> Condition No. 8.4.4: 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.

The intent of the Peace River Large Fish Indexing Survey (hereafter, Indexing Survey), as described in Appendix C (Peace River Fish Community Monitoring Program; Mon-2) of the Project's FAHMFP (BC Hydro 2015a), is to "monitor the response of large-bodied fish species in the Peace River to the Project". Large-bodied fish species include sportfish and sucker species (Mainstream 2012). The Indexing Survey is designed to provide supporting data to address the EAC and Federal Decision Statement conditions detailed above. Specifically, the Indexing Survey represents Task 2a of the Peace River Fish Community Monitoring Program (Mon-2) within the FAHMFP.

The Indexing Survey will monitor the response of large-bodied fish species to the Project over the short (10 years after Project operations begin) and longer term (30 years after the Project operations begin). In 2017, the monitoring program focused on collecting data that quantified the relative and absolute abundances and spatial distribution of seven indicator species. The seven indicator species included Arctic Grayling (*Thymallus arcticus*),

[1] Fish includes fish abundance, biomass, composition, health, and survival.
[2] Fish habitat includes water quality, sediment quality, lower trophic levels (periphyton and benthic invertebrates), and physical habitat.
[3] EIS, Volume 2, Section 12.1.2 (BC Hydro 2013).

Bull Trout (*Salvelinus confluentus*), Burbot (*Lota lota*), Goldeye (*Hiodon alosoides*), Mountain Whitefish (*Prosopium williamsoni*), Rainbow Trout (*Oncorhynchus mykiss*), and Walleye (*Sander vitreus*). These species were identified in local provincial management objectives (BC Ministry of Environment 2009; BC Government 2011) as species of interest to recreational anglers and harvested by Aboriginal groups, and were the focus of the Project's EIS effects assessment (BC Hydro 2013). In 2017, the program also collected genetic, diet, and tissue samples from select individuals. These samples were provided to BC Hydro and will be used to further characterize Peace River fish populations under other aspects of the Site C FAHMFP. The analysis and interpretation of these samples is not discussed in this report.

In 2008, BC Hydro implemented the Peace River Fish Index (GMSMON-2), an annual program designed to monitor Arctic Grayling, Bull Trout, and Mountain Whitefish populations in the Peace River downstream of Peace Canyon Dam (PCD) and their responses to instream physical works designed to improve fish habitat in select side channel areas (Mainstream and Gazey 2009–2014; Golder and Gazey 2015). Data collected under GMSMON-2 and its predecessor, the Peace River Fish Community Indexing Program (P&E 2002; P&E and Gazey 2003; Mainstream and Gazey 2004–2008), provide a continuous dataset for the fish community within the study area beginning in 2001 that can be compared to data collected during the current monitoring program (Golder and Gazey 2016–2017). Changes in methodologies, objectives, and study areas over 17 years of sampling limits the compatibility of some aspects of the dataset.

1.1 Key Management Question

The overarching management question for the Peace River Fish Community Monitoring Program is as follows:

1) How does the Project affect fish in the Peace River between the Project and the Many Islands area in Alberta during the short (10 years after Project operations begin) and longer (30 years after Project operations begin) term?

1.2 Management Hypotheses

The Peace River Fish Community Monitoring Program's overarching management question will be addressed by testing a series of management hypotheses that are based on predictions made in the Project's EIS. These predictions are summarized in Mon-2 of the FAHMFP as presented in the Table 1.

Management hypotheses detailed within the Peace River Fish Community Monitoring Program that will be tested using data collected under the Indexing Survey are as follows:

H_1: Post-Project total fish biomass in the Peace River between the Project and the Many Islands area in Alberta will be less than pre-Project conditions (current = 37.42 t; at 10 years of operations = 30.78 t; >30 years of operations = 30.79 t).

H_2: Post-Project harvestable fish biomass in the Peace River between the Project and the Many Islands area in Alberta will be greater than pre-Project estimates of harvestable fish biomass (current = 13.93 t; at 10 years of operations = 18.77 t; >30 years of operations = 18.78 t).

H_3: Post-Project biomass of each fish species in the Peace River between the Project and the Many Islands area in Alberta will be consistent with biomass estimates in the EIS.

H_4: Changes in post-Project fish community composition in the Peace River between the Project and the Many Islands area in Alberta will be consistent with EIS predictions.

H_5: The fish community can support angling effort that is similar to baseline conditions.

H_6: Indicator fish species will use the Site C offset habitat areas in the Peace River between the Project and the Many Islands area in Alberta for rearing, feeding, and/or spawning as shown in Table 2.

Table 1: Short- and longer- term predictions of fish biomass (t) for pre- and post-Project conditions for the Peace River from the Project to the Many Islands area in Alberta. Fish biomass is presented for the "Most Likely" scenario (plus a minimum to maximum range). Data summarized from Mon-2 of the FAHMFP (BC Hydro 2015a).

Species Group	Species Name	Pre-Project Biomass (t)	Post-Project Biomass (t)			
			Short Term (in 10 Years)		Longer Term (> 30 Years)	
			Most Likely	Range	Most Likely	Range
1	Walleye	3.38	1.69	0.34 - 1.69	1.69	0.34 - 1.69
	Lake Trout	0.00	0.00	0.00 - 0.01	0.00	0.00 - 0.01
	Rainbow Trout	0.17	0.35	0.17 - 0.35	0.35	0.17 - 0.35
	Northern Pike	0.74	0.37	0.37 - 0.74	0.37	0.37 - 0.74
	Burbot	0.10	0.05	0.01 - 0.05	0.05	0.01 - 0.05
Group 1 Subtotal		**4.39**	**2.46**	**0.89 - 2.83**	**2.46**	**0.89 - 2.83**
2	Bull Trout	1.49	1.23	1.23 - 2.54	1.23	1.23 - 2.54
	Arctic Grayling	0.64	0.32	0.06 - 0.64	0.32	0.06 - 0.64
	Mountain Whitefish	7.38	14.74	14.74 - 14.74	14.74	14.74 - 14.74
Group 2 Subtotal		**9.50**	**16.29**	**16.03 - 17.91**	**16.29**	**16.03 - 17.91**
3	Kokanee	0.03	0.01	0.00 - 0.02	0.03	0.01 - 0.04
	Lake Whitefish	0.00	0.01	0.00 - 0.01	0.00	0.00 - 0.01
Group 3 Subtotal		**0.03**	**0.02**	**0.01 - 0.03**	**0.03**	**0.01 - 0.04**
Total Harvestable Fish Biomass		**13.93**	**18.77**	**16.94 - 20.78**	**18.78**	**16.94 - 20.79**
4	Sucker species	21.74	10.87	10.87 - 10.87	10.87	10.87 - 10.87
	Small-bodied Fish	0.87	0.70	0.43 - 0.87	0.70	0.43 - 0.87
	Northern Pikeminnow	0.87	0.44	0.26 - 0.52	0.44	0.26 - 0.52
Group 4 Subtotal		**23.49**	**12.01**	**11.57 - 12.27**	**12.01**	**11.57 - 12.27**
Total Fish Biomass		**37.42**	**30.78**	**28.50 - 33.05**	**30.79**	**28.50 - 33.06**

The Site C offset habitat areas identified in Table 2 are described in detail in BC Hydro (2015b, 2015c) and are monitored under the Site C Offset Effectiveness Monitoring (Mon-2, Task 2d) within the FAHMFP. At the time of the 2017 field program, the River Road Rock Spurs and Upper Site 109L habitat areas had been completed. Lower Site 109L, Main Channel Bar Excavation, and Side Channel Site 108R have not been constructed yet. Site C Offset Effectiveness Monitoring (BC Hydro 2015b, 2015c) details both site-scale and reach-scale monitoring, both of which are presented under separate cover (e.g., Golder 2018a). While data for Offset Effectiveness Monitoring were collected in conjunction with Indexing Survey data, results from these data are not presented or included in Indexing Survey analyses.

Table 2: Expected fish use of proposed offsetting locations in the Peace River between the Project and the Many Islands area in Alberta (compiled from BC Hydro 2015b, 2015c).

Location	Species				
	Arctic Grayling	Bull Trout	Mountain Whitefish	Rainbow Trout	Walleye
River Road Rock Spurs	R[a], F	F	R, F	R, F	
Upper Site 109L	R	F	R, F, S	R, F	F
Side Channel Site 108R	R, F		R, F	R, F	
Main Channel Bar Excavation	R, F	R, F	R, F	F	F
Lower Site 109L	R	F	R, F, S	R, F	F

[a] R = rearing; F = feeding; and S = habitat suitable for spawning.

1.3 Study Objectives

The objective of the Indexing Survey is to validate predictions and address uncertainties identified in the EIS regarding the Project's effects on fish in the Peace River and to assess the effectiveness of fish and fish habitat mitigation measures. The purpose of the Indexing Survey is to monitor the response of large-bodied fish species in the Peace River to the construction and operation of the Project. The Indexing Survey will build on data previously collected under BC Hydro's WLR (Water License Requirements) Peace River Fish Index (GMSMON-2), and its predecessor the Peace River Fish Community Indexing Program. Objectives of GMSMON-2 (BC Hydro 2008), which also apply to the current Indexing Survey, are as follows:

1) Collect a time series of data on the abundance, spatial distribution, and biological characteristics of nearshore and shallow water fish populations in the Peace River that will build on previously collected data.

2) Build upon earlier investigations for further refinement of the sampling strategy, sampling methodology, and analytical procedures required to establish a long-term monitoring program for fish populations.

3) Identify gaps in data and understanding of current knowledge about fish populations and procedures for sampling.

1.4 Study Area And Study Period

The study area for the Indexing Survey includes an approximately 205 km section of the Peace River from near the outlet of PCD (river kilometre [River Km] 25 as measured downstream from WAC Bennett Dam) downstream to the Many Islands area in Alberta (River Km 230; Figure 1). The spatial extent of the program is consistent with the spatial boundaries for the effects assessment in the EIS, which was guided by physical modelling and fisheries studies.

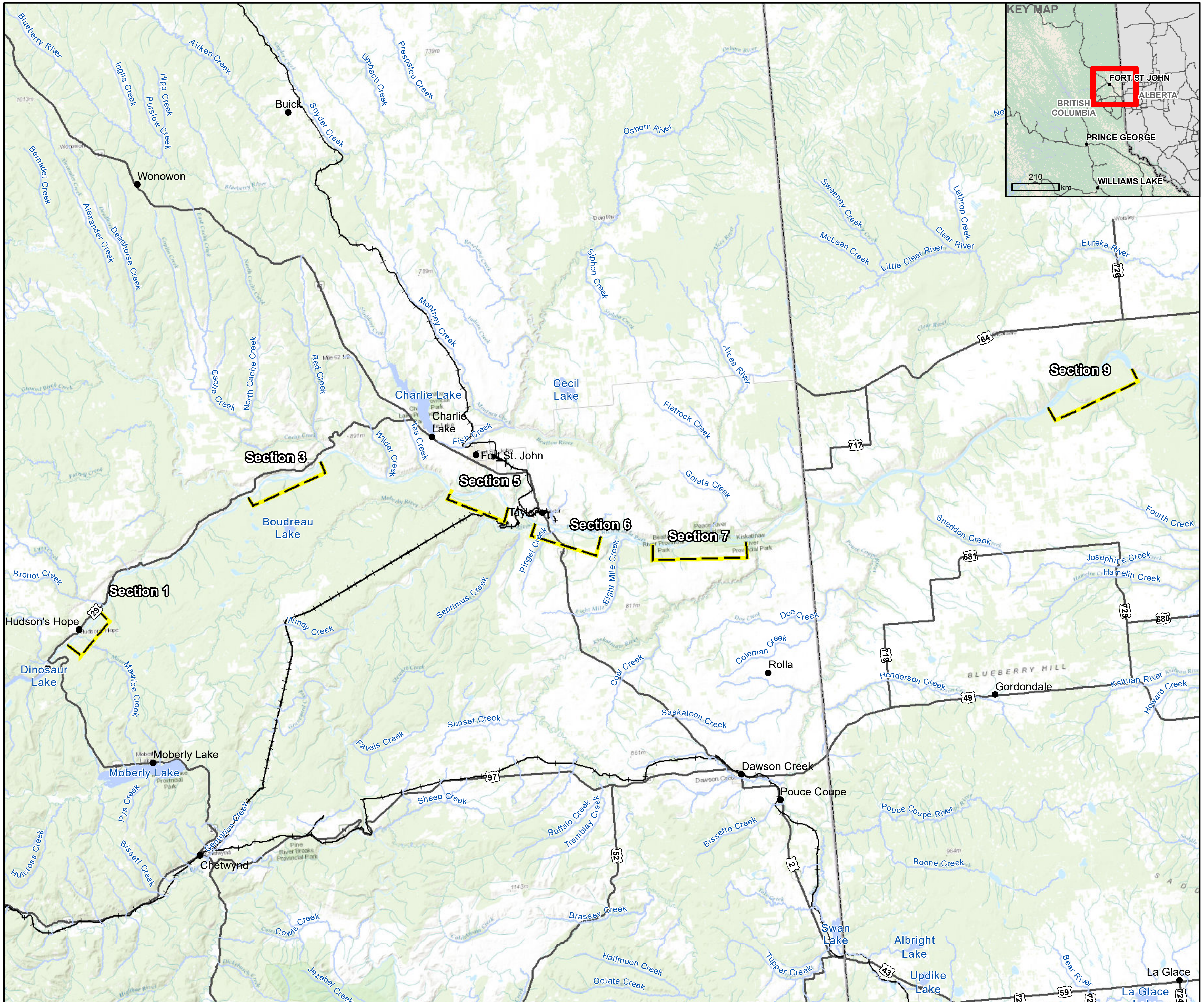
The mainstem of the Peace River between PCD and the Many Islands area in Alberta was delineated into various sections (Table 3) using information provided by Mainstream (2012). The upstream extent of Section 5 was moved approximately 5 km downstream relative to Mainstream's classification to more closely align with the location of the Project, as described below. The most downstream approximately 2 km of the Pine River was included in the study area and sampled as part of Section 6. The most downstream approximately 0.5 km of the Beatton River was included in the study area and sampled as part of Section 7. A summary of historical datasets by section, year, study period, and effort (number of days of sampling) are detailed in Appendix B, Table B1.

Table 3: Location and distance from WAC Bennett Dam of Peace River sample sections as delineated by Mainstream (2012) with the exception of Section 5.

Section Number	Location	River Kilometre[a]		Number of Sites sampled in 2017
		Upstream	Downstream	
1a	Peace River Canyon area	20.4	25.0	0
1	Downstream end of Peace River Canyon to the Lynx Creek confluence area	25.0	34.0	15
2	Lynx Creek confluence area downstream to the Halfway River confluence area	34.0	65.8	0
3	Halfway River confluence area downstream to the Cache Creek confluence area	65.8	82.1	15
4	Cache Creek Confluence area downstream to the Moberly River confluence area	82.1	105.0	0
5[b]	Moberly River confluence area downstream to near the Canadian National Railway bridge	105.0	117.7	15
6	Pine River confluence area downstream to the Six Mile Creek confluence area	121.5	134.0	18
7	Beatton River confluence area downstream to the Kiskatinaw River confluence area	140.0	158.0	18
8	Pouce Coupe River confluence area downstream to the Clear River confluence area	174.0	187.7	0
9	Dunvegan West Wildland Provincial Park boundary downstream to Many Islands Park	217.5	231.0	16

[a] River Km values as measured from the base of WAC Bennett Dam (River Km 0.0).
[b] The upstream delineation of Section 5 was moved approximately 5 km downstream to more closely align with the location of the Project.

Similar to project years 2015 and 2016, Sections 1a, 2, 4, and 8 were excluded from the 2017 program for several reasons, including the following: the limited amount of historical data available for these sections, the short lineal length of river they represent (Section 1a only), low historical catch rates (e.g., Mainstream 2010, 2011, 2013), and the similarity of their habitats relative to adjacent sections. A summary of effort by section and year is provided in Appendix B, Table B1. As detailed in the FAHMFP, only Sections 1, 3, 5, 6, 7, and 9 (Appendix A, Figures A1 to A6, Table A1) were selected for long-term monitoring under Mon-2, Task 2a. Sections 1 and 3 are situated upstream of the Project and are scheduled to be sampled under the current program until the reservoir filling stage of the Project’s development in 2023 (Construction Year 9). These sections will be sampled to monitor potential effects of construction (i.e., creation of the headpond and river diversion) on the Peace River fish community. Sections 5, 6, 7, and 9 are scheduled to be sampled annually under the current program until 2053 (Operation Year 30).



LEGEND

- PLACE NAME
- SECTION
- DAM SECTION
- PROVINCIAL BOUNDARY
- WATERCOURSE
- WATERBODY
- RAILWAY
- ROAD

0 10 20

1:625,000 METRES

REFERENCES

1. TRANSPORTATION, RAILWAY, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. DAM SITE OBTAINED FROM FROM GEOBASE®.
3.SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
BC HYDRO

PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

TITLE
OVERVIEW OF THE PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A) STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2019-01-09
DESIGNED	DF
PREPARED	CD
REVIEWED	DF
APPROVED	SR

PROJECT NO.	PHASE	REV.	FIGURE
1670320	2011	0	1

During most historical study years, the same sites were sampled within each section. Sites sampled in 2017 were identical to sites sampled in 2016 (Golder and Gazey 2017) with the exception of some Section 7 sites.

Three provincial parks are situated within Section 7: Beatton River Provincial Park, Peace River Corridor Provincial Park, and the Kiskatinaw River Protected Area. Of the 19 different sites established in Section 7 during baseline studies (Mainstream 2010, 2011, 2013), 11 were located within park boundaries. Under the *Park Act*, a Park Use permit (PUP) is required from BC Parks for research activities that take place within parks and protected areas. A PUP was not received for the 2015 or 2016 field programs and in lieu of sampling within park boundaries, 11 synoptic sites outside park boundaries but within Section 7 were sampled. A PUP for Beatton River Provincial Park and Peace River Corridor Provincial Park was received prior to the 2017 field program. Baseline sites located within these two parks were sampled in 2017. A PUP for the Kiskatinaw River Protected area was not available prior to the 2017 field season; a single baseline site located within this protected area was not sampled in 2017. The Kiskatinaw River is a known feeding area for Walleye and Goldeye (Mainstream 2010, 2011, 2013).

Overall, 97 sites were sampled within the six sections (Appendix A, Figures A1 to A6). The length of sites varied from 220 to 1900 m and consisted of the nearshore area along a bank of the river. The two sites in the Pine River were 1000 and 1500 m in length, and the two sites in the Beatton River were 430 and 600 m in length. Site descriptions and UTM locations for all 97 sites are included in Appendix A, Table A1.

Field crews sampled each site six times (i.e., six sessions) over the study period (Table 4). A sample is defined as a single pass through a site while boat electroshocking (see Section 2.1.4).

Each sample session took between 5 and 11 days to complete. Each section within each session was sampled over 1 to 4 days. During some sessions, two crews worked in single sections, but at different sites, simultaneously.

Table 4: Summary of boat electroshocking sample sessions conducted in the Peace River, 2017.

Session	Start Date	End Date	Section					
			1	3	5	6	7	9
1	21 Aug	29 Aug	21–23 Aug	23–27 Aug	26, 28 Sep	21–23 Aug	23–25 Aug	27–29 Aug
2	29 Aug	4 Sep	29–30 Aug	31 Aug, 1–2 Sep	3–4 Sep	29–31 Aug	31 Aug, 2 Sep	3–4 Sep
3	4 Sep	12 Sep	5–6 Sep	7–9 Sep	10, 12 Sep	4–6 Sep	7–8 Sep	9–11 Sep
4	12 Sep	23 Sep	12–13 Sep	14–17 Sep	17, 22–23 Sep	13–14 Sep	15–16 Sep	17–18 Sep
5	19 Sep	27 Sep	19 Sep	20–21 Sep	27 Sep	23–25 Sep	25 Sep	26 Sep
6	29 Sep	4 Oct	29 Sep	30 Sep	3 Oct	3–4 Oct	1 Oct	2 Oct

2.0 METHODS

2.1 Data Collection

2.1.1 Discharge

Hourly and five-minute discharge data were obtained from several different Water Survey of Canada[4] gauging stations. Data from Station 07EF001 (Peace River at Hudson Hope) were used to represent discharge in Section 1. Data from Station 07EF001 were combined with data from Station 07FA006 (Halfway River Near Farrell Creek) to represent discharge in Section 3. Data from Station 07FA004 (Peace River Above Pine River) were used to represent discharge in Section 5. Data from Station 07FD002 (Peace River Near Taylor) were used to represent discharge in Section 6. Data from Station 07FD010 (Peace River Above Alces River) were used to represent discharge in Section 7. Accurate discharge data for Section 9 were not available due to the locations of the nearest Peace River gauging stations relative to the inflow points of several large unmonitored tributaries. Unless indicated otherwise, discharges throughout this report are presented as cubic metres per second (m^3/s).

2.1.2 Water Temperature

Hourly water temperatures for 2017 for the Peace River were obtained from the Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9) within the FAHMFP. Hourly water temperatures for the Peace River prior to 2016 were obtained from BC Hydro's Peace River Baseline TGP/Temperature program (GMSWORKS-2; DES 2017). These data were collected using Onset Tidbit™ temperature data loggers (Model #UTBI-001; accuracy ± 0.2°C). In this report, water temperature data from 2008 to 2017 from three different Peace River stations were used. These included the Peace River downstream of PCD, downstream of the Halfway River, and downstream of the Moberly River. Water temperature data were summarized to provide daily average temperatures. Spot measurements of water temperature were obtained using a handheld Oakton ECTestr 11 meter (resolution 0.1°C; accuracy ± 0.5°C) at all sample sites at the time of sampling and recorded in the Peace River Large Fish Indexing database.

2.1.3 Habitat Conditions

Habitat variables recorded at each site (Table 5) included variables recorded during previous study years (Golder and Gazey 2015–2017) and variables recorded as part of other, similar BC Hydro programs on the Columbia River (i.e., CLBMON-16 [e.g., Golder et al. 2016a] and CLBMON-45 [e.g., Golder et al. 2016b]). These data were collected to provide a means of detecting changes in habitat availability or suitability in sample sites over time. Collected data were not intended to quantify habitat availability or imply habitat preferences.

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). Water clarity was visually estimated and categorized at each site as low (less than 1.0 m depth), medium (1.0 to 3.0 m depth), or high (greater than 3.0 m depth). Where water depths were sufficient, water clarity was also estimated using a "Secchi Bar" that was manufactured based on the description provided by Mainstream and Gazey (2014). Mean and maximum sample depths were estimated by the boat operator based on the boat's sonar depth display.

[4] Available for download at https://www.canada.ca/en/environment-climate-change/services/water-overview/quantity/monitoring/survey.html.

Table 5: Habitat variables and boat electroshocker settings recorded at each site during each sample session in 2017.

Variable	Description
Date	The date the site was sampled
Time	The time the site was sampled
Estimated Flow Category	A categorical ranking of PCD discharge (high; low; transitional) at the time of sampling
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)
Water Surface Visibility	A categorical ranking of water surface visibility (low = waves; medium = small ripples; high = flat surface)
Boat Model	The model of boat used during sampling
Range	The range of voltage used during sampling (high or low)
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
Length Sampled	The length of shoreline sampled (to the nearest 1 m)
Time Sampled	The duration of electroshocker operation (to the nearest 1 second)
Netter Skill	A categorical ranking of each netters skill level (1 = few misses; 2 = misses common for difficult fish; 3 = misses are common for difficult and easy fish; 4 = most fish are missed)
Observer Skill	A categorical ranking of each observer's skill level (1 = few misses; 2 = misses common for difficult fish; 3 = misses are common for difficult and easy fish; 4 = most fish are missed)
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)
Water Clarity	A categorical ranking of water clarity (High = greater than 3.0 m visibility; Medium = 1.0 to 3.0 m visibility; Low = less than 1 m visibility)
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 instream cover
Crew	The field crew that conducted the sample
Sample Comments	Any additional comments regarding the sample

2.1.4 Fish Capture

Boat electroshocking was conducted at all sites along the channel margin, typically within a range of 0.5 to 2.0 m water depth. Two different three-person crews were employed. Each crew used Smith-Root high-output Generator Powered Pulsator (GPP 5.0) electroshockers (Smith-Root, Vancouver, WA, USA) operated from outboard jet-drive riverboats. The electroshocking procedure consisted of manoeuvring the boat downstream along the shoreline of each sample site. Field crews sampled large eddies (i.e., eddies longer than approximately two boat lengths) while travelling with the direction of water flow. Two crew members, positioned on netting platforms at the bows of the boats, netted stunned fish, while the third individual on each crew operated the boat and electroshocking unit. The two netters on each crew attempted to capture all fish that were stunned by the electrical field. Captured fish were immediately placed into 175 L onboard live-wells equipped with freshwater pumps. Fish were netted one at a time to prevent electroshocking-induced injuries (i.e., fish were not double netted). Fish that were positively identified but avoided capture were enumerated and recorded as “observed”. Netters attempted to collect a random sample of fish species and sizes; however, netters focused their effort on rare fish species (e.g., Arctic Grayling) or life stages (e.g., adult Bull Trout) when they were observed. This approach was employed during previous study years (Mainstream and Gazey 2014; Golder and Gazey 2015-2017) and may cause an overestimate of the catch of these species and life stages; however, by maintaining this approach, the bias remains constant among study years.

Both the time sampled (seconds of electroshocker operation) and length of shoreline sampled (metres; Table 6) were recorded for each sample. The start and end location of each site was established prior to the start of the field program; however, if a complete site could not be sampled, the difference in distance between what was sampled and the established site length was estimated and recorded on the site form. This revised site length was used for that session in the subsequent analyses. Reasons for field crews not being able to sample an entire site’s length included public on shore, beavers swimming in a site, and shallow water depths preventing boat access.

Table 6: Number and lengths of sites sampled by boat electroshocking in 2017.

Section	Number of Sites	Site Length (m)		
		Minimum	Average	Maximum
1	15	500	860	1200
3	15	950	1338	1900
5	15	530	872	1280
6	18	400	977	1500
7	18	220	922	1400
9	16	260	977	1200

Each boat electroshocking unit was operated at a frequency of 30 Hz with pulsed direct current. Amperage was adjusted as needed to achieve the desired effect on fishes, which was the minimum level of immobilization that allowed efficient capture and did not cause undesired outcomes such as immediate tetany or visible hemorrhaging (Martinez and Kolz 2009). An amperage of 2.8 A typically produced the desired effect on fishes; however, amperage was set as low at 2.0 A and as high as 4.2 A at some sites based on local water conditions and the electroshocking unit employed.

The electroshocker settings used in 2014 to 2017 were different when compared to the settings employed during previous study years (Mainstream and Gazey 2004–2014). Prior to 2014 (i.e., the 2002–2013 epoch), higher frequencies and higher amperages were used. The settings used from 2014 to 2017 (i.e., the 2014–2017 epoch) were observed to result in less electroshocking-induced injuries on large-bodied Rainbow Trout in the Columbia River (Golder 2004, 2005) and align with recommendations by Snyder (2003) for pulsed direct current and low frequencies for adult salmonids. Reducing the impacts of sampling will help ensure the long-term sustainability of the monitoring program.

Although electrical output varies with water conductivity, water depth, and water temperature, field crews attempted to maintain electrical output at similar levels for all sites over all sessions.

2.1.5 Ageing

Scale samples were collected from all captured Arctic Grayling, Goldeye, Kokanee (*Oncorhynchus nerka*), Mountain Whitefish (with the exceptions detailed in Section 2.1.8), and Rainbow Trout. Fin ray samples were collected from all initially captured Bull Trout, Goldeye, Lake Trout (*Salvelinus namaycush*), Northern Pike (*Esox lucius*), and Walleye. Otoliths were collected opportunistically from Mountain Whitefish that succumbed to sampling. Ageing structures (i.e., scales, fin rays, and/or otoliths) were collected in accordance with the methods outlined in Mackay et al. (1990). All ageing structure samples were stored in appropriately labelled coin envelopes and archived for long-term storage for BC Hydro.

Scales were assigned an age by counting the number of growth annuli present on the scale following procedures outlined by Mackay et al. (1990). Scales were temporarily mounted between two slides and examined using a microscope. Where possible, several scales were examined, and the highest quality scale was photographed using a 3.1-megapixel digital macro camera (Leica EC3, Wetzlar, Germany) and saved as a JPEG-type picture file. All scale images were linked to the Peace River Large Fish Indexing Database and provided to BC Hydro (referred to as Attachment A). All scales were examined independently by two experienced individuals, and ages were assigned. If the assigned ages differed between the two examiners, the sample was re-examined by a third examiner. If there was agreement between two of three examiners, then the consensus age was assigned to the fish. If there was not agreement between two of three examiners, then the sample was rejected and the fish was not assigned an age.

Fin rays were aged by counting the number of growth annuli present on the fin ray following procedures outlined in Mackay et al. (1990). For Walleye, procedures detailed by Watkins and Spencer (2009) were implemented. 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 used prior to 2017 (Gesswein Canada, Toronto, Canada). The cross-sections were permanently mounted on a microscope slide using a clear coat nail polish and examined using a microscope. Where possible, several fin ray cross-sections were examined, and the cross-section with the most visible annuli was aged. All fin rays were examined independently by two experienced individuals. If the assigned ages differed between the two examiners, the sample was re-examined by a third examiner. If there was agreement between two of three examiners, then the consensus age was assigned to the fish. If there was not agreement between two of three examiners, then the sample was rejected and the fish was not assigned an age.

While assigning ages, examiners were aware of the species of each sample but did not have other information about the fish, such as body size or capture history. Goldeye were assigned ages using fin ray samples only based on the results of Golder and Gazey (2017).

Ages were assigned to all Arctic Grayling, Bull Trout, Northern Pike, and Rainbow Trout that were captured, except in cases where ageing structures were too poor quality to assign an age. In total, 743 Mountain Whitefish scale samples and 113 Walleye fin rays were analyzed, which represented 12.3% of the total number of Mountain Whitefish captured and 29.1% of the total number of Walleye captured in 2017. Ageing structures from Mountain Whitefish and Walleye aged in 2017 were from randomly selected, initially captured individuals. All Mountain Whitefish scale samples selected for ageing were collected during Session 1 of 2017 (21 to 29 August).

2.1.6 Stomach Content Collection

Stomach content samples will be analyzed under the Peace River Fish Food Organisms Monitoring Program (Mon-7). These samples were collected under the Indexing Survey. Results associated with stomach content samples are not discussed in this report; however, a summary of the sample collection methods are described below.

Stomach contents were collected using gastric lavage (Bowen 1989; Brosse et al. 2002; Baldwin et al. 2003; Budy et al. 2007) from a variety of size classes of Arctic Grayling, Mountain Whitefish, and Rainbow Trout. All samples were collected upstream of the BC-Alberta border (i.e., no samples were collected from Section 9). Samples were collected throughout the six-week study period. In total, 133 samples were collected from 50 Arctic Grayling, 45 Mountain Whitefish, 36 Rainbow Trout, and 2 Longnose Suckers. The two Longnose Sucker samples were opportunistically collected from individuals that succumbed to sampling.

Stomach contents were collected by gastric lavage using an apparatus modified from that described by Light et al. (1983). The apparatus consisted of a pressurised sprayer and wand fitted with a tubing adapter soldered to the adjustable spray nozzle from the bottle. Intravenous tubing and small diameter feeding tubes, both supplied by a veterinary office, were selected to match the mouth opening of the fish.

The sprayer reservoir was filled with river water and pressurised using the hand pump. The free end of the tubing was inserted into the fish's mouth and gently inserted down into the stomach. The fish was held, head down, over a 250 µm mesh sieve to capture discharge during lavage. The flow of water was then opened using the flow control lever on the spray handle. The small diameter of the tubing served to regulate the flow at a pressure that did not damage the internal organs of the fish. Each fish's stomach was flushed with river water for approximately 30 seconds until the water exiting the fish's mouth ran clear. The tubing was gently extracted from the stomach and mouth with the water still flowing to ensure that all stomach contents were flushed from the buccal cavity. Sampled fish were returned to the river. The collected sample was washed from the sieve into a sample container using as little water as possible and the remainder of the container was filled with 70–80% ethanol. The sample container was labelled and recorded in the database. At the end of the field program, all samples were provided to BC Hydro.

2.1.7 Mercury and Stable Isotope Sample Collection

Mercury samples will be analyzed under BC Hydro's Long-term Mercury Monitoring Program, and Stable Isotope Analysis (SIA) samples will be analyzed under other components of Mon-2. In 2017, mercury and SIA samples were collected under the Indexing Survey. Results associated with analysis of these samples are not discussed in this report; however, a summary of the sample collection methods are described below.

Mercury and SIA samples were collected based on protocols developed by Azimuth Consulting Ltd (Randy Baker pers. comm.). Both mercury and SIA samples were collected from the same fish (i.e., samples were paired with separate vials for mercury and SIA samples). For the purposes of collecting mercury and SIA samples, Sections 1 through 9 were combined into three different groups: Sections 1 and 3 combined; Sections 5, 6, and 7 combined; and Section 9. Samples were collected from Arctic Grayling (*n* = 1), Burbot (*n* = 3), Bull Trout (*n* = 63), Goldeye (*n* = 3), Longnose Sucker (*n* = 104), Mountain Whitefish (*n* = 84), Northern Pike (*n* = 10), Rainbow Trout (*n* = 28), Redside Shiner (*Richardsonius balteatus; n* = 1), and Walleye (*n* = 66).

To collect mercury and SIA samples, fish were placed into a 40 L tub with an anesthetic mixture. The anesthetic mixture consisted of clove oil and rubbing alcohol mixed at a ratio of 1:10, which was mixed with the water in the anesthetic bath at a rate of 5 mL per 10 L of water. Once the fish was anaesthetized, a few scales were removed from the left side of the fish just beneath the dorsal fin. Where the scales were removed, a 6 mm biopsy punch (Integra® Miltex®, 33-36, York, PA) was used to extract two tissue plugs, which were temporarily placed on a small plastic board. A small drop of Vetbond™ tissue adhesive (3M Canada, London, ON) was injected into each biopsy wound and the fish was returned to the livewell where it was allowed to recover. After the fish recovered, it was returned to the river. The biopsy tissue plugs were held with clean forceps and a clean stainless-steel scalpel was used to cut the outer skin off of the muscle of each tissue plug. One tissue plug was transferred into a single 6 mL plastic HDPE vial that was pre-labelled for mercury analysis. The second tissue plug was transferred into a second 6 mL HDPE vial that was pre-labelled for SIA analysis. If the sizes of plugs differed, the largest of the two plugs was put into the mercury vial. Vial numbers were recorded in the database. If a fish did not survive the procedure, it was processed according to the lethal sampling procedures detailed below.

For deceased fish, a stainless-steel filleting knife was used to remove a small fillet sample of muscle (approximately 10 to 15 g) from the left side of the fish. Care was taken to minimize collecting any bone or skin with the sample. The tissue sample was placed into a 125 mL Whirl Pac and labelled for mercury analysis. A second 5 to 10 g piece of tissue was placed into a second Whirl Pac and labelled for SIA analysis. Duplicate samples were collected from select mortalities for QA/QC purposes.

Collected tissue samples were placed on ice and transferred to a freezer at the end of each day.

2.1.8 Fish Processing

A site form was completed at the end of each sampled site. Site habitat conditions and the number of fish observed were recorded before the start of fish processing for life history data (Table 7). All captured fish were enumerated and identified to species, and their physical condition and general health were recorded (i.e., any abnormalities were noted). For each captured fish, the severity of deformities, erosion, lesions, and tumor (DELT) were recorded based on the external anomalies categories provided in Ohio EPA (1996). Data collected for each fish in 2017 were consistent with previous study years (e.g., Golder and Gazey 2017).

Table 7: Variables recorded for each fish captured in 2017.

Variable	Description
Species	The species of fish
Age-Class	A general size-class for the fish (e.g., YOY <120 mm FL, Immature <250 mm FL, and Adult ≥250 mm FL)
Length	The fork length of the fish to the nearest 1 mm (total lengths were recorded for Burbot)
Weight	The weight of the fish to the nearest 1 g
Sex and Maturity	The sex and maturity of the fish (determined where possible through external examination)
Ageing Method	The type of ageing structure collected if applicable (i.e., scale, fin ray, otolith)
Tag Colour/Type	The type (i.e., T-bar anchor or PIT tag) or colour (for T-bar anchor tags only) of tag applied or present at capture
Tag Number	The number of the applied tag or tag present at capture
Tag Scar	The presence of a scar from a previous tag application
Fin Clip	The presence of an adipose fin clip (only recorded if present without a tag)
Condition	The general condition of the fish (i.e., alive, dead, or unhealthy)
Preserve	Details regarding sample collection (if applicable)
Comments	Any additional comments regarding the fish

Fish were measured for fork length (FL) or total length (TL; for Burbot only), to the nearest 1 mm and weighed to the nearest 1 g using an A&D Weighing™ (San Jose, CA, USA) digital scale (Model SK-5001WP; accuracy ±1 g). Data were entered directly into the Peace River Large Fish Indexing Database (provided to BC Hydro as Attachment A) using a laptop computer. All sampled fish were automatically assigned a unique identifying number by the database that provided a method of cataloguing associated ageing structures.

All Arctic Grayling, Bull Trout, Burbot, Goldeye, Rainbow Trout, and Walleye that were greater than 149 mm in length and all Lake Trout, Largescale Sucker, Longnose Sucker, Mountain Whitefish, Northern Pike, and White Sucker that were greater than 199 mm in length and in good condition following processing were marked with a half-duplex (HDX) PIT tag (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. All tags and tag applicators were immersed in an antiseptic (Super Germiphene™; Brantford, ON, Canada) and rinsed with distilled water prior to insertion. The size of PIT tag implanted was based on the length of the fish and was the same as other BC Hydro monitoring programs in the Peace River, such as the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c) (Golder 2018b).

- Fish between 150 and 199 mm FL received 12 mm long PIT tags (12.0 mm x 2.12 mm HDX+).
- Fish between 200 and 299 mm FL received 23 mm long 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+).

HDX PIT tags were applied in 2016 and 2017; full-duplex (FDX) PIT tags were applied prior to 2016. The HDX PIT tags applied in 2016 and 2017 are compatible with the PIT arrays installed in the Halfway River watershed as part of the Peace River Bull Trout Spawning Assessment (Mon-1b, Task 2b; Ramos-Espinoza 2018). In 2017, all fish of the targeted species and size were implanted with an HDX tag, including recaptured fish that had previously been implanted with a FDX PIT tag. FDX and HDX tags are incompatible with each other (i.e., they do not interfere with each other); therefore, fish that are double-tagged with both tag types are readable by both the PIT arrays and by handheld tag detectors.

PIT tags were read using a Datamars DataTracer FDX/HDX handheld reader (Oregon RFID, Portland, OR, USA). When fish that had both HDX and FDX tags were scanned, the HDX tag would most often be detected because of its longer read-range, but occasionally only the previous FDX tag was detected. In either case, the fish could be linked to their previous encounter histories in the Peace River Large Fish Indexing Database.

As was done during previous study years, a simplified processing method was used for the more common species during Sessions 5 and 6. During these sessions, fish that did not have a PIT tag at capture were assigned a size category based on fork length (i.e., <150 mm, 150-199 mm, 200–299 mm, ≥300 mm) and were released without recording lengths or weights, collecting scale samples, or implanting PIT tags. This allowed field crews to conduct multiple sessions over a shorter time period by reducing fish handling and fish processing time. During Sessions 5 and 6, this simplified fish processing procedure was used for Mountain Whitefish in Sections 1 and 3, Mountain Whitefish and all sucker species (Largescale Sucker, Longnose Sucker, and White Sucker) in Section 5, and all sucker species in Sections 6 and 7. All other fish species were sampled using the full processing procedure. Due to the low total number of fish captured in Section 9, the full processing procedure was used for all species during all sessions for this section.

To reduce the possibility of capturing the same fish at multiple sites in a single session, fish were released near the middle of the site where they were captured.

2.2 Data Analyses

2.2.1 Data Compilation and Validation

Data for the monitoring program are stored in the Peace River Large Fish Indexing Database, which contains historical data collected under the Large River Fish Indexing Program (P&E 2002; P&E and Gazey 2003; Mainstream and Gazey 2004–2008), the Peace River Fish Index (Mainstream and Gazey 2009–2014; Golder and Gazey 2015), and the Peace River Large Fish Indexing Survey (Golder and Gazey 2016–2017). The database is designed to allow data to be entered directly by the crew while out in the field using Microsoft® Access 2010 software and contains several integrated features to ensure that data are entered correctly, consistently, and completely.

Various input validation rules programmed into the database checked each entry to verify that the data met specific criteria for that particular field. For example, all species codes were automatically checked upon entry against a list of accepted species codes that were saved as a reference table in the database; this feature forced the user to enter the correct species code for each species (e.g., Rainbow Trout had to be entered as “RB”; the database would not accept “RT” or “rb”). Combo boxes were used to restrict data entry to a limited list of choices, which kept data consistent and decreased data entry time. For example, a combo box limited the choices for Cloud Cover to Clear, Partly Cloudy, Mostly Cloudy, or Overcast. The user had to select one of these choices, which decreased data entry time (e.g., by eliminating the need to type out “Partly Cloudy”) and ensured consistency in the data (e.g., by forcing the user to select “Partly Cloudy” instead of typing “Part Cloud” or “P.C.”). The database contained input masks that required the user to enter data in a pre-determined manner. For example, an input mask required the user to enter Sample Time in 24-hour short-time format (i.e., HH:mm:ss). Event procedures ensured data conformed to underlying data in the database. For example, after the user entered life history information for a particular fish, the database automatically calculated the body condition of that fish. If the body condition was outside a previously determined range for that species (based on the measurements of other fish in the database), a message box appeared on the screen informing the user of a possible data entry error. This allowed the user to double-check the species, length, and weight of the fish before it was released. The database also allowed a direct connection between the PIT tag reader (Datamars DataTracer FDX/HDX reader) and the data entry form, which eliminated transcription errors associated with manually recording the 15-digit PIT tag numbers.

The database also included tools that allowed field crews to quickly query historical encounters of tagged fish while the fish was in-hand. This allowed the crew to determine if ageing structures, such as fin rays, had been previously collected from a fish or comment on the status of previously noted conditions (e.g., whether a damaged fin had properly healed). Quality Assurance/Quality Control (QA/QC) was conducted on the database before analyses. QA/QC included checks of capture codes and tag numbers for consistency and accuracy, checks of data ranges, visual inspection of plots, and removal of age-length and length-weight outliers, where applicable.

Various metrics were used to provide background information and descriptive summaries of fish populations. Although these summaries are important, not all of them are presented or specifically discussed in detail in this report. However, these metrics are provided in the appendices for reference purposes and are referred to when necessary to support or discount results of various analyses. Metrics presented in the appendices include the following:

- discharge and water temperature summaries (Appendix C, Figures C1 to C5)
- bank habitat classification types and site lengths by habitat type when applicable (Appendix D, Tables D1 and D2)
- habitat variables recorded at each sample site (Appendix D, Table D3)
- percent composition of sportfish and non-sportfish by study year (Appendix E, Tables E1 and E2)
- catch rates for all sportfish (Appendix E, Table E3) and non-sportfish (Appendix E, Table E4), 2017
- summary of captured and recaptured fish by species and session, 2017 (Appendix E, Table E5)
- length-frequency histograms, age-frequency histograms, length-weight regressions, and catch curve estimates of mortality by year for Arctic Grayling, Bull Trout, Largescale Sucker, Longnose Sucker, Mountain Whitefish, Northern Pike, Rainbow Trout, Walleye, and White Sucker where applicable, 2002 to 2017 (Appendix F, Figures F1 to F41)
- Pairwise comparisons of length-weight regressions between years and section (Appendix F, Tables F1 to F4)

For all figures in this report, sites are ordered by increasing distance from WAC Bennett Dam (River Km 0.0) based on the upstream boundary of each site.

As detailed in Section 1.4 and Appendix B, Table B1, not all sections were sampled during all study years. For figures and statistics related to fish life history (i.e., length, weight, and age), analyses were supplemented, when feasible, with data collected in Sections 6, 7, and 9 under the Peace River Fish Inventory in 2009, 2010, and 2011 (Mainstream 2010, 2011, 2013). The Peace River Fish Inventory employed similar capture techniques during similar times of the year. Because effort differed between the Peace River Fish Inventory and the current program, these data were not included in figures or statistics related to effort or fish counts.

2.2.2 Population Abundance Estimates

A mark-recapture program was conducted on Arctic Grayling, Bull Trout, Largescale Sucker, Longnose Sucker, Mountain Whitefish, Northern Pike, Rainbow Trout, Walleye, and White Sucker over the 2017 study period. Although all species were tagged with the intention of including them in the mark-recapture program, there were insufficient tagged fish captured to generate abundance estimates for Northern Pike, Walleye, and White Sucker.

Similar to 2015 and 2016, PIT tags were applied to all Mountain Whitefish greater than or equal to 200 mm FL during Sessions 1 through 4. Prior to 2015 (i.e., under GMSMON-2), only fish greater than or equal to 250 mm FL were tagged with either T-bar anchor or PIT tags, depending on the study year. The inclusion of fish between 200 and 249 mm FL since 2015 has increased the number of tags available for recapture, thereby increasing the precision of future growth, survival, and abundance estimates. Furthermore, Mountain Whitefish in the 200 to 249 mm FL size range are large enough to fully recruit to the electroshocking gear while still being young enough to estimate ages based on fork lengths. The majority of these fish are age-2. Including age-2 fish capture data in future mark-recapture studies could allow the generation of survival and abundance estimates for specific brood years, which could be used to test for correlations with environmental conditions during early life history and help test the management hypotheses. To maintain consistency with analyses conducted during previous study years, Mountain Whitefish tagged between 200 to 249 mm FL were excluded from the 2017 population abundance models; however, this size range should be included in future analyses as more data from this size range allows comparisons among study years.

In the text that follows, frequent reference is made to the terms “capture probability” and “catchability”. Capture probability is defined as the probability of detecting (i.e., encountering) an individual fish given that it is alive during a sampling event (Otis et al. 1978). For the current study, a sampling event is a sampling day or session within a section (one to four sampling days; Table 4), dependent on the estimation model used. Catchability is defined as the proportion of the population that is captured by a defined unit of effort (Ricker 1975). Under these classical definitions, the two terms are not synonymous. For example, if the number of fish sampled was directly related to the level of effort employed, then sessions with different levels of effort on the same population may have exhibited similar catchabilities but different capture probabilities.

During Sessions 1 through 4, PIT tags were applied to all captured fish of appropriate size and species. In the final two sessions (i.e., Sessions 5 and 6), simplified fish processing procedures were implemented, and PIT tags were not applied to untagged Mountain Whitefish, allowing additional capture effort and recapture of previously tagged fish, which improved the statistical confidence of the estimates. Overall, the program was successful in terms of the number of tags applied and recaptured for Mountain Whitefish but was less successful for all other species including Arctic Grayling, Bull Trout, Rainbow Trout, and sucker species. Therefore, the methods described (diagnostics, population estimation, catchability, and sampling power analyses) herein were comprehensively applied to Mountain Whitefish. Due to sparse data, only the closed population estimation methodologies without empirical diagnostics for model selection were applied for Arctic Grayling, Bull Trout, Rainbow Trout, and sucker species.

2.2.2.1 Factors that Impact Population Abundance Estimates

The tagging program has some characteristics that must be considered with reference to the population estimation methodology and limitations of the subsequent estimates:

- Capture probability was likely heterogeneous (i.e., some fish were more likely to be caught than others) because of spatial distribution or the reaction of the fish to the boat electroshocker.
- Some fish may have been more or less prone to capture by the boat electroshocker because of their size (i.e., size selectivity). The larger the voltage gradient that the fish experiences across its body, the more susceptible it is to the electrical field. Therefore, a larger fish, with a corresponding larger voltage gradient, is more susceptible to capture than a smaller fish that experiences a relatively smaller voltage gradient.
- Tags were generally applied to fish greater than 250 mm; thus, estimates are only applicable to that portion of the population.
- Fish grew over the duration of the study such that fish recruited into the portion of the population greater than 250 mm while the study was being conducted. However, given the short duration of the study period (44 days), appreciable growth was not expected.
- Tagged fish could move to sections where capture probability may have been different because of possible differences in sample size (sampling effort), catchability, number of available tags for recapture, or the population size.
- Capture probability within a section could vary over time because of differences in catchability possibly generated by physical-biological interactions (e.g., varying water depths, water clarity).

To investigate these characteristics, capture behaviours of tagged Mountain Whitefish were examined. Length histograms of the fish tagged and recaptured were examined to reveal selectivity patterns generated by the presence of a tag. These patterns were further evaluated by comparing cumulative length distributions at release and recapture. Growth over the study period was examined by regressing the time at large (days) of a recaptured fish on the increment in growth (i.e., difference in length measured at release and recapture).

The movements of fish between sections during the 2017 study period were assessed through weighting the number of recaptured fish by sampling intensity. The distance travelled upstream or downstream between a fish's initial release and recapture was determined using the upstream River Km value for each of the 97 sample sites.

2.2.2.2 Empirical Model Selection

Apparent survival of Mountain Whitefish over the study period, which represents fish that survive and have not left the study area, was estimated with the Cormack-Jolly-Seber (CJS) model using MARK software (White 2006), consistent with previous study years. Unlike other open population models (e.g., Jolly-Seber), the CJS model allows for time-varying capture probability. Only tagged fish were used because their encounter histories were known. The encounter history for an individual fish was assigned to the section of first encounter regardless of the location of subsequent encounters. The CJS analysis was applied to several aggregations of survival and capture probabilities over time and sections. The best fitting model for survival is reported here and applied to the population estimation models.

The large number of recaptured Mountain Whitefish also allowed an empirical evaluation of the change in catchability over the study period. Two models (constant versus time-varying catchability) were compared using the delta Akaike's information criterion (ΔAIC) adjusted to account for the number of parameters following Burnham and Anderson (2002). If the catchability is held constant, then the probability that an encountered fish is marked at sequence t (p_t) depends only on the proportion of the population that is marked, as follows:

(1)
$$p_t = \frac{M_t}{M_t + U_t} = \frac{M_t}{N}$$

where M_t is the cumulative tags applied that are available for recapture at time t, U_t is the number of untagged fish in the population at time t, and N is the population size that is to be estimated. The number of cumulative tags available at time t was adjusted (estimated) for mortality following procedures detailed below (see Equation 6). Note that if catchability varies over time, but equally for tagged and untagged fish, then p_t does not change and still reflects the proportion of the population that is tagged. This is the formulation that is used in the Bayes sequential model presented below. If the catchability of tagged and untagged fish varies over the study period, then the probability that an encountered fish is tagged can be characterized as follows:

(2)
$$p_t = \frac{M_t}{N \exp(b_t)} \text{ with the constraint that } \sum_t b_t = 0$$

where b_t is the logarithmic population deviation and will provide a better fit to the data. In the remainder of this document, all reference to "time-varying catchability" is as characterized by Equation 2. Equation 2 is also consistent with a change in population size (population change and time-varying catchability are confounded). The negative log-likelihoods (L) were computed for these models with an assumed binomial sampling distribution as follows:

(3)
$$L \propto \sum_t \left[R_t \log_e(p_t) + (C_t - R_t) \log_e(1 - p_t) \right]$$

where R_t is the number of recovered tags in the sample of C_t fish taken at time t. Parameter estimates, standard deviations, and AIC values were calculated through the minimization of Equation 3 using AD Model Builder (Fournier et al. 2012) to implement the model. For these estimates, each sampling day after the first session was used as a sequence.

2.2.2.3 Bayes Sequential Model for a Closed Population

A Bayesian mark-recapture model for closed populations (Gazey and Staley 1986; Gazey 1994) was applied to the mark-recapture data. The Bayesian model was adapted to accommodate adjustments for apparent mortality, movement between sections, stratified capture probabilities, and sparse recaptures characteristic of Arctic Grayling and Bull Trout. The major assumptions of the model were as follows:

1) The population size in the study area did not change and was not subject to apparent mortality over the study period. Any apparent mortality was assumed to be constant over the study area and the study period and was specified (instantaneous daily mortality). Fish could move within the study area (i.e., to different sections); however, the movement was fully determined by the history of recaptured fish.
2) All fish in a stratum (day and section), whether tagged or untagged, had the same probability of being captured.
3) Fish did not lose their tags over the study period.
4) All tags were reported when encountered. If marks were not always detected, then a missed-tag detection rate could be specified in the model.

The following data were used by the Bayes sequential model to generate population abundance estimates:

- m_{ti} the number of tags applied in 2017, or tagged during a previous study year and encountered in 2017 during day *t* in section *i*
- c_{ti} the number of fish examined for tags during day *t* in section *i*
- r_{ti} the number of recaptured fish in the sample c_{ti}
- d_{ti} the number of fish removed or killed at recapture r_{ti}

A fish had to be greater than or equal to 250 mm FL (or 200 mm FL for Arctic Grayling) to be a member of m_{ti}. A fish was counted as examined (a member of c_{ti}) only if the fish was examined for the presence of a tag and met the length requirements outlined above. Untagged Mountain Whitefish captures in Sessions 5 and 6 were assigned size bins of "<150 mm FL", "150 – 199 mm FL", "200- 299 mm FL", and "≥ 300 mm FL" as detailed in Section 2.1.8. To compute the number of fish ≥ 250 mm FL in each section, the "200 – 299 mm FL" bin was prorated based on the proportion of observed 250–299 mm FL fish captured in Sessions 1 to 4 in the associated section. A fish was counted as a recapture (r_{ti}) only if it was a member of the sample (c_{ti}), was a member of tags applied (m_{ti}), and was recaptured in a session later than its release session. A fish was counted as removed (d_{ti}) if it was not returned to the river, its tag was removed, or if the fish was deemed to be unlikely to survive.

The number of tags available for recapture, adjusted for movement, was determined by first estimating the proportion of tags released in section *i* moving to section *j* (p_{ij}), defined as follows:

$$\sum_{j} p_{ij} = 1$$

The movements of tagged fish were determined by their recapture histories corrected for sampling intensity as follows:

(4) $$\hat{p}_{ij} = \frac{\dfrac{w_{ij}}{\sum_t c_{tj}}}{\sum_j \dfrac{w_{ij}}{\sum_t c_{tj}}}$$

where w_{ij} is the total number of recaptures that were released in section *i* and recaptured in section *j* over the entire study period. The maximum number of releases available for recapture during day *t* in section *j* (m^*_{tj}) is then as follows:

(5) $$m^*_{tj} = \sum_i \hat{p}_{ij} m_{ti}$$

The typical closed population model assumptions (e.g., Gazey and Staley 1986) can be adjusted for mortality, emigration of fish from the study area, and the non-detection of a tag when a fish is recaptured. Thus, the number of tags available for recapture at the start of day *t* in section *i* (M_{ti}) consists of released tags in each section adjusted for removals (mortality and emigration) summed over time:

(6) $$M_{ti} = \sum_{v=1}^{t-h} (m^*_{vi} - d_{vi}) \exp\{(v + h - t)Q_i\}$$

where Q_i is the instantaneous daily rate of apparent mortality in the *i*-th region and *h* is the number of lags or mixing days (nominally set to three days).

The number of fish examined during day *t* in the *i*-th region (C_{ti}) does not require correction:

(7) $$C_{ti} = c_{ti}$$

Recaptured fish (R_{ti}) in the sample, C_{ti}, however, needed to be adjusted for the proportion of undetected tags (*u*) as follows:

(8) $$R_{ti} = (1 + u) r_{ti}$$

The corrected number of tags available, sampled, and recaptured (Equations 6, 7, and 8) were used in the model (Gazey and Staley 1986) to form the population abundance estimates. If apparent mortality is assumed ($Q_i > 0$ in Equation 6), then the population abundance estimates represent the mean population size weighted by the information (likelihood of recapture) contained in each sampling event during the study period.

Population size was estimated using a Microsoft Excel© spreadsheet model with macros coded in Visual Basic. The model has two phases. First, mark-recapture data were assembled by section under the selection criteria of minimum time-at-large (i.e., days) and minimum fork length (mm) specified by the user. Second, the user specified the sections to be included in the estimate, an annual instantaneous mortality rate, the proportion of undetected tagged fish, and the confidence interval percentage desired for the output. The model then assembled the adjusted mark-recapture data (Equations 6, 7, and 8) and followed Gazey and Staley (1986) using the replacement model to compute the population abundance estimates. Output included posterior distributions, the Bayesian mean, standard deviation, median, mode, symmetric confidence interval, and the highest probability density (HPD) interval.

Population abundance estimates were generated for the six sections using tags applied at a start-date of 21 August 2017, a minimum length of 250 mm FL (200 mm FL for Arctic Grayling), daily instantaneous removal rate (which represented natural mortality, unobserved removals, and emigration) estimated using the CJS model, and an undetected tag rate of 0%. The total population abundance estimate for the study area was obtained by summing the section estimates. Confidence intervals for the total study area estimates were calculated invoking a normal distribution under the central limit theorem with a variance equal to the sum of the variances for the sections where a population abundance estimate was feasible. For Arctic Grayling, all tagged fish were used to increase the available data; however, population abundance estimates were only produced for Section 3, which had five recaptures (all other sections combined had three recaptures). Minimal population abundance estimates (i.e., the probability of *x* that the population size is at least *y*) were computed for Arctic Grayling following Gazey and Staley (1986).

2.2.2.4 Mountain Whitefish Synthesis Model

The Mountain Whitefish age-structured stochastic model that was developed by Gazey and Korman (2016) was updated to include recent (i.e., 2017) data in addition to historical data collected between 2002 and 2016. The model synthesised length-at-age, incremental growth from release-recapture occurrences, length frequency, and mark-recapture data.

The synthesis model evaluates the consistency of assumed population dynamics with historical data. Demographic parameter estimates are expected to be more accurate and precise than separate analyses (e.g., separate analyses of growth and abundance) because appropriate population dynamics and all available information are used by the model. A synthesis model can also provide an effective mechanism for monitoring a population. New data may require alterations to the model to improve the fit to the data, which enhances knowledge of population dynamics. Additionally, a synthesis model can assist impact assessment through identification of quantities that can be reliably predicted or identify additional data required to obtain reliable predictions.

A detailed mathematical description of the synthesis model is provided by Gazey and Korman (2016). The model currently focuses on Mountain Whitefish captured in Sections 1, 3, and 5 with no movement of Mountain Whitefish between the sections modelled. Major assumptions required to enable predictions were as follows:

- Fish enter the population (recruitment) each year at age-0 before the start of sampling in August.
- Ages assigned to age-0 fish through scale analysis are without error.
- Trends in growth track a von Bertalanffy curve with an assumed measurement error of length, individual variation of length, and environmental annual variation in mean length.
- Age dependent survival is a simple power function of the expected length.
- The lengths of fish belonging to an age-class are normally distributed around their mean length.

- The oldest age-class represents all older fish and is subject to the same mortality (i.e., an absorbing age-class where the fish lives forever but the number of fish belonging to a cohort diminishes over time).
- The initial population size (i.e., 2002 for Sections 1 and 3, and 2004 for Section 5) of each age-class is set from that year's survival (i.e., stationary equilibrium age structure for the initial year).
- Selectivity of fish captured using boat electroshocking follows a logistic curve as a function of size for each sample section. Also, because of different electroshocker settings among study years, separate selectivity curves were applied for the epochs 2002–2013 and 2014–2017.
- The age composition of newly tagged fish reflects the available age composition of the untagged population.
- The population in a sample section is closed to additions or mortality (or tag loss) during each year's study period (28–44 days). Random movements of fish in and out of sections is permissible.
- Within-year capture probabilities are related to across-year capture probabilities through a simple power function.
- All tags are reported on recovery.

Parameter estimation was achieved through minimization of the model objective function, which consisted of multiple negative log-likelihood data components (function of predictions, observations, and assumed stochastic distributions). These components included length-at-age, incremental length, untagged length composition, tagged length composition, frequency of untagged binary bins (<250 mm FL and ≥250 mm FL), untagged captures, within year tag recaptures, across year tag recaptures, a recruitment prior, and two penalty functions to avoid the prediction of negative population values.

2.2.3 Catchability

If catchability is constant across years and sample sections, then indices of abundance such as catch rate (number of fish sampled per unit effort, CPUE) would be comparable. Handling time to process a fish, gear saturation, size selectivity by the sampling gear, and other variations in physical conditions can cause systematic bias in the relationship between CPUE and abundance (Hilborn and Walters 1992). Catchability coefficients (parameters relating abundance indices to actual abundance; Ricker 1975) were calculated using closed population assumptions, possibly subject to apparent mortality. If an index of abundance is applicable, then the coefficients should remain constant over study years and sections.

An estimate for the catchability coefficient for the *i*-th section was calculated following Ricker (1975) as follows:

$$\hat{q}_i = \frac{\sum_t C_{ti}}{E_i \cdot N_i} \tag{9}$$

where C_{ti} is from Equation 7, E_i is electroshocking effort (measured as hours of electroshocking or distance traveled), and N_i is the Bayes population abundance estimate for Section *i*, as described in Section 2.2.2.3 above. Given the number of fish sampled and effort data, the variance of the catchability coefficient was defined as follows:

$$Var(\hat{q}_i) = \left(\frac{\sum_t C_{ti}}{E_i} \right)^2 Var\left(\frac{1}{N_i} \right)$$

(10)

where the reciprocal of estimated abundance is distributed normally and can be estimated using the following expression (Ricker 1975):

$$Var\left(\frac{1}{N_i} \right) = \frac{\sum_t R_{ti}}{\left(\sum_t M_{ti} C_{ti} \right)^2}$$

(11)

2.2.4 Precision of Population Abundance Estimates

To explore the precision that may be obtained under alternative sampling intensities, a power analysis was conducted on Mountain Whitefish sampled in Section 1. Section 1 was selected because a consistent sampling program has been conducted in this section since 2002, providing a large, comparable dataset. The analysis assumed that the Bayesian mean estimate ($\overline{N}$) was the actual population size and adjusted the data for an altered sampling factor for any sequence as follows:

$$M_t' = \left[1 - \left(1 - \frac{M_t}{\overline{N}} \right)^f \right] \cdot \overline{N}$$

(12)

$$C_t' = \left[1 - \left(1 - \frac{C_t}{\overline{N}} \right)^f \right] \cdot \overline{N}$$

(13)

$$R_t' = R_t \cdot \frac{M_t'}{M_t} \cdot \frac{C_t'}{C_t}$$

(14)

where *f* was the sampling factor (e.g., *f* = 2 represents a doubling of the sampling effort), M_t was the number of tags applied at the start of the *t*-th sampling sequence, C_t was the total number of fish examined for tags, and R_t was the number of recaptured fish. The prime notation represents the data generated for a specified sampling factor. Since the number of fish sampled was small in relation to the population size, a sampling factor of two nearly doubles the number of tags applied and quadruples the number of recaptured fish.

For the purposes of this analysis, precision was defined as half of the 80% HPD expressed as a percentage of the mean (i.e., precision = 100 – *x*, where *x* is the percentage of the mean when at 80% HPD). If the posterior distribution was perfectly symmetrical, then our precision definition would equate to the plus/minus 80% confidence interval.

2.2.5 Catch and Life History Data

Catch rates for each site were expressed as the number of fish captured per kilometre of shoreline sampled per hour of electroshocker operation (CPUE = no. fish/km-h). The CPUE for each session at each site was the sum of the number of fish captured per kilometre of shoreline sampled per hour of electroshocker operation. The average CPUE was calculated by averaging the CPUE from all sites and sessions. The standard error of the average CPUE was calculated using the square root of the variance of the CPUE from all sites for all sessions divided by the number of sampling events.

Length-frequencies were calculated using the statistical environment R, v. 3.3.2 (R Core Team 2014). Frequency plots were constructed for fork lengths by year, for all years combined (but plotted separately for each section), and by section within 2017. For all species, fork lengths were plotted using 10 mm bins. Similar to length-frequency, age-frequency plots were constructed by year, for all years combined (but plotted separately by section), and by section within 2017.

Fulton's body condition index (*K*; Murphy and Willis 1996) was calculated as follows:

(15) $$K = \left(\frac{W_t}{L^3}\right) \times 100{,}000$$

where W_t was a fish's weight (g) and *L* was a fish's fork length (mm). Body condition was plotted for all previous years by section. Mean condition values were estimated for each year and section combination, along with their respective 95% confidence intervals. These plots were constructed for most species.

Length-at-age data were used to construct three-parameter von Bertalanffy models (Quinn and Deriso 1999) for all species of interest:

(16) $$L(t) = L_\infty (1 - e^{-K(t - t0)})$$

where L_∞ is the asymptotic length of each species, *K* is the rate at which the fish approaches the asymptotic size (i.e., growth rate coefficient), and t_0 is the theoretical time when a fish has length zero. Non-linear modeling in R was used to evaluate all three parameters of interest.

For each study year *i*, the mean fork length of all study years excluding Year *i* was estimated, and the estimated mean was subtracted from the individual fork lengths sampled in Year *i*. The mean and 95% confidence intervals of the estimated differences in fork lengths were then calculated for each year.

Weight-length relationships were examined using linear regression. The response variable was ln(weight) and the predictor variables were ln(length), year (categorical variable), and the interaction between ln(length) and year. The interaction term was interpreted as the difference in the weight-length relationship among years. Estimates of model parameters, *a* and *b*, are presented on the back-transformed scale for the following equation (Murphy and Willis 1996):

(17) $$W = a \times L^b$$

where *W* is weight (g), *L* is fork length (mm). To incorporate the variation by section and year, the model was extended as follows:

(18) $$\ln(W) = a + b \times \ln(L) + c \times Section + d \times Year + bc \times \ln(L) \times Section + bd \times \ln(L) \times Year + cd \times Section \times Year + bcd \times \ln(L) \times Year \times Section$$

where *a*, *b*, *c*, *d*, *bc*, *bd*, *cd*, and *bcd* are regression coefficients estimated during the modelling process. The full model, including all interaction terms, was used to construct post-hoc multiple comparisons to identify which slopes were significantly different. Since interaction terms were part of the model, two post-hoc multiple comparisons were performed:

1) pairwise comparisons between years within each section (i.e., within Sections 1, 3, 5 combined and within Sections 6, 7, and 9 combined); and

2) between section bins within each sample year.

The p-values of the post hoc tests were adjusted using the Tukey Honest Significant Difference (HSD) method. Resulting estimates were presented using compact letter display, where each year (or section) was represented by a letter, and years (or sections) with different letters were significantly different.

Catch curves (Ricker 1975) were estimated for Arctic Grayling, Bull Trout, Mountain Whitefish, and Walleye using year-specific data. Sections 1, 3, 5 were combined into one curve for each species because these sections were consistently sampled between 2002 and 2017. Sections 6, 7, and 9 were combined into another curve for each species because these sections were only sampled from 2015 to 2017. In addition, 2017 data were used to construct section-specific catch curves; this was performed for Arctic Grayling, Bull Trout, Mountain Whitefish, and Walleye only, due to scarce age data for other species. Instantaneous total mortality (*Z*) was estimated using ordinary least squares regression of natural logarithm-transformed counts of fish at age, performed on the descending arm of the age distribution:

(19) $$\ln(N_t) = \ln(N_0) - Z \times t$$

where N_0 is the number of fish at the first age-class included in the catch curve analysis, *Z* is instantaneous total mortality, and *t* is time in years. Annual survival was then estimated as $S = e^{-Z}$. Annual mortality (*A*) was calculated as 1-*S*. Confidence intervals (95%) around the annual mortality estimates were calculated using the confidence intervals estimated during regression around *Z*, converting it to confidence intervals around *A* as described above. The catch curves used counts of fish for age-3 and individuals from older age-classes. Abundances of age-0 to age-2 fish were not used in catch curves because they were under-represented in the study area, likely because many individuals rear in tributaries, and the smaller age-classes were not fully recruited to the sampling gear.

Recaptured fish that had previously been tagged with T-bar anchor tags in earlier years of the program (2002 to 2004) were included in catch rates but were omitted from all length, weight, age, and growth analyses due to possible effects of the tag on growth (e.g., Mainstream and Gazey 2004, 2006). Within-year recaptures were also excluded from age, length, weight, and growth analyses but included in catch rates.

2.2.6 Diversity Profiles

Diversity profiles will eventually be used to monitor changes to the Peace River's fish community composition in response to the construction and operation of the project. Specifically, profiles will be used to test hypothesis H_4 after the River Diversion stage of construction.

Traditional indices of diversity, such as species richness, Shannon's index, or Simpson's index differ in how the relative abundance of species affects the index, which affects the degree to which rare versus common species are represented. A diversity profile is a method that plots the relationship between diversity and the degree to which relative abundance is represented (Leinster and Cobbold 2012). The response variable in a diversity profile is the “effective number of species”, which is the number of equally common species required to get a particular value of an index (Jost 2006). Effective numbers are recommended for comparisons of diversity because they allow intuitive and straightforward comparison of the number of species, instead of individual indices, which are more difficult to interpret and can be misleading due to non-linearity (Jost 2006; Chao et al. 2014). For instance, a community of eight equally common species has a Shannon index of 2.1 (calculated using natural log) and 8 effective species, whereas a community of 16 equally common species has a Shannon index of 2.8 and 16 effective species. The second community is twice as diverse as the first but appears only 33% more diverse using the Shannon index (2.7 vs. 2.1).

Diversity profiles also can take into account similarity between species when calculating diversity. Most measures of diversity do not take into account similarity between species, such that the diversity of a community of three trout species is equal to that of a community with a sculpin species, a trout species, and Walleye. However, most people would intuitively consider the latter community more diverse. Diversity profiles can account for diversity among species by assigning a similarity value between 0 and 1 for each pair of species, where a value of 1 indicates an equivalent species and a value of 0 indicates no similarity (Leinster and Cobbold 2012). Similarity values could be assigned based on any biologically criteria desired, such as genetic or functional similarity.

Diversity profiles were calculated using the following equation:

(20) $$ {}^{q}D^{\mathbf{Z}}(\mathbf{p}) = \left(\sum p_i \, (\mathbf{Zp})_i^{q-1}\right)^{1/(1-q)} $$

where D is the effective number of species, p is the relative abundance of the species present, q is the parameter representing the relative contribution of relative abundance data, and Z is the similarity matrix among species (Leinster and Cobbold 2012). A value of $q = 0$ represents no importance of relative abundance and is equivalent to a count of the number of species, often referred to as species richness. A value of $q = 1$ is equivalent to the Shannon index. Values less than 1 result in rare species being over-represented, and values greater than 1 result in common species being over-represented. Values on the right of a diversity profile (highest values of q) are insensitive to changes in rare species and values on the left are sensitive to rare species. The shape of diversity profiles can be used to interpret the community composition and compare composition between datasets. For instance, a flat profile indicates near equal abundance among species, whereas a steeper profile indicates more unequal abundance among species. Diversity profiles allow comparison of the number of effective species across the entire range of importance of rare/common species, instead of requiring the assumptions of a single diversity index. Diversity profiles have previously been used in a power analysis to assess the likelihood of detecting significant differences in community composition in the Peace River before and after Project construction (Ma et al. 2015).

Diversity profiles were calculated separately for each river section for all years with available data. The analysis used captured fish of all species but excluded fish not identified to the species level (e.g., fish recorded as sculpin species or sucker species). For the species similarity matrix (Z), values were set to 0 for all pairs of species, with the interpretation that all pairs of species were equally and completely different. This is in contrast to the analysis by Ma et al. (2015) that used values of 1 for all “small fish” species and for all sucker species, which treated each of these groups as one species. Diversity was not statistically compared between each section (e.g., t-test). Instead, the effective number of species are shown graphically to allow the reader to decide what magnitude of difference is biologically meaningful.

3.0 RESULTS

3.1 Physical Parameters

3.1.1 Discharge

Discharge in the Peace River is regulated by the operations at WAC Bennett Dam and PCD. In most years, total river discharge gradually decreases from January to early June, increases from early June to mid-July, remains near stable from mid-July to early October, and increases from early October to late December. In 2017, mean daily discharge in the Peace River (i.e., discharge through PCD) was within historical bounds for the 2002–2016 period, with the exception of an extended low flow period from mid-April to mid-July, when flows were below average and either approached or attained historical minimum mean daily discharge levels (Figure 2; Appendix C, Figure C1). During the 2017 sample period, flows were consistently above the seasonal historical average and approached the historical seasonal maximum discharge level on five occasions. Overall, flows exhibited only minor fluctuations during the 2017 sample period and did not exhibit the large fluctuations that were recorded in 2016, when mean daily discharge fluctuated between the historical seasonal maximum and minimum during the 2016 sample period. Above average rainfall was recorded for the region in May, June, and July 2017, with lower amounts in August, September, and October[5].

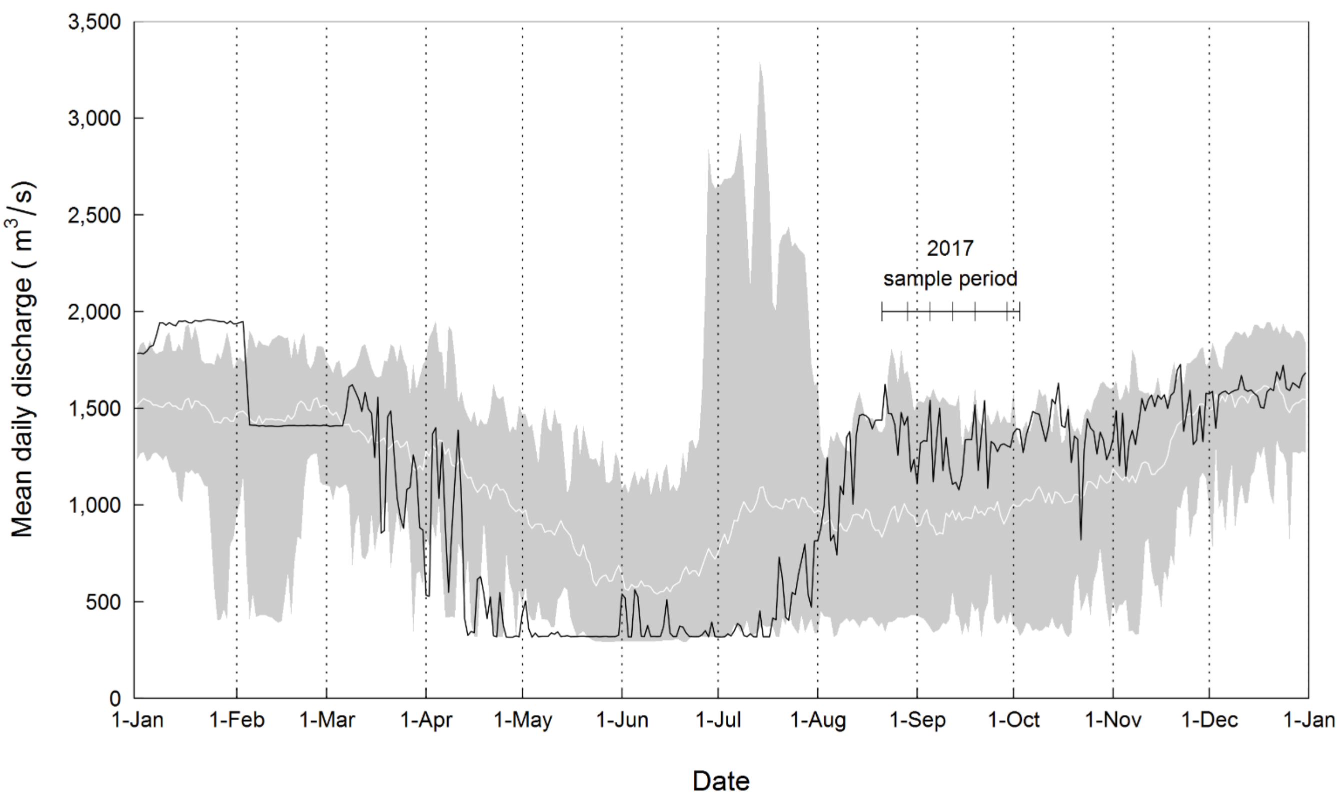


Figure 2: Mean daily discharge (m^3/s) for the Peace River at Peace Canyon Dam, 2017 (black line). The shaded area represents minimum and maximum mean daily discharge values recorded at the dam from 2002 to 2016. The white line represents average mean daily discharge values over the same time period. Vertical lines on the sample period bar represent the approximate start and end times of each sample session.

[5] https://ftstjohn.weatherstats.ca/charts/precipitation-monthly.html

During the 2017 sample period, flow patterns in the Peace River were variable and ranged from a high of approximately 2000 m^3/s in Section 7 to a low of approximately 300 m^3/s in Section 1 (Figure 3). In most sections, sampling was typically conducted when discharge was approximately 1500 m^3/s. In Section 6, four sample days were conducted while discharges declined.

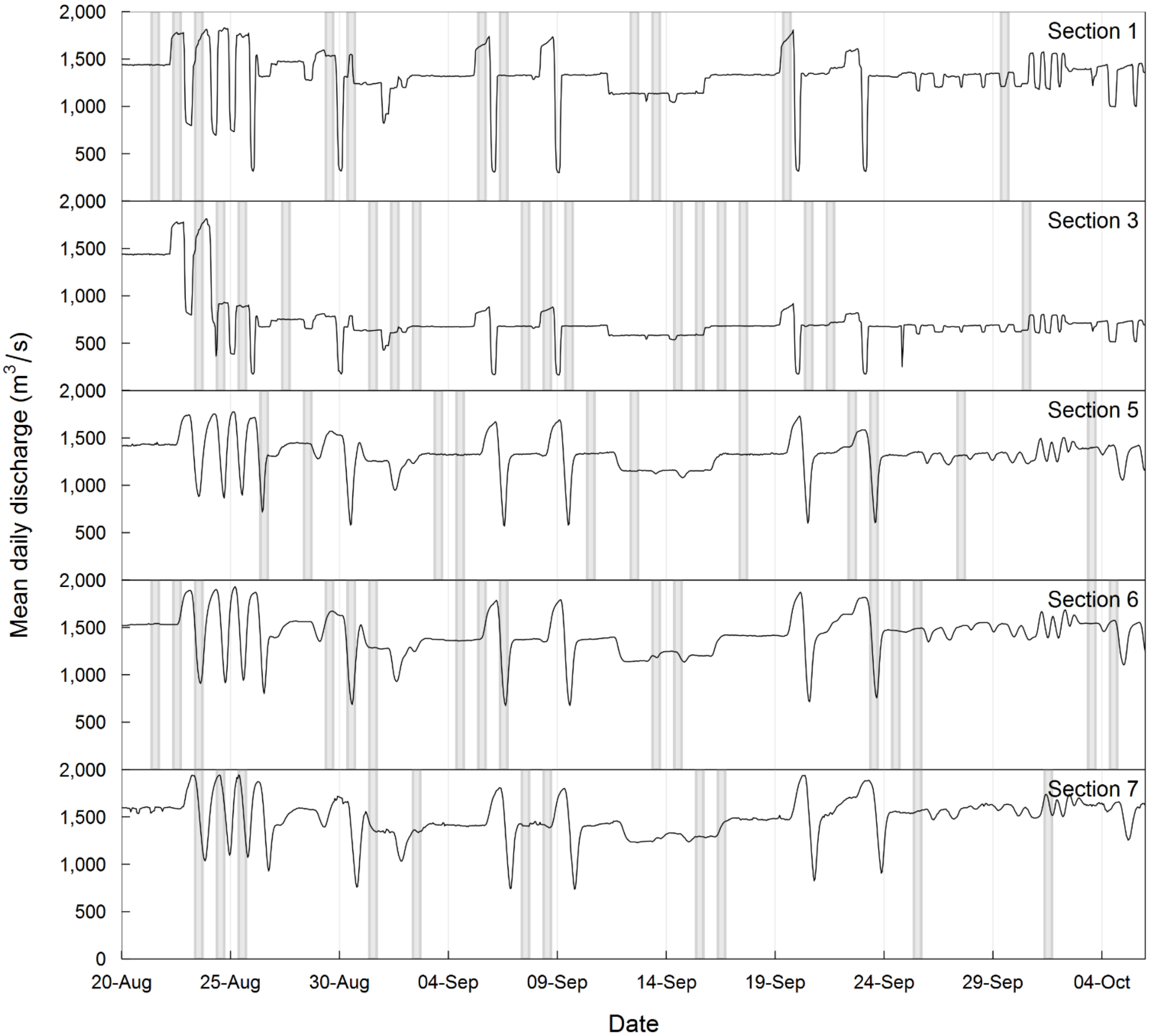


Figure 3: Sectional discharge in five-minute intervals for the Peace River, 20 August to 5 October 2017. The shaded areas represent the approximate timing of daily sampling (from 9:00 a.m. to 5:00 p.m.). Section 3 data represent approximate values as detailed in Section 2.1.1.

3.1.2 Water Temperature

During a typical study year, water temperatures are generally lower in Section 1 during the spring and summer and higher in Section 1 during the fall and winter compared to Sections 3 and 5 (Appendix C, Figure C2; DES 2017). During a typical year, Peace River water temperatures remain low (generally less than 2°C) from January to early April, gradually increase from early April to early August, and gradually decrease from early August to late December (Appendix C, Figures C3 to C5).

In 2017, mean water temperatures in the Peace River, as measured near PCD and representative of water temperatures within Section 1, declined sharply in early August from a maximum annual water temperature recorded in late July (Figure 4). This decline in water temperature corresponded with an increase in discharge from PCD. During the 2017 study period, water temperatures downstream of PCD either approached or exceeded historical mean daily water temperatures recorded between 2008 and 2016. Overall, mean daily water temperature exhibited moderate to minor daily fluctuations and gradually declined over the 2017 study period.

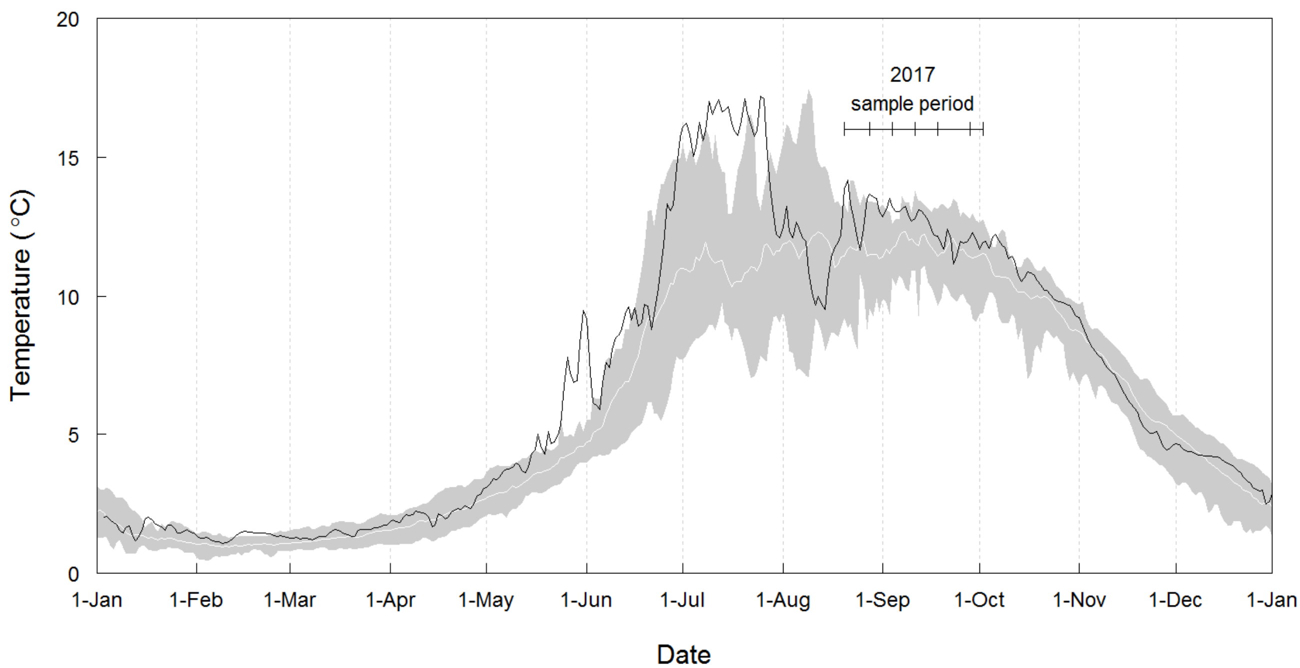


Figure 4: Mean daily water temperature (°C) for the Peace River recorded near the Peace Canyon Dam, 2017 (black line). The shaded area represents the minimum and maximum mean daily water temperature values recorded at that location between 2008 and 2016. The white line represents the average mean daily water temperature during the same time period. Data were collected under the Site C FAHMFP (Mon-8/9; DES 2017). Vertical lines on the sample period bar represent the approximate start and end times of each sample session.

Mean daily water temperatures in the Peace River, as measured downstream of the confluence of the Peace and Halfway rivers, represents water temperatures in Sections 3. Water temperature exhibited a typical seasonal decline over the duration of the 2017 study period and was generally within the historical temperature bounds recorded between 2008 and 2016 (Figure 5). From Sessions 1 to 3, mean daily water temperature was near uniform and only exhibited small fluctuations up to 1.5°C. After Session 3, mean daily water temperature declined over the remainder of the study period, with a slight increase in water temperature during the final session.

Through Sessions 1 through 4, slightly lower water temperatures were evident in Section 3 when compared to Section 1, suggesting colder Halfway River discharge.

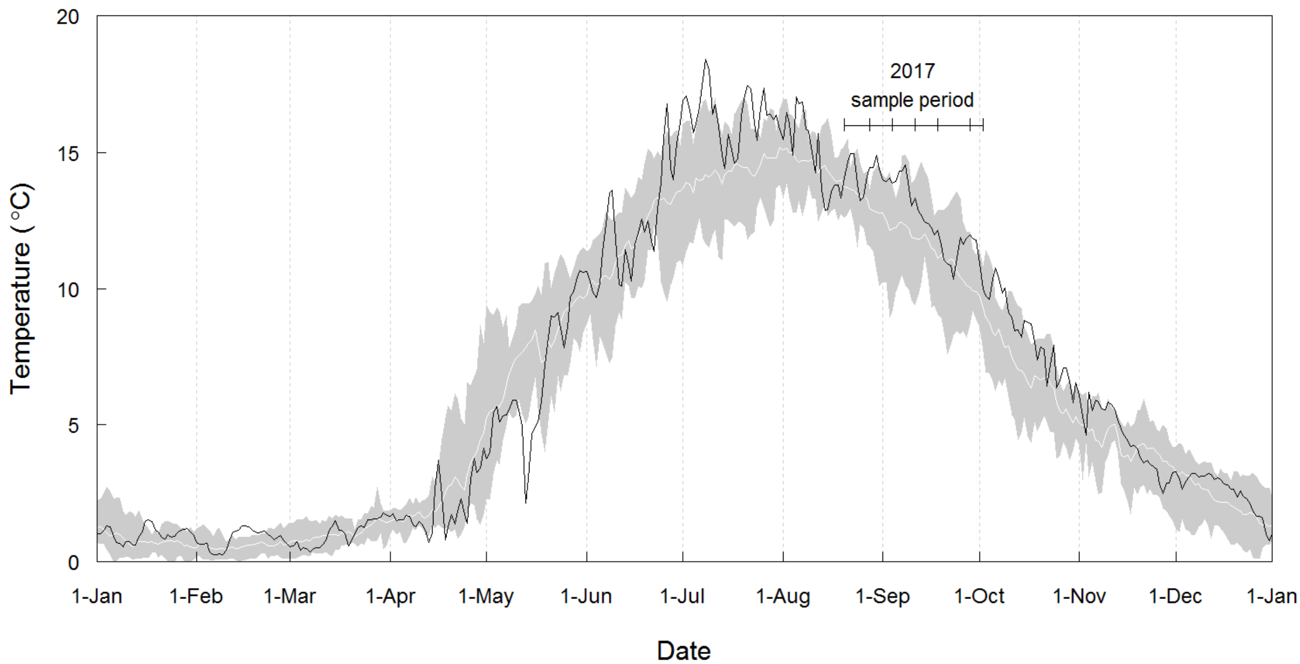


Figure 5: Mean daily water temperature (°C) for the Peace River recorded near the Halfway River confluence, 2017 (black line). The shaded area represents the minimum and maximum mean daily water temperature values recorded at that location between 2008 and 2016. The white line represents the average mean daily water temperature during the same time period. Data were collected under the Site C FAHMFP (Mon-8/9; DES 2017). Vertical lines on the sample period bar represent the approximate start and end times of each sample session.

Mean daily water temperature in the Peace River, as measured below the confluence of the Peace and Moberly rivers, represents water temperatures in Section 5. Water temperature in Section 5 exhibited a typical seasonal decline over the duration of the 2017 sample period (Figure 6). Periodic minor fluctuations in temperature recorded in Section 5 were similar to changes recorded in Section 3. Peace River water temperature in Section 5 was, on average, slightly warmer than water temperatures recorded in Section 3, suggesting the contribution of warmer water from the Moberly River to the Peace River.

For Section 6, continuous water temperature data are not available prior to 2017; however, over the course of the 2017 study period, water temperatures recorded at the time of sampling in Section 6 generally declined from a high of approximately 15.0°C to a low of approximately 5.5°C (Appendix D, Table D3).

For Sections 7 and 9, continuous water temperature data are not available; therefore, data for these two sections are limited to spot temperature readings taken at the time of sampling. In 2017, daily average spot temperature readings in Section 7 gradually declined over the study period from a high of 12.9°C to a low of 10.4°C. For Section 9, daily average spot temperature readings gradually declined over the study period from a high of 13.7°C to a low of 9.7°C.

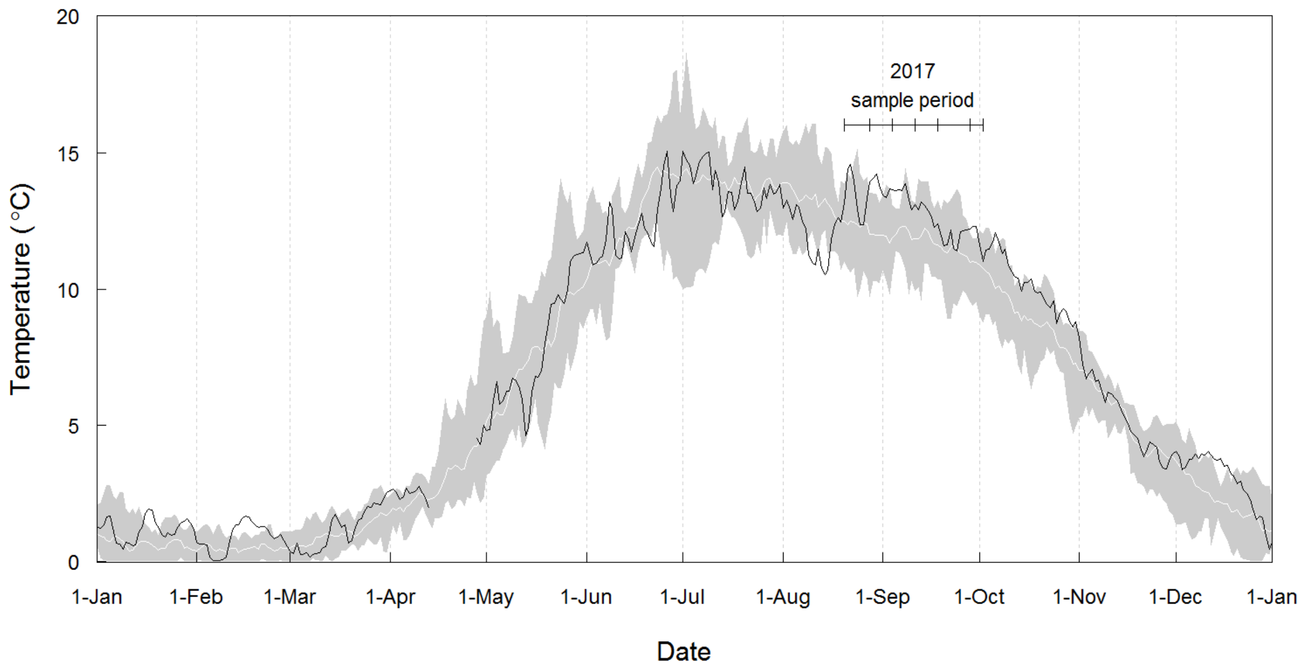


Figure 6: Mean daily water temperature (°C) for the Peace River recorded near the Moberly River confluence, 2017 (black line). The shaded area represents the minimum and maximum mean daily water temperature values recorded at that location between 2008 and 2016. The white line represents the average mean daily water temperature during the same time period. Data were collected under the Site C FAHMFP (Mon-8/9; DES 2017). Vertical lines on the sample period bar represent the approximate start and end times of each sample session.

3.1.3 Habitat Variables

A description of fish habitat available in the study area is provided by Mainstream (2012). Habitat variables collected at each site during the present study are provided in Appendix D, Table D3 and are also included in the Peace River Large Fish Indexing Database (Attachment A). In Sections 1, 3, and 5, each site was categorized into various habitat types using their bank habitat type as assigned by R.L.&L. (2001) and the presence or absence of physical cover as assigned by P&E and Gazey (2003). The Bank Habitat Type Classification System is summarized in Appendix D, Table D2. Bank habitat types and the presence or absence of physical cover have not been classified and are not available for Sections 6, 7, and 9. Sampling locations and habitat classifications (when available) are illustrated in Appendix A, Figures A1 to A6. Site lengths were calculated using ArcView® GIS software (ESRI Canada, Toronto, ON, Canada) and are shown in Appendix A, Table A1. Overall, habitat data recorded during the 2017 survey did not suggest any substantial changes to fish habitat in any sections when compared to 2016 data.

3.2 General Characteristics of the Fish Community

In 2017, 15,829 fish from 24 different species were captured in the Peace River (Table 8). These values do not include fish that were observed but avoided capture and do not include intra-year recaptured individuals. Of those 24 species, 11 were classified as sportfish and 13 were classified as non-sportfish. Catch was greatest in Section 3 (25% of the total catch) and lowest in Section 9 (8% of the total catch; Table 8).

Mountain Whitefish was the most common species encountered, representing 52% of the total catch and 90% of the sportfish catch, followed by Longnose Sucker (32% of the total catch), Largescale Sucker (6%), Walleye (2%), Bull Trout (1%), Northern Pikeminnow (*Ptychocheilus oregonensis*; 1%), Redside Shiner (*Richardsonius balteatus*; 1%), and White Sucker (1%). The remaining species each accounted for less than 1% of the total catch and included the following species in declining order of abundance: Rainbow Trout, Arctic Grayling, Lake Chub (*Couesius plumbeus*), Goldeye, Longnose Dace (*Rhinichthys cataractae*), Slimy Sculpin (*Cottus cognatus*), Northern Pike, Finescale Dace (*Phoxinus neogaeus*), Trout-perch (*Percopsis omiscomaycus*), Kokanee, Spottail Shiner (*Notropis hudsonius*), Prickly Sculpin (*Cottus asper*), Burbot, Peamouth, Yellow Perch (*Perca flavescens*), and Lake Trout. In general, cold-water species (as defined by Mainstream 2012), such as Bull Trout, Mountain Whitefish, and Rainbow Trout, were found throughout all sections of the study area. Cool-water species (Mainstream 2012), such as Northern Pike and Walleye, were more common in the downstream portions of the study area (Table 8).

Table 8: Number of fish caught by boat electroshocking and their frequency of occurrence in sampled sections of the Peace River, 21 August to 4 October 2017.

Species	Section												All Sections		
	1		3		5		6		7		9				
	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	%[c]
Sportfish															
Arctic Grayling	11	<1	43	2	26	2	3	<1	4	<1			87	1	1
Bull Trout	56	2	82	3	42	3	34	2	14	2	9	3	237	3	1
Burbot					2	<1			3	<1	1	<1	6	<1	<1
Goldeye											3	1	3	<1	<1
Kokanee	41	2	8	<1	2	<1	1	<1	3	<1	1	<1	56	1	<1
Lake Trout	1	<1											1	<1	<1
Mountain Whitefish	2,149	93	2,476	92	1,381	92	1,338	91	713	81	155	56	8,212	90	52
Northern Pike			2	<1	9	1	16	1	6	1	4	1	37	<1	<1
Rainbow Trout	49	2	53	2	13	1	5	<1	1	<1	1	<1	122	1	1
Walleye	1	<1	35	1	25	2	68	5	140	16	103	37	372	4	2
Yellow Perch					2	<1			1	<1	1	<1	4	<1	<1
Sportfish subtotal	**2,308**	**100**	**2,699**	**100**	**1,502**	**100**	**1,465**	**100**	**885**	**100**	**278**	**100**	**9,137**	**100**	**58**
Non-sportfish															
Finescale Dace					1	<1	8	<1	15	1	11	1	35	1	<1
Lake Chub			2	<1	1	<1	8	<1	17	1	37	4	65	1	<1
Largescale Sucker	80	14	254	19	170	19	199	11	134	11	47	5	884	13	6
Longnose Sucker	393	69	996	75	607	69	1,274	73	949	79	802	82	5,021	75	32
Longnose Dace			6	<1	2	<1	28	2	3	<1	5	1	44	1	<1
Northern Pikeminnow	14	2	44	3	20	2	59	3	42	4	16	2	195	3	1
Peamouth	3	1			1	<1	1	<1					5	<1	<1
Prickly Sculpin	3	1	3	<1	1	<1							7	<1	<1
Redside Shiner			5	<1	44	5	84	5	23	2	26	3	182	3	1
Slimy Sculpin	15	3	9	1	10	1	7	<1	1	<1			42	1	<1
Spottail Shiner					2	<1	4	<1	2	<1	2	<1	10	<1	<1
Trout-perch							21	1	4	<1	1	<1	26	<1	<1
White Sucker	60	11	12	1	23	3	48	3	5	<1	28	3	176	3	1
Non-sportfish subtotal	**568**	**100**	**1,331**	**100**	**882**	**100**	**1,741**	**100**	**1,195**	**100**	**975**	**100**	**6,692**	**100**	**42**
All species[c]	**2,876**	**18**	**4,030**	**25**	**2,384**	**15**	**3,206**	**20**	**2,080**	**13**	**1,253**	**8**	**15,829**	**100**	**100**

[a] Includes fish captured and identified to species; does not include fish that avoided capture or within-year recaptured fish.

[b] Percent composition of the sportfish or non-sportfish catch.

[c] Percent composition of the total catch.

Arctic Grayling, Bull Trout, and Mountain Whitefish were consistently captured between 2002 and 2017; therefore, changes in catch-rates over time were compared for these species (Figure 7). Changes in catch rates of other species over time were not compared. Arctic Grayling catch rates declined between 2011 and 2014, increased slightly between 2015 and 2016 and remained stable between 2016 and 2017; confidence intervals overlapped for most estimates. Catch rates of Arctic Grayling were greatest in 2004 (18 fish/km-h) and were also high in 2007 (16 fish/km-h). Bull Trout catch rates in 2017 were similar to most other study years (Figure 7). Mountain Whitefish catch rates were stable between 2002 and 2010, increased substantially in 2011, and decreased between 2011 and 2014 (Figure 7). Catch rates of Mountain Whitefish were lower from 2014 to 2017 than during all previous study years. Catch rates of Mountain Whitefish declined an average of approximately 20% each year between 2011 and 2014.

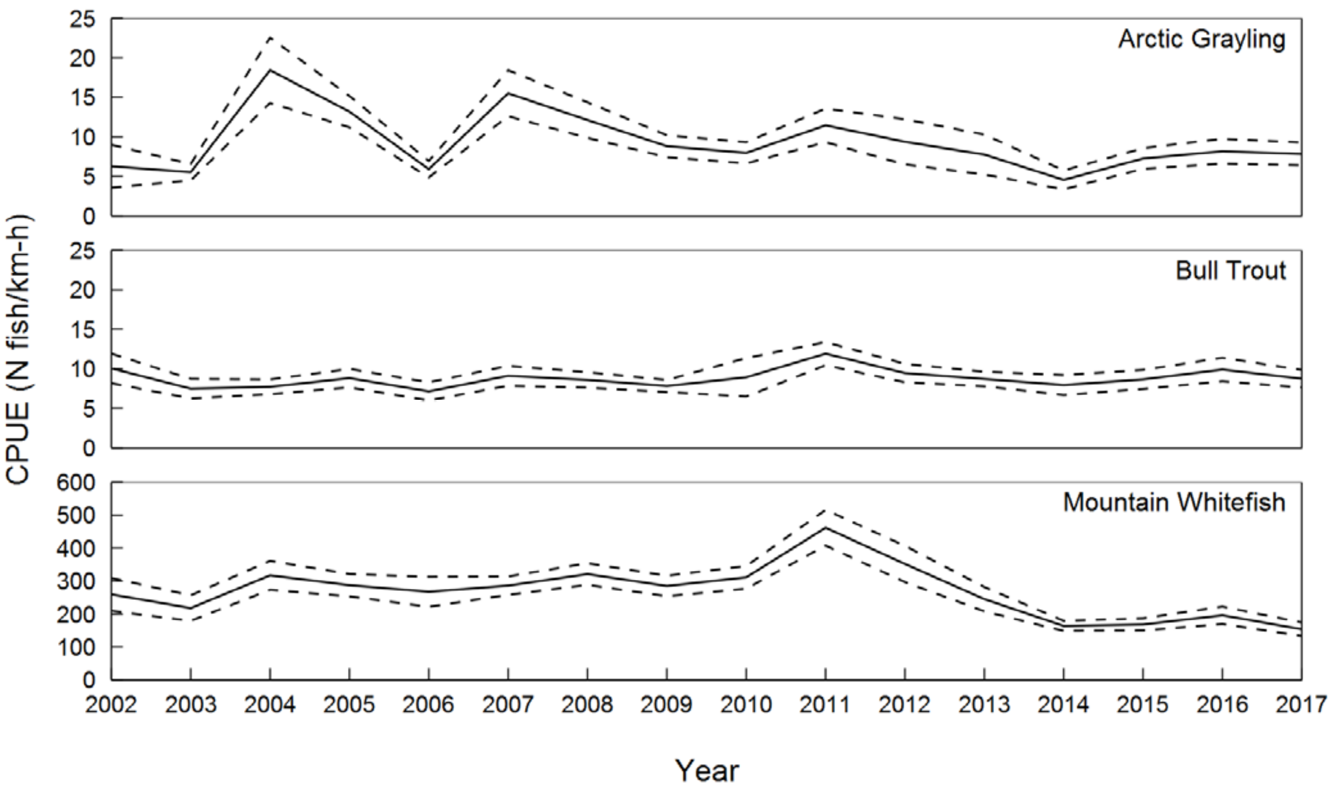


Figure 7: Mean annual catch rates (CPUE) for Arctic Grayling, Bull Trout, and Mountain Whitefish captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River combined, 2002 to 2017. The dashed lines denote 95% confidence intervals. Analysis included captured fish only and all size-cohorts combined. Sections 6, 7, and 9 were excluded as these sections were not consistently sampled prior to 2016. Note the different Y axis scales.

3.3 Arctic Grayling

3.3.1 Biological Characteristics

During the 2017 survey, 87 Arctic Grayling were captured (i.e., excluding within-year recaptures) and were encountered in all sections except Section 9 (11 in Section 1, 43 in Section 3, 26 in Section 5, 3 in Section 6, 4 in Section 7). Fewer Arctic Grayling were recorded in Section 6 in 2017 (n = 3) than in 2016 (n = 21). Fork lengths ranged between 164 and 370 mm; weights ranged between 46 and 574 g.

Scale samples were analyzed from all captured Arctic Grayling; however, ages could not be assigned to 2 of the 87 samples. Assigned ages ranged between age-1 to age-3.

The numbers of Arctic Grayling by age-class (Table 9) and length-frequencies (Figure 8) indicate that both juvenile (age-1) and older (age-2+) age-classes are present in the study area. The age-0 cohort was not encountered in 2017. Although not always encountered annually, this cohort was encountered during the previous two study years (i.e., 2016 and 2017). Historical length-frequency data (Appendix F, Figure F1) showed a variety of length groupings during most study years.

Table 9: Average fork length, weight, and body condition by age for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

Age	Fork Length (mm)			Weight (g)			Body Condition (K)		
	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]
1	189 ± 13	164 - 222	22	81 ± 22	46 – 142	20	1.18 ± 0.13	0.95 - 1.45	20
2	284 ± 23	234 – 330	29	278 ± 70	143 – 430	29	1.19 ± 0.09	1.02 - 1.36	29
3	331 ± 16	292 – 370	34	434 ± 64	298 - 574	34	1.20 ± 0.07	1.08 - 1.38	34

[a] Number of individuals sampled.

The interpretation of age-frequency distributions of Arctic Grayling by section was limited due to the low number of captured and aged individuals in most sections (Figure 9). Most of the Arctic Grayling were age-2 or age-3. Data suggest strong recruitment originating from the 2014 brood year, which is indicated by a large percentage of age-1 individuals in 2015, age-2 individuals in 2016, and age-3 individuals in 2017 (Figure 9; Appendix F, Figure F3 and F4).

Growth rates for younger Arctic Grayling (age-0 and age-1 individuals) estimated using the von Bertalanffy growth curve were influenced by the lack of age-0 fish encountered in 2017. Growth rates for age-2 and age-3 fish were similar to previous study years (Figure 10). Length-at-age data were similar to most previous study years for all sections (Figure 11). Analyses indicate declining length-at-age in Sections 5 and 6 over the previous three to four years, depending on the age-class. This trend is most evident in age-1 and age-2 individuals. Length-weight regressions were similar for Arctic Grayling among sections (Figure 12), although sample sizes were small. No consistent temporal trends in length-weight regression slopes were recorded for Arctic Grayling in Sections 1, 3, and 5; however, several fluctuations in ln-transformed weights adjusted to mean ln-transformed fork lengths were observed (Appendix F, Figure F1). For example, adjusted transformed weights gradually decreased between 2005 and 2008 and sharply increased between 2008 and 2009, which was followed by a gradual decrease until 2011. Similarly, throughout 2014–2017, a gradual decrease in adjusted transformed weights at mean transformed fork lengths was recorded. Results are likely influenced by low Arctic Grayling catch rates during most study years and sections.

The body condition (K) of Arctic Grayling captured in 2017 ranged between 0.95 and 1.45 (Table 9). Overall, body condition values recorded in 2017 were similar to most previous study years (Figure 13).

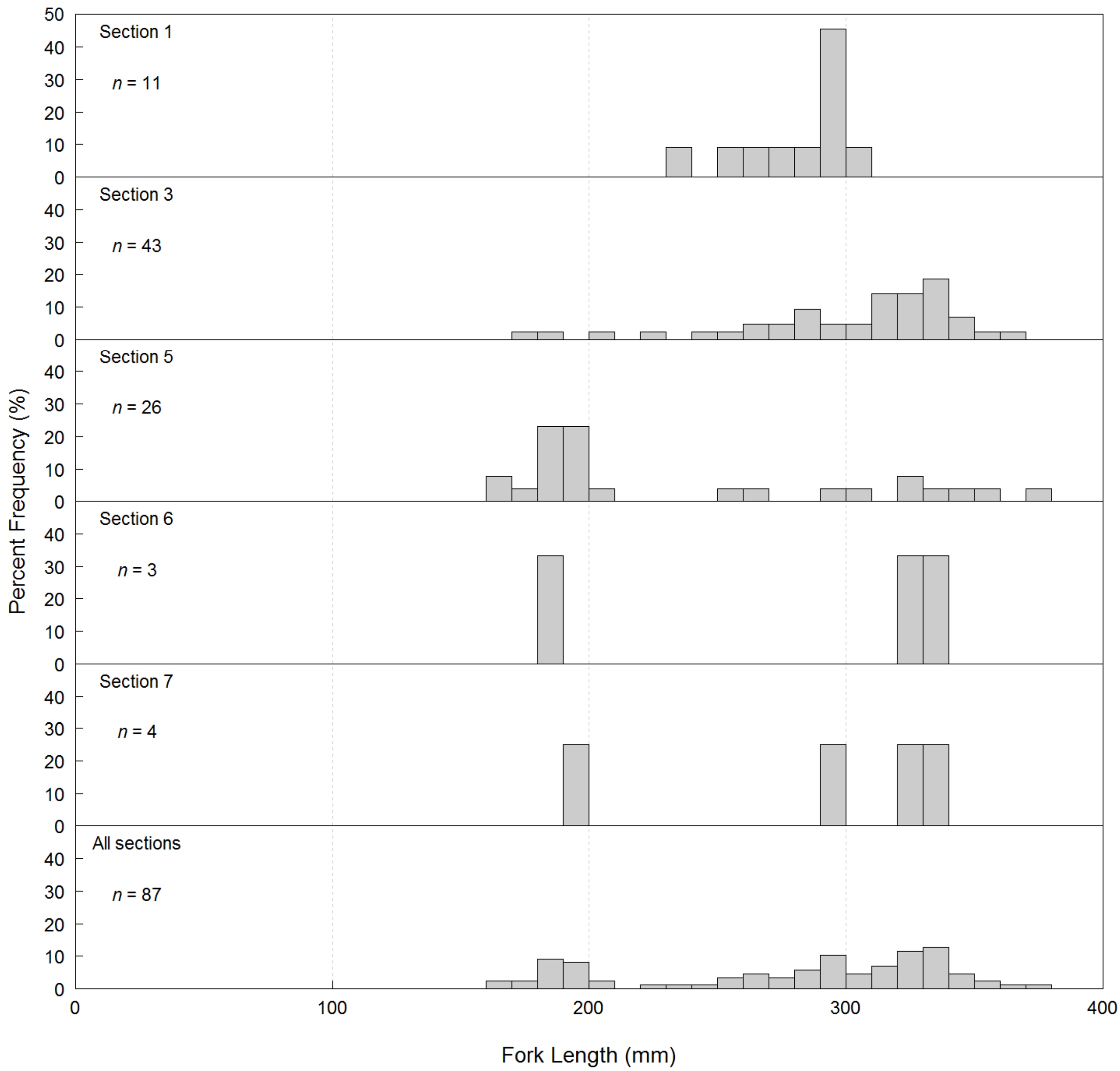


Figure 8: Length-frequency distribution for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

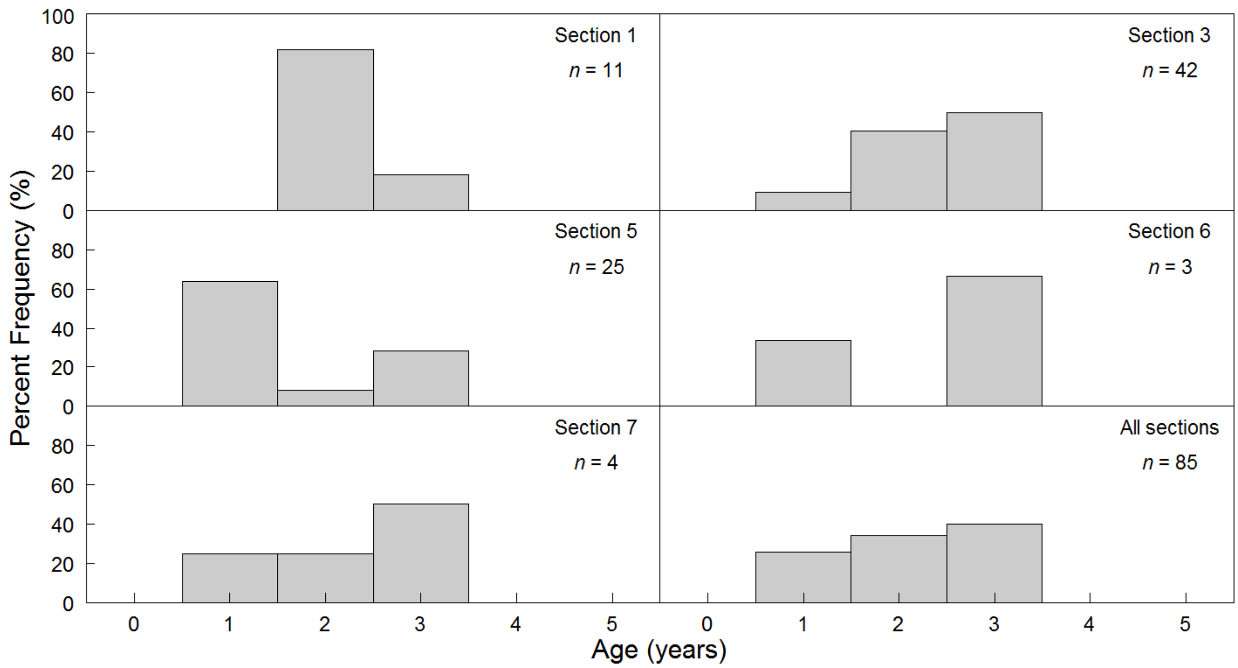


Figure 9: Age-frequency distributions for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

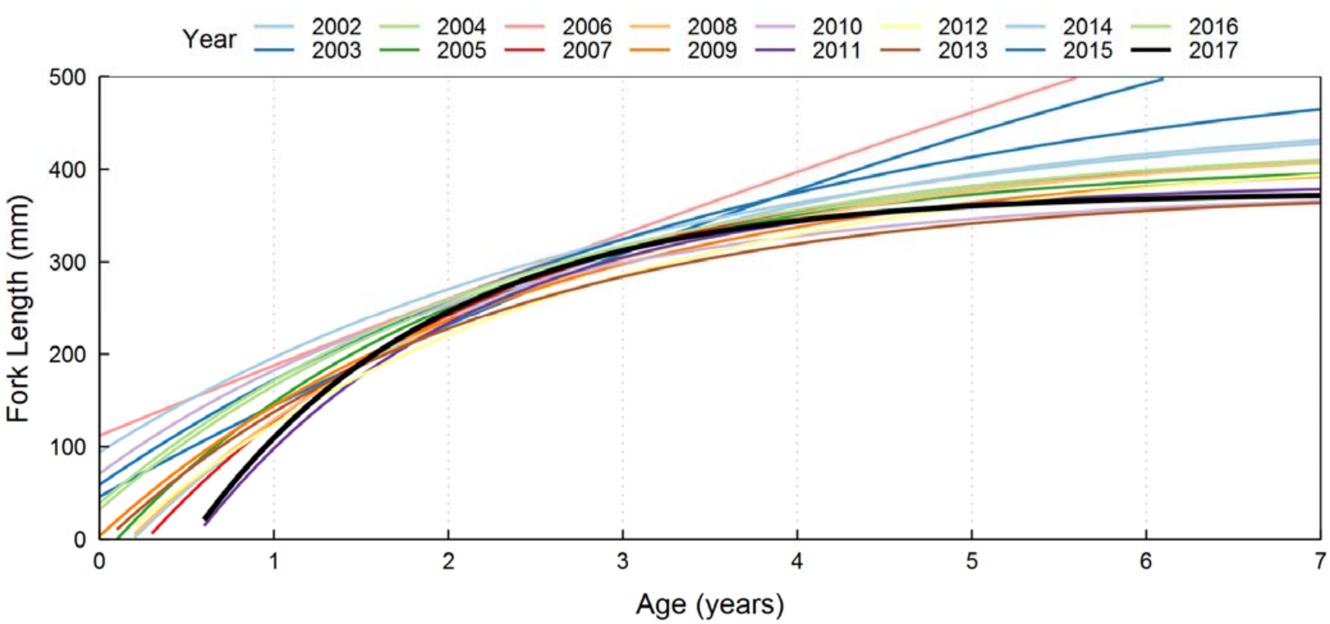


Figure 10: von Bertalanffy growth curves for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017.

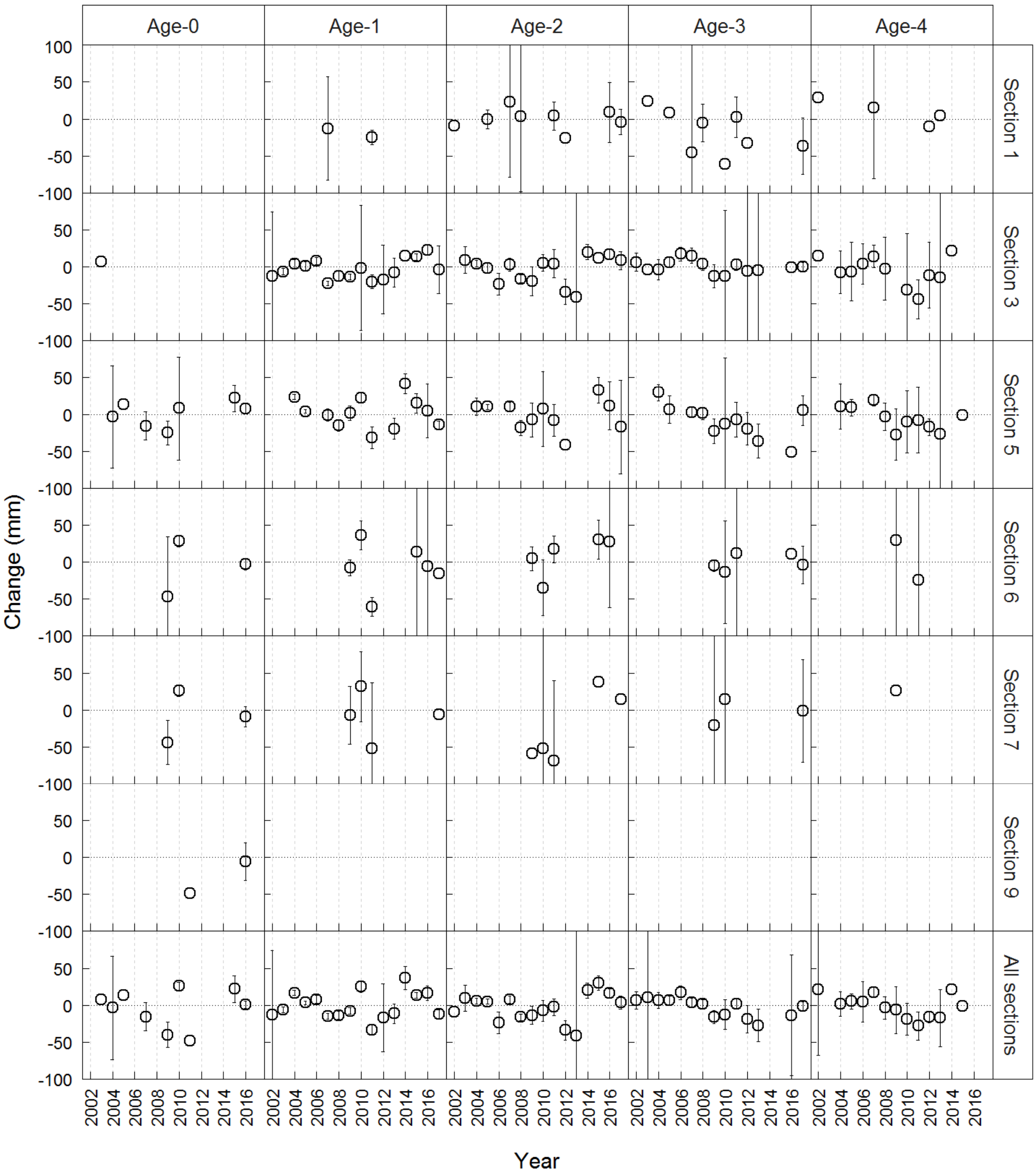


Figure 11: **Change in mean length-at-age for Arctic Grayling captured by boat electroshocking in the Peace River, 2002 to 2017. Change is defined as the difference between the annual estimate and the estimate of all years combined. Error bars represent 95% confidence intervals. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).**

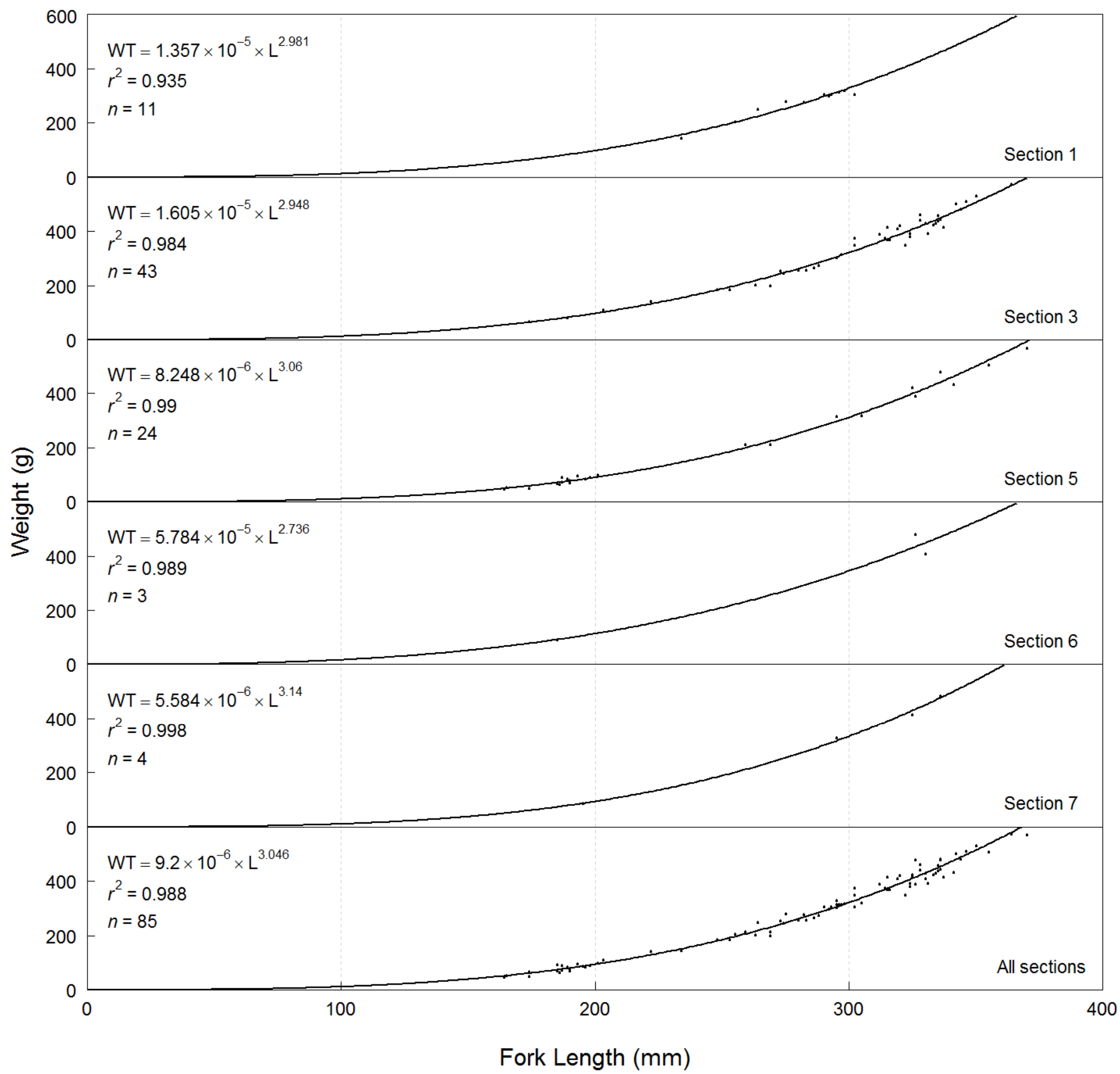


Figure 12: Length-weight regressions for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

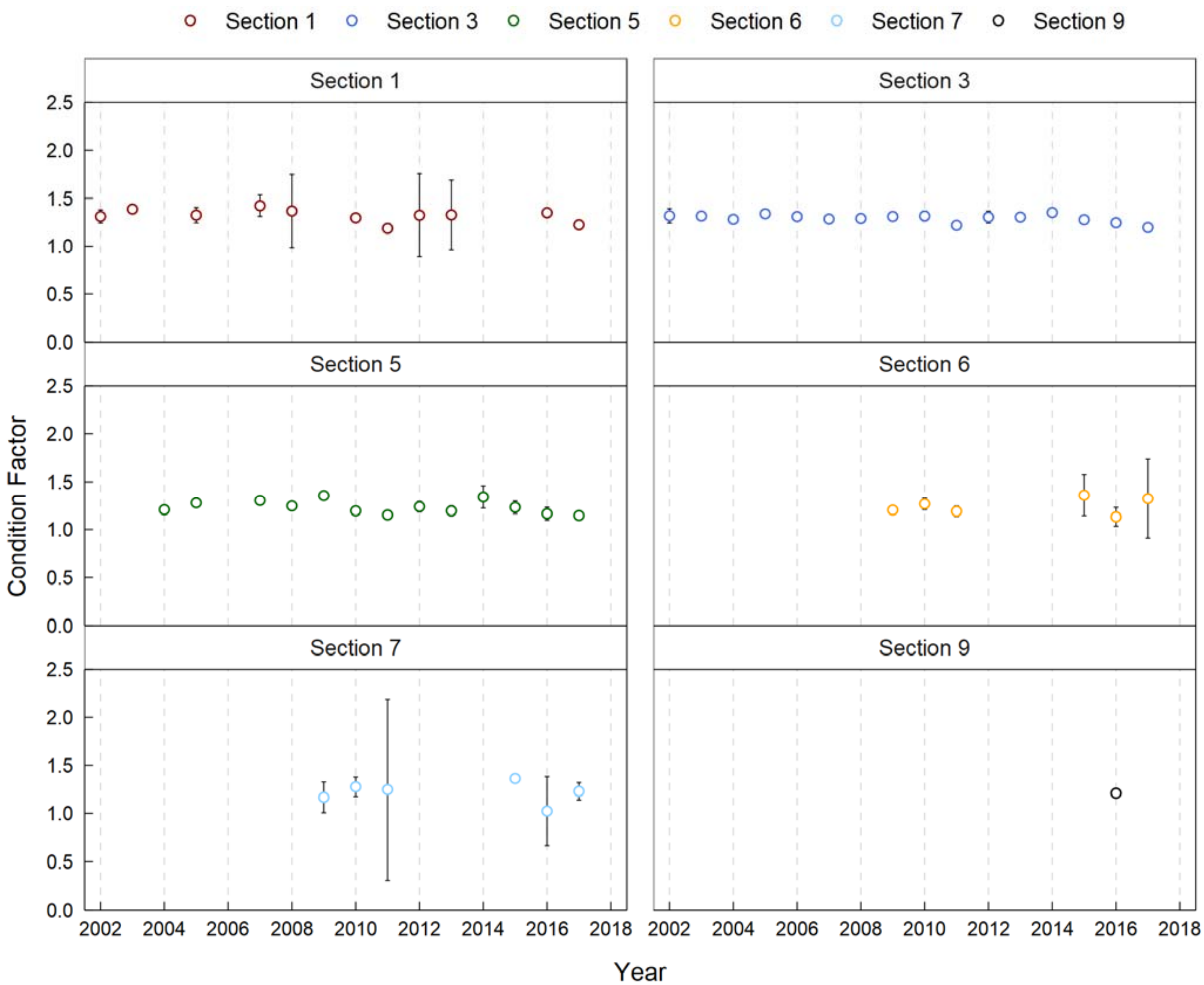


Figure 13: Mean body condition with 95% confidence intervals for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. For Sections 6 and 7, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

3.3.2 Abundance and Spatial Distribution

A thorough description of the population abundance analysis conducted by W.J. Gazey Research is provided in Appendix G. The text below represents a summary of key findings and conclusions drawn from results provided in Appendix G.

Arctic Grayling catches declined slightly from 2016 (*n* = 111) to 2017 (*n* = 87 fish). Of the 87 Arctic Grayling captured in 2017, 77% were captured at sites with physical cover and 13% were captured at sites without physical cover; the remaining 17% were captured in sites where the presence of cover was not assessed by P&E and Gazey (2003). Overall, capture data from all study years combined indicate that Arctic Grayling are common in Sections 3, 5 and 6 and present in small numbers in Sections 1, 7, and 9. However, the 12 Arctic Grayling

(11 captured plus 1 that was observed but avoided capture) recorded in Section 1 in 2017 represent the highest number of Arctic Grayling encountered in this section over all study years.

A fish released in Section 1 in 2017 was recaptured in Section 3; there was no other movement between sections. Low catches coupled with low recaptures of Arctic Grayling prevented the generation of population abundance estimates for most sections in 2017. Arctic Grayling recaptured during the 2017 survey (*n* = 10) were recorded in Section 1 (*n* = 1), Section 3 (*n* = 5), Section 5 (*n* = 1), and Section 7 (*n* = 3). Only Section 3 had sufficient recaptures to enable a minimum population abundance estimate of 309 fish with a 0.95 confidence probability (Table 10; Appendix G, Figure G16). Arctic Grayling abundance in Section 3 was lower in 2017 when compared to 2016 (Figure 14).

Table 10: Population abundance estimates generated using the Bayes sequential model for Arctic Grayling captured by boat electroshocking in Section 3 of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
3	309	202	95	649	160	51.8

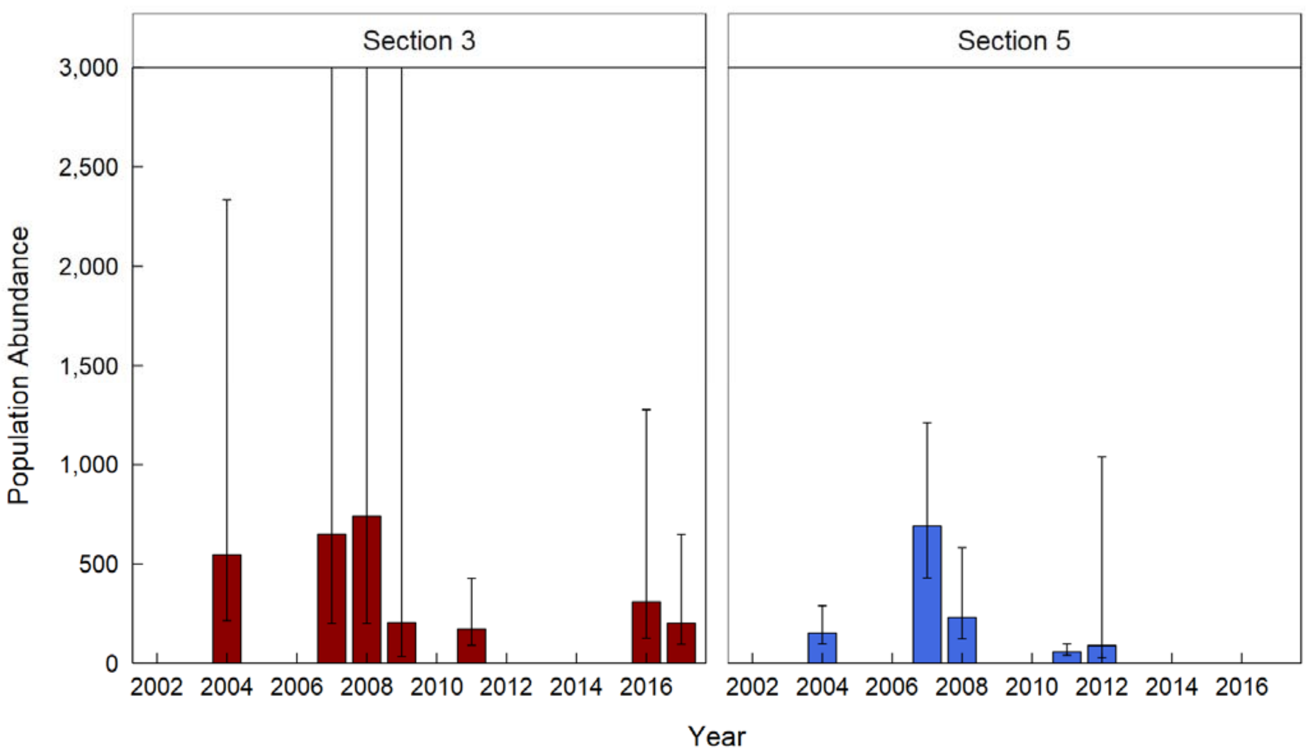


Figure 14: Population abundance estimates (with 95% credibility intervals) generated using the Bayes sequential model for Arctic Grayling captured by boat electroshocking in Sections 3 and 5 of the Peace River, 2002-2017.

3.4 Bull Trout

3.4.1 Biological Characteristics

During the 2017 survey, 238 Bull Trout were initially captured (i.e., excluding within-year and inter-year recaptures; Table 8) and measured for length and weight. Fork lengths ranged between 188 and 730 mm, and weights ranged between 62 and 4796 g. Fin ray samples were analyzed from all captured individuals; ages were successfully assigned to 179 individuals, ranging from age-2 to age-9 and included a single age-12 fish (Table 11).

Table 11: Average fork length, weight, and body condition by age for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

Age	Fork Length (mm)			Weight (g)			Body Condition (K)		
	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]
2	196 ± 7	188 – 200	3	75 ± 12	62 – 84	3	1.00 ± 0.06	0.93 - 1.05	3
3	248 ± 20	200 – 280	37	149 ± 37	88 – 225	37	0.96 ± 0.09	0.76 - 1.15	37
4	326 ± 37	262 – 387	44	364 ± 131	179 - 686	43	1.00 ± 0.11	0.84 - 1.38	43
5	392 ± 48	316 – 486	38	637 ± 240	297 – 1,185	37	1.00 ± 0.10	0.84 - 1.20	37
6	431 ± 70	360 - 620	29	887 ± 619	426 – 3,007	29	0.99 ± 0.11	0.82 - 1.26	29
7	490 ± 102	367 – 682	14	1,396 ± 961	501 – 3,520	14	1.03 ± 0.10	0.89 - 1.23	14
8	514 ± 88	408 – 674	10	1,449 ± 804	634 – 3,106	10	0.98 ± 0.11	0.86 - 1.15	10
9	520 ± 106	445 - 641	3	1,411 ± 885	822 – 2,429	3	0.92 ± 0.01	0.92 - 0.93	3
12	730	-	1	3,910	-	1	1.01	-	1

[a] Number of individuals sampled.

Length-frequency histograms suggest similar size distributions between sections in the study area (Figure 15). The majority of Bull Trout sampled (59%) were between 200 and 400 mm FL, which is consistent with historical results (Appendix F, Figures F6 and F7) and indicative of the use of the area primarily by subadults during the study period. Only four Bull Trout less than or equal to 200 mm FL were captured in 2017. Smaller Bull Trout (i.e., less than approximately 200 mm FL) rear in select Peace River tributaries (Mainstream 2012) and are very rare in the mainstem. During the study period, there are typically few large, sexually mature Bull Trout present in the Peace River mainstem because they are spawning in select tributaries (mainly in the Halfway River watershed; Mainstream 2012).

Age-frequency histograms indicated that age-3 through age-6 were the more common age-classes of Bull Trout captured (Figure 16). Most juvenile Bull Trout do not enter the Peace River mainstem until age-2 or age-3 (Appendix F, Figures F8 and F9) after rearing in Peace River tributaries. The age-2 Bull Trout captured during the 2017 survey were large enough (188–200 mm FL; *n* = 3) to be effectively sampled by the boat electroshocker, indicating that this age-class is not being missed by the sampling gear but is present in low numbers.
Age distributions did not differ substantially by section, with most of the available age-classes being present in most sections and habitats during the 2017 survey.

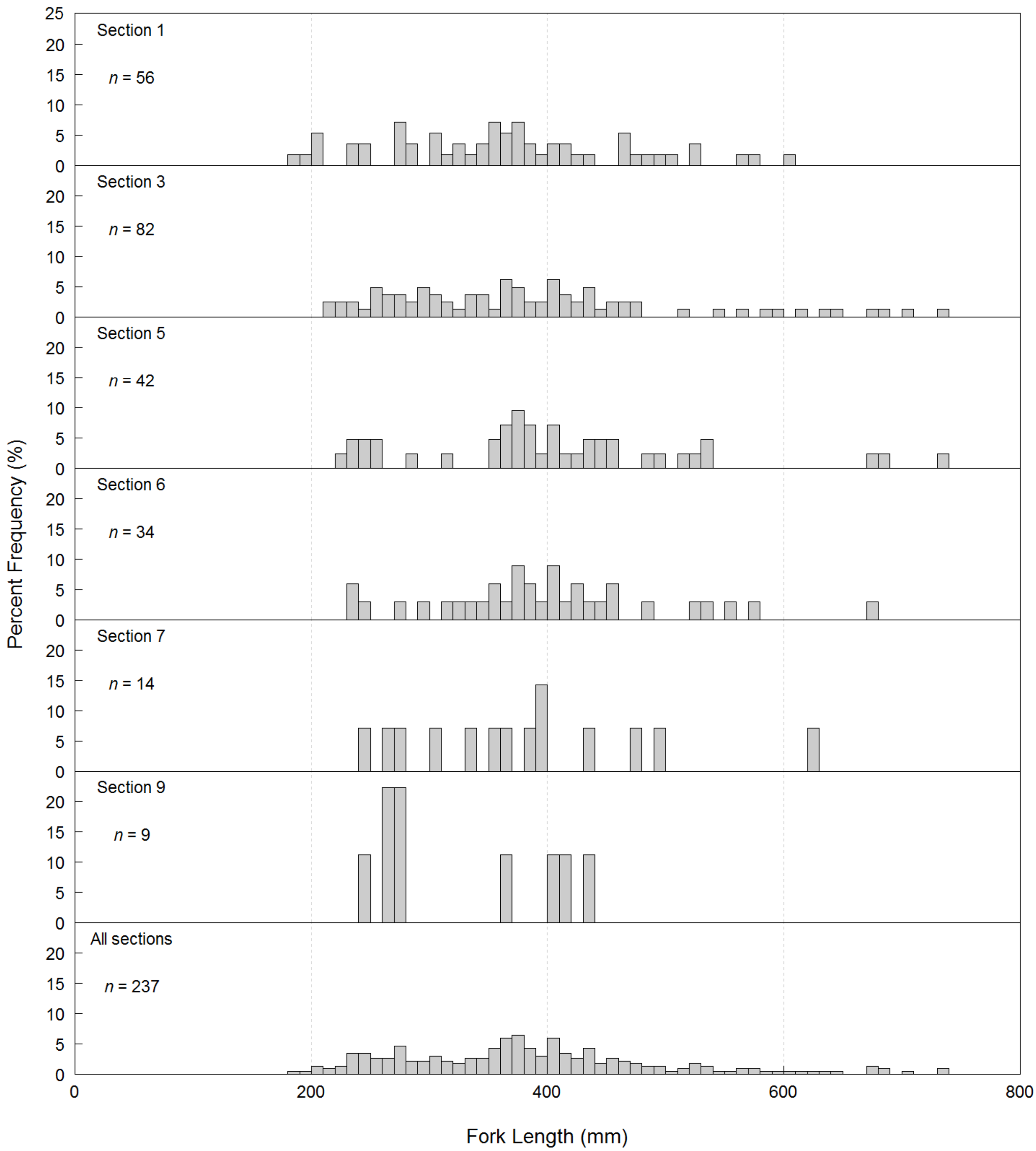


Figure 15: Length-frequency distributions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

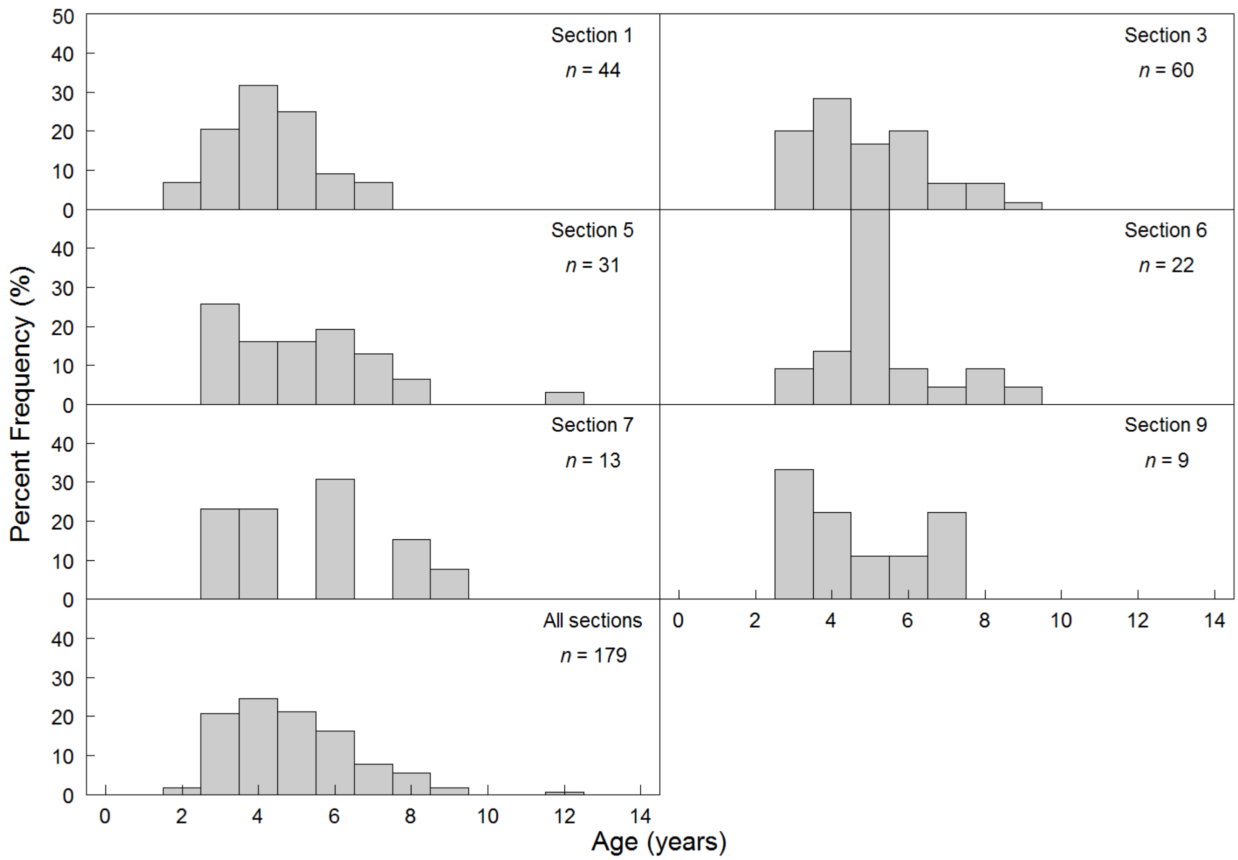


Figure 16: Age-frequency distributions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

The absence of distinct modes in length-frequency histograms (Figure 15; Appendix F, Figures F6 and F7) suggests that Bull Trout grow slowly after migrating into the Peace River from their natal streams. Slow growth of Bull Trout in the study area is supported by average length-at-age data (Table 11) and von Bertalanffy growth analyses (Figure 17 and Figure 18). In 2017, for juvenile and subadult Bull Trout from age-2 to age-4, there was little difference in growth between sections (Figure 17). Lower growth rate estimates in 2017 compared to previous study years could partially be attributed to the use of a diamond bladed rotary sectioning saw. The saw produced thinner and more polished ray sections, when compared to the hand saw technique used in 2014–2016. The improvement in the quality of the sections made it easier to accurately assign ages. Results suggest that fish ages were likely under-aged during previous study years. Additional ageing data collected in future study years will potentially allow verification of the reduced Bull Trout growth rate identified in 2017 to determine if the trend persists.

The average change in length-at-age analysis for Bull Trout (Figure 19) was limited to individuals less than age-4 due to the slow growth, wide range of lengths recorded, and unknown precision and suspected less accurate age estimates assigned to older individuals. Average length-at-age was lower in 2017 than the immediately preceding years but remained similar to historical averages. Greater variability in length-at-age was recorded for the age-2 cohort due to small sample size. The confidence limits of average length-at-age estimates overlapped from study year 2014 onward in most sections where substantial numbers of fish were caught. In sections where catch was lower, greater variability in length-at-age was recorded due to small sample size. Overall, the results of this analysis should be treated as suspect due to substantial overlap of length-at-age estimates for age classes age-1 through age-4 (Table 11).

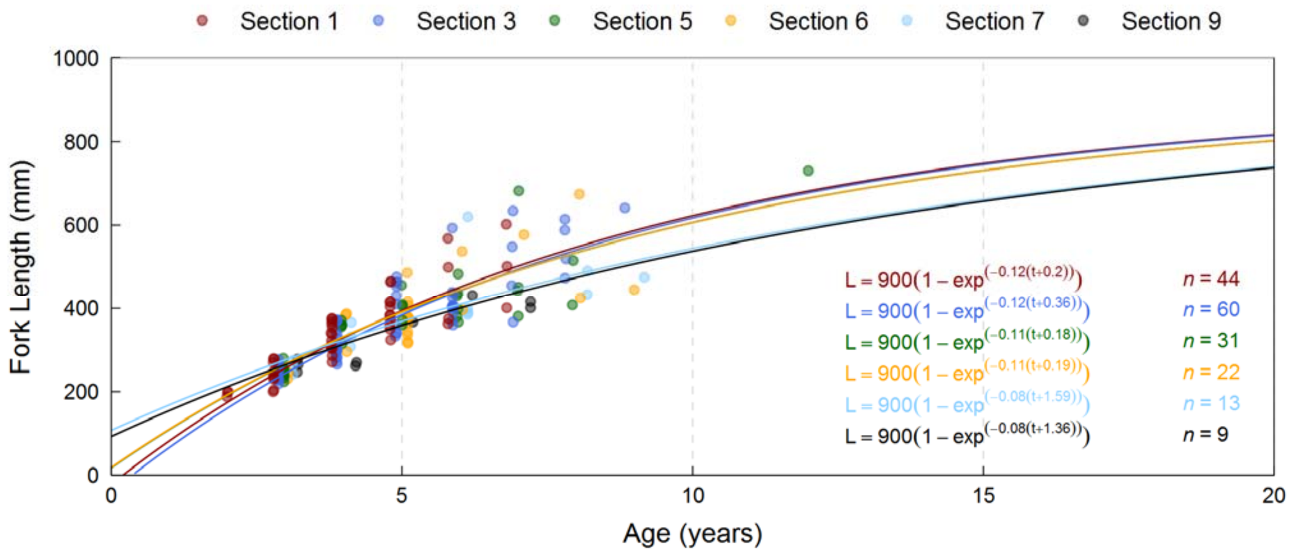


Figure 17: von Bertalanffy growth curve for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

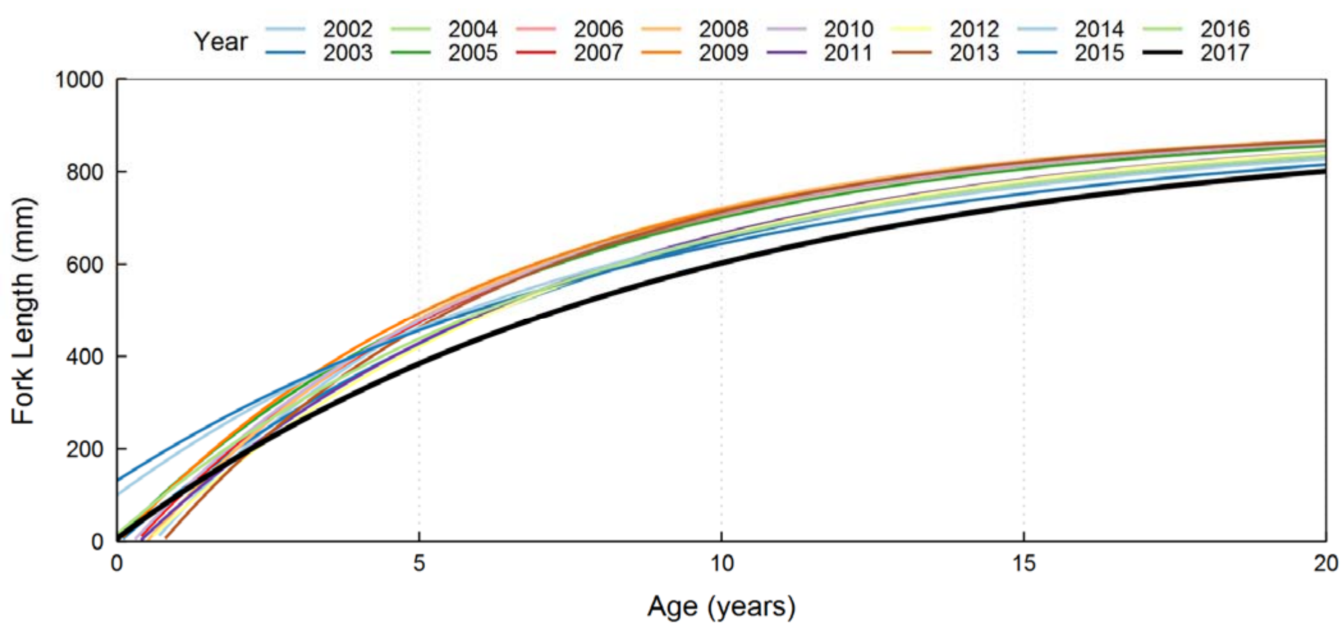


Figure 18: von Bertalanffy growth curve for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017.

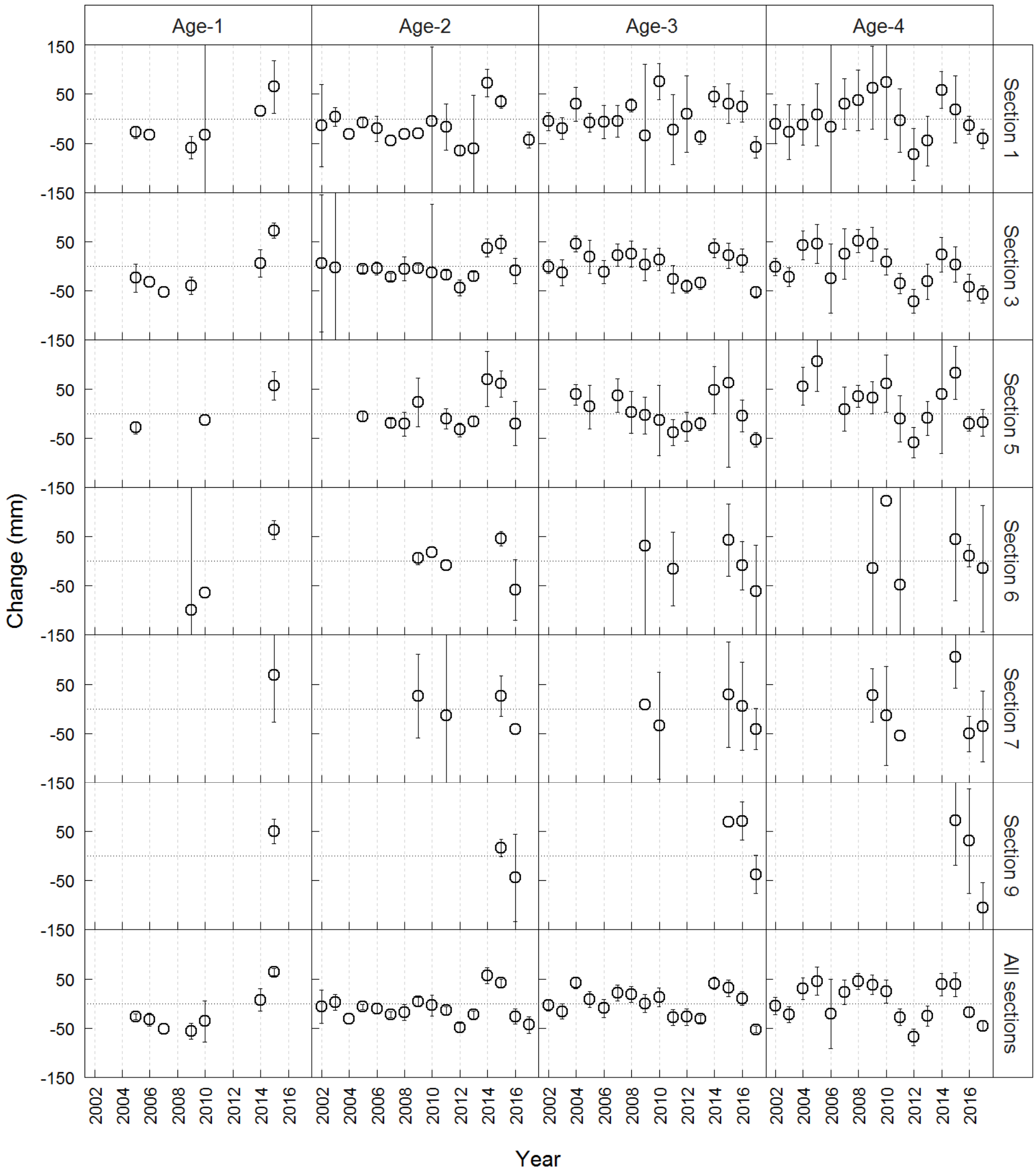


Figure 19: Change in mean length-at-age for Bull Trout captured by boat electroshocking during the Peace River Fish Index, 2002 to 2017. Change is defined as the difference between the annual estimate and the estimate of all years combined. Error bars represent 95% confidence intervals. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

Overall, estimates of mean body condition (*K*) increased from 2002 to 2009, particularly in Section 1. In Section 3, body condition declined between 2014 and 2016, but remained stable between 2016 and 2017. Body condition declined between each successive year between 2014 and 2017 in Section 5 and declined between each successive year between 2015 and 2017 in Section 6. Body condition estimates in Sections 7 and 9 have been variable over the last three years (i.e., since these sections were added to the program in 2015); however, an increase was recorded for Sections 7 and 9 between 2016 and 2017. Overlapping confidence intervals for many of the annual estimates suggested that within year differences among sections were not statistically different (Figure 20). Confidence intervals surrounding mean body condition estimates before and after 2014 generally do not overlap. During most study years, body condition estimates were typically greatest in Section 1.

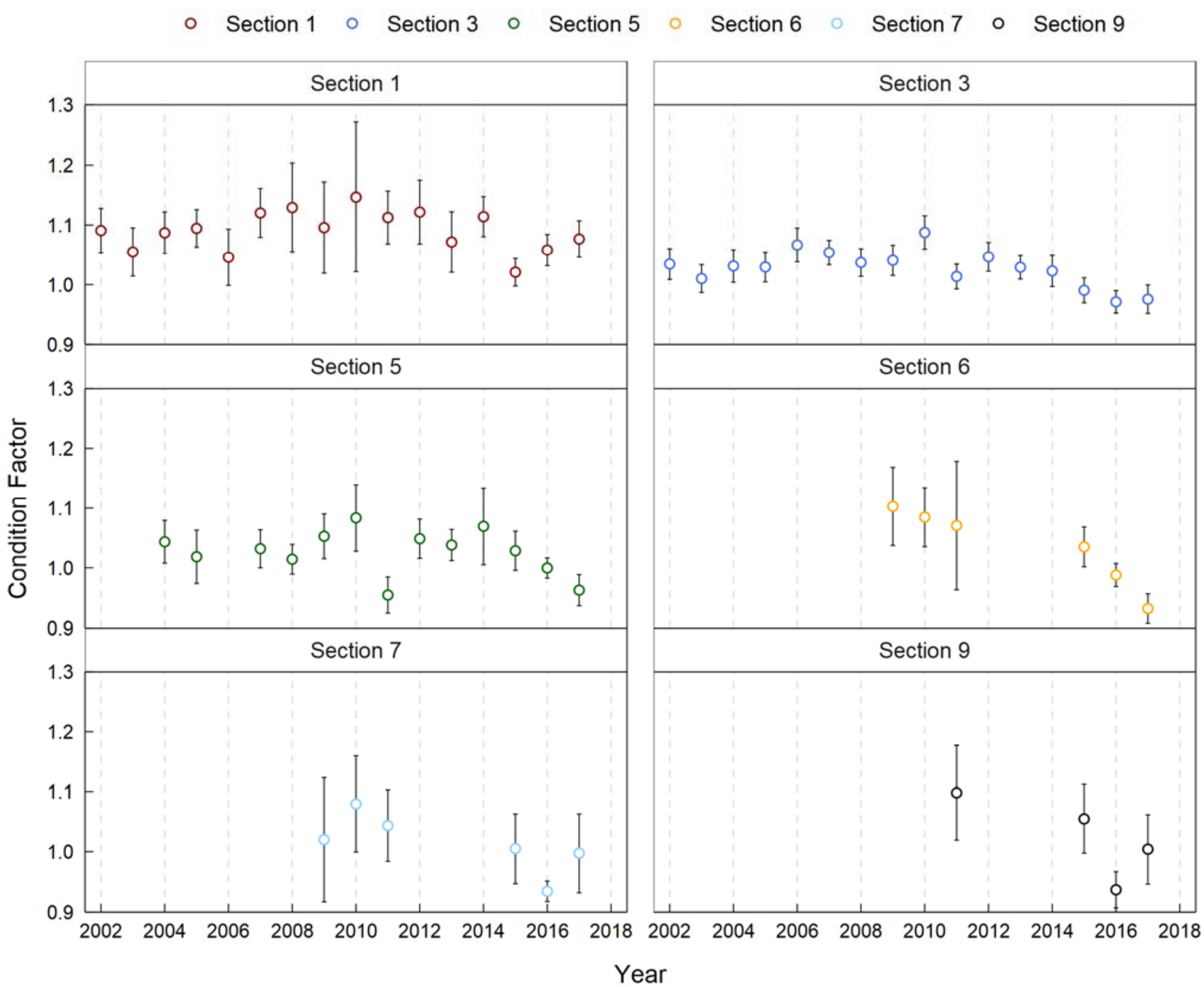


Figure 20: Mean body condition with 95% confidence intervals for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

In 2017, length-weight regression analyses for Bull Trout (Figure 21) were similar to historical study years (Appendix F, Figure F10) and showed low variability over the 14-year study period.

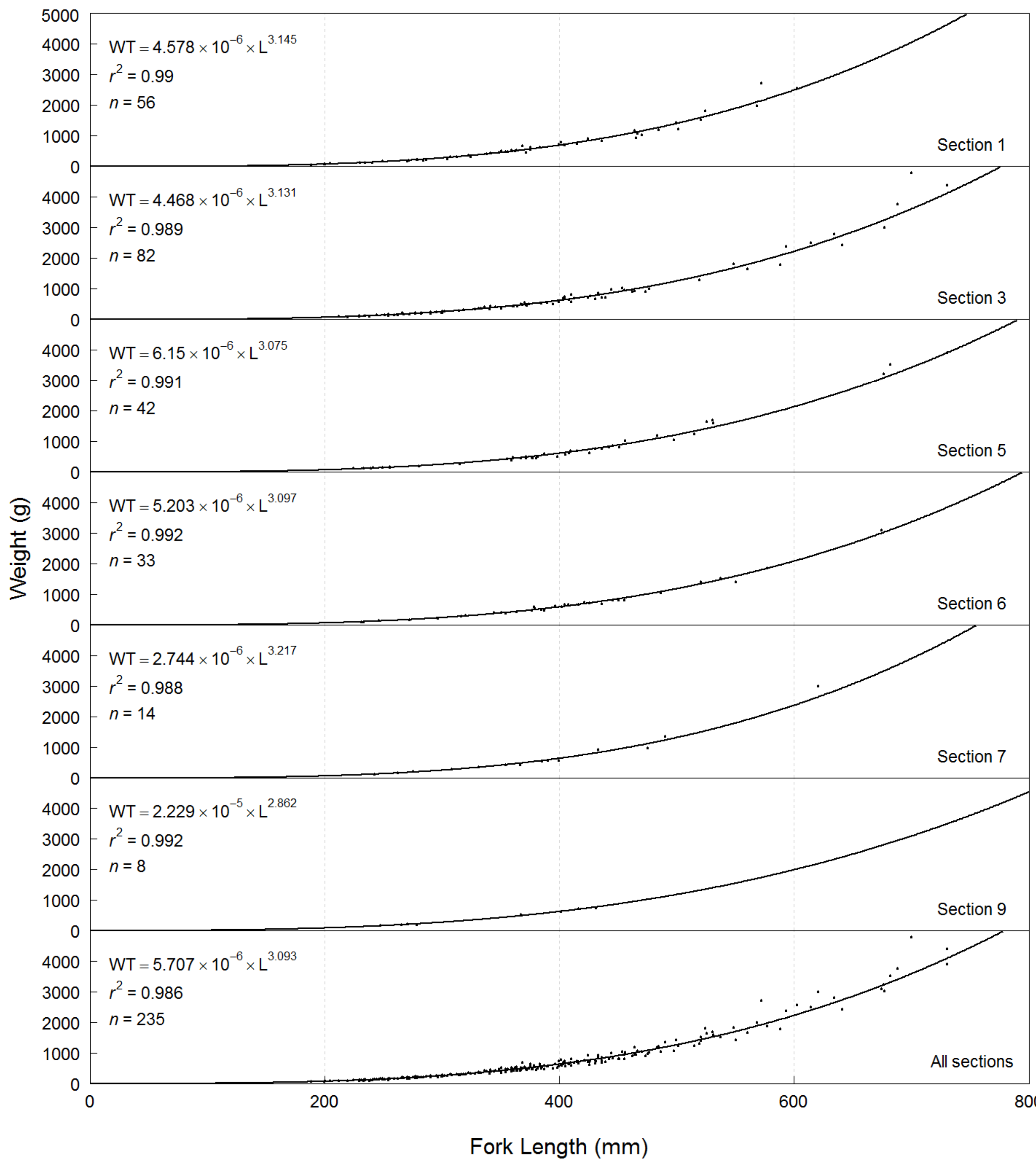


Figure 21: Length-weight regressions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

3.4.2 Abundance and Spatial Distribution

A thorough description of the population abundance analysis conducted by W.J. Gazey Research is provided in Appendix G. The text below represents a summary of key findings and conclusions drawn from results provided in Appendix G.

Of the 235 Bull Trout that were implanted with a PIT tag, 34 were recaptured. One Bull Trout was recaptured in a downstream section relative to its initial release section. All other individuals were recaptured in their initial sections. A summary of the 2017 population estimates using the Bayes sequential model is given in Table 12. A population estimate was not generated for Section 9 in 2017 because recaptures were not recorded in this section.

Table 12: Population abundance estimates generated using the Bayes sequential model for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
1	251	174	86	500	124	49.4
3	621	432	208	1,239	297	47.9
5	142	106	57	265	61	43.0
6	55	43	25	98	21	38.4
7	63	41	22	131	35	54.8
Total	1,132		485	1,779	330	29.2

In 2017, the Section 3 population abundance estimate increased compared to the previous year; whereas, the Section 1 population estimate decreased (Figure 22). Overall, the Section 1, 3, and 5 population estimates were higher from 2015 to 2017 when compared to 2013 to 2014 study years, although confidence intervals surrounding estimates were wide and overlapped during most years. Within most study years, population abundance estimates were typically greater in Sections 1 and 3 when compared to Sections 5.

In 2015, Bull Trout abundance in Section 6 was substantially higher when compared to Sections 7 and 9 (Figure 22). This pattern of distribution was not evident in 2016 or 2017. In 2017, Bull Trout population abundance was low in the downstream sections (Section 6, 7, and 9) relative to 2015 and 2016 estimates.

The annual mortality rate for Bull Trout as calculated by catch curve analysis using data from all study years combined was 21–47%, depending on the section (Appendix F, Figure F11). Individual annual estimates of mortality for Bull Trout (Sections 1, 3, and 5 combined) varied between a low of 24% in 2012 and a high of 64% in 2003 (Appendix F, Figure F12).

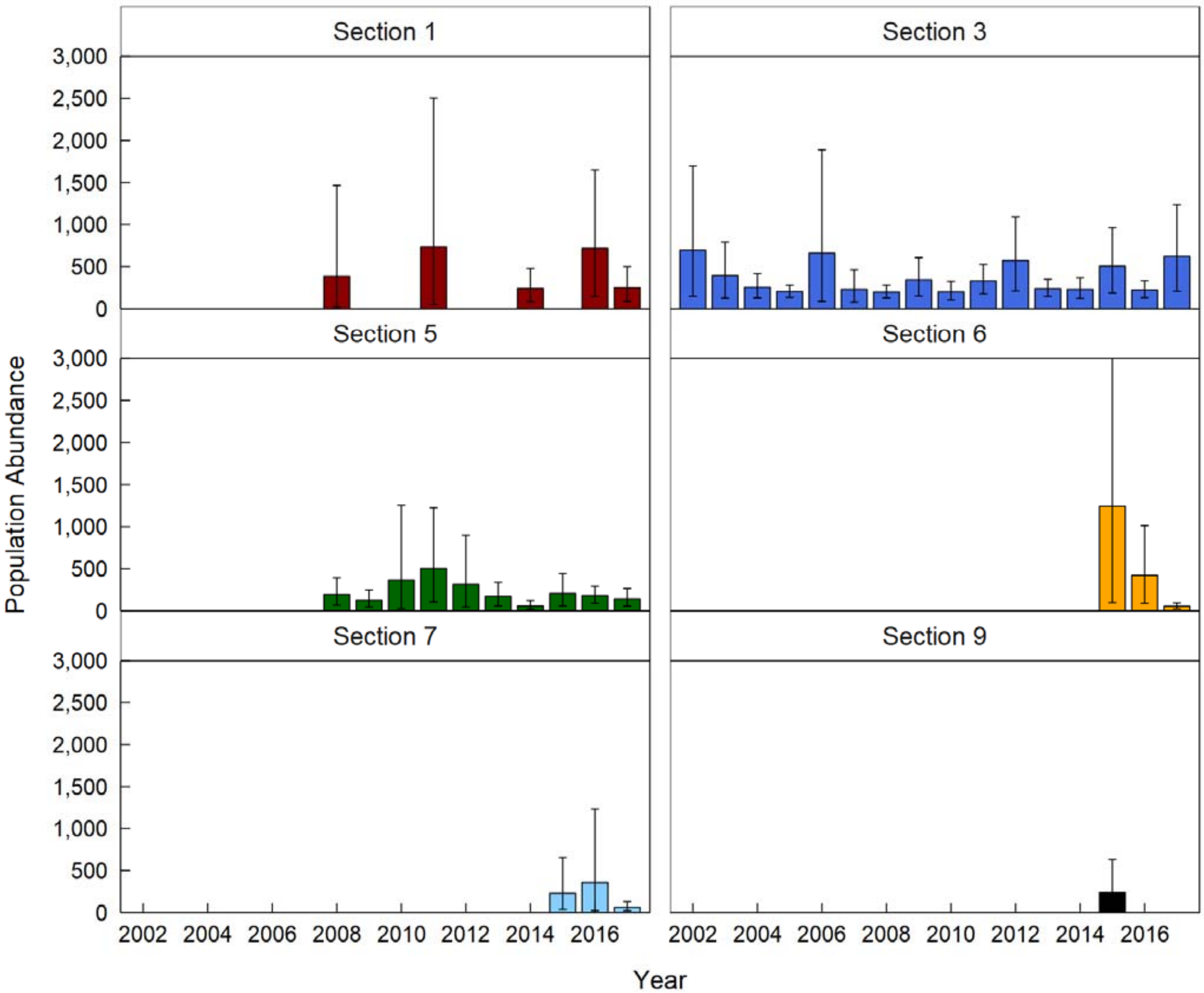


Figure 22: Population abundance estimates (with 95% credibility intervals) generated using the Bayes sequential model for Bull Trout captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002–2017.

3.5 Burbot

In 2017, six Burbot were captured and an additional four Burbot were observed but not captured.

Overall encounters (i.e., captured plus observed fish) were substantially lower in 2017 (n = 10) and 2015 (n = 5) when compared to 2016 (n = 60). Burbot are a cool-water species (Mainstream 2012) and in 2017 were captured only in Section 5 (n = 2), Section 7 (n = 3), and Section 9 (n = 1). Total lengths ranged between 326 and 725 mm, and weights ranged between 186 and 2310 g. Ageing structures were not collected from Burbot. The age of the smallest Burbot encountered in 2017 (186 mm TL) is likely age-1 or age-2 based on growth rates in other systems (e.g., Bailey 2011; Bonar et al. 2000).

The limited number of immature Burbot encountered (Figure 23), coupled with their sporadic use of the study area (i.e., an approximate 12-fold increase in encounters in 2016 compared to 2015 and 2017) suggests that the area is primarily used for feeding by subadults and adults during the study period and only during years when conditions are suitable. Average Secchi depth across all sections and sessions combined was lower in 2016 (61 cm) when compared to 2014, 2015, and 2017 (135 cm; Attachment A).

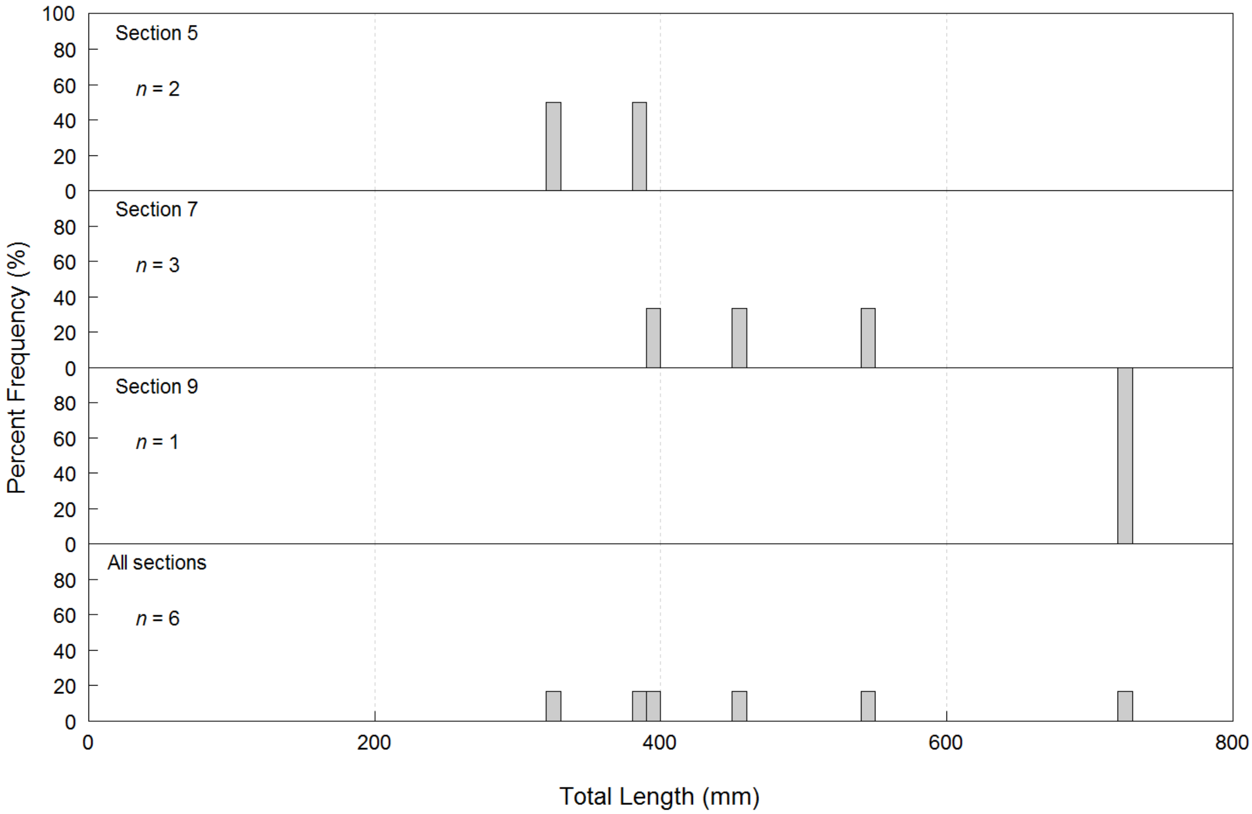


Figure 23: Length-frequency distribution for Burbot captured by boat electroshocking in the Peace River (by section and all sections combined), 21 August to 4 October 2017.

All six of the Burbot captured during the 2017 survey were implanted with PIT tags; none were subsequently recaptured. Population abundance estimates were not generated for Burbot due to the low number of tagged and recaptured fish.

3.6 Goldeye

In total, three Goldeye were captured during the 2017 survey and an additional two Goldeye were observed but not captured. All three Goldeye were captured in Section 9. Historically, Goldeye are typically only present in downstream sections of the study area (i.e., downstream of Section 3). Fork lengths of captured fish ranged between 384 and 430 mm, weights ranged between 692 and 974 g, and body conditions (K) ranged between 1.22 and 1.55 (Table 13). Ages were not assigned to Goldeye captured in 2017 due to the low precision among age estimates. The data available suggest that Goldeye are present in small numbers in the downstream portion of the study area during the study period. Body condition (Figure 24) data for Goldeye in 2017 were consistent with historical datasets (Mainstream 2010, 2011, 2013).

All three of the Goldeye captured during the 2017 survey were implanted with PIT tags; however, none of them were subsequently recaptured. Population abundance estimates were not generated for Goldeye.

Table 13: Fork length, weight, body condition, and age for Goldeye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

Section	Fork Length (mm)	Weight (g)	Body Condition (K)
9	384	692	1.22
9	393	942	1.55
9	430	974	1.23

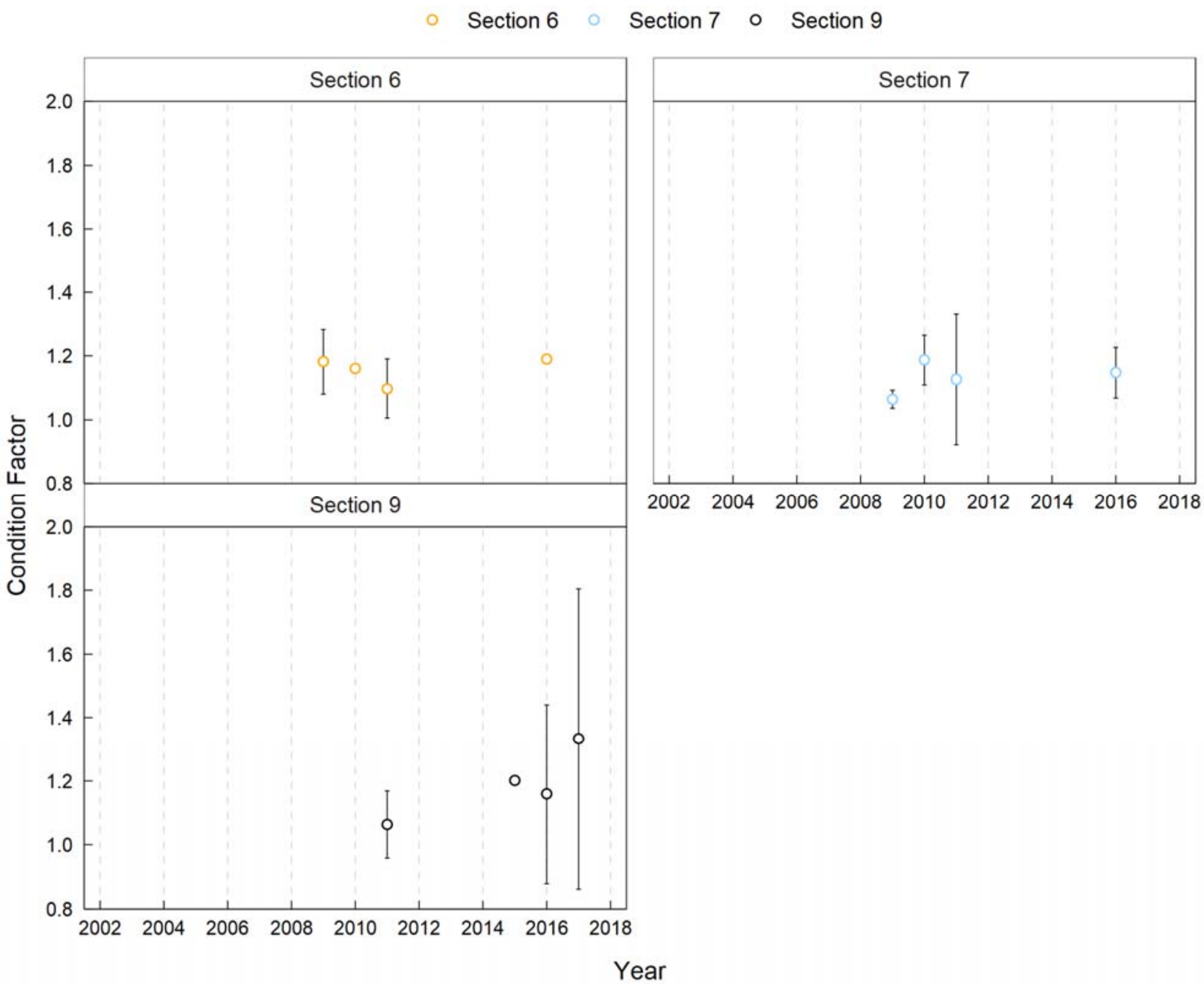


Figure 24: Mean body condition with 95% confidence intervals for Goldeye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. Data from 2009, 2010, and 2011 were collected during boat electroshocking surveys conducted during the late summer to fall period by Mainstream (2010, 2011, 2013).

3.7 Largescale Sucker

3.7.1 Biological Characteristics

During the 2017 survey, 884 Largescale Sucker were initially captured (i.e., excluding within-year and inter-year recaptures; Table 8). Of these 884 fish, 597 were measured for length and weight. Fork lengths ranged between 55 and 584 mm, and weights ranged between 6 and 2506 g.

Length-frequency histograms for Largescale Sucker suggest some differences in length distribution between sections (Figure 25). Small fish (i.e., 100–400 mm FL) were most commonly recorded in Section 9, whereas large fish (i.e., 400–600 mm FL) were most commonly recorded in Section 1. This finding is consistent with the 2015 and 2016 survey results.

In 2017, the length-weight relationship for Largescale Sucker (Figure 26) was similar to historical study years (Appendix F, Figures F25). The mean body condition of Largescale Sucker varied little among years; however, 2017 data suggest a trend of declining condition with distance downstream of PCD (Sections 1 to 3 only; Figure 27). A similar trend was identified in 2016.

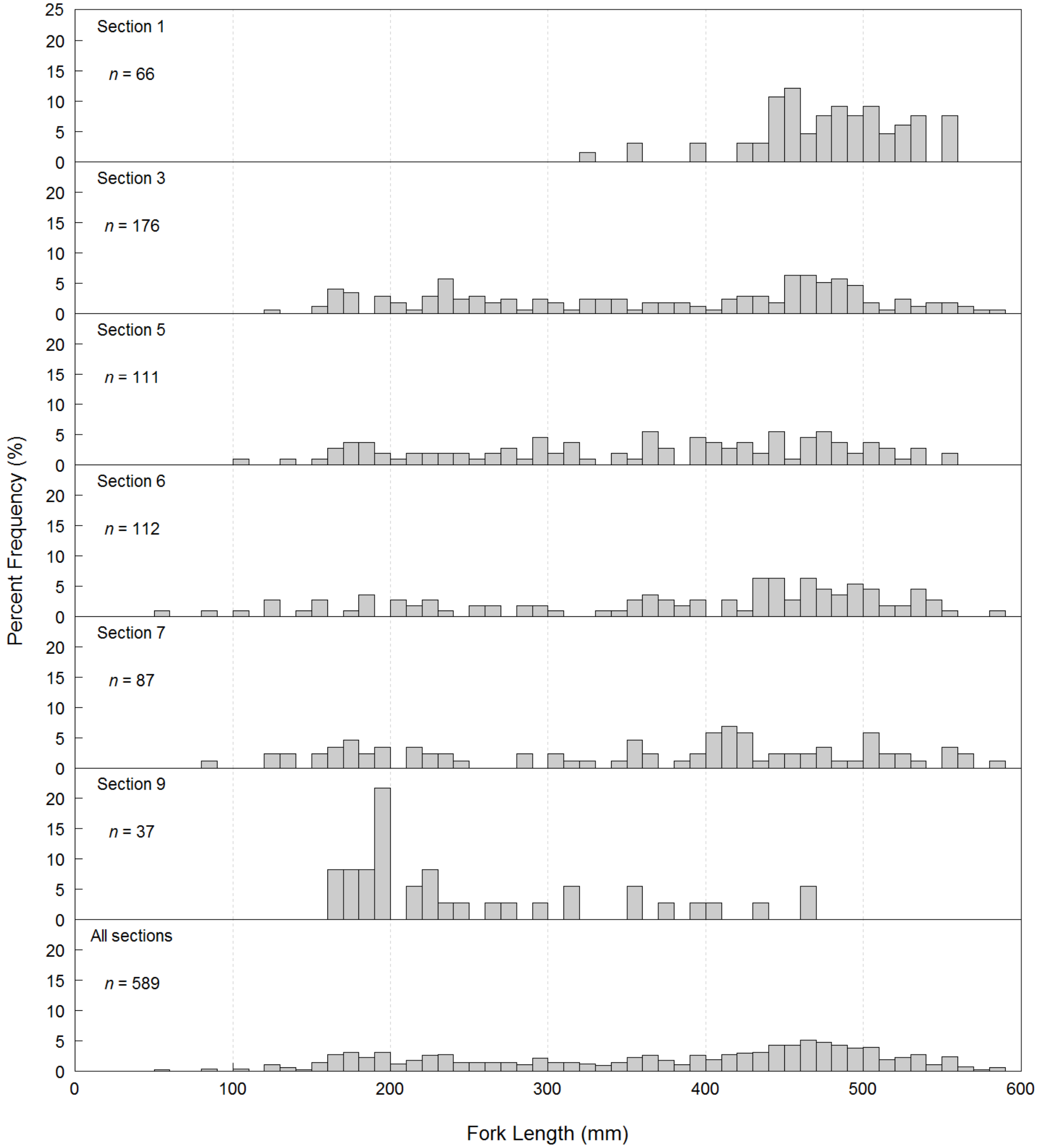


Figure 25: Length-frequency distributions for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

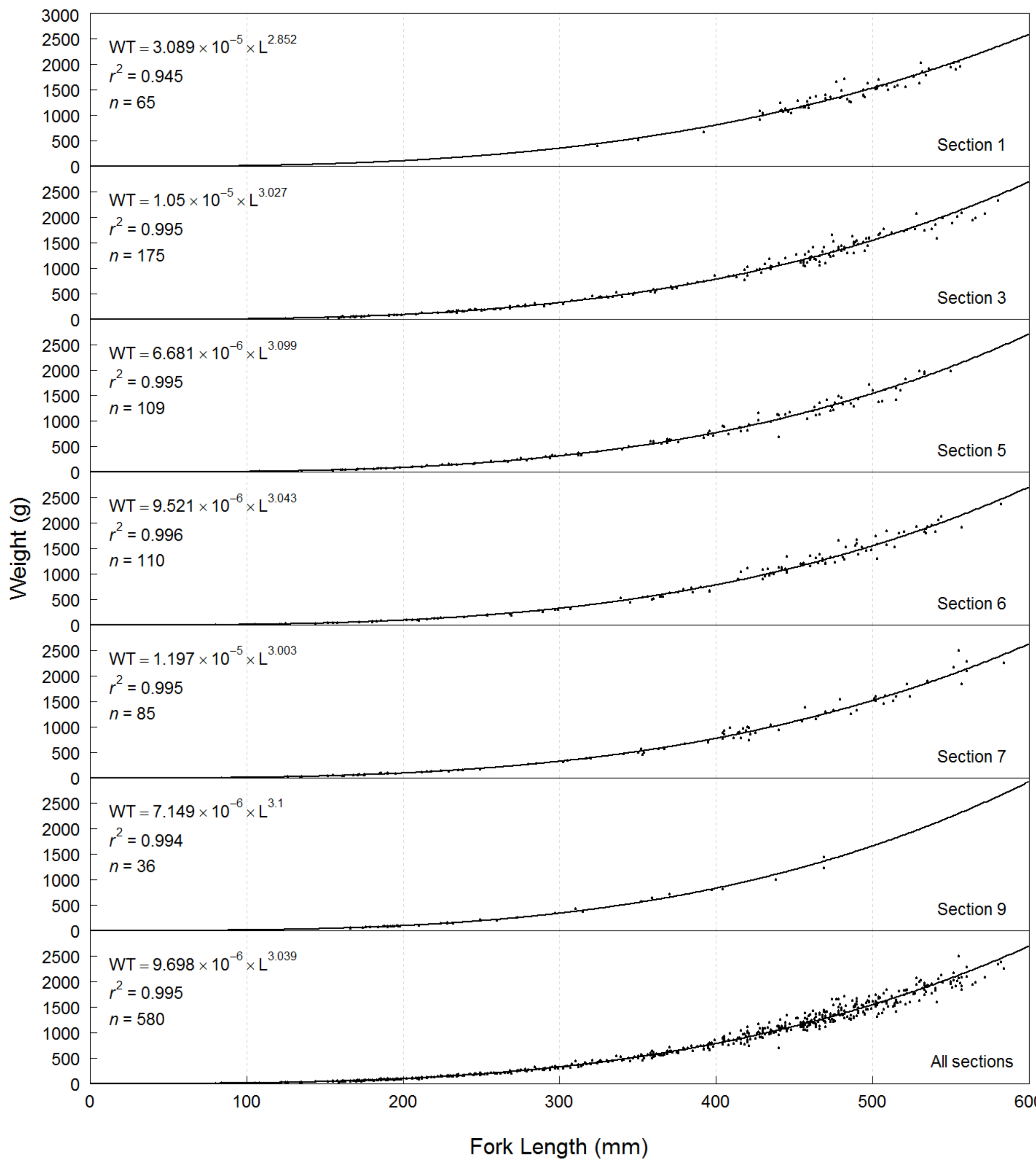


Figure 26: Length-weight regressions for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

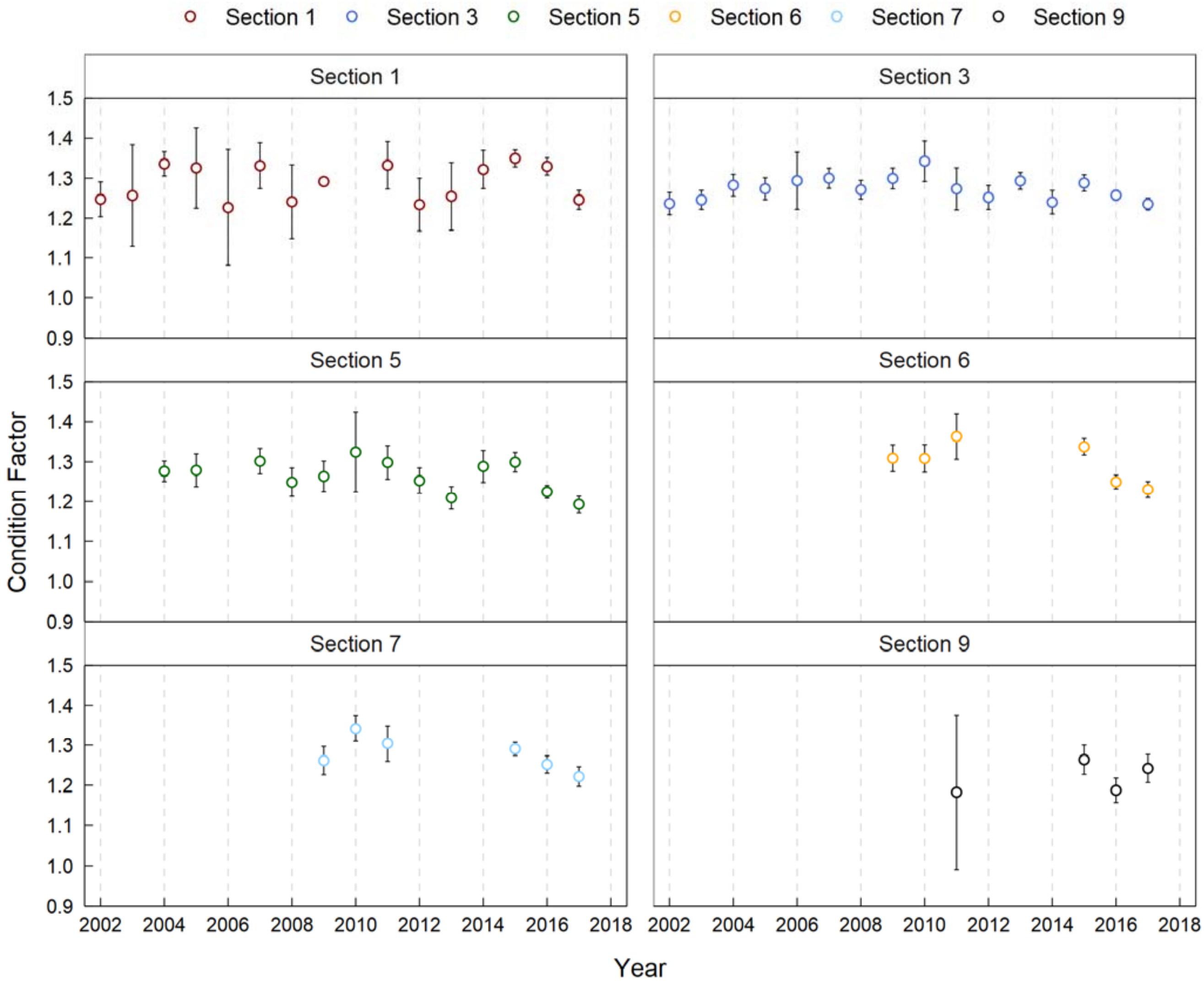


Figure 27: Mean body condition with 95% confidence intervals for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

3.7.2 Abundance and Spatial Distribution

Low numbers of recaptures of Largescale Sucker in 2017 in Section 1 (n = 2), Section 5 (n = 1), and Section 9 (n = 0) prevented the calculation of population abundance estimates for these sections. The 2017 abundance estimates for the remaining sections (Table 14) had wide confidence bands when compared to 2015 and 2016 estimates (Figure 28) due to overall low recapture rates. Population abundance estimates were not available for years prior to 2015 because this species was not marked prior to 2015. Movement of Largescale Suckers between sections was detected in 2017, with approximate 15% of fish recaptured (3 of 20 individuals) in sections upstream (n = 1) or downstream (n = 2) of the section they were initially tagged and released.

Table 14: Population abundance estimates generated using the Bayes sequential model for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
3	7,282	3,860	1,400	17,900	5,255	72.2
6	4,090	2,200	800	9,980	2,838	69.4
7	829	520	220	1,840	495	59.7
Total	12,201		454	23,948	5,993	49.1

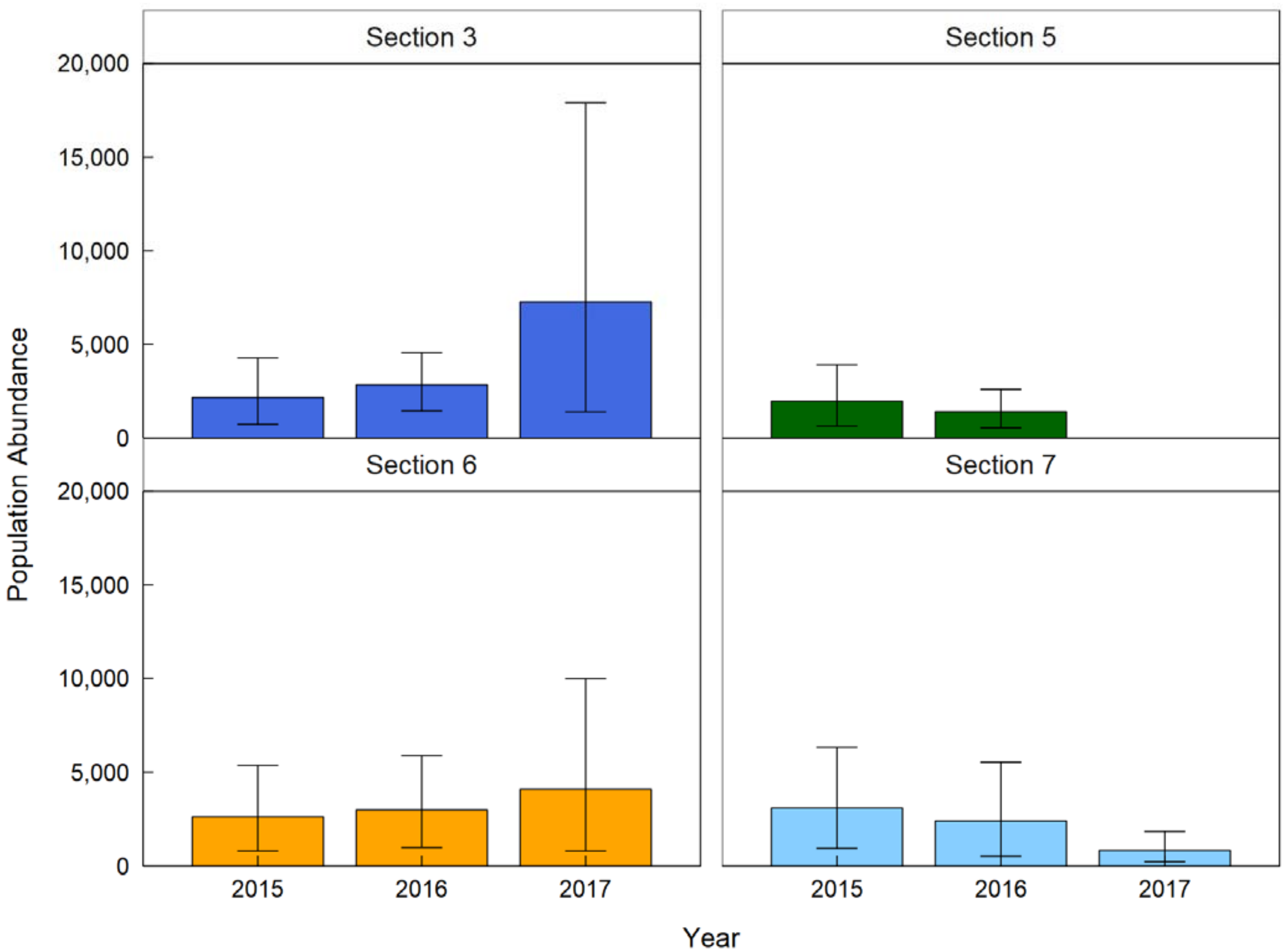


Figure 28: Population abundance estimates (with 95% credibility intervals) generated using the Bayes sequential model for Largescale Sucker captured by boat electroshocking in Sections 3, 5, 6, and 7 of the Peace River, 2002–2017.

3.8 Longnose Sucker

3.8.1 Biological Characteristics

During the 2017 survey, 5021 Longnose Sucker were initially captured (i.e., excluding within-year and inter-year recaptures; Table 8). Of these 5021 fish, 3784 were measured for length and weight. Fork lengths ranged between 50 and 565 mm, and weights ranged between 2 and 2281 g.

For Longnose Sucker, a lack of distinct modes in length-frequency histograms for most sections suggest that the sample comprised of multiple age-classes with overlapping length distributions (Figure 29). Most captured Longnose Sucker were between 350 and 450 mm FL in all sections in 2017 and previous study years (Appendix F, Figures F20 and F21). Section 9 had more small (i.e., less than 250 mm FL) Longnose Sucker, whereas Section 1 had fewer small Longnose Sucker when compared to other sections; this distribution pattern is consistent with previous study years (Figure 29).

There was no consistent trend over time in the body condition of Longnose Sucker (Figure 30). Similar to the trend observed in Largescale Sucker (Figure 27), 2017 data suggest declining condition in Longnose Sucker with increasing distance downstream of PCD, with substantially higher condition recorded in Section 1 and substantially lower condition recorded in Section 9. The lower condition in Section 9 is partially related to fish size, as small suckers, which are more abundant in Section 9 than in other sections, typically have lower condition values than larger individuals (Attachment A). This pattern of conditions was noted in 2015 and 2016, but was not observed in historical datasets (Mainstream 2010, 2011, 2013; Figure 30).

Length-weight relationships for Longnose Sucker were similar among sections (Figure 31) and did not suggest substantial changes over time (Appendix F, Figure F22).

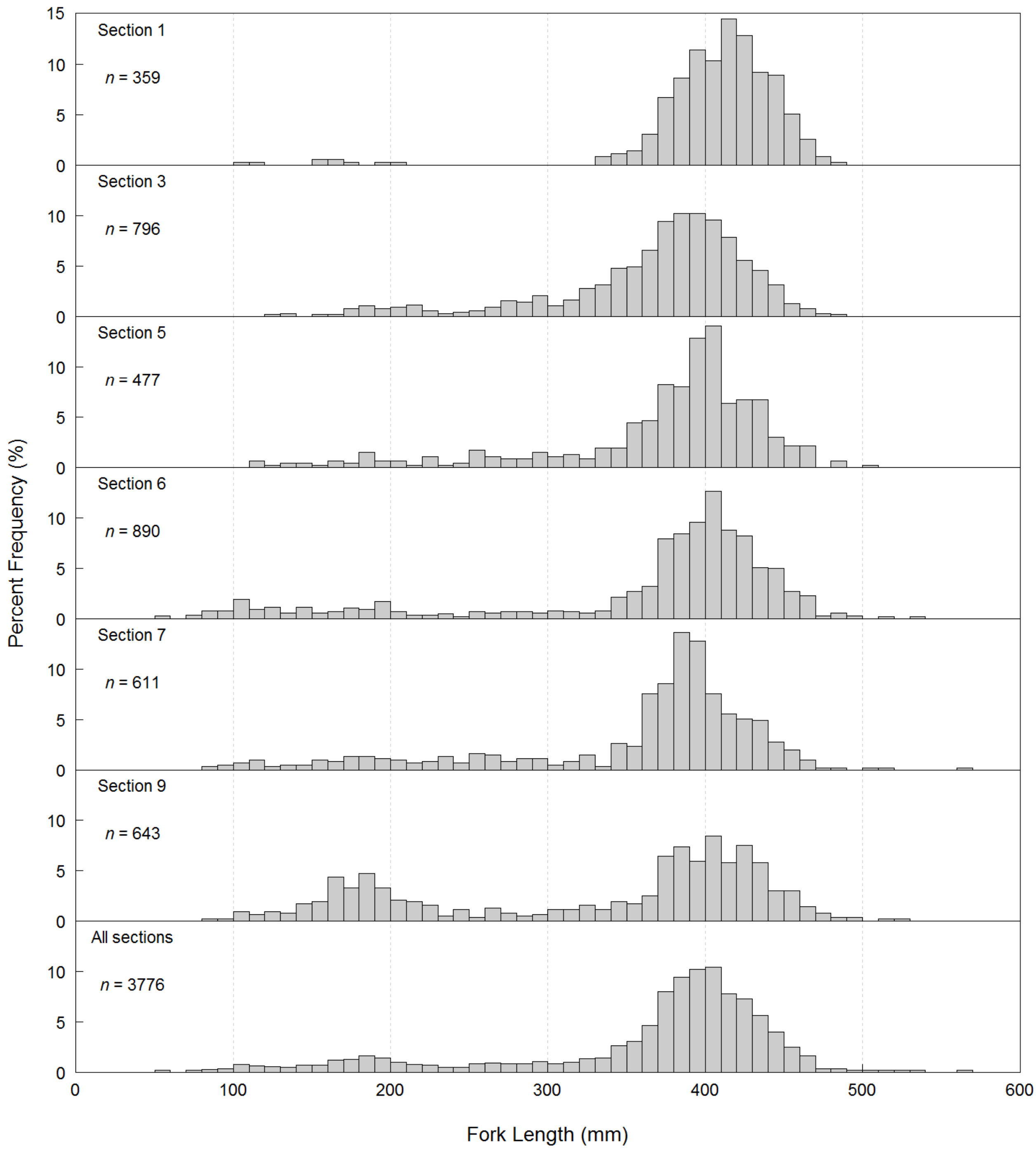


Figure 29: Length-frequency distributions for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

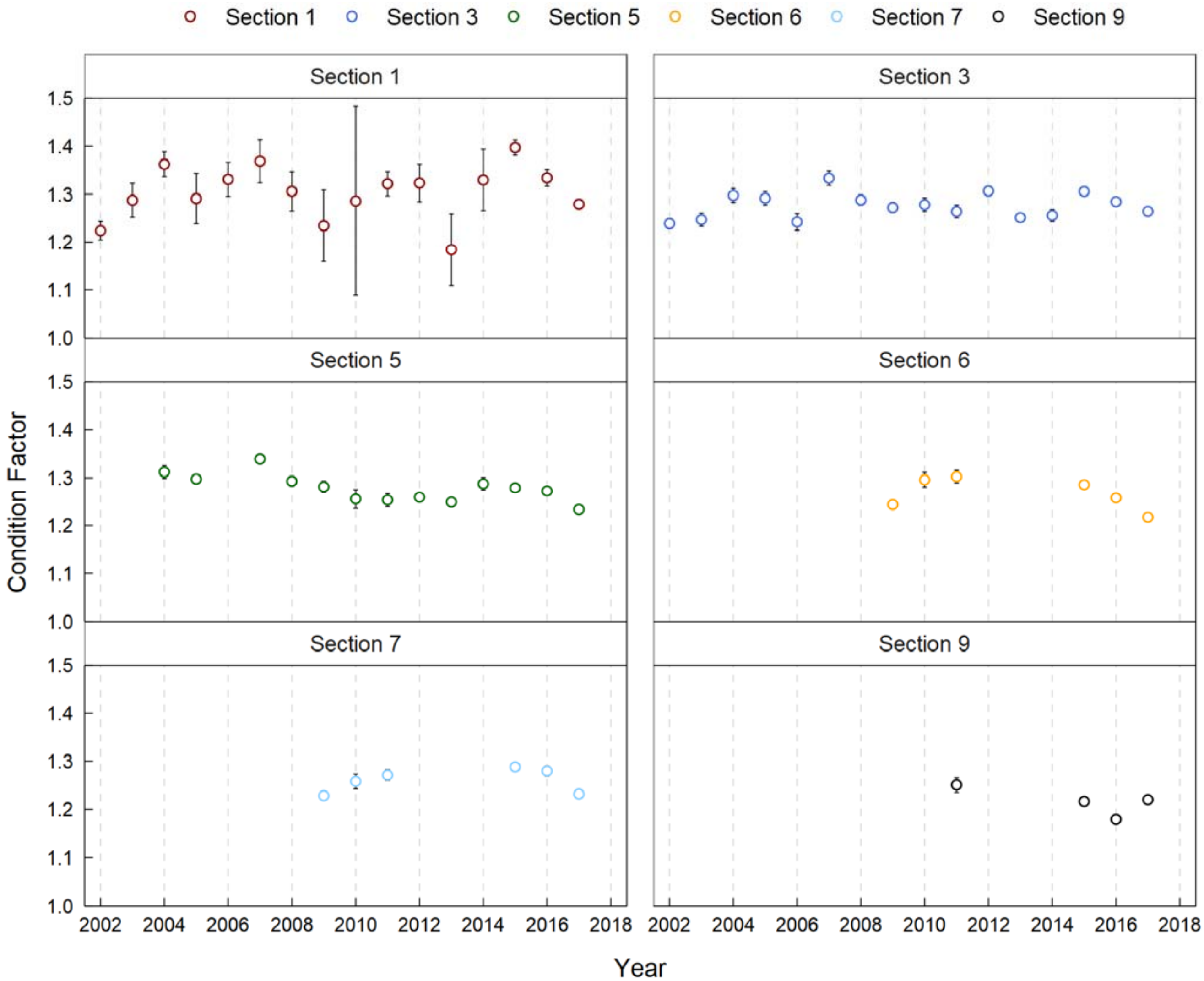


Figure 30: Mean body condition with 95% confidence intervals for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

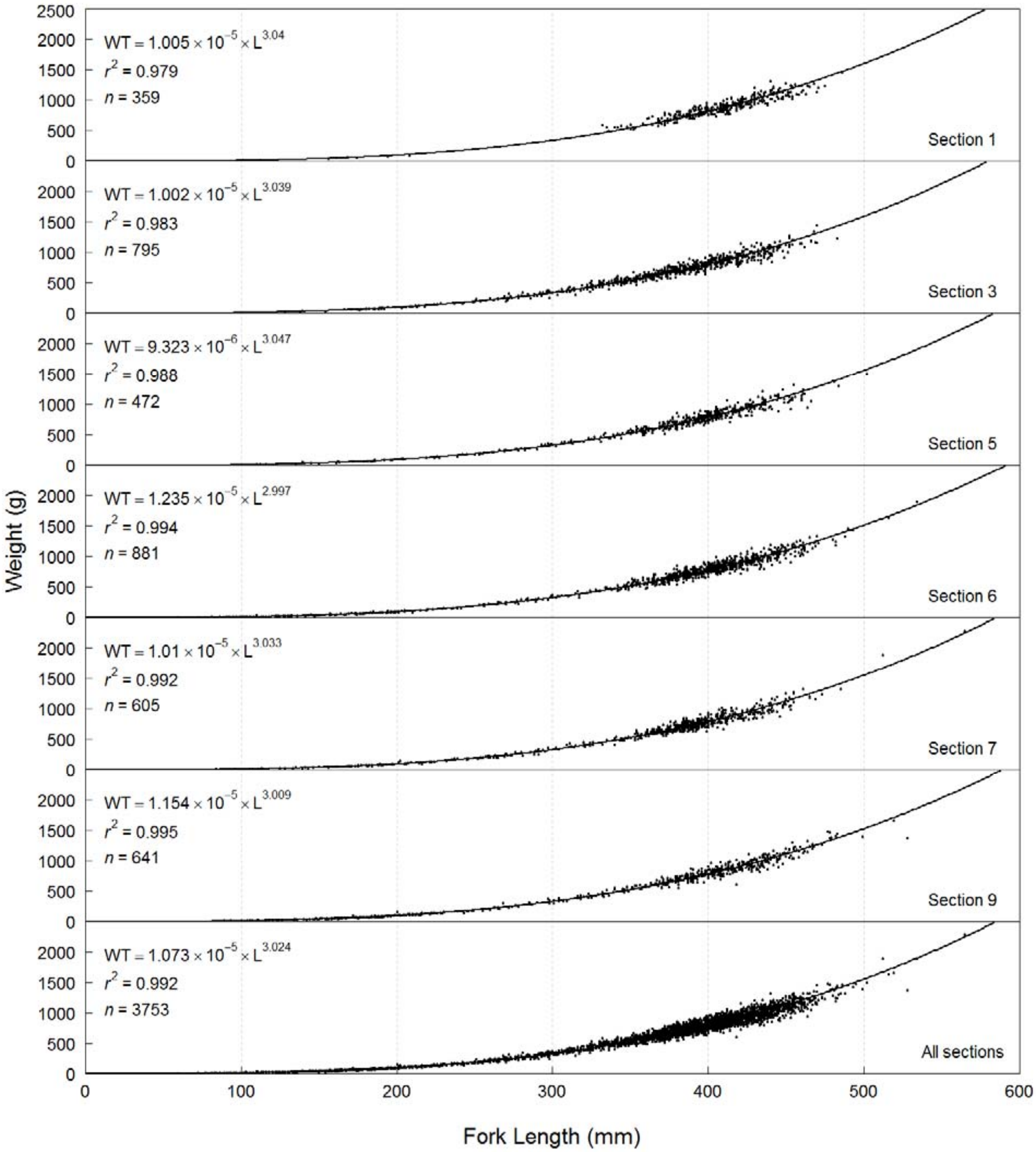


Figure 31: Length-weight regressions for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

3.8.2 Abundance and Spatial Distribution

In 2017, Longnose Sucker were more abundant in Sections 3, 5, 6, and 7 and comparatively less abundant in Sections 1 and 9 (Table 15). Higher recapture rates in 2017 compared to previous studies resulted in tighter confidence bounds associated with population abundance estimates for each section. In 2017, population abundance estimates for Sections 6 and 7 were lower than in previous study years. Confidence intervals associated with each section estimate overlapped for Sections 1 through 7; Section 9 confidence intervals did not overlap with Sections 3 through 6, which lends statistical support of lower Longnose Suckers abundance in Section 9 compared to upstream sections (Figure 32). Population abundance estimates were not available for years prior to 2015 because Longnose Sucker were not tagged prior to 2015. Movement of Longnose Suckers between sections was detected in 2017, with approximate 10% (21 of 215 individuals) recaptured in sections upstream (n = 1) or downstream (n = 20) of the section in which they were initially tagged and released.

Table 15: Population abundance estimates generated using the Bayes sequential model for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
1	6,822	5,360	2,840	12,140	2,612	38.3
3	8,672	8,220	6,080	11,540	1,425	16.4
5	12,482	10,920	6,760	19,440	3,371	27.0
6	10,833	10,380	7,880	14,060	1,606	14.8
7	8,948	8,540	6,420	11,760	1,389	15.5
9	4,652	4,380	3,180	6,300	816	17.5
Total	52,409		42,533	62,285	5,039	9.6

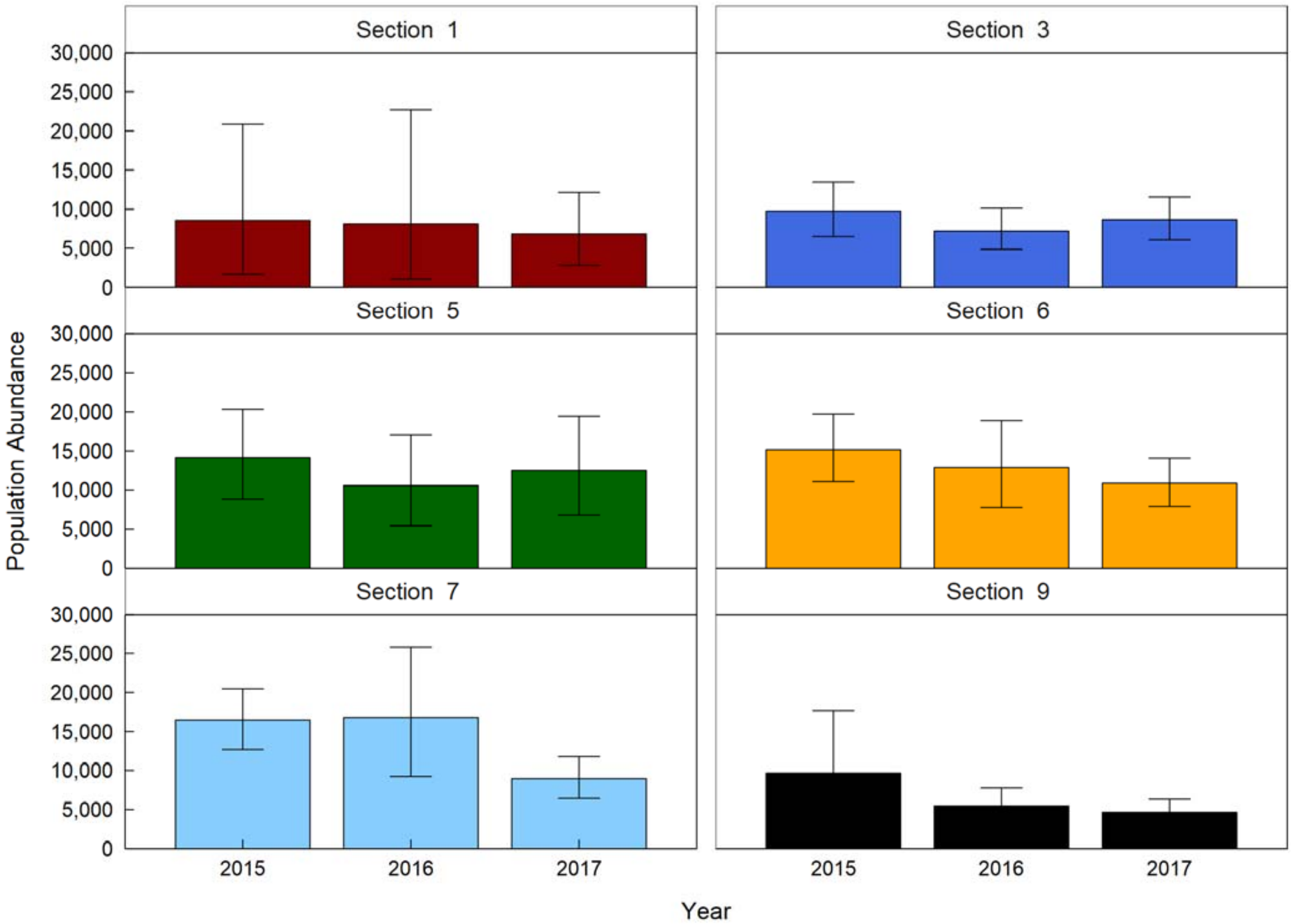


Figure 32: Population abundance estimates (with 95% credibility intervals) generated using the Bayes sequential model for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2015-2017.

3.9 Mountain Whitefish

3.9.1 Biological Characteristics

During the 2017 survey, 8212 Mountain Whitefish were initially captured (i.e., excluding within-year recaptures) and 5609 of these were measured for length and weight. Fork lengths ranged between 71 and 505 mm FL, and weights ranged between 2 and 1479 g. Scale samples were analyzed from 730 individuals; ages ranged between age-0 and age-11. Length, weight, and body condition by age-class are summarized in Table 16.

For Mountain Whitefish, four modes were evident in the 2017 length-frequency histograms (Figure 33), corresponding to the age-0, age-1, age-2, and age-3 and older cohorts. Based on these and similar data from previous study years, growth slows considerably after approximately age-3 for this species, most likely due to fish reaching sexual maturity. The slower growth rate of older individuals prevented the identification of distinct age-classes in the length-frequency histograms for fish larger than approximately 250 mm FL. In 2017, Section 9 had the greatest percentage of age-0 Mountain Whitefish, based on length-frequency, whereas Section 1 had the lowest percentage (Figure 33). Age-0 Mountain Whitefish were more common in downstream sections than in upstream sections. The length-frequency of each age cohort captured in upstream (Sections 1, 3, 5) and downstream (Sections 6, 7, and 9) sections of the study area overlapped and were essentially identical (Figure 34). Overall, low numbers of age-0 Mountain Whitefish were captured in 2017 (Figure 35), which was consistent with previous study years (Appendix F, Figures F15 and F16) and likely due to age-0 Mountain Whitefish being too small to fully recruit to the boat electroshocker (Mainstream and Gazey 2014; Golder et al. 2016a, 2016b). A large percentage of the 2014 catch consisted of age-1 fish, but in subsequent years, the proportion of age-1 fish in the catch has declined on an annual basis. In 2017, the proportion of age-1 fish in the catch was similar to values recorded prior to 2014 (Appendix F, Figures F13 and F14).

Table 16: Average fork length, weight, and body condition by age for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

Age	Fork Length (mm)			Weight (g)			Body Condition (K)		
	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]
0	85 ± 7	75 - 97	9	6 ± 1	4 - 8	6	1.03 ± 0.24	0.78 - 1.40	6
1	146 ± 10	122 - 165	26	31 ± 6	22 - 41	19	1.01 ± 0.21	0.68 - 1.37	19
2	206 ± 20	173 - 263	69	93 ± 31	55 - 222	67	1.03 ± 0.11	0.81 - 1.27	67
3	257 ± 20	223 - 299	99	181 ± 45	100 - 295	99	1.05 ± 0.09	0.79 - 1.28	99
4	285 ± 20	251 - 339	72	245 ± 50	163 - 400	72	1.05 ± 0.11	0.84 - 1.61	72
5	315 ± 18	262 - 367	136	319 ± 58	199 - 531	136	1.02 ± 0.10	0.57 - 1.34	136
6	326 ± 21	255 - 386	168	353 ± 63	172 - 609	168	1.02 ± 0.10	0.77 - 1.37	168
7	343 ± 23	298 - 421	100	397 ± 87	275 - 872	100	0.98 ± 0.13	0.69 - 1.39	100
8	366 ± 32	313 - 438	37	477 ± 111	295 - 722	37	0.97 ± 0.09	0.82 - 1.21	37
9	403 ± 36	346 - 450	6	662 ± 214	404 - 999	6	0.98 ± 0.08	0.88 - 1.10	6
10	441 ± 28	415 - 474	4	828 ± 190	672 - 1067	4	0.95 ± 0.04	0.90 - 1.00	4
11	433 ± 45	380 - 489	4	817 ± 287	555 - 1225	4	0.98 ± 0.09	0.85 - 1.05	4

[a] Number of individuals sampled.

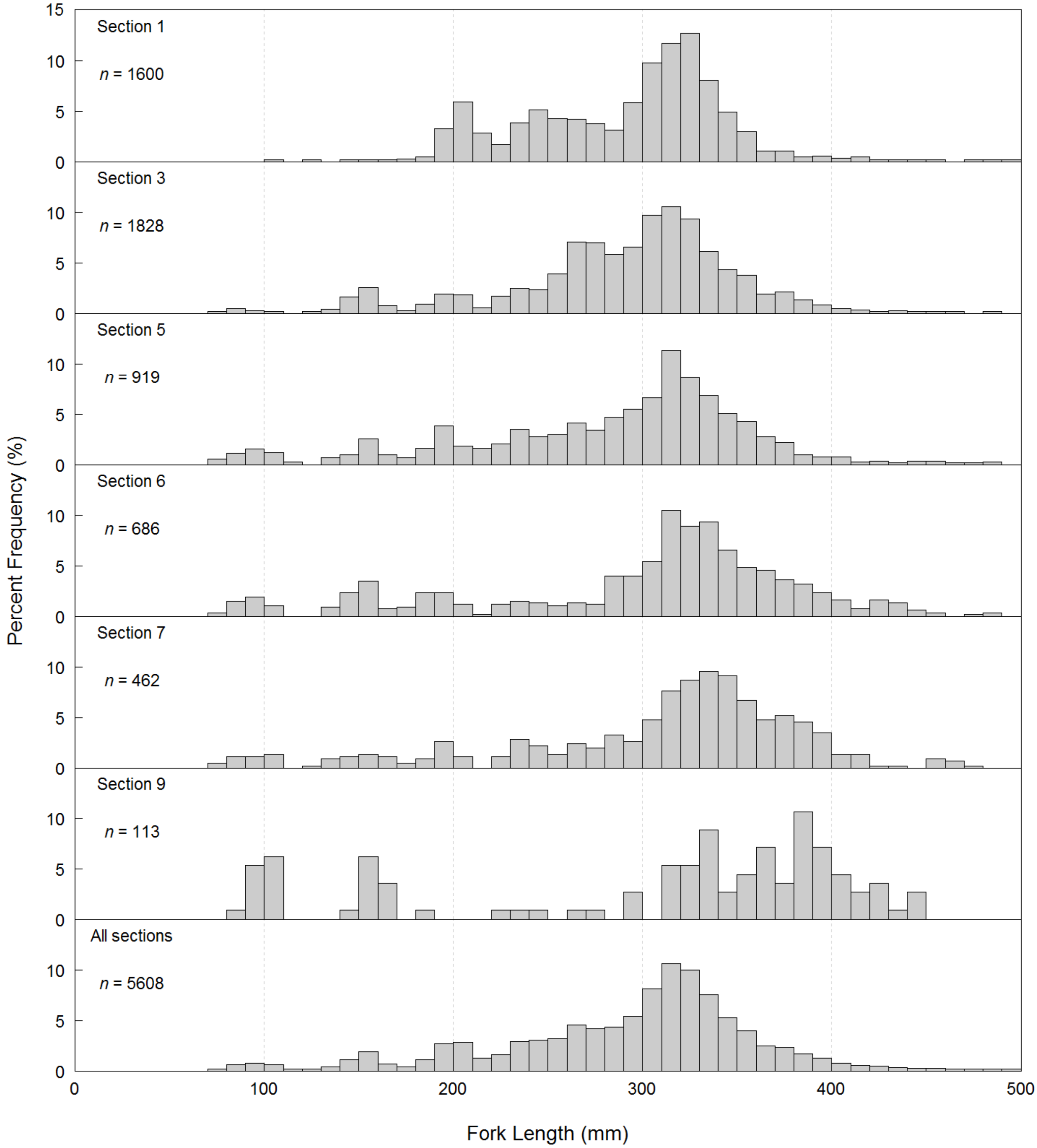


Figure 33: Length-frequency distributions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

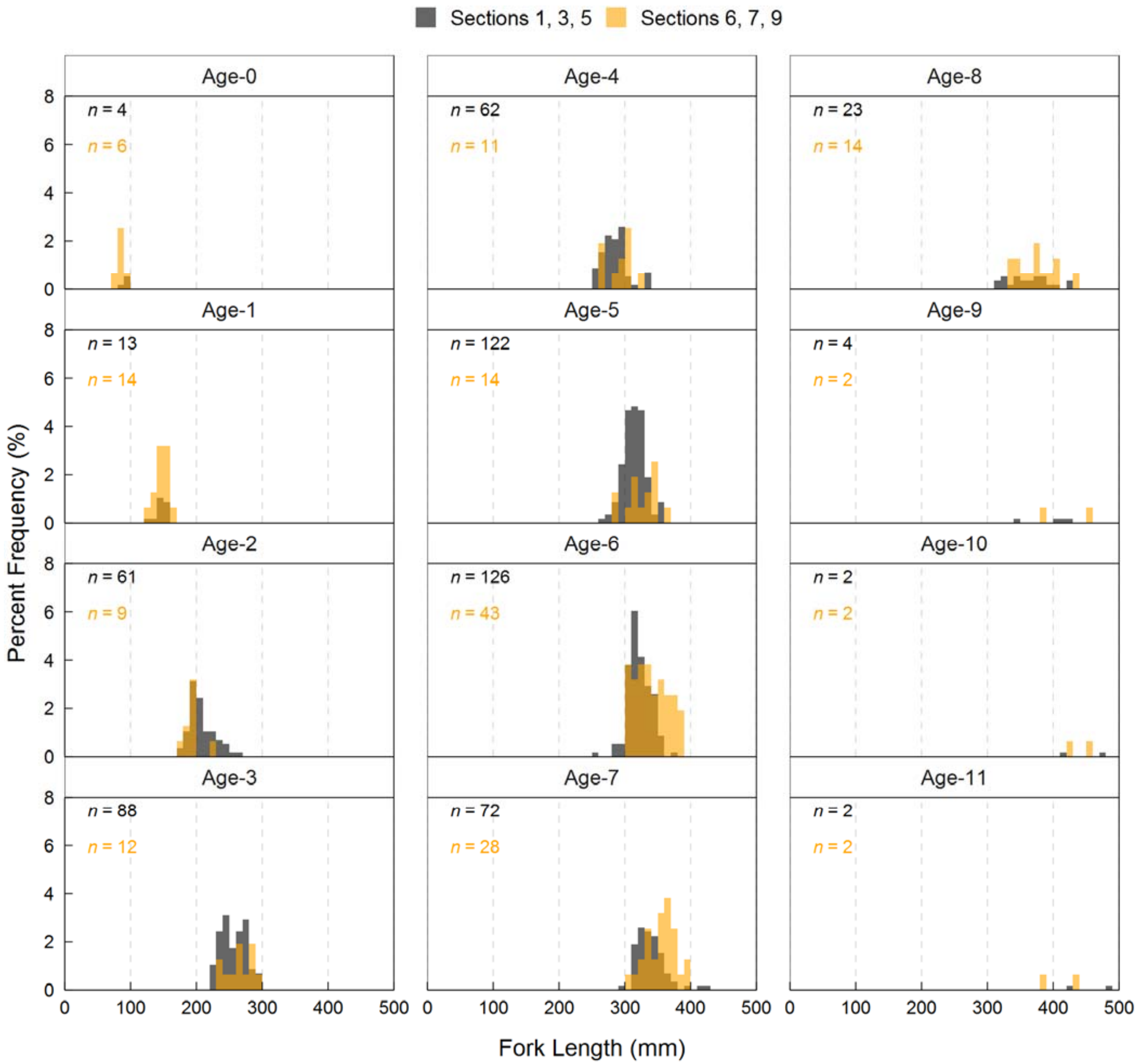


Figure 34: Length-at-age frequency distributions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

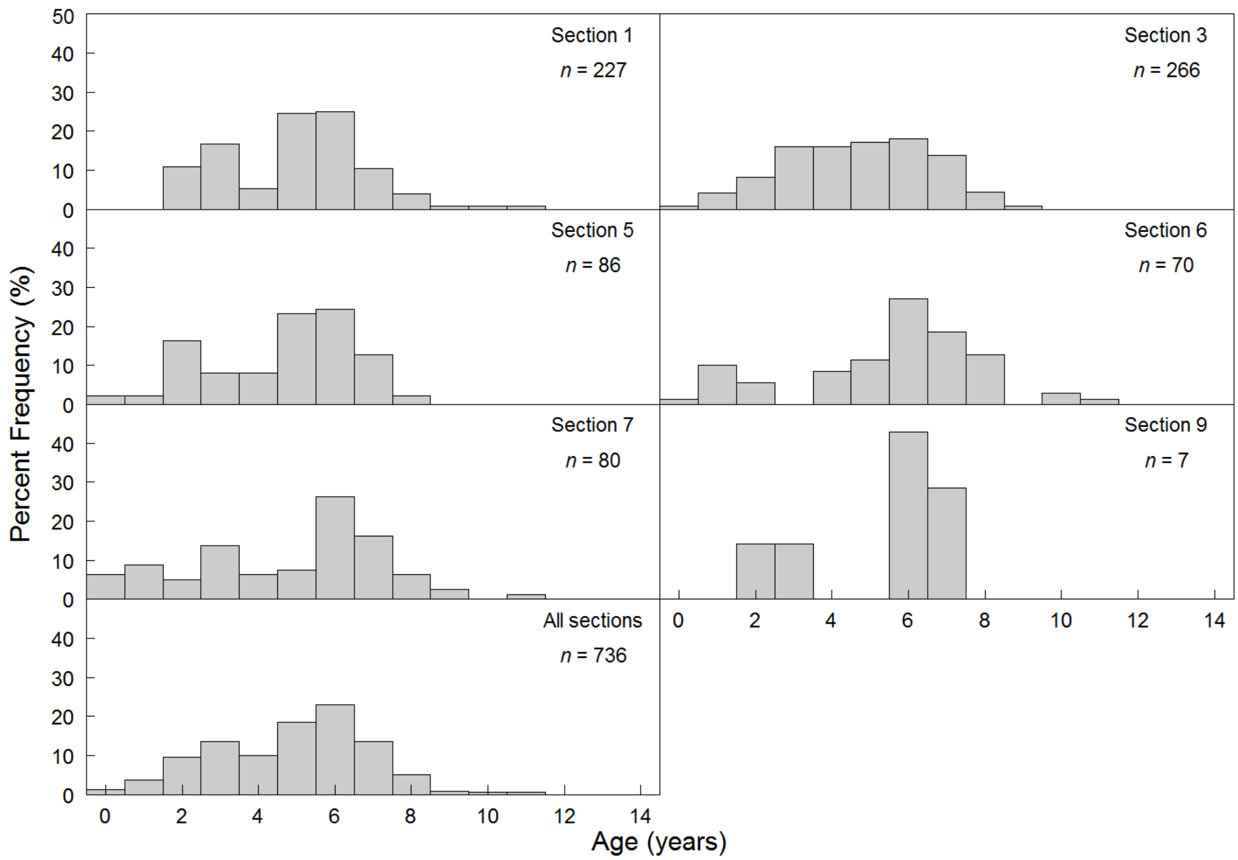


Figure 35: Age-frequency distributions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

The annual growth of Mountain Whitefish in the study area, as assessed using the von Bertalanffy growth curve, was similar among sections (Figure 36). The anomalous result in Section 9 is likely due to the low number of young (age-0 to age-3 individuals) and old (age-8 and older) fish included in the model. Similar to 2015 and 2016, the growth curve in 2017 suggests faster growth of juvenile Mountain Whitefish. Growth rates in 2017 were, in general, similar to growth rates recorded during other study years (Figure 37). Consistent among years, Mountain Whitefish in the study area exhibit rapid growth until approximately age-3; thereafter, growth slows considerably (Figure 36 and Figure 37).

The average change in length-at-age analysis for Mountain Whitefish (Figure 38) was limited to individuals younger than age-5 due to the slow growth, wide range of lengths recorded, and unknown precision of ages assigned to older individuals. Overall (all sections combined), the age-1 through age-4 age-classes grew to a larger size in 2014, 2015, and 2016 when compared to previous years. Confidence intervals did not overlap the 2014–2016 and the 2013 estimates, with a difference of approximately 10 to 20 mm in length-at-age, depending on the age group, relative to the 14-year average. In 2017, growth rates generally declined for all age-classes, compared to the long-term historical average and high growth rates recorded in 2015 and 2016. A reduction in length-at-age in 2017 also was noted for Arctic Grayling for age-classes age-1 and age-2 (Figure 11), but to a lesser extent compared to Mountain Whitefish (Figure 38). Both Mountain Whitefish and Arctic Grayling are largely insectivores that feed on drifting prey and on invertebrates on the stream bottom; therefore, similar changes in growth rate, either positive or negative, would be expected for both species and potentially related to changes in food availability.

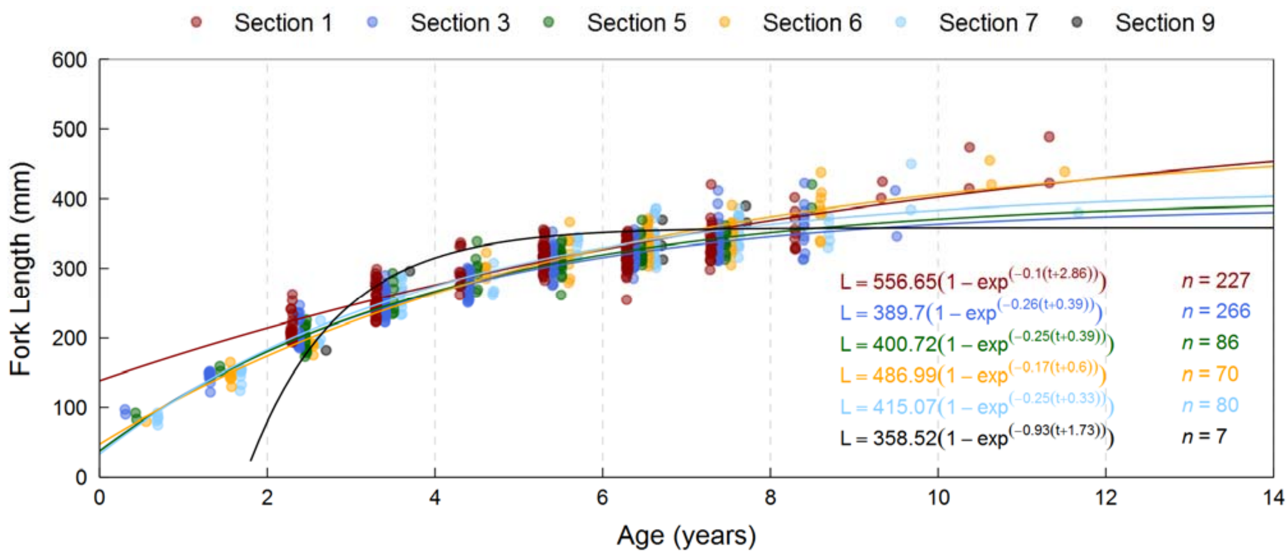


Figure 36: von Bertalanffy growth curve for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

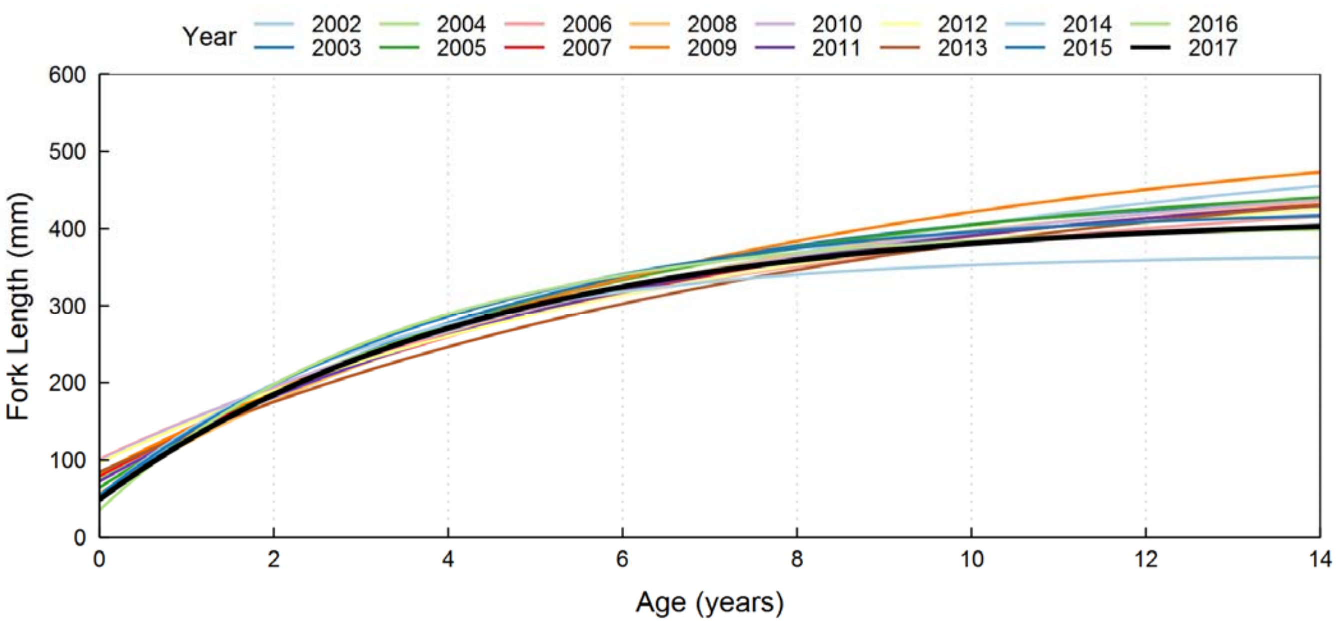


Figure 37: von Bertalanffy growth curve for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017.

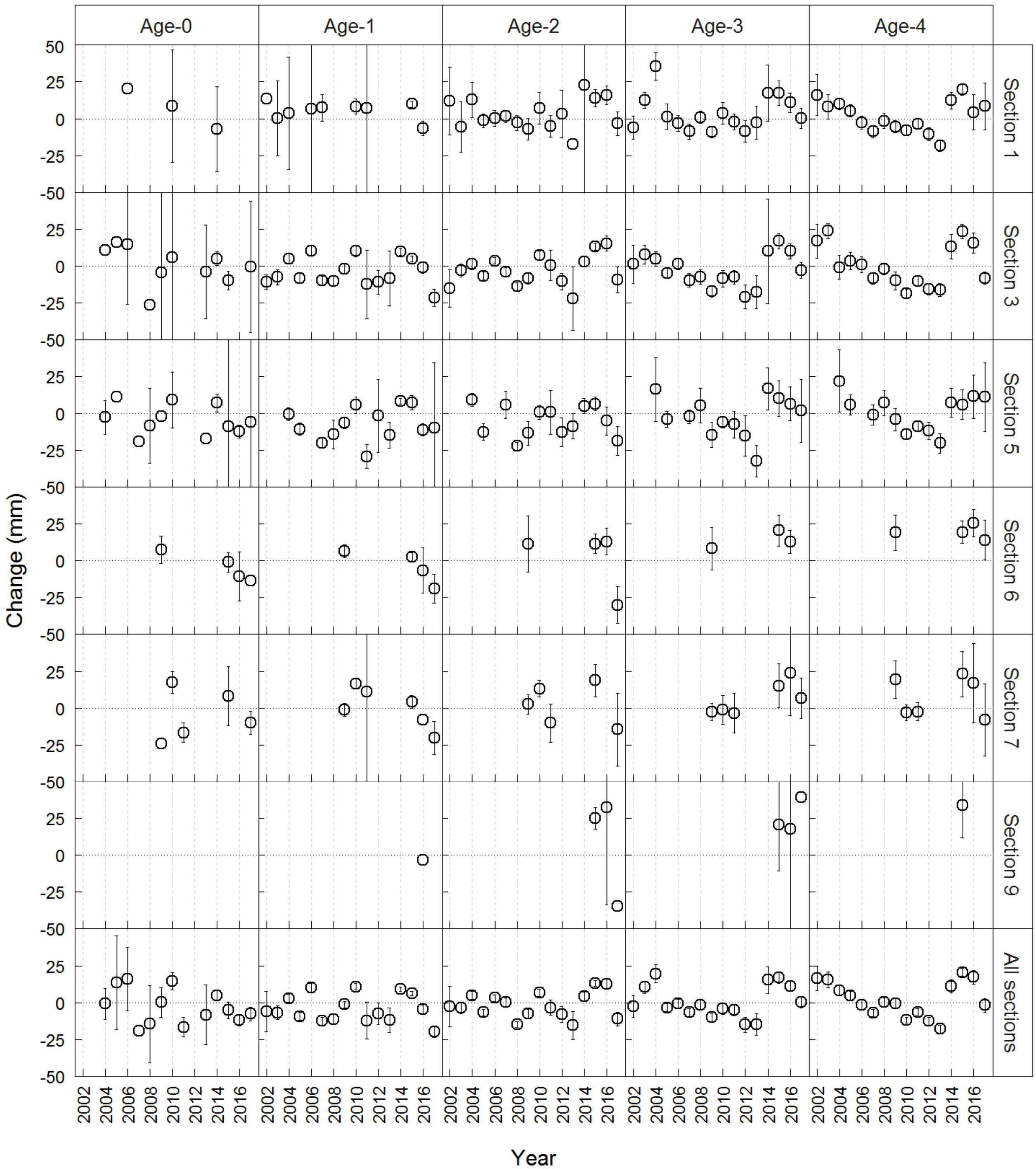


Figure 38: Change in mean length-at-age for Mountain Whitefish captured by boat electroshocking during the Peace River Fish Index, 2002 to 2017. Change is defined as the difference between the annual estimate and the estimate of all years and sections combined. Error bars represent 95% confidence intervals. For Sections 6 and 7, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

Mean body condition (K) of Mountain Whitefish decreased from upstream to downstream, with the highest body condition recorded in Section 1, incremental reductions in body condition from Section 3 to Section 7, and the lowest body condition recorded in Section 9 (Figure 39). Historically, high mean body condition was recorded for Mountain Whitefish from 2003 to 2010 and from 2014 to 2015, whereas lower body condition was recorded in 2002 and from 2011 to 2013. Body condition since 2015 has continually declined, with levels recorded in 2017 equal or lower than all previous study years, depending on section. Compared to Arctic Grayling (Figure 13) and Bull Trout (Figure 20), Mountain Whitefish body condition was typically more variable among study years (Figure 39).

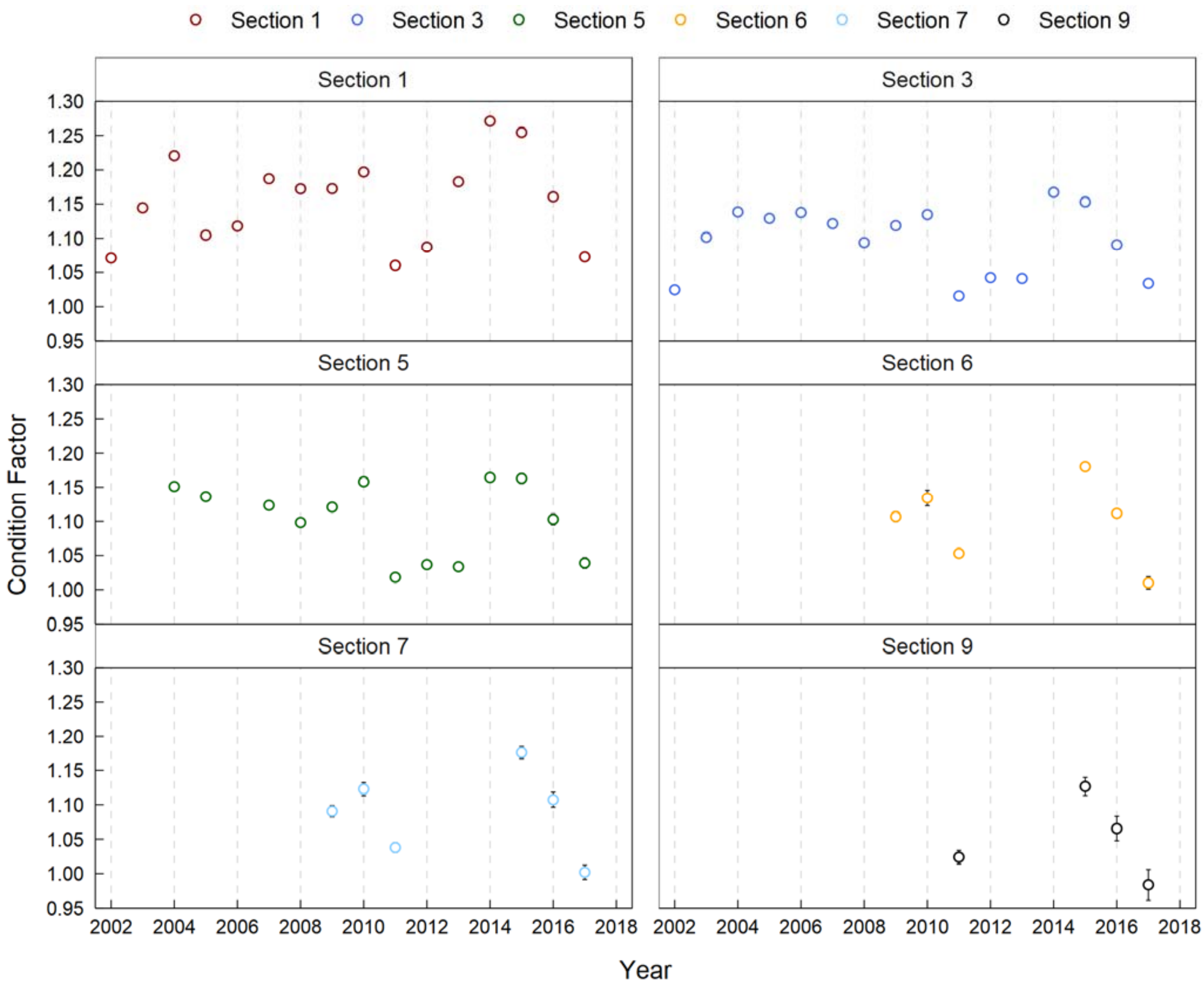


Figure 39: Mean body condition with 95% confidence intervals for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013).

Length-weight regression equations for Mountain Whitefish were similar among all sections (Figure 40) in 2017 and among all study years for the sections combined (Appendix F, Figure F17).

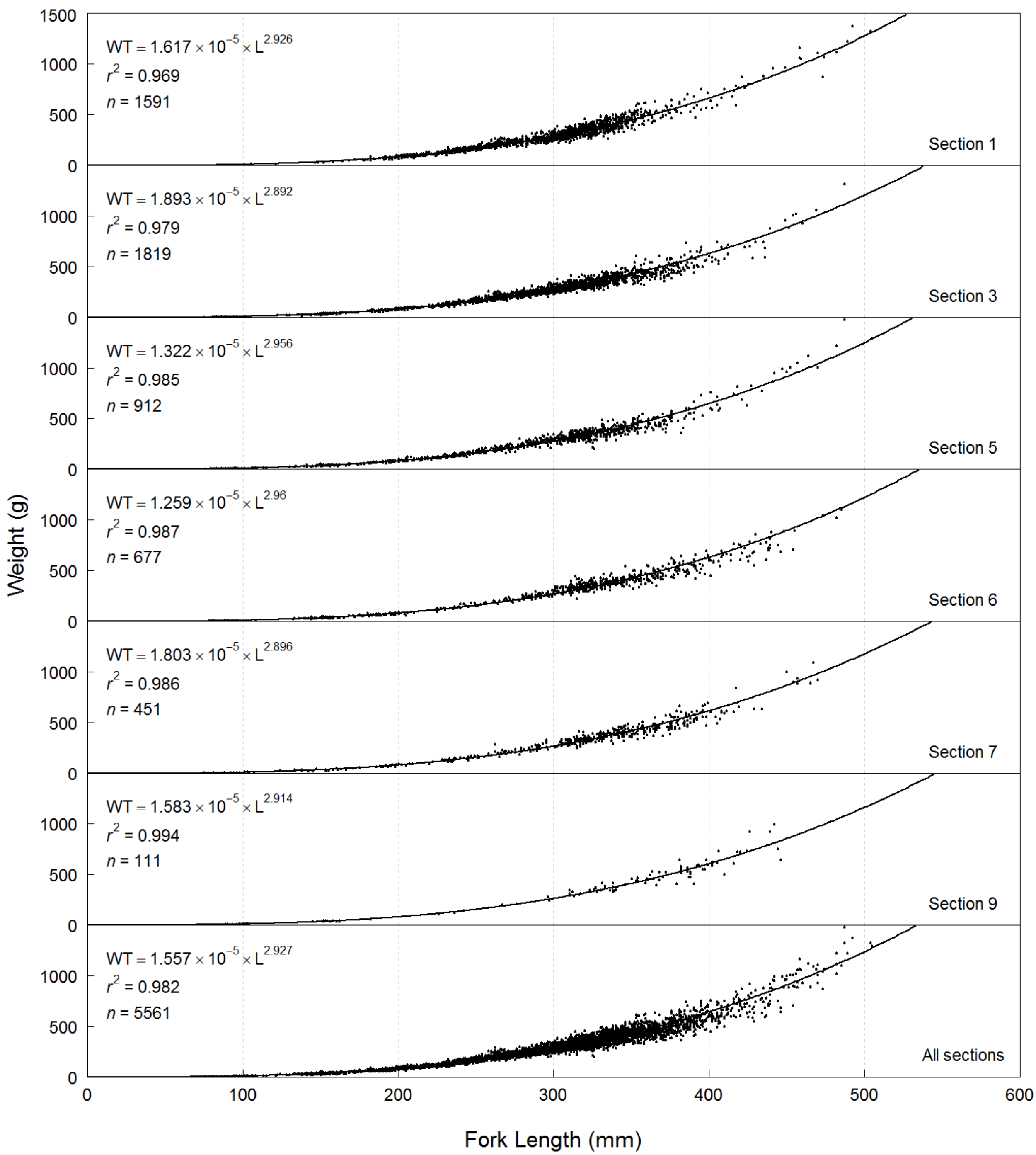


Figure 40: Length-weight regressions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

3.9.2 Abundance and Spatial Distribution

Appendix G provides a thorough description of the Mountain Whitefish population abundance analysis conducted by W.J. Gazey Research. The text below represents a summary of key findings and conclusions drawn from the results provided in Appendix G. Population estimates were restricted to data collected from fish implanted with PIT tags that were equal to or larger than 250 mm FL; mark-recapture data from fish between 200 and 249 mm FL were excluded from the population abundance analysis to maintain consistency with previous study years.

Comparison of Mountain Whitefish length distributions between length at initial capture and subsequent recapture events in 2017 found that the recapture frequency of smaller fish (200–275 mm FL) was lower than that of larger fish (i.e., larger than 275 mm FL). Consistent with past studies, though not statistically significant, smaller fish (i.e., 250–275 mm FL) appeared to be under-represented in the recaptures in all sections, with fish between 200 and 250 mm FL being even more under-represented in the recaptures.

Growth (i.e., the increment in length of recaptured fish as a function of time-at-large) was not statistically significant in 2017; moreover, the mean increment of a recaptured fish was only 0.8 mm. Based on these data, the number of unmarked fish entering the population (i.e., fish greater than 250 mm FL) through growth during the study period (termed growth recruitment) was expected to be negligible. Limited growth also allowed length measurement error to be evaluated (standard deviation of 3.2 mm for each measurement recorded in 2017).

Mountain Whitefish exhibited some movement between sections in 2017 (overall, 6.5% of fish moved). In general, the fish exhibited high site fidelity within a river section between release and recovery. The CJS analysis revealed no apparent mortality (survival not significantly different than 1.0) of tagged Mountain Whitefish during the 2017 study.

The test for time-varying catchability among sessions within 2017 using ADMB models resulted in substantially better fit for time-varying catchability in Section 1 ($P < 0.001$), while constant catchability fit better or almost as well in all other sections. The logarithmic population deviation estimates displayed little trend over time except for Section 1, which trended upward over time.

The sequential posterior probability plots through the application of the Bayes sequential model (the sequential posterior probability plots should stabilize about a common mode if the model assumptions hold) revealed convergent distributions for all sections except Section 1.

Table 17 presents a summary of the 2017 population estimates for the Bayes sequential model. Population estimates in Figures 42 and 43 that were deemed to have substantive assumption violations are labelled in the figure as suspect. In 2004 the population estimates appeared valid; however, very low water likely concentrated the fish from locations that were not sampled in other years. Similarly, the population estimates for 2010 and 2011 are the largest on record and coincide with low water levels. In 2016, the population estimate for Section 1 was similarly high and low water levels impeded sampling during Session 3. Aberrantly, water levels were low in 2014 but the population estimates were near a historical low. The reliability of the 2017 population estimates is discussed in Section 4.3.2.

Overall, population abundance estimates for Mountain Whitefish in 2017 were lower than estimates in 2015 and 2016 for all sections, with reduced population abundance estimates for Sections 1, 6 and 7 compared to previous study years. (Figure 41). Mountain Whitefish abundance in Section 1 was higher than other sections during most study years between 2002 and 2017.

Table 17: Population abundance estimates generated using the Bayes sequential model for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
1	20,801	20,020	15,460	26,640	2,900	13.9
3	14,067	13,820	11,620	16,660	1,291	9.2
5	8,683	8,360	6,440	11,120	1,213	14.0
6	6,857	6,680	5,380	8,460	788	11.5
7	3,550	3,400	2,580	4,620	528	14.9
9	1,155	840	400	2,240	538	46.5
Total	55,113		48,119	62,107	3,569	6.5

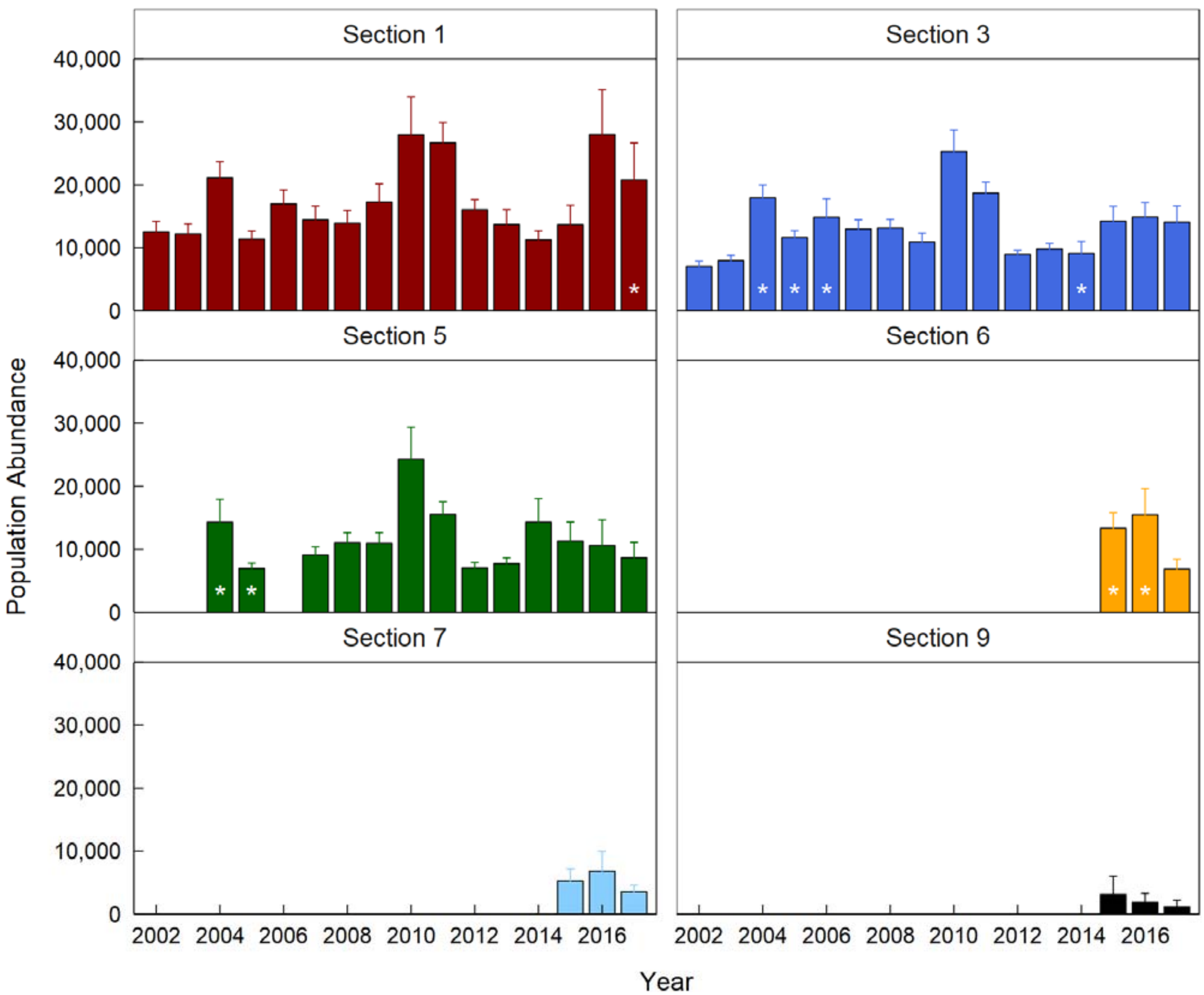


Figure 41: Population abundance estimates (with 95% credibility intervals) generated using the Bayes sequential model for Mountain Whitefish captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002–2017. Stars denote suspect estimates due to assumption violations.

3.9.2.1 Mountain Whitefish Synthesis Model

Appendix H provides a summary of the data input into the Mountain Whitefish Synthesis Model, as well as the model's subsequent results. The synthesis model fit to the data was generally good. One exception was that across-year recaptures were underestimated for Section 5 for session-year observations greater than 25 recaptures. Figure 42 compares synthesis model and Bayes sequential model estimates by section and year and Table 18 presents the parameter estimates, absent capture probability estimates. Overall, synthesis model and Bayes sequential model estimates were similar, with the synthesis model typically yielding slightly higher estimates. Predicted mean length at age-10 and survival of marked fish had consistent trends by section and year. Selectivity was flatter (i.e., more consistent selectivity across size classes) from 2014 to 2017 when compared to 2002 to 2013 (i.e., a higher preference for smaller fish; Appendix H, Figure H11), likely due to modifications to the boat electroshocker settings that were implemented in 2014. Recruitment estimates were not precise and exhibited large variation among study years.

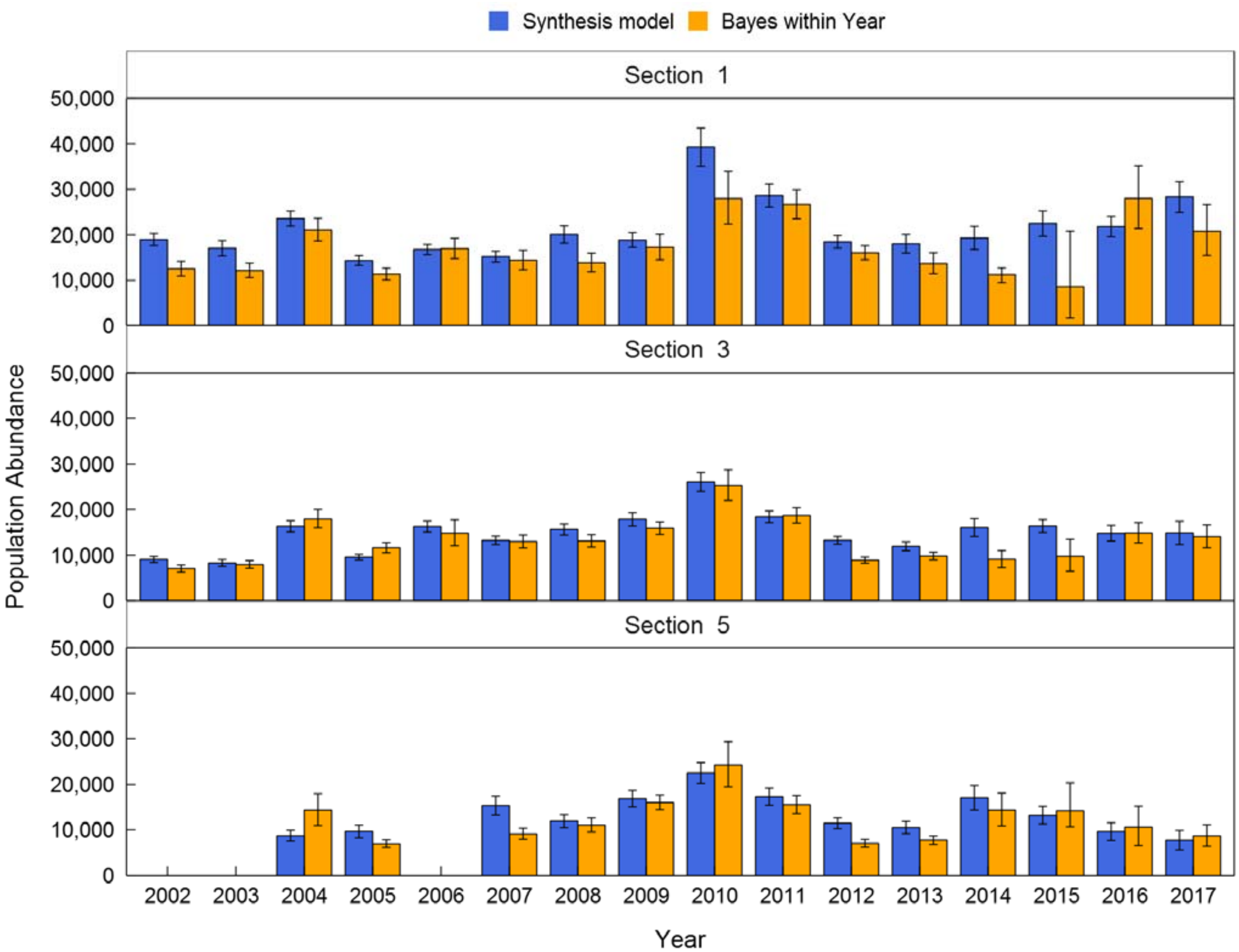


Figure 42: Comparison of Mountain Whitefish population abundance estimates based on the synthesis model and the Bayes sequential model by section and year. Bayesian error bars are the 95% highest probability density interval and the synthesis model error bars are ±2 standard errors.

Table 18: Synthesis model parameter estimates and associated standard errors, 2017.

Parameter	Year	Section 1		Section 3		Section 5	
		Estimate	SE	Estimate	SE	Estimate	SE
Nuisance length-at-age							
Length age-10 (mm)		325.2	4.2	328.6	3.1	349.7	6.9
Growth coefficient		0.383	0.018	0.354	0.010	0.282	0.015
Individual length SD (mm)		25.2	0.7	25.6	0.5	31.9	1.2
Growth							
Length age-0 (mm)		98.3	2.6	94.3	1.0	93.6	1.2
Growth coefficient		0.188	0.005	0.124	0.004	0.147	0.006
Individual length SD (mm)		27.9	0.6	51.6	1.6	44.8	1.6
Length age-10 (mm)	2003	292.0	2.4	284.8	3.1		
	2004	310.4	1.8	334.9	3.0		
	2005	280.7	1.8	289.8	2.7	310.7	3.5
	2006	292.5	1.9	328.8	3.0		
	2007	289.7	1.9	299.9	2.7	340.9	3.6
	2008	305.2	2.0	294.4	2.4	321.6	3.4
	2009	290.6	2.0	288.3	2.8	322.5	3.1
	2010	307.6	2.1	296.5	2.3	319.1	3.2
	2011	286.3	1.6	270.5	2.3	289.6	2.8
	2012	277.0	1.6	257.8	2.3	273.9	2.9
	2013	286.5	2.0	259.9	2.4	278.8	2.9
	2014	331.2	2.1	319.0	3.1	326.9	3.3
	2015	327.7	2.5	311.9	2.9	317.1	4.0
	2016	306.4	2.4	289.7	2.6	298.8	5.0
	2017	298.7	2.6	280.7	2.7	293.3	4.0
Selectivity							
Mid length bin (10 mm increments)	2002-13	28.6	0.30	30.9	0.33	34.2	0.67
	2014-17	30.5	0.81	375.5		349.4	
Slope	2002-13	1.7	0.06	2.8	0.06	3.6	0.15
	2014-17	2.0	0.21	14.4	1.51	15.1	2.42
Asymptotic Survival (logit)							
	2002-04	-1.199	0.047	-1.294	0.031		
	2005-07	-0.930	0.060	-1.415	0.055	-0.936	0.047
	2008-10	-1.347	0.093	-1.269	0.057	-1.982	0.141
	2011-13	0.040	0.081	-0.589	0.066	-0.488	0.109
	2014-16	-41.738		-2.669	0.467	-1.092	0.225
Recruitment ($\log_e$)							
	2002	11.61	0.16	11.69	0.12		
	2003	11.85	0.45	14.20	0.15		
	2004	13.47	0.30	10.52	0.68	12.91	0.21
	2005	13.63	0.30	14.27	0.14	14.26	0.28
	2006	12.36	0.55	11.29	1.01	12.98	0.49
	2007	12.30	0.51	10.61	0.66	10.67	0.65
	2008	12.51	0.41	10.49	0.62	10.26	0.51
	2009	11.53	0.53	10.42	0.64	9.97	0.55
	2010	11.64	0.56	12.11	0.96	10.40	0.56
	2011	12.32	0.69	12.58	0.51	10.59	0.65
	2012	14.33	0.39	10.50	0.68	12.05	0.37
	2013	13.17	0.48	9.51	0.49	10.19	0.57
	2014	12.16	0.53	9.07	0.38	9.97	0.48
	2015	12.25	0.66	8.27	0.40	10.01	0.42
	2016	12.41	0.72	8.26	0.42	9.36	0.44
	2017	12.50	0.75	8.32	0.45	8.57	0.49
Miscellaneous							
Capture probability coefficient		0.0440	0.0102	0.0351	0.0108	0.0700	0.0172
Negative binomial dispersion coefficient		1.86	0.12	2.55	0.15	2.85	0.20

3.10 Northern Pike

3.10.1 Biological Characteristics

During the 2017 survey, 37 Northern Pike were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Fork lengths ranged between 330 and 920 mm FL, weights ranged between 244 and 6227 g, and body condition (K) ranged between 0.6 and 0.9. Fin rays were collected from all captured Northern Pike; however, assigned ages varied widely between analysts and were considered unreliable. Thus, ageing results are not presented for this species. According to Mackay et al. (1990), clethra are the preferred structures for ageing Northern Pike, but their collection would require lethal sampling, which was not compatible with the study objectives.

Length-frequency data indicate that the study area is used primarily by adult Northern Pike; the smallest Northern Pike recorded in 2017 was 330 mm FL (Attachment A). Distinct modes, representative of age-cohorts and year-class strength, were not evident in the length-frequency analysis (Figure 43). Northern Pike were not captured in Section 1 in 2017, but were present in Sections 3 through 9. Catch of Northern Pike was highest in Section 6 (*n* = 16; Table 8).

Length-weight relationships for Northern Pike in 2017 are shown in Figure 44. The mean body condition (K) of Northern Pike in 2017 ranged between 0.6 and 0.9 for all size-classes and sections and was consistent with mean body condition recorded during recent study years (Figure 45).

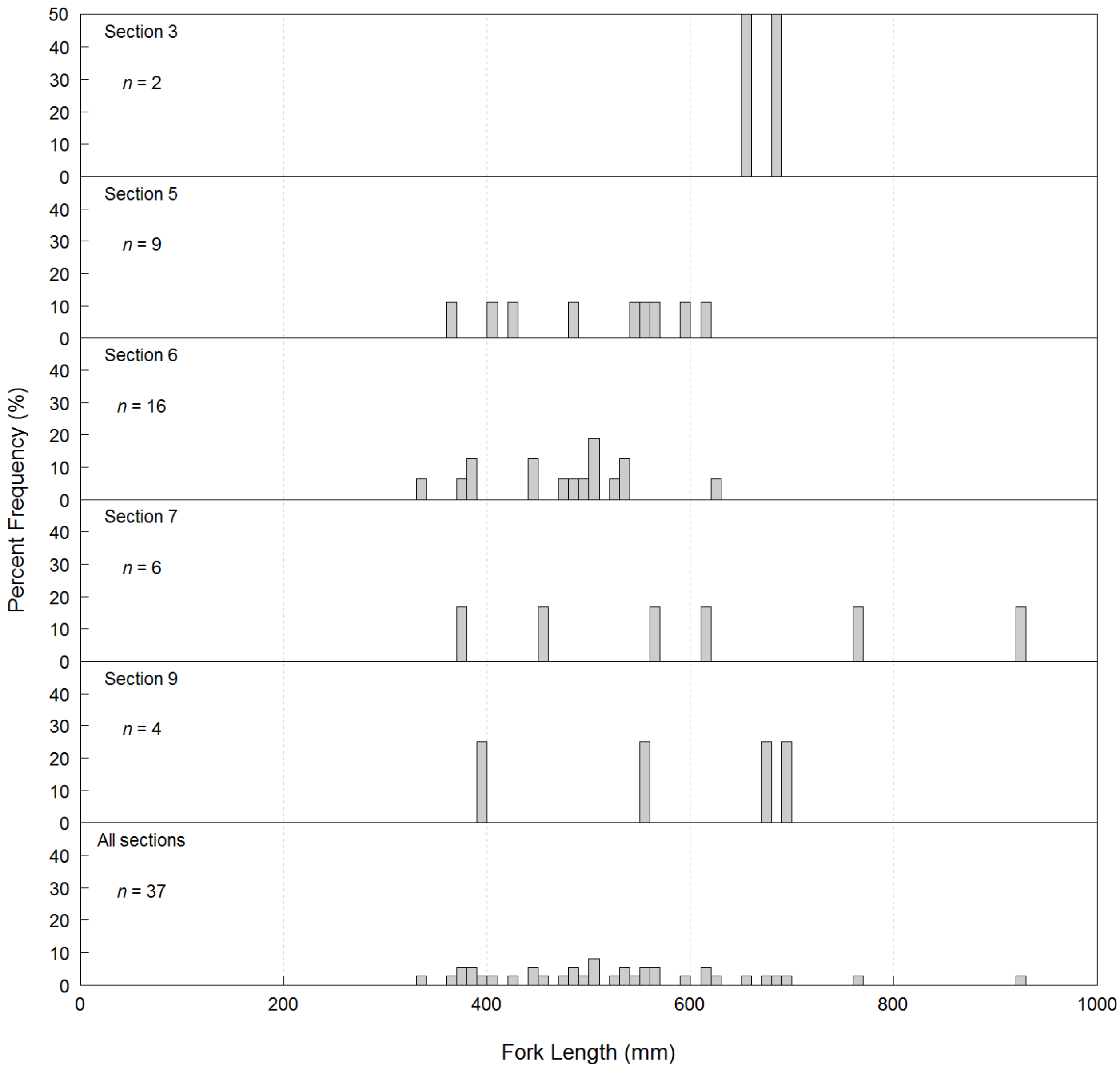


Figure 43: Length-frequency distributions for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

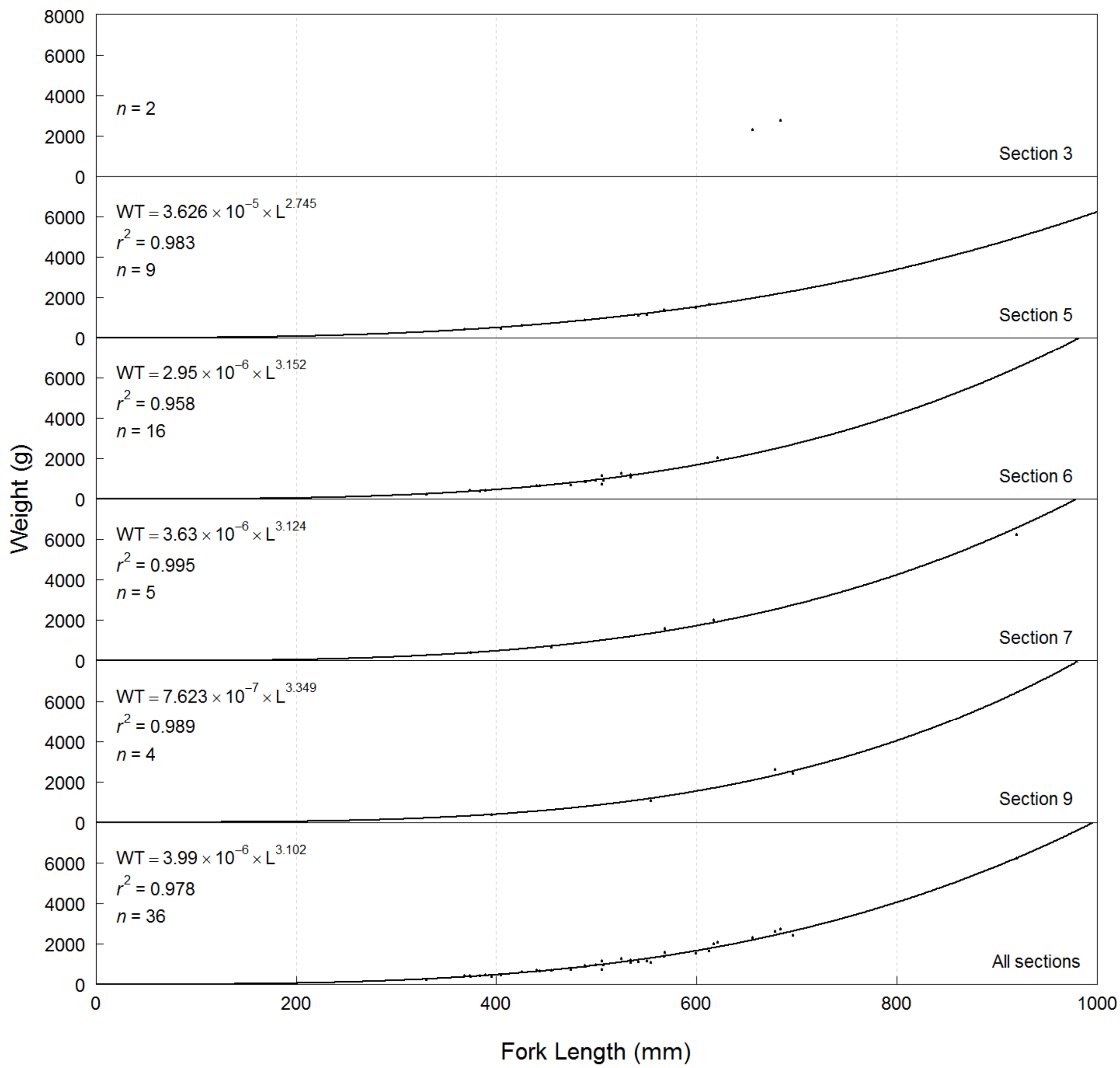


Figure 44: Length-weight regressions for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

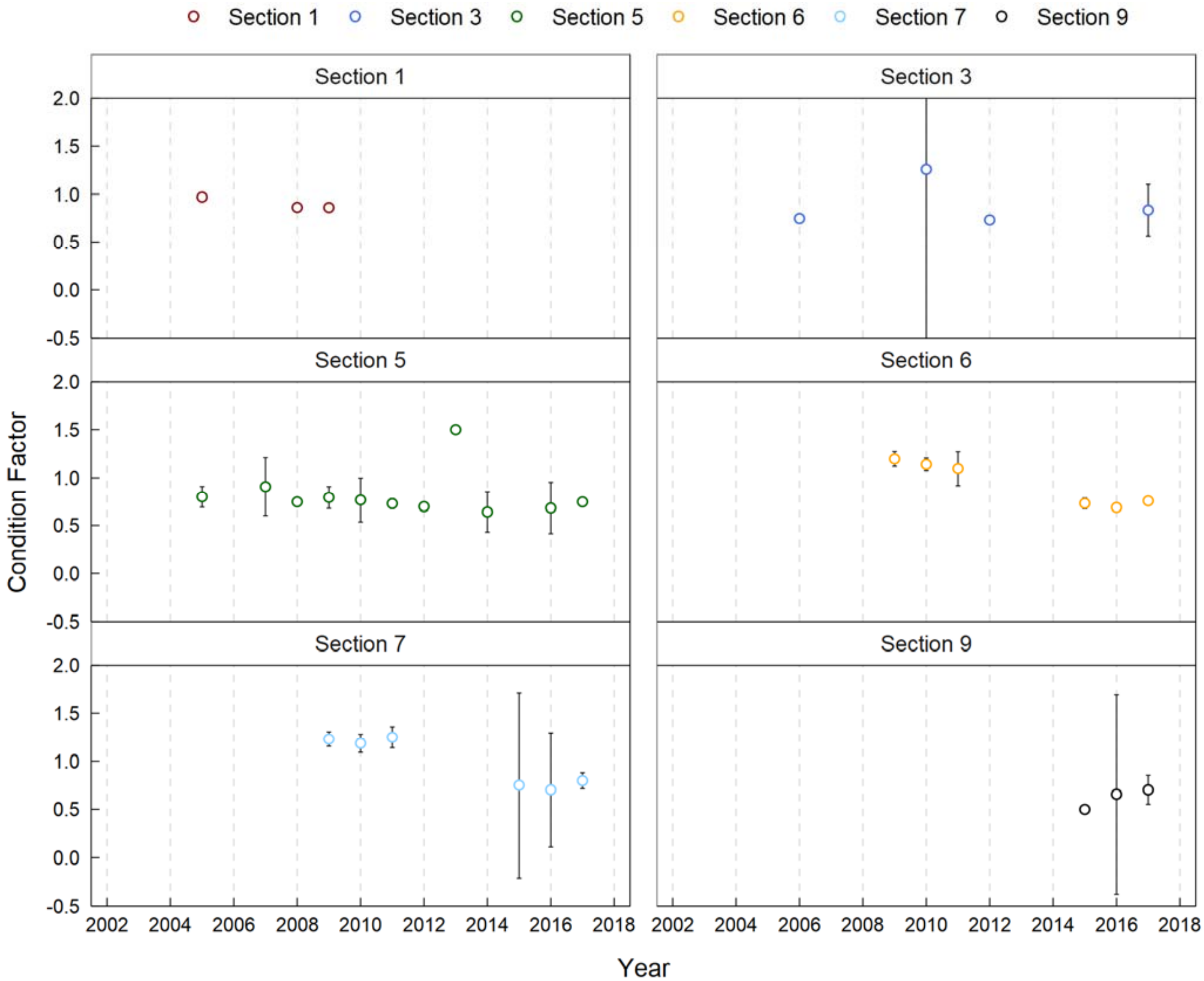


Figure 45: Mean body condition with 95% confidence intervals (CIs) for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. For Sections 6, 7, and 9, analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010, 2011, 2013). The 95% CI of Section 3 values in 2010 extends from -1.14 to 3.66.

3.10.2 Abundance and Spatial Distribution

In total, 35 of the 37 Northern Pike captured during the 2017 survey were implanted with PIT tags; none of them were recaptured. Since sampling was initiated in all six sections (i.e., Sections 1, 3, 5, 6, 7, and 9) in 2015, Northern Pike have been most frequently encountered in Section 6. During that time, 67 Northern Pike have been captured. Of those 67 fish, 34 (51%) have been recorded in Section 6. The remaining fish have been recorded in Section 5 (19%), Section 7 (16%), Section 9 (10%), and Section 3 (3%). A Northern Pike has not been recorded in Section 1 since 2009 (Mainstream and Gazey 2010). These data suggest a preference for the downstream portions of the study area for this species. Even though more Northern Pike were captured in 2017 than any previous study year, data for this species are sparse; additional data would be required to identify substantial changes or trends over time.

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3.11 Rainbow Trout

3.11.1 Biological Characteristics

During the 2017 survey, 122 Rainbow Trout were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Ages were assigned to 109 Rainbow Trout based on scale analyses.
Ages ranged from age-2 to age-5. Fork lengths ranged between 139 and 456 mm and weights ranged between 41 and 983 g (Table 19). Body condition (K) ranged between 0.84 and 1.53, with higher values recorded for age-2 individuals when compared to the older age-classes.

Table 19: Average fork length, weight, and body condition by age for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

Age	Fork Length (mm)			Weight (g)			Body Condition (K)		
	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]
2	190 ± 24	139 – 227	41	85 ± 33	37 – 141	41	1.17 ± 0.13	0.91 - 1.53	41
3	287 ± 35	232 – 359	38	269 ± 94	142 – 502	38	1.10 ± 0.09	0.88 - 1.28	38
4	350 ± 32	265 – 395	21	471 ± 122	232 – 730	21	1.08 ± 0.10	0.94 - 1.25	21
5	383 ± 41	334 – 456	9	584 ± 185	375 – 983	9	1.02 ± 0.08	0.84 - 1.14	9

[a] Number of individuals sampled.

Most of the Rainbow Trout captured were between 150 and 400 mm FL (Figure 46). In the upstream sections of the study area (Sections 1, 3, and 5), the length-frequency histograms for each section overlapped and distinct modes associated with specific age cohorts were not evident. In the downstream sections of the study area (Sections 6, 7 and 9), few Rainbow Trout were captured (n = 7). Age-2 and age-3 Rainbow Trout were the most common in the study area (Figure 47). Similar to previous study year, young (age-0 and age-1) Rainbow Trout were not common in 2017, which may be because these age-classes remain in spawning tributaries and have not yet migrated into the Peace River mainstem at the time of sampling.

Rainbow Trout growth data fit poorly to the von Bertalanffy model (Figure 48), suggesting that the oldest age-classes captured (age-5) had not yet reached their asymptotic length. There were little differences in growth between sections; however, the data did fit the model poorly. These results also made it difficult to compare 2017 growth data to historical study years (Figure 49). Mean body condition was similar among all years and sections, with overlapping confidence intervals for most estimates (Figure 50). Differences in length-weight relationships were similar across sections (Figure 51).

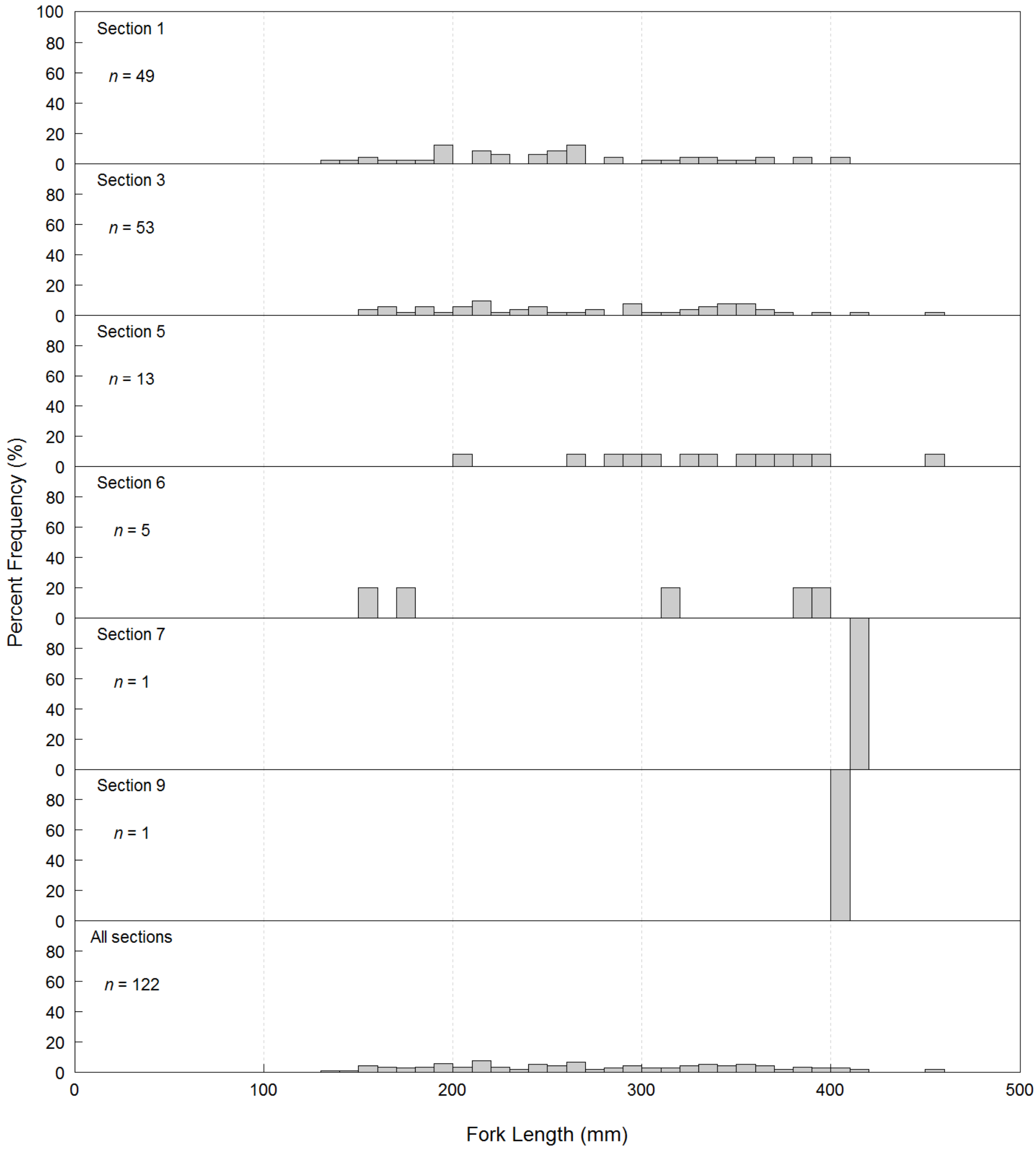

Figure 46: Length-frequency distributions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

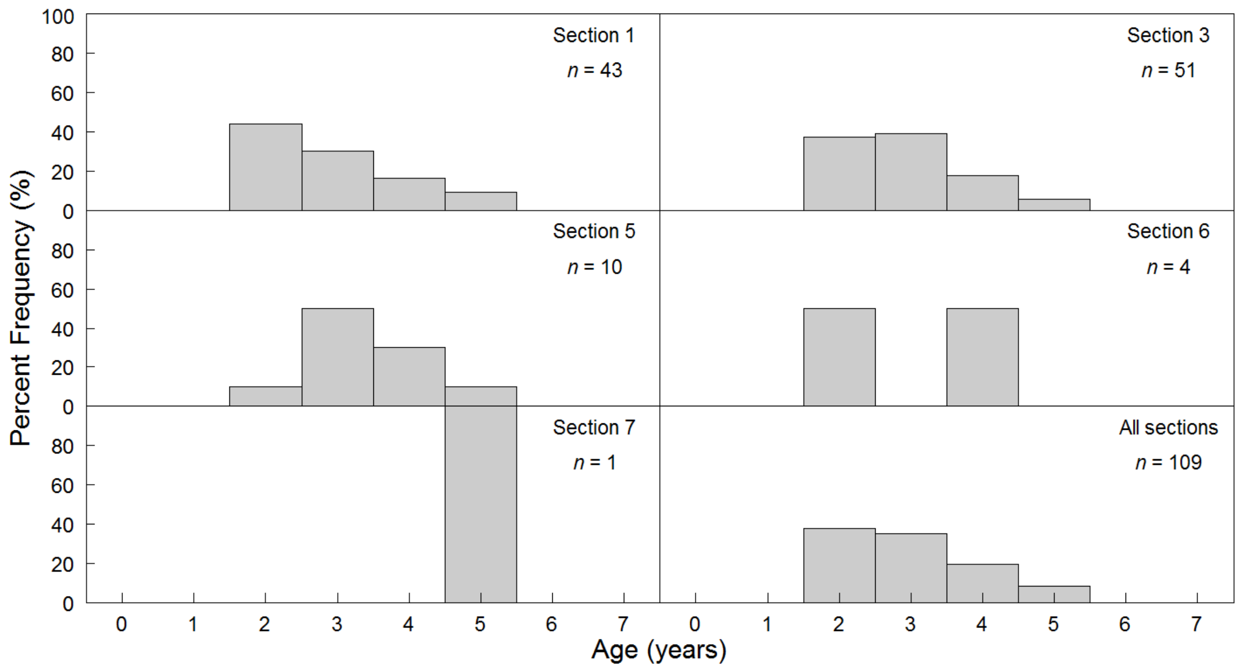

Figure 47: Age-frequency distributions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

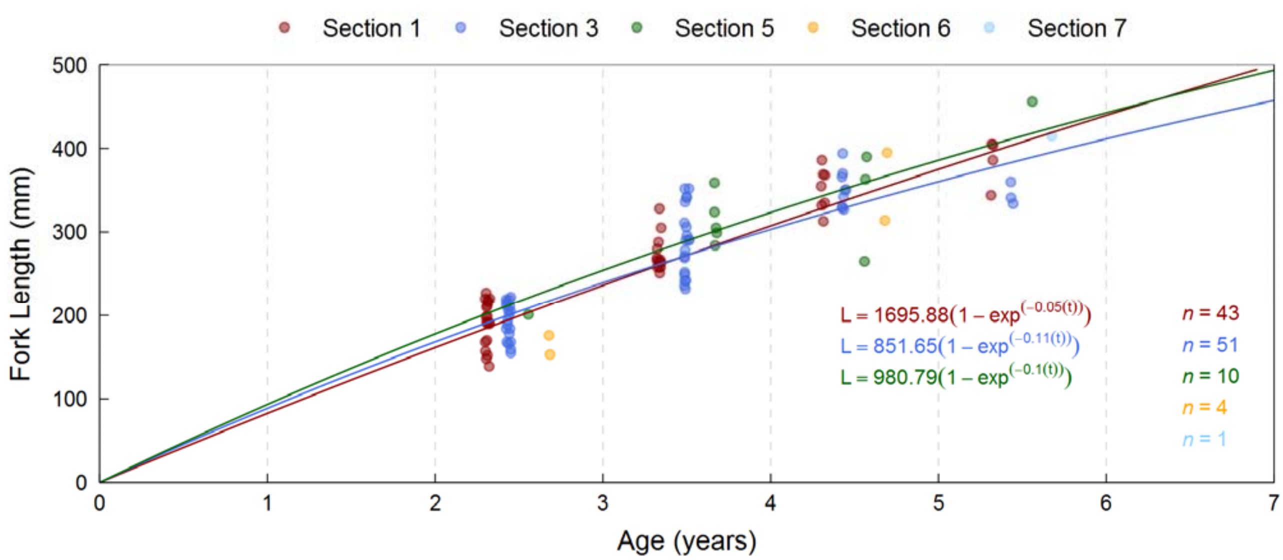

Figure 48: von Bertalanffy growth curve for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

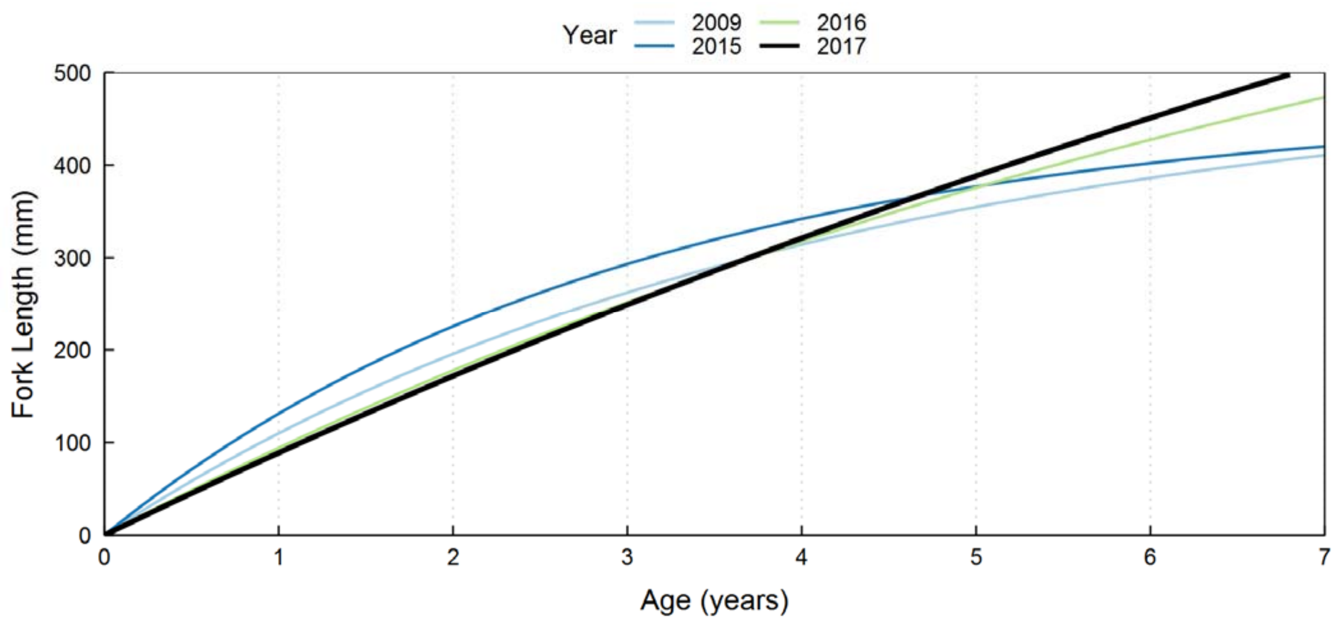

Figure 49: von Bertalanffy growth curve for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2009 to 2017.

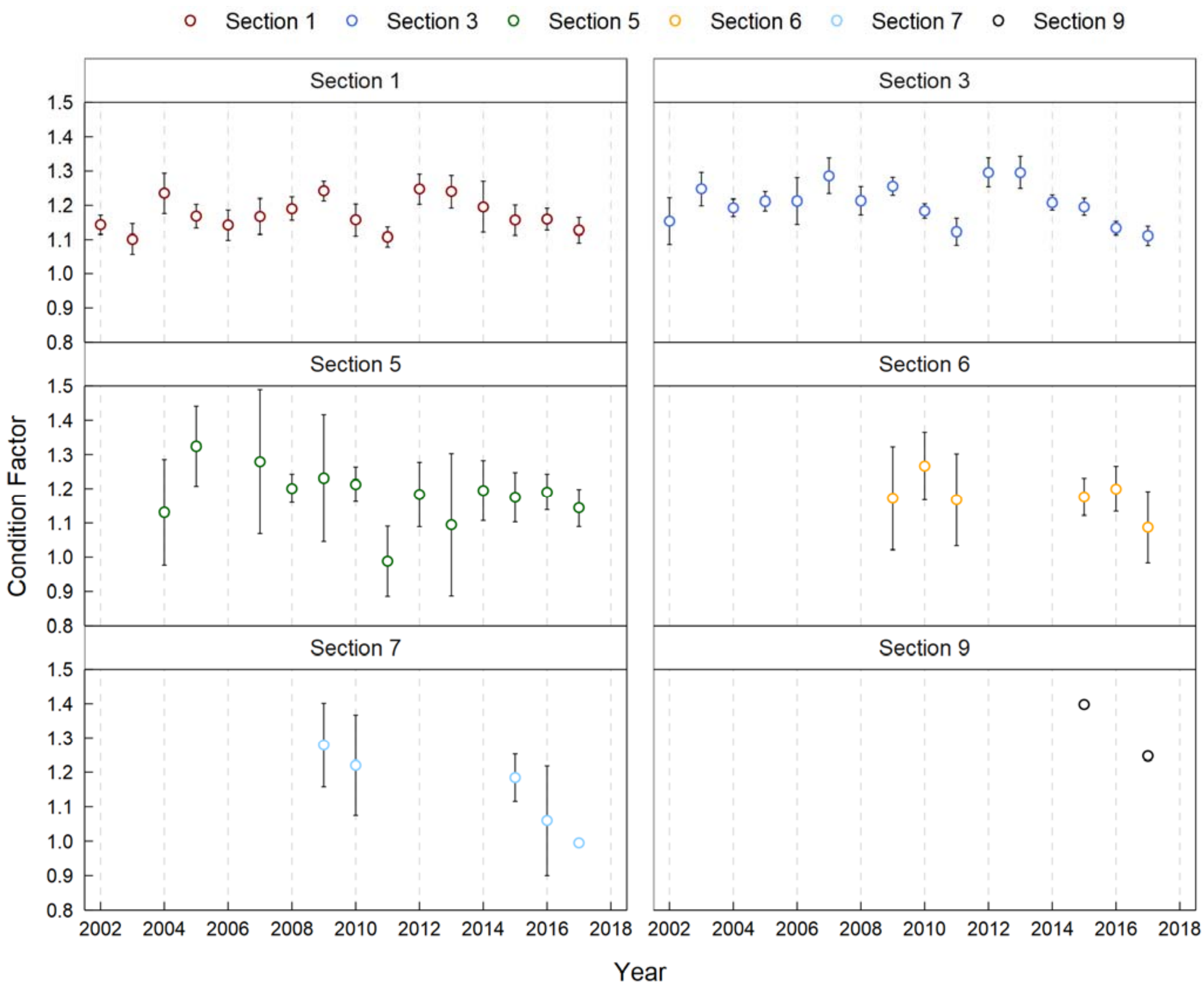

Figure 50: Mean body condition with 95% confidence intervals for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017.

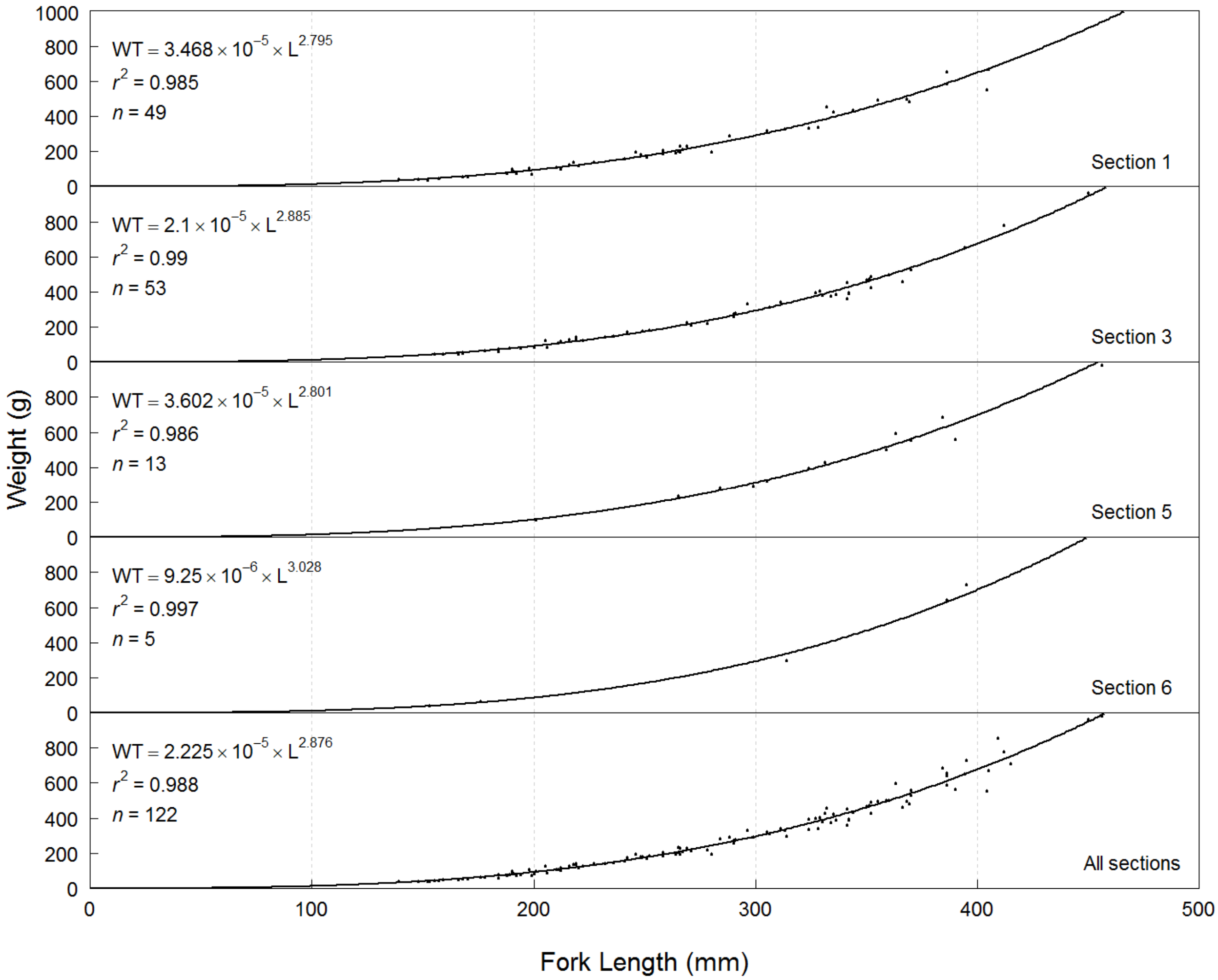

Figure 51: Length-weight regressions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

3.11.2 Abundance and Spatial Distribution

In 2017, 84% of the Rainbow Trout catch was recorded in the upstream two sections (40% in Section 1 and 44% in Section 3; Table 8). Rainbow Trout were in low abundance in the downstream 4 sections, with only single individuals recorded in both Section 7 and Section 9. This distribution pattern is consistent with historical study years (Attachment A).

Of the 122 Rainbow Trout captured during the 2017 survey, 120 were implanted with PIT tags. Of those 120 fish, 11 were subsequently recaptured. Seven of the recaptured fish were recorded in Section 3 and three recaptured fish were recorded in Section 5. A single individual was recaptured twice in Section 7. Movement between sections was not observed. There were sufficient data to produce population abundance estimates for Sections 3 and 5 only. In sections where sufficient fish were recaptured, Rainbow Trout abundance estimates in 2016 and

2017 were similar and estimate confidence limits overlapped between years and among sections (Table 20 and Figure 52). Significant changes in Rainbow Trout abundance were not evident, and although the annual catch for this species is highly variable, overall, catch data do not suggest any large trends in abundance or catchability between 2002 and 2017.

Table 20: Population abundance estimates generated using the Bayes sequential model for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
3	91	68	38	168	38	41.6
5	147	33	13	537	172	116.8
Total[a]	238	127	74	302	176	73.9

[a] Calculated from the joint distribution of Section 3 plus Section 5.

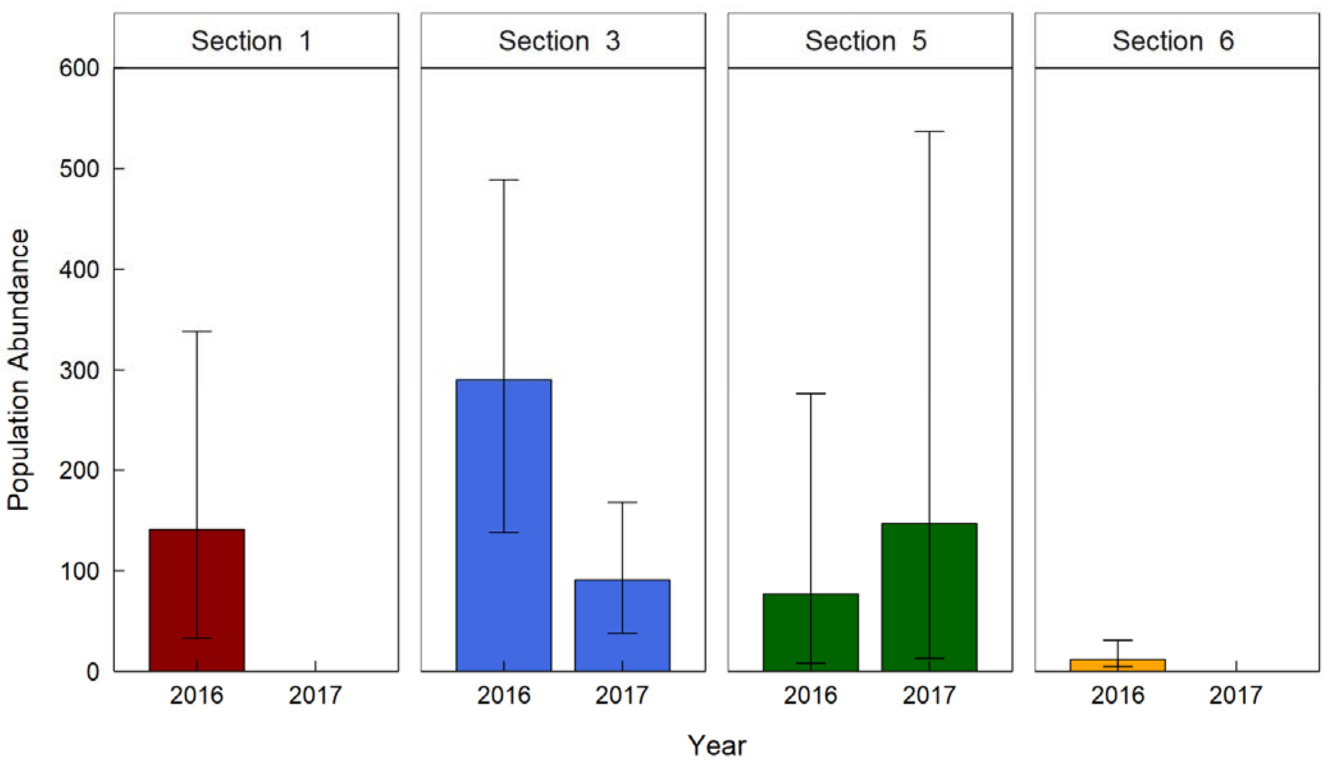

Figure 52: Population abundance estimates (with 95% credibility intervals) generated using the Bayes sequential model for Rainbow Trout captured by boat electroshocking in Sections 1, 3, 5, and 6 of the Peace River, 2016–2017.

3.12 Walleye

3.12.1 Biological Characteristics

During the 2017 survey, 372 Walleye were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Ages were assigned to 114 Walleye based on analyses of fin rays. For fish assigned an age, fork lengths ranged between 94 and 568 mm, weights ranged between 6 and 2044 g, and body condition (K) ranged between 0.7 and 1.3 (Table 21). Ages of Walleye ranged from age-0 to age-11. Modes representing age-0 and age-1 age-classes were evident in the length frequency histogram. After age-1, length ranges overlapped adjacent age-classes (Figure 53; Figure 54).

Table 21: Average fork length, weight, and body condition by age for Walleye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 14 October 2017.

Age	Fork Length (mm)			Weight (g)			Body Condition (K)		
	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]	Average ± SD	Range	*n*[a]
0	106 ± 10	94 – 122	7	11 ± 3	6 – 16	7	0.86 ± 0.09	0.72 – 0.98	7
1	211 ± 52	154 – 257	3	116 ± 71	37 – 176	3	1.09 ± 0.12	1.01 – 1.22	3
2	309 ± 17	279 – 331	8	319 ± 45	249 – 368	8	1.08 ± 0.08	0.92 – 1.16	8
3	318 ± 29	274 – 388	23	358 ± 102	231 – 663	23	1.09 ± 0.07	0.92 – 1.20	23
4	361 ± 25	301 – 401	26	508 ± 113	282 – 693	26	1.06 ± 0.09	0.91 – 1.26	26
5	400 ± 45	341 – 478	9	709 ± 225	438 – 1,176	9	1.08 ± 0.06	1.00 – 1.18	9
6	425 ± 51	316 – 506	15	868 ± 286	445 – 1,493	15	1.10 ± 0.13	0.96 – 1.41	15
7	441 ± 49	386 – 556	13	963 ± 361	624 – 1,897	13	1.12 ± 0.08	1.02 – 1.29	13
8	453 ± 27	434 – 472	2	975 ± 157	864 – 1,086	2	1.04 ± 0.02	1.03 – 1.06	2
9	482 ± 37	456 – 524	3	1,331 ± 321	1,118 – 1,701	3	1.17 ± 0.02	1.15 – 1.18	3
10	509 ± 57	455 – 568	3	1,458 ± 515	1,080 – 2,044	3	1.08 ± 0.09	0.98 – 1.15	3
11	519 ± 15	508 – 529	2	1,422 ± 29	1,401 – 1,442	2	1.02 ± 0.07	0.97 – 1.07	2

[a] Number of individuals sampled.

The majority of Walleye captured (328 out of 371 individuals; 88%) were longer than 250 mm FL. The age-6 and age-7 age-classes that dominated the 2015 Walleye catch (Appendix F, Figure F35) were less evident in the 2016 catch. In 2017, a clear dominance of a specific age-class was not evident and similar numbers of age-3 through age-7 fish were captured (Figure 55). Moderate abundances of the age-3 and age-4 cohorts, corresponding to the 2013 and 2012 brood years, respectively, were captured in 2017. These two brood years were underrepresented in the 2015 catch (Appendix F, Figure F35). Consistent with previous studies, all small Walleye (i.e., fish less than approximately 230 mm FL corresponding to the age-0 and age-1 cohorts) were encountered in Sections 6, 7 and 9; small Walleye were not encountered in Sections 1, 3, 5 (Appendix F, Figures F32 and F33).

Growth curves estimated using the von Bertalanffy method suggested that Walleye growth slows and approaches an asymptote at approximately 500 mm FL when the fish are between age-9 and age-10 (Figure 56). Walleye growth estimates were refined in 2017 due to the capture of older fish (age-7 and older; n = 23). Growth curves from previous years when length-at-age data were available (i.e., 2009 to 2011 [Mainstream 2010, 2011, 2013], 2015 and 2016) suggested similar growth rates with growth slowing after approximately age-5 and an asymptote at approximately age-10 (Figure 57).

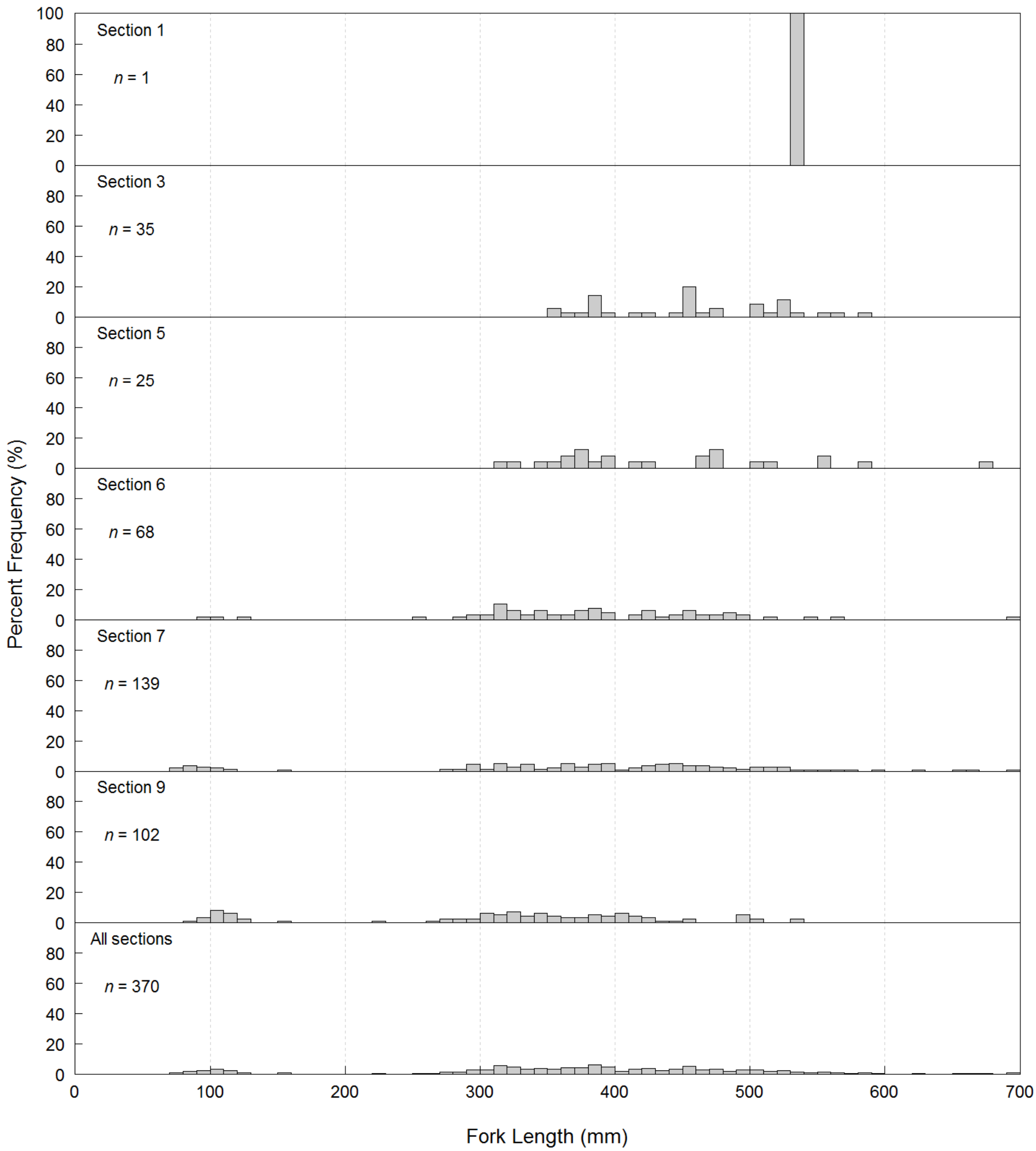

Figure 53: Length-frequency distributions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 14 October 2017.

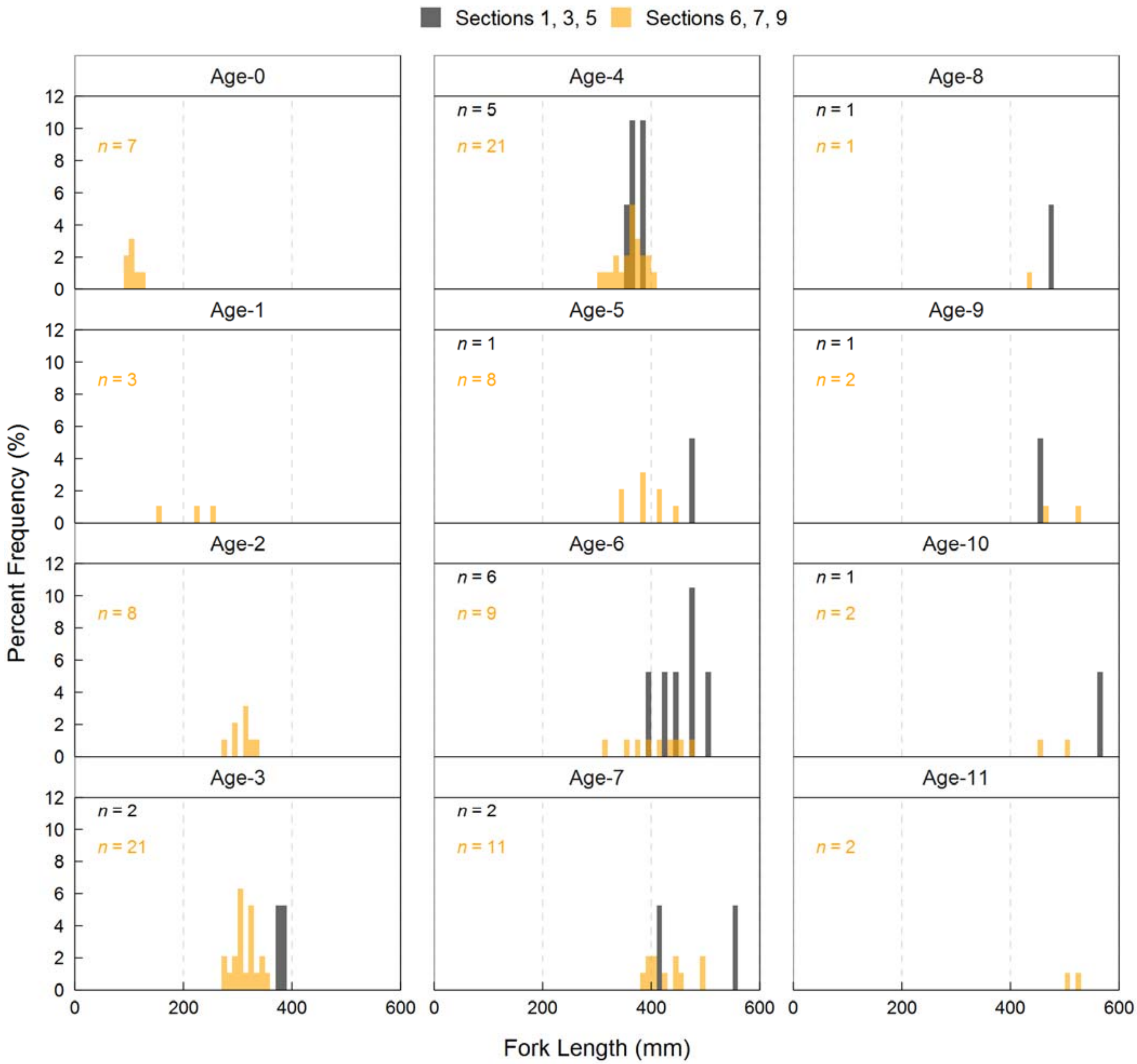

Figure 54: Length-at-age frequency distributions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

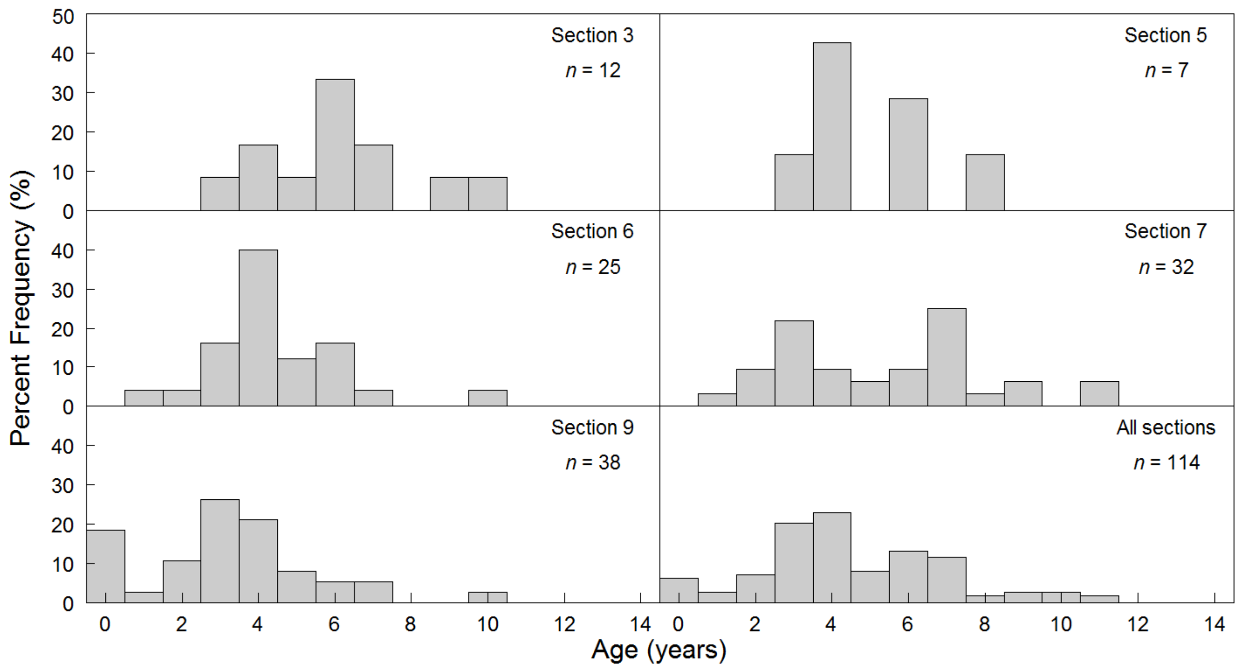

Figure 55: Age-frequency distributions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 14 October 2017.

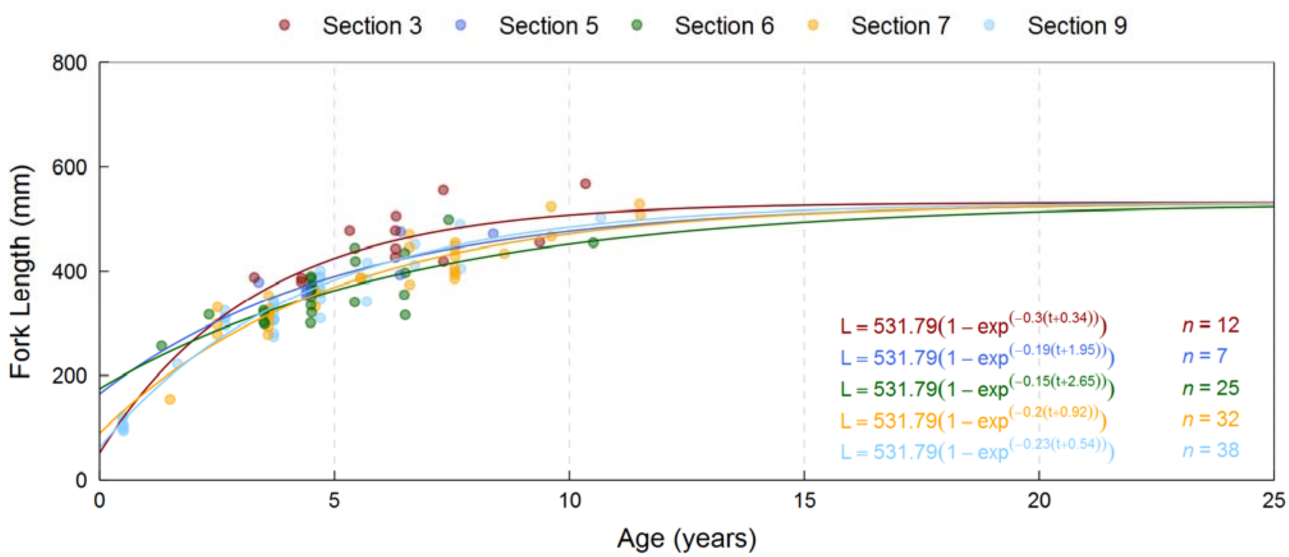

Figure 56: von Bertalanffy growth curve for Walleye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 14 October 2017.

Mean body condition varied little among years, and in 2017, body condition was similar in all sections, with the exception of a slight decline recorded in Section 9 compared to upstream sections (Figure 58). Length-weight regressions did not to vary (Figure 59; Appendix F, Figure F36).

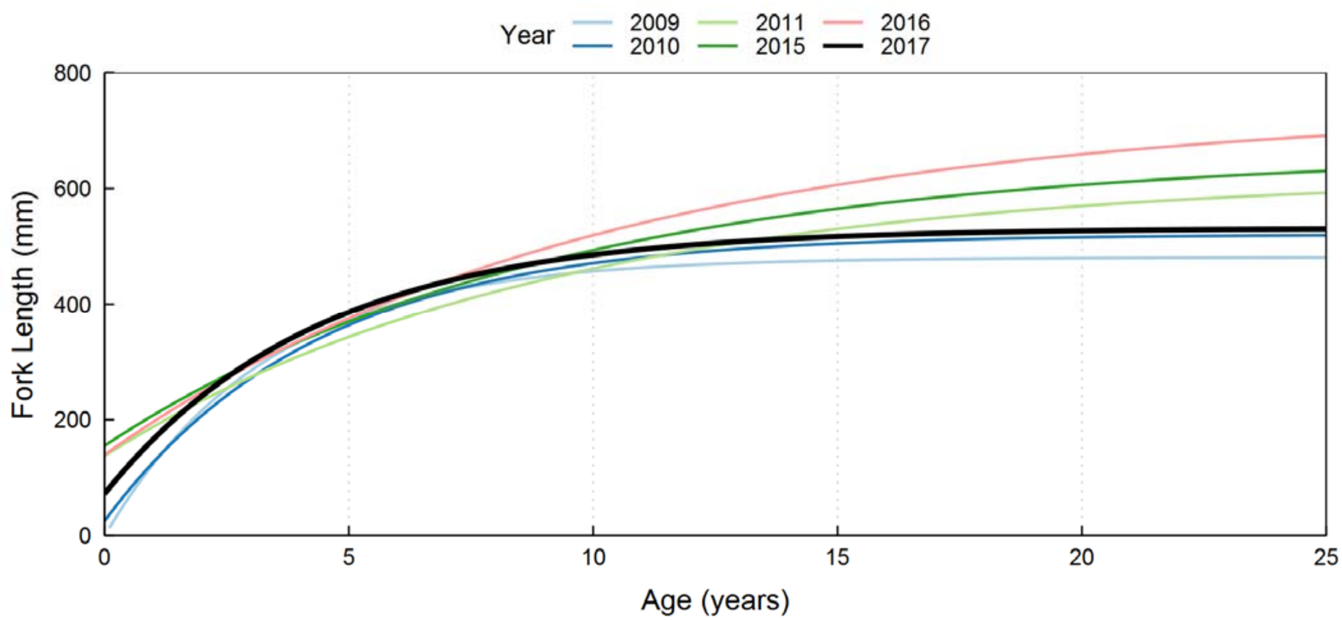

Figure 57: von Bertalanffy growth curve for Walleye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017.

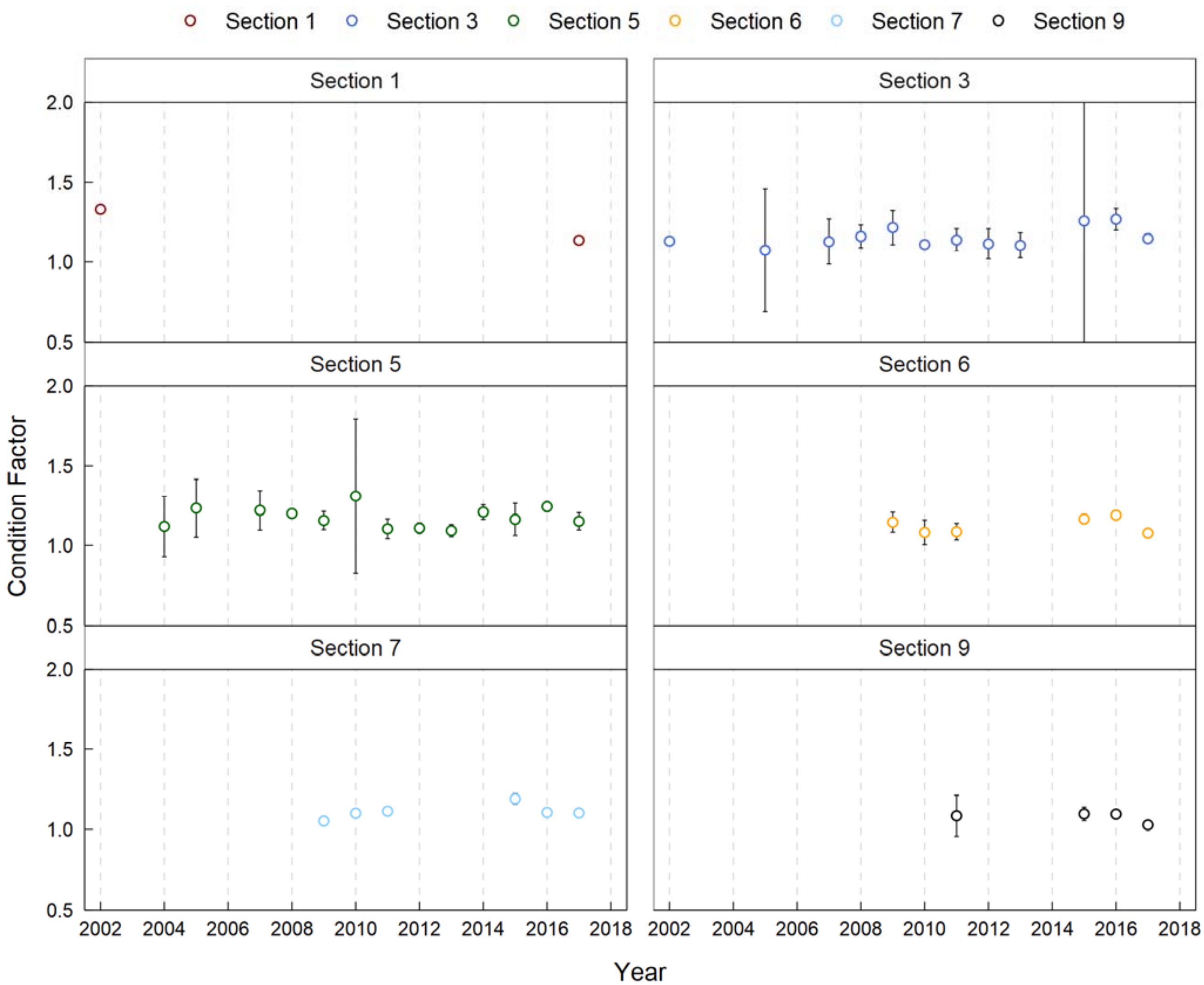

Figure 58: Mean body condition with 95% confidence intervals (CIs) for Walleye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017. The 95% CI of Section 3 values in 2015 extends from -0.39 to 2.91.

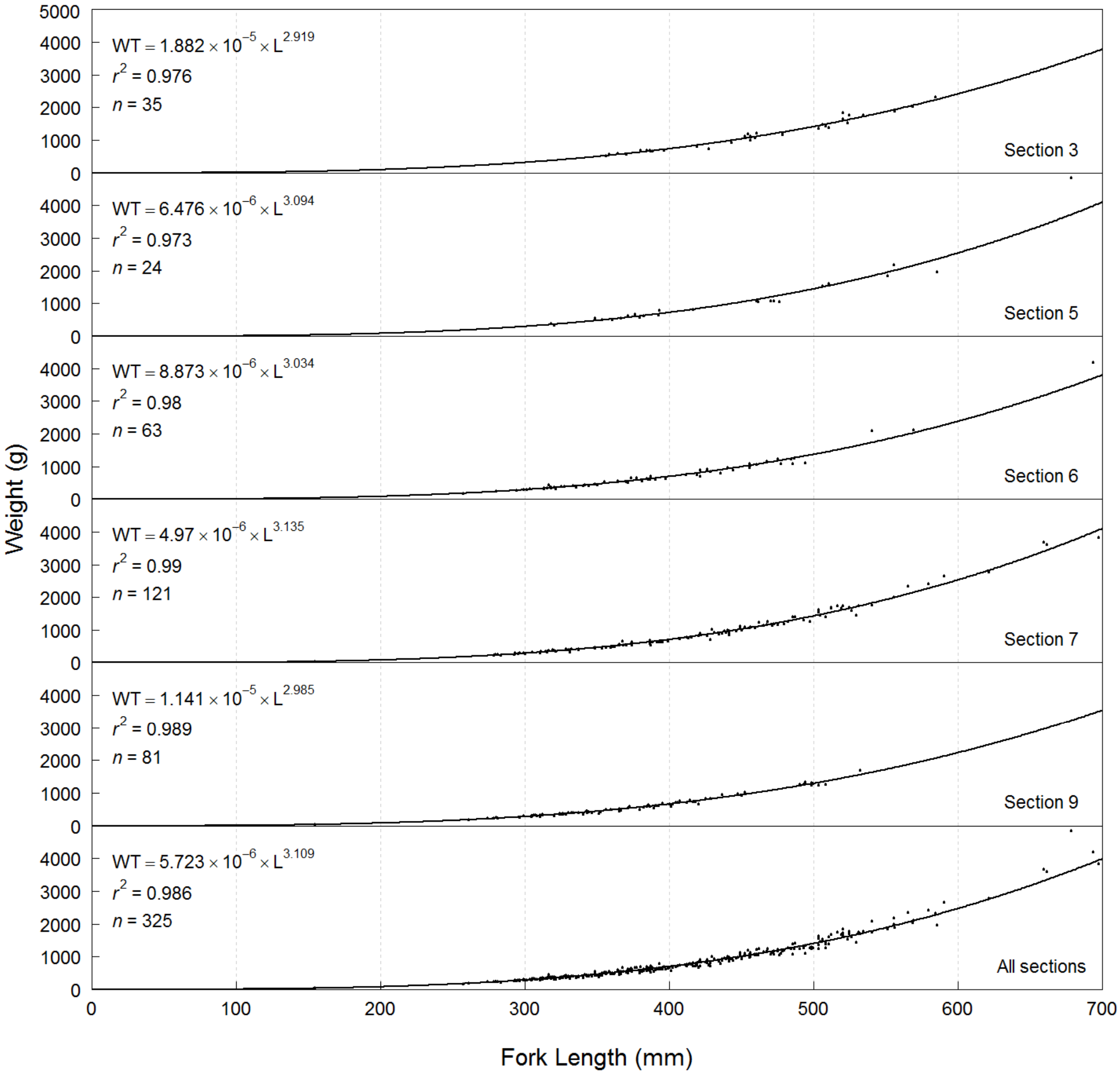

Figure 59: Length-weight regressions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 21 August to 14 October 2017.

3.12.2 Abundance and Spatial Distribution

In Sections 1, 3, and 5, which were consistently sampled between 2002 and 2016, the number of Walleye captured ranged from 0 to 58 individuals, with the greatest number recorded in 2008 (n = 58). In 2017, 61 Walleye were captured in these three sections. Most of these 61 fish were recorded in Section 3 (n = 35) and Section 5 (n = 25; Table 8). A single Walleye recorded in Section 1 in 2017 represents one of the four individuals recorded upstream of the Halfway River confluence since the program began in 2001. Prior to 2017, the last Walleye recorded in Section 1 was in 2012 (two individuals). In Sections 6, 7, and 9, which were only sampled as part of this program from 2015 onward, 103 Walleye were captured in 2015, 197 in 2016, and 311 in 2017 (Appendix E, Table E2). Data to date indicate a preference for the downstream portions of the study area for this species and suggest increasing use of the area since 2015.

Of the 372 Walleye captured in 2017, 329 of these fish were implanted with PIT tags, and of those, 16 were recaptured in subsequent sessions; one individual was recaptured twice. All fish were recaptured in the same section they were initially tagged and released except for one individual that was initially captured in Section 6 and recaptured in Section 7. In Sections 7 and 9, sufficient fish were recaptured in 2017 to calculate Walleye abundance estimates (Table 22). Due to the low number of recaptures, confidence limits associated with the estimates were wide.

Table 22: Population abundance estimates generated using the Bayes sequential model for Walleye captured by boat electroshocking in sampled sections of the Peace River, 2017.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
7	1,299	990	510	2,380	527	40.6
9	2,150	920	300	5,930	1713	79.7
Total[a]	3,449	2,290	1,450	4,220	1,792	52.0

[a] Calculated from the joint distribution of Section 7 plus Section 9.

3.13 White Sucker

3.13.1 Biological Characteristics

During the 2017 survey, 176 White Sucker were initially captured (i.e., excluding within-year and inter-year recaptures; Table 8). Of these 176 fish, 138 were measured for length and weight. Fork lengths ranged between 64 and 506 mm, and weights ranged between 4 and 1863 g.

The majority of White Sucker encountered were between 300 and 500 mm FL. Length-frequency histograms suggest similar length distributions among sections (Figure 60), except that White Sucker less than 190 mm FL were only captured in Section 6. Use of Section 6 by young White Suckers was also identified in 2016. In 2017, the length-weight relationship for White Sucker (Figure 61) was similar to historical study years (Appendix F, Figure F41). The mean body condition of White Sucker varied little among sections or years (Figure 62).

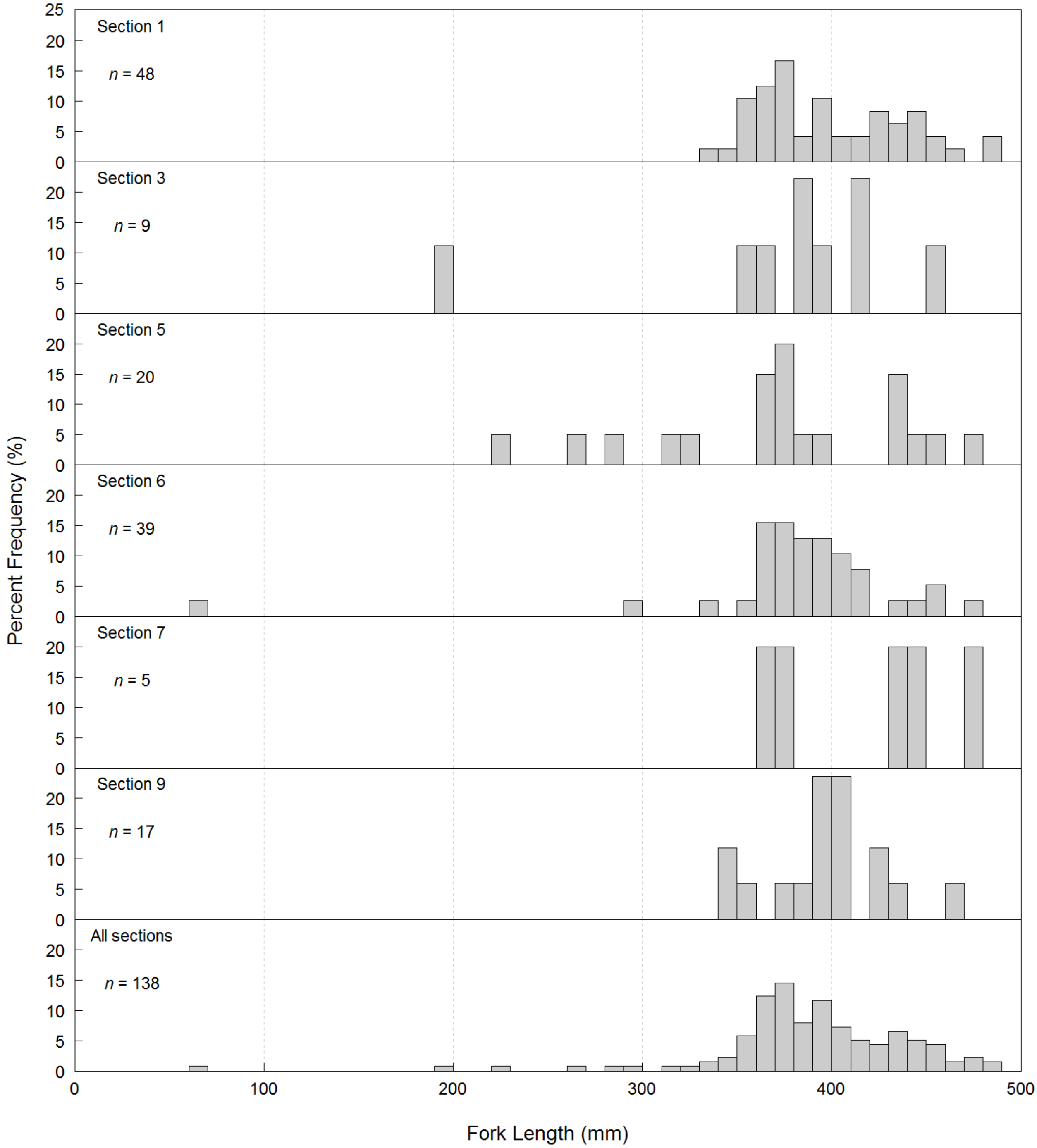

Figure 60: Length-frequency distributions for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

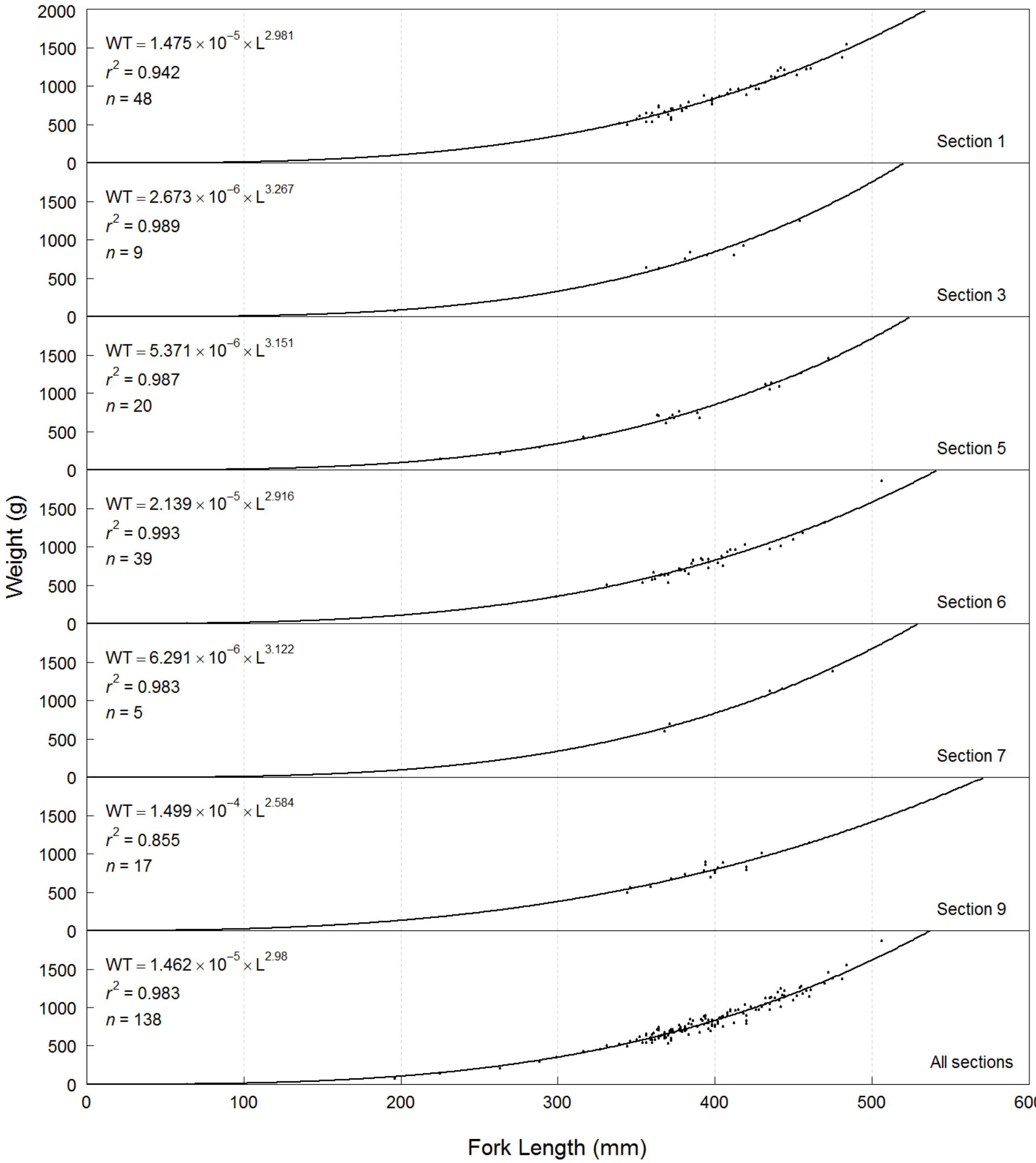

Figure 61: Length-weight regressions for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 21 August to 4 October 2017.

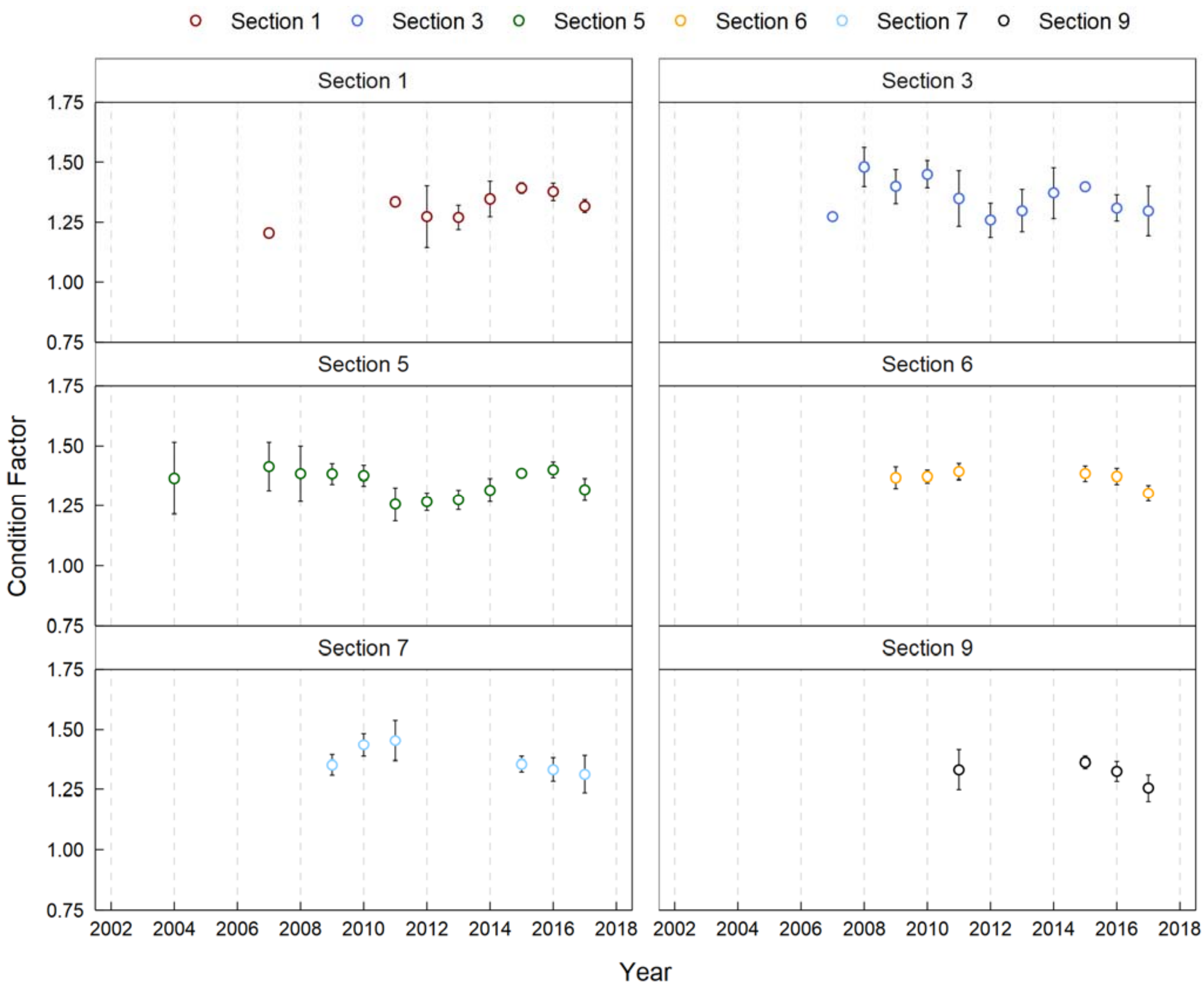

Figure 62: Mean body condition with 95% confidence intervals (CIs) for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2017.

3.13.2 Abundance and Spatial Distribution

In 2017, White Sucker were recorded in all sections; however, they were noticeably less common in Section 3 and Section 7 in 2017 (Table 8) when compared to 2016. Of the 176 White Sucker encountered during the 2017 survey (all sections and sessions combined), 136 were implanted with PIT tags; five were subsequently recaptured. Movement between sections was not observed. There were insufficient data to produce population abundance estimates for this species.

3.14 Catchability

Insufficient numbers of recaptured fish prevented the computation of catchability coefficients for all species except Mountain Whitefish.

For Mountain Whitefish, catchability coefficients were computed based on the Bayesian sequential estimates. The catchability coefficients were calculated using effort as measured in the kilometres of shoreline sampled (top panel) and using effort as measured in the number hours of electroshocking (bottom panel) for all sections sampled from 2015 to 2017 (Figure 63). Confidence limits overlapped for all sections and years.

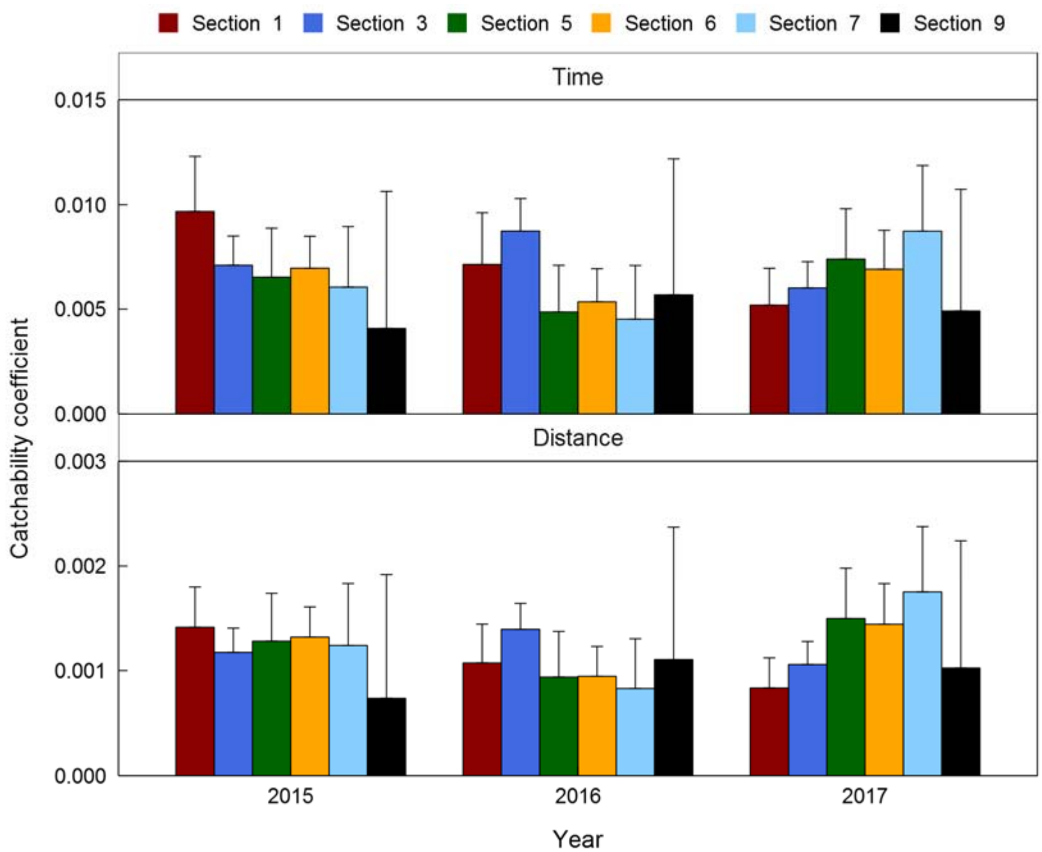

Figure 63: Catchability estimates by section for Mountain Whitefish captured by boat electroshocking based on sampling effort measured in time (top panel) and distance (bottom panel) in the Peace River, 2015–2017.

The 2017 catchability coefficients for Sections 1, 3, and 5 were of similar scale to those estimated in 2010, and 2014 to 2016 (Figure 64). The coefficients were consistent among sections within 2017, as were many other years (e.g., 2008 through 2012). Coefficients were not consistent across all years but were similar between 2014 and 2017.

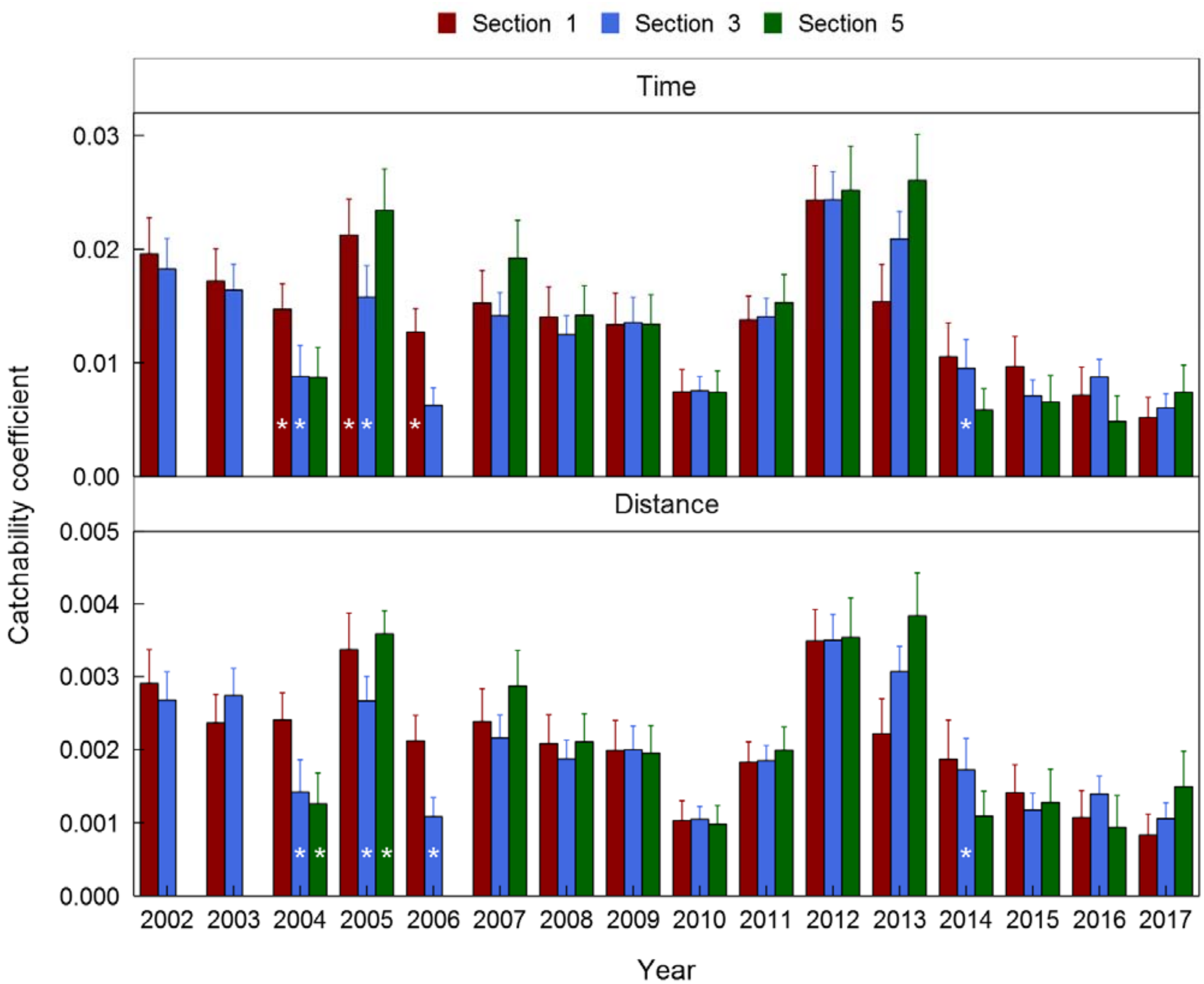

Figure 64: Catchability estimates by year and section (Sections 1, 3, and 5) for Mountain Whitefish captured by boat electroshocking based on sampling effort measured in time (top panel) or distance (bottom panel) in the Peace River, 2002–2017. Vertical bars represent 95% confidence intervals; stars indicate suspect population abundance estimates.

3.15 Precision of Population Abundance Estimates

Low numbers of captures and recaptures in Section 1 over all study years prevented the generation of reliable power curves for all species except Mountain Whitefish. Results for other species are not presented.

Sampling intensity can be isolated to each section because there is little movement of fish between sections. Figure 65 plots precision of population abundance estimates as a function of electroshocking effort (i.e., hours of electroshocker operation) for Mountain Whitefish in Section 1. The analysis was limited to Section 1 because it was the only section sampled every year between 2002 and 2017. Overall, power was low in 2017 compared to previous years. This reduction in power in 2017 was attributed to low catch that reduced statistical strength of estimates compared to previous years when catch rates were higher. The analysis indicates that a reduction in effort in Section 1 may result in substantive loss of power and an increase in effort would likely result in modest gains in precision (Figure 65).

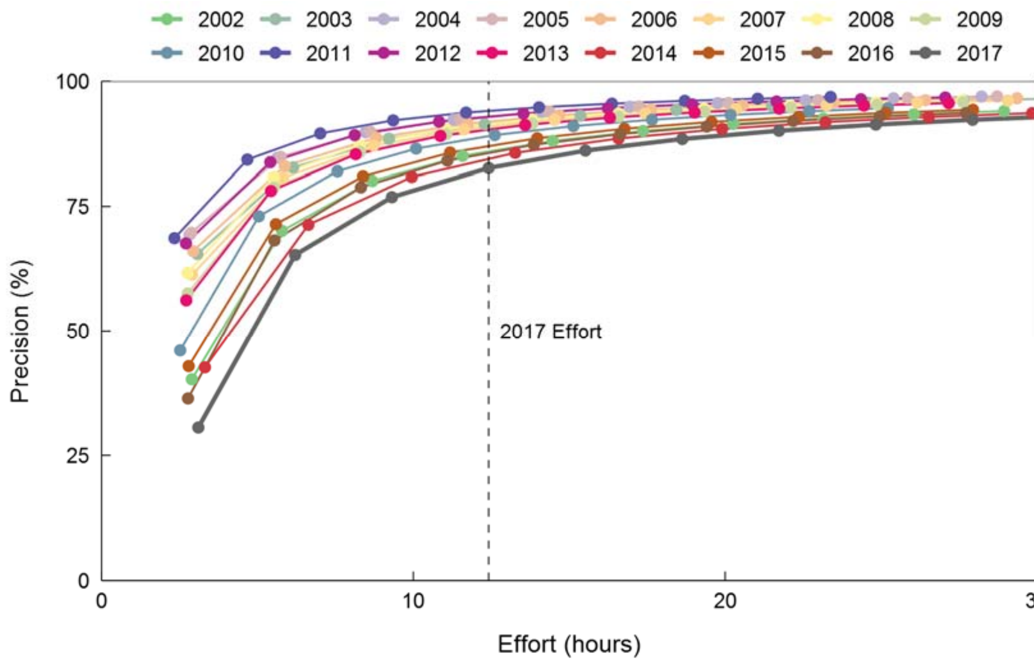

Figure 65: Precision of the Bayesian mean estimates of Mountain Whitefish abundance in Section 1 of the Peace River at various levels of effort, 2002 to 2017. The vertical dashed line represents the amount of effort (in hours) expended during the 2017 survey.

3.16 Diversity Profiles

In the diversity profiles, the effective number of species is used to indicate the diversity of fish species, while varying the value of *q*, which represents the relative contribution of rare species to the diversity metric. The steep decline in the effective number of species with increasing values of *q* reflects the community composition in the study area, with a few species dominating the catch and low numbers of rare species (Figure 66). This community composition results in species richness (*q* = 0) of 10 to 20 effective species, but less than four effective species at values of *q* equal or greater than one in all sections. Diversity was generally greater in downstream sections (Sections 6, 7, and 9) when compared to sections further upstream (Sections 1, 3, and 5).

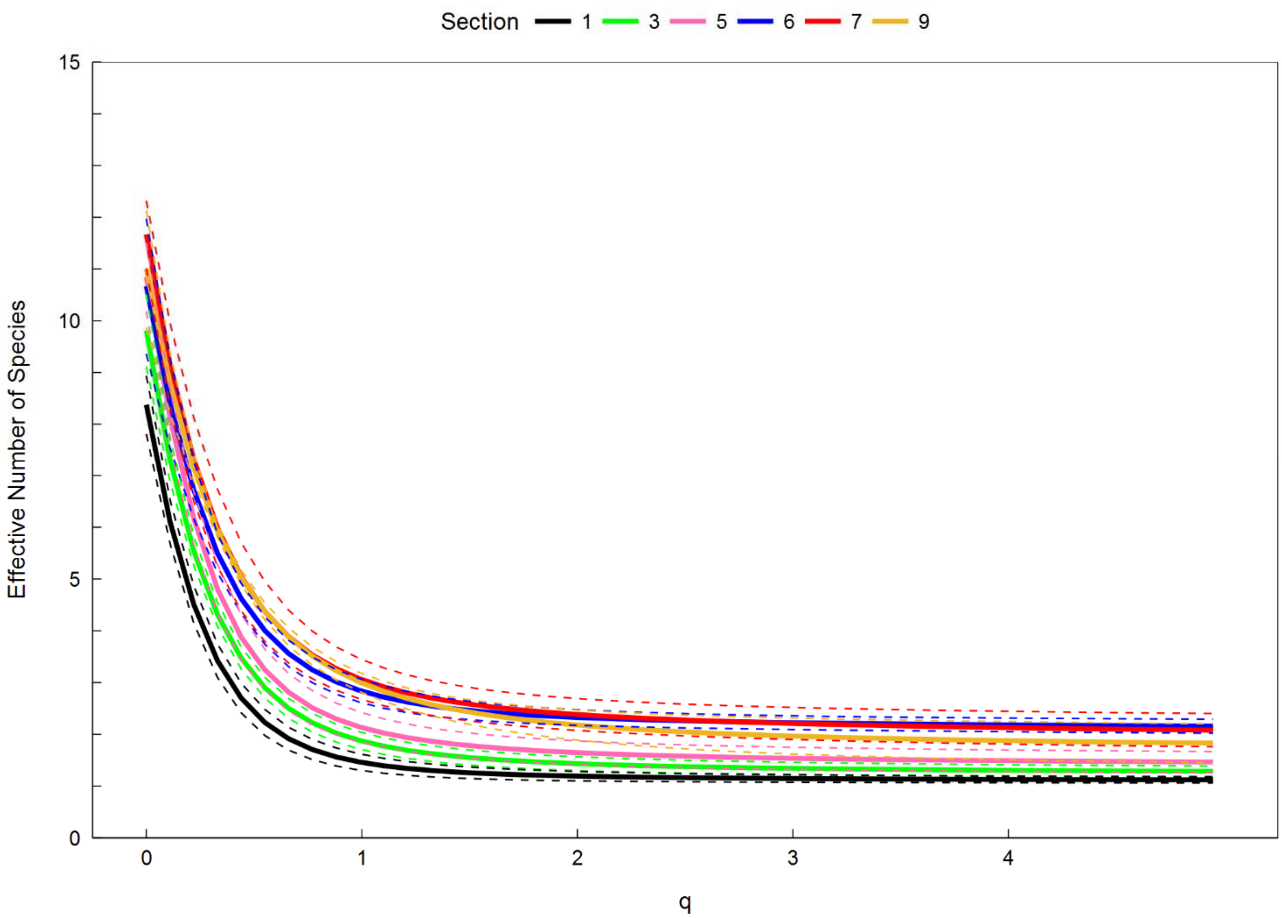

Figure 66: Diversity profiles showing effective number of species versus the parameter (*q*) representing the importance of rare/common species in the calculation. Values are means (solid lines) with 95% confidence intervals (dashed lines) from annual diversity profiles from 2002 to 2017 combined for each section in the Peace River study area (Sections 6, 7, and 9 only include data from 2015 to 2017). A value of q = 0 corresponds to species richness while a value of q = 1 corresponds to the Shannon index.

4.0 DISCUSSION

4.1 Management Hypotheses

Management hypotheses for this monitoring program relate to the predicted changes in the biomass and community composition of fish in the Peace River during the construction and operation of the Project. Data collected from 2002 to 2015 represent the baseline, pre-Project state of the fish community, while data collected in 2016 and 2017 represent initial stages of Project construction. Currently, management hypotheses are not scheduled to be statistically tested until after the river diversion phase of construction (i.e., after 2020).

4.2 Annual Sampling Consistency

Field methods employed during the Indexing Survey were standardized in 2002; these methods were carried over to the GMSMON-2 program when it commenced in 2008, and to the current program in 2015. Over the 16-year study period (2002 to 2017), small changes were occasionally made to the methods based on results of preceding study years or to better address each program's management objectives. Examples of some of these changes include the sections of river sampled and the types of tags deployed (T-bar anchor tags initially, changing to full-duplex PIT tags in 2004, and to half-duplex PIT tags in 2016). For a long-term monitoring program, changes to methods, which also includes changes in handling procedures (such as additive effects associated with collecting tissue or stomach content samples), have the potential to confound results and hinder the identification of patterns and trends in the data through changes in behavior, health, or survival. Changes made between 2002 and 2013 are discussed in previous reports. In 2017, boat electroshocking methods adhered to methods developed by Mainstream and Gazey (2014) and subsequently modified in 2014 to reduce electroshocker related injuries to fish. These modifications included operating the electroshocking equipment at a lower frequency (30 Hz when compared to 60 Hz) and amperage (a range 2.0–4.2 A compared to 3.2–5.2 A). Studies from other river systems indicate that salmonids, particularly larger salmonids, are less likely to be injured (i.e., branding, internal hemorrhaging, or spinal injuries) at the lower operational settings (Snyder 2003; Golder 2004, 2005).

It is not known whether the difference in electroshocker settings used in 2014–2017 versus 2002–2013 resulted in differences in the rates of injury, survival, capture probability, and recapture of sampled fishes; however, the Mountain Whitefish synthesis model indicates differences in selectivity between the two epochs for this species. From 2014 to 2017, selectivity was more uniform across size classes when compared to 2002–2013 (Appendix H, Figure H11). Higher frequencies, which were used from 2002–2013, result in greater electrical power. Greater power makes it easier to catch small fish (Dolan and Miranda 2003). Lower frequencies, which were used from 2014–2017, have less electrical power, reducing the small fish catch and increasing the portion of large fish in the catch. The change in selectivity confounds comparisons between the two epochs but could prove beneficial to long-term study results, due to reduced injury or mortality associated with electroshocking. Increased selectivity for younger age-classes, particularly age-2 fish because they are young but still large enough to tag, would increase the precision of age-based metrics, including length-at-age, annual growth, recruitment, and inter-annual survival, and improve the precision of the synthesis model.

4.3 Population Estimates

4.3.1 Evaluation of Assumptions

Mountain Whitefish are an indicator species for the study and are captured in sufficient numbers to allow detailed population abundance modeling. Based on field observations, Mountain Whitefish are sensitive to external stresses, and that may result in the loss of tagged fish or reduced recapture rates, potentially confounding population abundance estimates and modeling efforts. Factors that affect population estimates can be evaluated through an assessment of assumptions required for the Bayes sequential and stratified population models, which are as follows:

1) The population size in the study area does not change (i.e., is closed) and is not subject to apparent mortality over the period of the experiment.

The data do not support a closed population for Mountain Whitefish in Section 1. For all other sections and species, data support a closed population. Most recaptured Mountain Whitefish (93.5% of recaptures) were recaptured in the section they were initially released into; only 6.5% of recaptured Mountain Whitefish were encountered in a different section. Moreover, the model accounts for fish that move under the assumption that all movement is described by the history of recaptured marks. For Mountain Whitefish, significant growth over the study period did not occur (mean increment in growth of a recaptured fish was 0.8 mm). The number of unmarked fish entering the population through growth (e.g., fish less than 250 mm FL during Session 1 but growing to larger than 250 mm FL in Session 2) during the study period (termed growth recruitment) would be negligible.
No significant apparent mortality was estimated by the CJS analysis. Inspection of the posterior probability plot sequences generated by the Bayes model indicated that all species and sections (except Mountain Whitefish in Section 1) were convergent with no marked trend to larger or smaller population sizes. For Mountain Whitefish in Section 1, the posterior distributions and estimates of logarithmic population deviations using the time-varying catchability model indicated either unaccounted in-migration of fish to the section or a trend to lower catchability of marked fish through time.

2) All fish in a stratum (day and section), whether marked or unmarked, have the same probability of being caught.

It is possible that marked and unmarked Mountain Whitefish in Section 1 did not have the same probability of being caught. For all other sections and species, data supports the assumption. The study area was stratified into six sections to account for any differences from marks applied, population size, or spatial catchability. Similarly, the day strata accounted for new marks applied through the study. Only PIT tags were used in the analyses.
For Mountain Whitefish in Section 1, the time-varying catchability model had a better fit to the data than the constant catchability model. The constant catchability model fit the data better or nearly as well in all other sections.

3) Fish do not lose their marks over the period of the study.

Overall, tag retention was high, with only 4 out of 4363 Mountain Whitefish (0.09%) showing evidence of a tag implantation wound (current year) or scar (previous year) without a tag being detected. The impact on 2017 population estimates from lost tags was assumed to be negligible.

4) All marked fish are reported on recapture.

Only fish brought on board were included in the number of fish examined for a tag; therefore, it is unlikely that a tagged fish would avoid detection.

4.3.2 Reliability of Estimates

The foremost issue for the reliability of estimates is the weight each session should receive for the estimation of population size. The sequential Bayes algorithm updates the posterior distribution of the previous session by the information from the current session. Gazey and Staley (1986) showed that the sequential mark-recapture experiment can be characterized as a sequential Bayes algorithm updated by the binomial kernel. Thus, the sequential Bayes model weights each session by the information contained in the sample regardless of variation in catchability or population size. The sequential Bayes algorithm also incorporates time-varying capture probability because capture probability is implicitly linked to sampling intensity (i.e., sample size divided by population size; Williams et al. 2001). In addition, unmarked releases do not bias population estimates. From a practical perspective, when the model assumptions hold, the population estimates will be accurate. When the assumptions do not hold, the population estimate should provide good approximations.

The sequential Bayes model provides good population estimates for within-year sampling on the Peace River. The assumptions required to produce population estimates appear to hold for all species and sections with the exception of Mountain Whitefish in Section 1, which resulted in higher uncertainty in estimates for this section and species relative to others.

Low numbers of captured and recaptured Arctic Graying limited the effectiveness of the mark-recapture study for this species. For Bull Trout, population estimates were available in all sampled sections but Section 9; however, the precision was generally poor (overall CV = 29%). Forecasts of effort levels needed for reliable population estimates were not conducted for either species.

4.4 Precision of Population Abundance Estimates

Sampling intensity could be isolated to each section because there was little movement of fishes between sections. The precision obtained from the effort employed in 2017 was the lowest recorded since the inception of the project. Variation in either population size or catchability reduced precision. The power analysis indicated that a reduction in effort in Section 1 would risk a substantive loss of precision. As an example, in 2017, 12.4 hours of effort were employed in Section 1 (i.e., 12.4 hours of electroshocker operation) and precision was estimated at 82%. If effort was increased by 50%, precision was estimated to increase approximately 6%, but if effort was reduced by 50%, precision would decrease by 17%. If modifications to the study design are required during future study years, adding or removing sections would be preferred over increasing or decreasing the intensity of sampling within a section.

Mark-recapture data from Arctic Grayling were insufficient for population analyses, due to few fish being captured and low numbers of recaptures. For Bull Trout, population estimates were generated for all sections except Section 9; however, the precision of the estimates was low (overall CV = 29%). Forecasts of effort levels needed to generate reliable population estimates for these two species were not conducted.

4.5 Catchability

Catchability coefficients were calculated under the assumptions of a closed population with no apparent mortality, and that abundance indices are proportional to the population size (Figure 63 and Figure 64). If the above assumptions are true, coefficients should remain constant over study years and sample sections. Mainstream and Gazey (2006) provided three caveats for using boat electroshocking catch rates as an index of Mountain Whitefish abundance in the Peace River:

1) Sampling protocols (methods, equipment, and approach) must be consistent
2) Water clarity must remain above 50 cm
3) The target population must remain closed during the sampling period

The 2017 survey generally complied with the above caveats, and estimated catchability coefficients were consistent across sections within 2017. Historically, the coefficients have not been consistent across years, but were consistent, albeit lower, during the 2014–2017 epoch. Additional years of data are required to determine if the altered electroshocker settings employed from 2014 to 2017 allow for more consistent Mountain Whitefish catchability or to determine if Mountain Whitefish catchability was consistent from 2014 to 2017 for other, unknown reasons.

4.6 Arctic Grayling

Insufficient mark-recapture data prevented the generation of population abundance estimates that could corroborate any trend, be it decrease (2004–2014) or increase (2014 – present). Over the 14-year monitoring period, the catch rate of Arctic Grayling generally declined, with the lowest catch rate for Arctic Grayling being recorded in 2014. Arctic Grayling catch rates increased from 2015 to 2016, with catch rates in 2016 being approximately 60% higher than in 2014. In 2017, Arctic Grayling catch rate was lower than in 2016 and more similar to levels recorded in 2015In 2016, almost 20% of the Arctic Grayling catch was recorded in Section 6, which was not consistent with 2015 or 2017 results.

Use of the downstream portions of the study area by Arctic Grayling is not fully understood due to the limited amount of catch data available for Sections 6, 7 and 9 prior to 2015 (Mainstream 2010, 2011, 2013).
Overall, catch data recorded after 2015 suggests that use of Sections 6, 7, and 9 is low. Of the196 Arctic Grayling tagged since 2015, only one fish tagged in a downstream section of the study area (Section 7 in 2015) has been recaptured in an upstream section of the study area (Section 3 in 2017). To date, none of the Arctic Grayling tagged in the three upstream sections have been recaptured in a downstream section; however, AMEC and LGL (2009) did detect Arctic Grayling movements between these two areas during telemetry surveys conducted in 2008.

Age data since 2015 indicated that all age-classes of Arctic Grayling were present in the study area including age-0 and age-1 juveniles and adults up to age-3, although age-0 fish were not captured in 2017.

Additional years of data from downstream sections could be used to assess the movement and distribution of Arctic Grayling within the study area in response to the construction and operation of the Project. It is anticipated that low recapture rates will result in uncertain absolute abundance estimates for this species during the construction and operation phases of the Project. Therefore, changes in abundance over time for this species should be assessed using indicators of relative abundance (e.g., catch-per-unit effort metrics). The anticipated reliance on relative abundance metrics highlights the importance of maintaining sample effort and methods across study years.

The trends observed in Arctic Grayling length-at-age data over the last six years suggests that statistical analyses of growth-related metrics may be possible after additional years of study; however, these analyses are likely to have low statistical power because of continued small sample sizes.

The bulk of the Arctic Grayling population spawns in Peace River tributaries, most notably the Moberly River (Mainstream 2012). After hatching, age-0 Arctic Grayling disperse downstream into the Peace River mainstem over the summer season. The success of these life stages of Arctic Grayling (i.e., spawning and age-0 dispersal) is paramount to sustaining the Peace River Arctic Grayling population. These early life history stages are also highly susceptible to environmental perturbation (McPhail 2007). Low abundance of a particular cohort, such as the 2011 and 2015 brood years (Appendix F, Figure F3), is likely related to poor environmental conditions during the spring and summer of the cohort’s spawning year. In both 2011 and 2015, discharges from the Moberly River were substantially greater than average during the spring (Water Office 2017), which may have negatively impacted pre-spawning migrations, spawning/incubation, or the downstream dispersal of age-0 Arctic Grayling.

4.7 Bull Trout

The 2017 population abundance estimates and catch-per-unit-effort data did not suggest substantial or sustained changes in Bull Trout abundance when compared to historical data. Population abundance estimates for Bull Trout were lower in Sections 1, 6 and 7 in 2017 than in 2016. Conversely, Section 3 and 5 abundance estimates in 2017 were approximately equal to or higher than estimates generated in 2016. Abundance estimates in Sections 3 and 5 were likely inflated by the low number of recaptured fish as a proportion of total catch.

Consistent with previous study years, age-0 and age-1 Bull Trout were not recorded in 2017 and age-2 fish were rarely recorded. Young Bull Trout are known to rear in Peace River tributaries, most notably tributaries to the Halfway River, and during the study period (August/September), older, mature Bull Trout have migrated into tributaries to spawn. The Bull Trout population sampled during the Indexing Survey was largely composed of fish that were old enough to have migrated out of their natal streams but had not yet reached sexual maturity (i.e., subadults), but could partially consist of Bull Trout that had forgone spawning (i.e., skip spawners) or Bull Trout that had not yet migrated into tributaries to spawn.

There was little difference in growth between sections for Bull Trout, which could be due to the migratory nature of the Bull Trout population. It is possible that Peace River Bull Trout are not present in any single section of the study area long enough for the habitat quality of that section to influence their growth rate. Similar to most previous study years, the body condition of Bull Trout was higher in Section 1 than most other sections, a result that may be influenced by Bull Trout feeding on dead and injured fish entrained through PCD.

Prior to the 2017 study, there was higher uncertainty associated with Bull Trout age assignments (Golder and Gazey 2017), due in part to limitations imposed by the available fin ray sectioning methodology, which resulted in a relative thick fin ray section that was more difficult to accurately age. In 2017, use of a diamond bladed rotary section saw resulted in substantially thinner ray sections. These thinner ray sections were easier to age, which resulted in more accurate ages and greater precision among age estimates assigned to individual fish.

The notable downward shift in the von Bertalanffy growth curve in 2017 suggests that Bull Trout age were likely underestimated in previous study years (Figure 17, Figure 18).

Age-class modes were absent within annual Bull Trout length-frequency histograms, in part due to small sample sizes and slow growth rates. Chemical ageing of Bull Trout using microchemistry analyses on fin ray samples may better address the program’s management questions. Although a feasible approach in other systems (Golder 2010), fin ray microchemistry analysis is watershed-specific and would likely require a substantial level of investigation. With the refinement of the ageing technique in 2017 (Section 2.1.5), continuation of the current approach may be a cost-effective approach to effectively address some management questions.

4.8 Mountain Whitefish

Mountain Whitefish abundance estimates were similar over recent study years, suggesting a stable population. Sections 1, 3, and 5 were consistently sampled from 2002 to 2017. Over all study years, relative population abundance estimates for Mountain Whitefish (greater than 250 mm FL) were typically highest in Section 1 and decrease incrementally downstream, with lower abundance in Section 3 and the lowest abundance estimates in Section 5. In Section 1, abundance in most years between 2002 and 2017 was similar, with the exception of substantial increases in abundance in Section 1 in 2010, 2011, 2016, and 2017.

Typical of most years, discharges in the Peace River in 2017 exhibited some variability during the study period, but the magnitude of the discharge changes were small compared other years (e.g., 2016) and likely did not influence Mountain Whitefish population abundance estimates. Previous studies found that the abundance of Mountain Whitefish in the study area appeared to be related to water levels, with higher densities generally observed when water levels were lower (e.g., Golder and Gazey 2017). Mainstream and Gazey (2011) postulated that at lower water levels, side channel habitats become isolated or unsuitable for use by Mountain Whitefish, thereby concentrating fish in remaining portions of the study area, where they are more susceptible to capture during the sampling program. This hypothesis was supported by data from 2010, 2011, and 2016 that recorded high Mountain Whitefish abundance estimates in years when, for a substantial portion of the study period, flows remained below the historical seasonal average (Appendix C, Figure C1). In years with lower population abundance estimates (i.e., 2012–2015), flows ranged from above average to below average and the relationship between flow and abundance estimates was less evident. In 2017, flows remained consistently above average over the duration of the study; however, Mountain Whitefish population abundance estimates were high and similar to estimates recorded in low flow years. Presently, it is difficult to conclude whether variation in population abundance estimates represent true Peace River fish abundances or are indicative of changes in Peace River water levels and the concentration of fish in sampled areas.

Overall, population abundance estimates for the time-varying catchability model (i.e., allowed to vary across sessions within a year) generally exceeded the constant catchability model. In 2017, catchability varied by time in all sections except Section 7 where catchability remained constant. Use of specific sections of the river in relation to aspects of Mountain Whitefish life history may influence catchability. The Halfway River is a known spawning area for Mountain Whitefish (RRCS 1978; Mainstream 2012) and may serve as a holding area for this species prior to the spawning season. AMEC and LGL (2008) noted substantial movements of Mountain Whitefish as early as August, which they associated with pre-spawning migration. Spawning for this species likely occurs in October when water temperature declines to approximately 7°C (Northcote and Ennis 1994 cited in Mainstream and Gazey 2014). Therefore, differences in the catchability of Mountain Whitefish between sample sessions in

Section 3 could be due to pre-spawning movements and migration into the Halfway River or other spawning tributaries.

Since 2015, the average body condition of Mountain Whitefish has continuously decreased, with the lowest body condition recorded in 2017. Consistent among study years, the highest average body condition is typically recorded in the upstream sections and the lowest in the downstream-most sections of the study area. The underlying biological factors responsible for this decline in average body condition were not evident. Completion of future studies will allow further analysis to examine whether or not this trend persists and identification of possible causal factors.

4.8.1 Mountain Whitefish Synthesis Model

The population estimates generated by the synthesis model were based on more information than used for the Bayes within year estimates. Therefore, the synthesis population estimates should be more reliable if the model assumptions were consistent with the data.

The partial lack of fit for Mountain Whitefish across year recaptures in Section 5 is not understood and may undermine the reliability of predicted survival, recruitment, and population estimates. The consistency of Section 5 population estimates between the synthesis model and the within-year Bayes model (no across-year recaptures) argues that the impact was not large.

The altered electroshocker settings that were implemented in 2014 changed the selectivity of the gear. Additional years of data will be required to fully characterize the new selectivity (e.g., the functional form of the selectivity function may require alteration of the model). The monitoring program targets large fish, and when combined with high variation in growth, survival, and selectivity, large uncertainty in recruitment estimates should be anticipated.

4.9 Rainbow Trout

Population abundance estimates for Rainbow Trout exhibited large credibility intervals for all study years and sections due to the low number of captured and recaptured individuals, hindering the identification of any meaningful trends. The number of Rainbow Trout captured in 2017 was similar to the number recorded in 2015, but lower than the number recorded in 2016. The annual variation in catch among years does not appear to correspond to environmental variables and most likely reflects underlying variability in Rainbow Trout catchability.

Consistent with previous studies, approximately 95% of the encountered Rainbow Trout were recorded in the upstream three sections of the study area. The higher abundance of Rainbow Trout was attributed to feeding and rearing habitat provided by tributaries to the Peace River in the upstream portion of the study area. Lynx Creek, which flows into the Peace River in Section 1, is a known spawning and rearing stream for Peace River Rainbow Trout (RRCS 1978; Mainstream 2012). It is possible that recent landslides in the Lynx Creek watershed[6] have left the system undesirable for Rainbow Trout, resulting in more fish rearing and feeding in the Peace River. Increased rearing use of the Peace River mainstem by Rainbow Trout is supported by increased numbers of age-1 Rainbow Trout in 2016 and 2017 relative to 2015.

[6] http://hudsonshope.ca/residents/water-services/.

Population abundance estimates were generated for Rainbow Trout for two of the six study sections in 2017, whereas in 2016, due to higher catch, estimates were generated for four of the six sections. Confidence intervals associated with the 2017 estimate for Section 3 were tighter compared to the 2016 estimate. In both 2016 and 2017, confidence intervals were wide around population abundance estimates for downstream sections. Increases to the Rainbow Trout catch and recapture rates will be required in future study years to improve the certainty around estimates.

4.10 Walleye

More Walleye were recorded in 2017 than during any previous study year. The number of Walleye encountered during the survey increased each year between 2014 and 2017. Walleye are more commonly recorded in the downstream sections of the study area. As such, substantially more Walleye have been recorded since 2015 (when Sections 6, 7, and 9 were added to the program). In total, 115 Walleye were captured in 2015, 231 were captured in 2016, and 372 were captured in 2017. In 2017, a Park Use permit was issued that allowed sites historically established in Beatton River Provincial Park (e.g., Mainstream 2010) to be sampled, including sites at the Beatton River’s confluence with the Peace River. This confluence area is a known feeding area for Walleye (Mainstream 2012). Two sites located at the confluence area (i.e., 07BEA01 and 07BEA02) accounted for 18% (n = 68) of the 2017 Walleye catch.

Mark-recapture data collected in 2017 allowed the generation of population abundance estimates for Sections 7 and 9. Confidence intervals associated with both estimates were wide; however, if the current trend of increasing Walleye catch persists into future study years, additional population abundance estimates will allow inter-year comparisons and assessments of the influence that construction and operation of the Project has had on the Peace River Walleye population.

The precision of ages assigned to Walleye was a source of uncertainty in both 2015 and 2016. In 2017, improvements in ray sectioning methods and the implementation of alternative ageing techniques (Watkins and Spencer 2009) improved accuracy and agreement between individual technicians. As such, these techniques should continue to be implemented during future study years.

4.11 Sucker species

Although none of the sucker species are considered indicator species under this program’s objectives, all adult large-bodied fishes are monitored as part of the program in order to eventually test Management Hypothesis #4 regarding fish community structure. Sucker species may be useful for detecting changes in the fish community in the study area for several reasons. Suckers can contribute substantially to ecosystem function through nutrient cycling, affect the invertebrate communities through grazing, and serve as prey items (both as eggs and fish) for other fish species (Cooke et al. 2005). For these reasons, and their low trophic position as grazers, suckers can be an important sentinel species for monitoring changes in fish communities and ecosystems (Cooke et al. 2005). Suckers (all species combined) are common in the Peace River catch data and their large sample sizes and recapture rates will likely result in greater precision in estimates of fish population metrics and greater power to detect change during and after construction of the Project when compared to some of the indicator fish species.

Population abundances estimates for Largescale Sucker and Longnose Sucker were consistent between years with suitable data (2015 and 2017) and sections, while White Sucker abundance was more variable.

The distribution of suckers varied by species, life-stage, and section. In both 2016 and 2017, nearly all of the Largescale Sucker and Longnose Sucker captured in Section 1 were adults (based on length). There was a large proportion of juvenile Largescale Sucker and Longnose Sucker in Section 9. White Sucker was the least common of the three species in all six sections, and nearly all White Sucker captured were adults. Sucker species were not marked with PIT tags prior to 2015; therefore, population abundance estimates were not available prior to 2015.

Over the three years in which sampling has been conducted in the downstream sections (2015–2017), mean values of body condition indicated declining condition in Largescale Sucker and Longnose Sucker with increasing distance from PCD; however, this trend was not evident for Largescale Sucker in 2017. Reasons for this trend are unknown and additional years of data are required to confirm this result. The trend is not apparent in White Sucker data.

4.12 Other species

For two of the seven indicator species (Burbot and Goldeye) there were not enough mark-recapture data to calculate precise population abundance estimates.

Only six Burbot were captured in 2017, which was a substantial decrease in catch compared to 2016 (*n* = 37). With the exception of 2016, previous indexing studies conducted since 2002 typically captured between one and six Burbot each year. Reasons for the substantial increase in 2016 are not known, but reduced habitat quality in the Moberly River, resulting in Burbot moving into the Peace River, was identified as a likely factor (Golder and Gazey 2017). The higher catch rate in 2016 could also be related to Peace River water turbidity levels. In 2016, Secchi depths recorded at the time of sampling averaged 61 cm (all samples combined), compared to an average of 151 cm in 2014, 2015, and 2017 (all samples combined). Burbot are photosensitive (McPhail 2007) and may be abundant in the study area, but occupy deeper waters that are not effectively sampled by boat electroshocking. It is possible that, with higher water turbidity levels in 2016, these fish moved into shallower water and were more susceptible to capture. Given Burbot's propensity for deeper water during the daytime, boat electroshocking is not an ideal capture method for this species. Due to typically low catch numbers, it is unlikely that Burbot catches will allow meaningful inter-annual comparisons of life history metrics or abundance levels during future years of the study.

Goldeye were captured in low numbers in 2015 (*n* = 1), 2016 (*n* = 8), and 2017 (*n* = 3). Goldeye are seasonal residents in the study area, migrating upstream into the study area in the spring to spawn and/or feed in select tributaries, most notably the Beatton River (Mainstream 2011). The Goldeye encountered during the survey likely represent the last of this population migrating out of these tributaries and travelling back downstream. The study design in its current form will continue to encounter sporadic captures and small sample sizes for this species. It is unlikely that Goldeye catches will allow meaningful inter-annual comparisons of life history metrics or abundance levels in future study years. Additional sampling in the late spring to early summer while a larger portion of the Goldeye population is present in the study area may provide more meaningful data for this species.

Northern Pike is not an indicator species under the current program but is a sportfish that was captured in low numbers during most previous study years. During the three years that sampling was conducted in the downstream sections, more Northern Pike were captured in the 2017 study (*n* = 37) than in the 2015 (*n* = 13) and 2016 (*n* = 17) combined. Juvenile Northern Pike were present in Sections 5, 6, and 9. Northern Pike were not captured in Sections 1 in 2017, but have been captured in small numbers in this section in previous study years.

In 2017, 12 Spottail Shiner were encountered. This species was recorded in all sections except Sections 1 and 3. Spottail Shiner is a species of conservation concern and is on the Provincial red list[7]. Spottail Shiner are not native in the Peace River watershed, and those present originated from a population introduced into Charlie Lake, which flows into the Beatton River (McPhail 2007).

4.13 Species Diversity

Species richness (diversity) was generally greater in the downstream portion of the study area (Sections 6, 7, and 9) than in upstream portion (Sections 1, 3, and 5). The downstream sections of the study represent the transition zone between cold/clear and cool/turbid habitats detailed by Mainstream (2012). As such, these sections likely include fish species that prefer both habitat types.

Based on the current results, diversity profiles will potentially be an effective approach to identifying changes in species richness in response to the construction and operation of the Project.

[7] http://www.speciesatriskbc.ca/node/9189.

5.0 CONCLUSIONS

Sampling conducted since 2002 provides a long-term, baseline dataset that can be used to estimate the abundance, spatial distribution, body condition, and growth rates of large-bodied fish populations in the Peace River prior to the construction, and during construction and operation of the Project. During future study years, data from this program will be used to test management hypotheses that relate to predicted changes in biomass and fish community composition in the Peace River during and after the construction and operation of the Project.

The confidence bounds from most 2017 population estimates overlapped estimates from previous study years and were, in many cases, not statistically different. Estimated growth rates and average body condition were also lower for most species in 2017. In 2017, Mountain Whitefish continued a trend noted in 2016 of reduced overall catch rate, average body condition, and growth for most age-classes in most sections. During the 2017 study period, Peace River discharge levels were above average compared to previous study years. Higher flows during sampling potentially resulted in lower catches, which in turn reduced the statistical confidence of population estimates.

Higher than expected catches of Walleye, Northern Pike, and Longnose Sucker were recorded in 2017. However, catches of other species were lower in 2017 than in 2016.

For some indicator fish species, most notably Burbot and Goldeye, small sample sizes and limited mark-recapture data will likely limit the program’s ability to detect changes in abundance over time. Continued encounters at numbers similar to those recorded in 2015 and 2017 are likely to provide information suitable of determining the presence/absence, and potentially the distribution, of these species; however, results are unlikely to provide meaningful estimates of absolute or relative abundance.

6.0 CLOSURE

We trust that the information contained in this report meets your present requirements. Please contact us if you have any questions or concerns regarding the above.

Golder Associates Ltd.

Dustin Ford
Associate, Project Manager, RPBio

Shawn Redden
Associate, Project Director, RPBio

DF/SR/asd/cmc

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APPENDIX A

Maps and UTM Locations

Table A1. Location and distance from WAC Bennett Dam of Peace River boat electroshocking sites sampled in 2017.

Section	Site Name	Bank[a]	Bank Habitat Type[b]	Physical Habitat[c]	Upper Site Limit				Lower Site Limit				Site Length (m)
					Zone[d]	Easting	Northing	River Km[e]	Zone[d]	Easting	Northing	River Km[e]	
1	0101	ILDB	A3	Absent	10	566453	6207858	25.4	10	566936	6208239	25.9	600
	0102	ILDB	A3	Absent	10	566936	6208240	25.9	10	567497	6208907	26.9	975
	0103	RDB	A1	Present	10	566302	6207742	25.3	10	567401	6208075	26.2	1200
	0104	IRDB	A3	Absent	10	566460	6207754	25.4	10	566934	6207880	25.8	500
	0105	RDB	A2	Present	10	567402	6208074	26.2	10	568000	6208913	27.3	1100
	0107	LDB	A1	Present	10	568372	6210050	28.4	10	568798	6210402	28.9	550
	0108	RDB	A3	Absent	10	568605	6209966	28.5	10	569259	6210477	29.3	850
	0109	RDB	A3	Absent	10	569260	6210478	29.3	10	569850	6211235	30.3	975
	0110	LDB	A1	Present	10	568798	6210403	28.9	10	569302	6211053	29.7	650
	0111	LDB	A1	Present	10	569302	6211053	29.7	10	569825	6211869	30.7	1000
	0112	LDB	A1	Present	10	569824	6211868	30.7	10	570686	6212472	31.8	1070
	0113	RDB	A2	Present	10	569994	6211528	30.6	10	570510	6212043	31.3	750
	0114	LDB	A2	Present	10	570686	6212474	31.8	10	571342	6213121	32.8	950
	0116	RDB	A3	Absent	10	570511	6212043	31.3	10	571265	6212633	32.3	985
	0119	LDB	A1	Present	10	567516	6209096	27.0	10	568019	6209628	27.8	750
3	0301	RDB	A2	Present	10	600824	6232860	71.3	10	602606	6233198	73.1	1800
	0302	IRDB	A2	Present	10	599753	6233307	70.2	10	601597	6233232	72.0	1900
	0303	IRDB	A2	Present	10	601597	6233232	72.0	10	602930	6233597	73.6	1450
	0304	ILDB	A2	Absent	10	602583	6233193	73.1	10	603787	6233290	74.5	1350
	0305	LDB	A2	Absent	10	603204	6233827	73.8	10	604640	6233426	75.4	1550
	0306	LDB	A3	Absent	10	604655	6233435	75.4	10	605586	6233750	76.5	1000
	0307	IRDB	A3	Absent	10	605976	6233888	77.0	10	606935	6234160	78.0	950
	0308	IRDB	A3	Absent	10	606935	6234158	78.0	10	607692	6235034	79.4	1350
	0309	ILDB	A3	Absent	10	605976	6233878	77.0	10	606666	6234387	77.8	950
	0310	ILDB	A3	Present	10	606662	6234395	77.8	10	607691	6235034	79.4	1200
	0311	LDB	A3	Present	10	605585	6233743	76.5	10	606512	6234441	77.7	1250
	0312	LDB	A2	Absent	10	607058	6234840	78.6	10	608047	6235753	80.2	1170
	0314	RDB	A2	Present	10	604468	6233079	75.1	10	605400	6233321	76.1	975
	0315	RDB	A3	Present	10	605400	6233320	76.1	10	606956	6233951	77.9	1700
	0316	RDB	A2	Present	10	606956	6233951	77.9	10	607974	6234928	79.3	1475
5	0502	RDB	A2	Present	10	630016	6229305	106.2	10	630954	6229298	107.1	950
	0505	LDB	A1	Present	10	630553	6229765	106.7	10	631540	6229590	107.7	1000
	0506	LDB	A2	Present	10	631539	6229590	107.7	10	632491	6229713	108.6	1000
	0507	RDB	A2	Present	10	632339	6229356	108.4	10	633099	6229489	109.1	780
	0508	LDB	A2	Present	10	637926	6227901	115.5	10	638432	6227150	116.4	925
	0509	IRDB	A3	Absent	10	632785	6229686	108.9	10	633704	6229905	109.8	975
	0510	RDB	A1	Present	10	634530	6229634	110.5	10	635555	6230048	111.6	1130
	0511	LDB	A2	Present	10	635651	6230419	111.8	10	636334	6230361	112.4	720
	0512	IRDB	A3	Absent	10	633855	6229835	110.0	10	634872	6230026	111.0	1280
	0513	RDB	A3	Absent	10	637113	6228814	114.2	10	637433	6228125	115.0	770
	0514	ILDB	A3	Absent	10	637427	6228123	115.0	10	637735	6227647	115.5	560
	0515	IRDB	A3	Absent	10	637376	6229072	114.1	10	637591	6228192	115.0	970
	0516	ILDB	n/a	n/a	10	633861	6229939	58.2	10	634404	6230473	57.7	800
	0517	ILDB	n/a	n/a	10	634513	6230626	57.7	10	635000	6230250	56.8	700
	05SC060	RDB	n/a	n/a	10	633456	6229118	58.7	10	633909	6229258	58.3	530

[a] RDB=Right bank as viewed facing downstream; LDB=Left bank as viewed facing downstream; IRDB=Right bank of island as viewed facing downstream; ILDB=Left bank of island as viewed facing downstream.

[b] Bank Habitat Type as assigned by R.L.&L. (2001). See Appendix C, Table C2 for a description of each bank habitat type.

[c] Absent=Nearshore habitat without physical cover; Present=Nearshore habitat with physical cover. Assigned by P&E and Gazey (2003).

[d] NAD 83.

[e] River kilometres measured downstream from WAC Bennett Dam (RiverKm 0.0).

Continued . . .

Table A1. Concluded.

Section	Site Name	Bank[a]	Bank Habitat Type[b]	Physical Habitat[c]	Upper Site Limit				Lower Site Limit				Site Length (m)
					Zone[d]	Easting	Northing	River Km[e]	Zone[d]	Easting	Northing	River Km[e]	
6	0601	LDB	n/a	n/a	10	643238	6224330	122.0	10	644400	6224099	123.0	1200
	0602	RDB	n/a	n/a	10	644567	6223590	123.3	10	645385	6223368	124.1	900
	0603	IRDB	n/a	n/a	10	646156	6223144	124.8	10	647208	6222813	125.9	1300
	0604	RDB	n/a	n/a	10	646546	6222599	125.4	10	647508	6222650	126.2	1000
	0605	IRDB	n/a	n/a	10	647888	6222979	126.5	10	648668	6223109	127.3	800
	0606	LDB	n/a	n/a	10	649302	6223371	127.1	10	650601	6222912	129.3	1400
	0607	IRDB	n/a	n/a	10	651250	6222649	130.0	10	652139	6222123	131.0	1000
	0608	RDB	n/a	n/a	10	647711	6222699	126.4	10	648681	6222855	127.3	1000
	0609	ILDB	n/a	n/a	10	649423	6223115	128.0	10	650300	6222732	129.0	1000
	0610	ILDB	n/a	n/a	10	650309	6222738	129.0	10	651089	6222427	129.9	850
	0611	ILDB	n/a	n/a	10	651070	6222442	129.9	10	651842	6221990	130.9	900
	0612	IRDB	n/a	n/a	10	652136	6222141	131.0	10	652937	6221822	132.0	850
	0613	RDB	n/a	n/a	10	653270	6221438	132.4	10	654182	6221491	133.2	900
	0614	IRDB	n/a	n/a	10	645301	6223722	123.5	10	646108	6223365	124.7	975
	06PIN01	RDB	n/a	n/a	10	641497	6223588	1.9[f]	10	642638	6224067	0.3[f]	1500
	06PIN02	RDB	n/a	n/a	10	642639	6224071	0.3[f]	10	643433	6224055	122.2	1000
	06SC036	IRDB	n/a	n/a	10	654048	6222162	133.3	10	654522	6222203	133.8	500
	06SC047	RDB	n/a	n/a	10	644017	6223518	122.8	10	644510	6223546	123.2	550
7	0701	LDB	n/a	n/a	10	662099	6220280	141.8	10	662869	6220173	142.5	785
	0702	IRDB	n/a	n/a	10	664322	6219824	144.0	10	665185	6220188	144.8	950
	0703	LDB	n/a	n/a	10	665724	6220631	145.5	10	666643	6220828	146.4	950
	0704	IRDB	n/a	n/a	10	667149	6220752	146.8	10	668100	6220738	147.7	1000
	0705	RDB	n/a	n/a	10	667571	6220294	147.2	10	668547	6220497	148.1	1000
	0706	RDB	n/a	n/a	10	668544	6220498	148.1	10	669537	6220614	149.0	1000
	0707	IRDB	n/a	n/a	10	669735	6220916	149.3	10	670551	6221286	150.1	980
	0708	LDB	n/a	n/a	10	663908	6220160	143.6	10	665071	6220480	144.8	1240
	0709	IRDB	n/a	n/a	10	665176	6220191	144.8	10	666096	6220512	145.7	1000
	0710	IRDB	n/a	n/a	10	668109	6220743	147.7	10	669272	6220889	148.8	1400
	0711	ILDB	n/a	n/a	10	669781	6220712	149.3	10	671111	6221081	150.6	1390
	0712	ILDB	n/a	n/a	10	671288	6221104	150.8	10	672241	6220774	151.9	1065
	0713	IRDB	n/a	n/a	10	672355	6221006	151.7	10	672991	6220293	152.7	980
	0714	IRDB	n/a	n/a	10	673481	6220112	153.2	10	674730	6219912	154.4	1275
	07BEA01	LDB	n/a	n/a	10	662969	6220383	0.4[g]	10	663146	6220001	0.0[g]	430
	07BEA02	LDB	n/a	n/a	10	663146	6220001	143.9	10	663728	6220100	143.5	600
	07SC012	LDB	n/a	n/a	10	676579	6220730	156.4	10	676792	6220831	156.6	220
	07SC022	RDB	n/a	n/a	10	666832	6219962	146.3	10	667130	6220145	146.7	360
9	0901	LDB	n/a	n/a	11	357843	6239030	217.6	11	358391	6239968	218.7	1100
	0902	LDB	n/a	n/a	11	358391	6239968	218.6	11	359350	6240287	219.5	1000
	0903	ILDB	n/a	n/a	11	358363	6239289	218.1	11	359084	6240016	219.2	1100
	0904	ILDB	n/a	n/a	11	359520	6240016	219.4	11	360625	6240169	220.7	1100
	0905	LDB	n/a	n/a	11	361692	6240512	221.7	11	362771	6240709	222.9	1100
	0906	RDB	n/a	n/a	11	363235	6241089	223.5	11	363870	6241929	224.6	1000
	0907	ILDB	n/a	n/a	11	364583	6242344	225.2	11	365319	6243257	226.3	1200
	0908	ILDB	n/a	n/a	11	365837	6243458	226.6	11	366849	6243231	228.0	1100
	0909	ILDB	n/a	n/a	11	366849	6243231	228.0	11	367534	6242583	228.9	950
	0910	LDB	n/a	n/a	11	363258	6240685	223.3	11	364070	6241393	224.3	1100
	0911	IRDB	n/a	n/a	11	366799	6243728	227.6	11	367379	6243081	228.4	1000
	0912	LDB	n/a	n/a	11	368560	6241724	230.0	11	368549	6240689	231.0	1100
	0913	RDB	n/a	n/a	11	367347	6241966	229.5	11	367721	6241096	230.5	1000
	0914	IRDB	n/a	n/a	11	367734	6241649	230.0	11	368179	6240875	230.8	950
	09SC53	RDB	n/a	n/a	11	360795	6239970	220.8	11	361029	6240059	221.1	260
	09SC61	RDB	n/a	n/a	11	366861	6242408	228.6	11	367347	6241966	229.4	675

[a] RDB=Right bank as viewed facing downstream; LDB=Left bank as viewed facing downstream; IRDB=Right bank of island as viewed facing downstream; ILDB=Left bank of island as viewed facing downstream.

[b] Bank Habitat Type as assigned by R.L.&L. (2001). See Appendix C, Table C2 for a description of each bank habitat type.

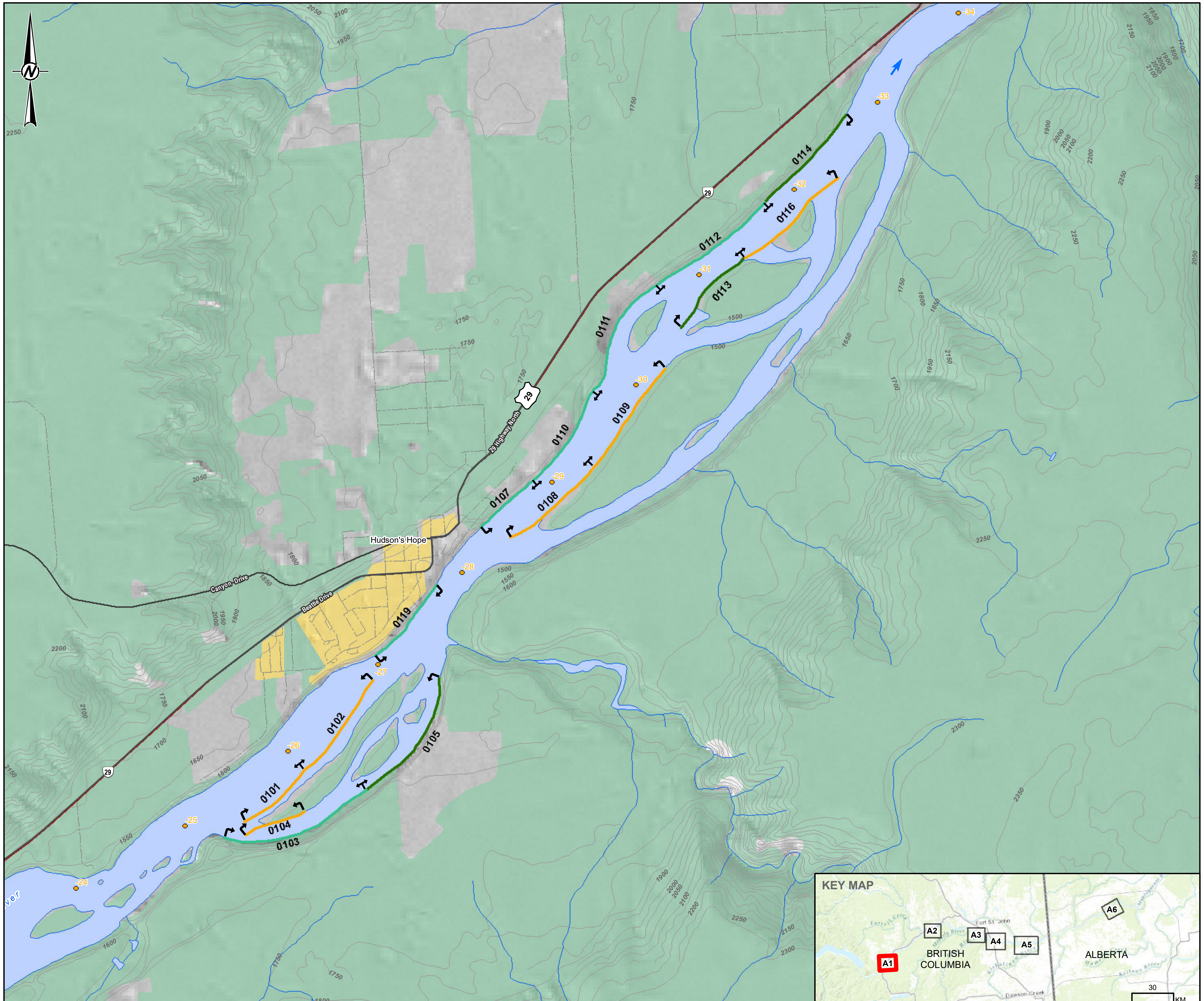
[c] Absent=Nearshore habitat without physical cover; Present=Nearshore habitat with physical cover. Assigned by P&E and Gazey (2003).

[d] NAD 83.

[e] River kilometres measured downstream from WAC Bennett Dam (RiverKm 0.0).

[f] River kilometres measured upstream from the Pine River's confluence with the Peace River (RiverKm 0.0).

[g] River kilometres measured upstream from the Beatton River's confluence with the Peace River (RiverKm 0.0).



LEGEND

- RIVER KILOMETRE AS MEASURED DOWNSTREAM FROM W.A.C. BENNETT DAM
- FLOW DIRECTION
- 0110 BOAT ELECTROSHOCKING SITE

SITE HABITAT CLASSIFICATION

- UNASSIGNED HABITAT CLASSIFICATION
- A1 WITH PHYSICAL COVER
- A2 WITH PHYSICAL COVER
- A3 WITHOUT PHYSICAL COVER

TRANSPORTATION

- ARTERIAL ROAD
- LOCAL ROAD
- HIGHWAY

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

- CONTOUR (ft)
- URBAN AREA
- FOREST AREA
- PROVINCIAL PARK AND PROTECTED AREA

DRAFT

0 590 1,180

1:30,000 METRES

REFERENCES

1. TRANSPORTATION, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. RAILROAD OBTAINED FROM IHS ENERGY.
3. RIVER KILOMETER MARKERS OBTAINED FROM BC HYDRO.
4. DAM SECTION AND ISLANDS OBTAINED FROM FROM GEOBASE®.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS

CLIENT
BC HYDRO

PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

TITLE
SECTION 1 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT

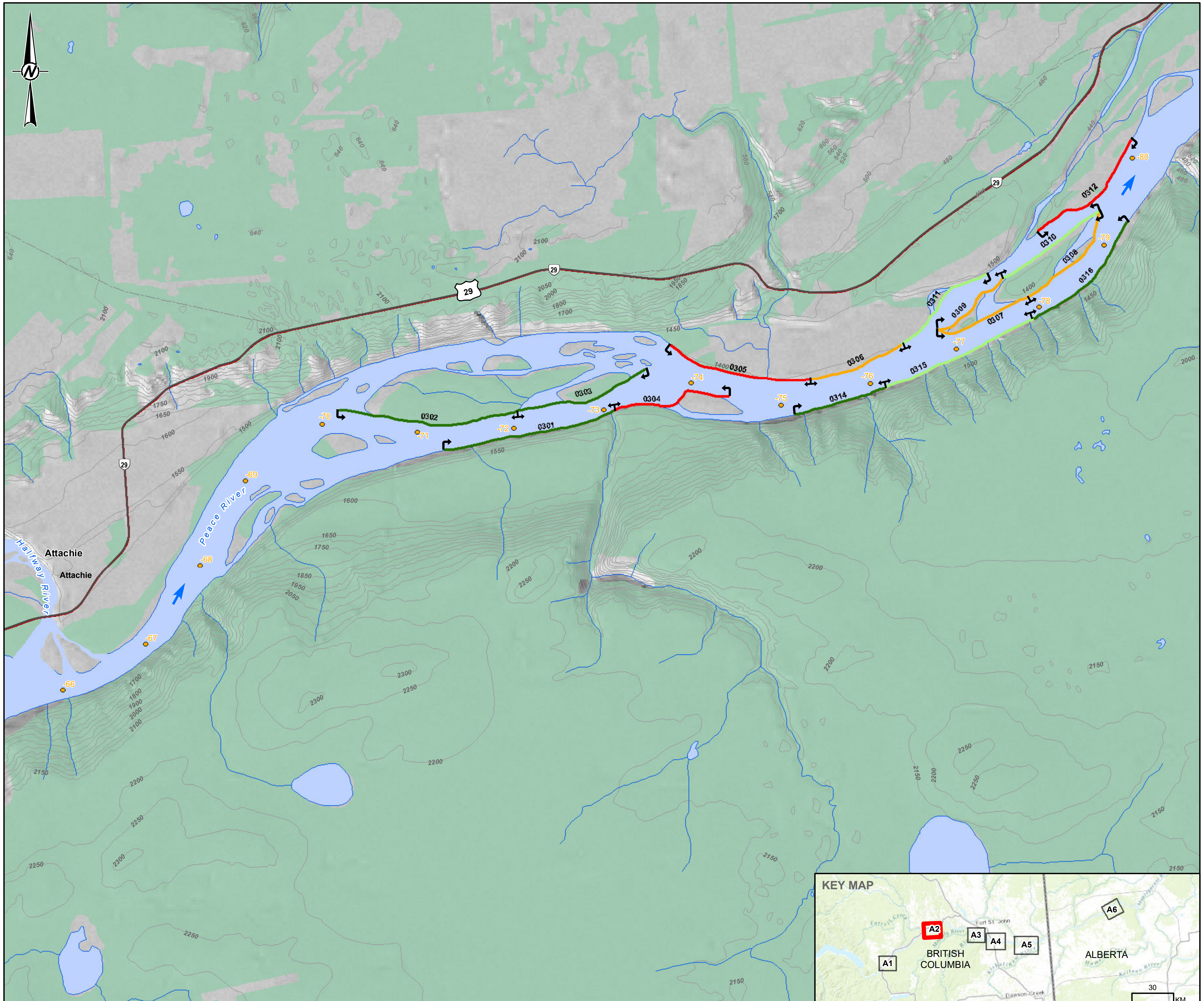
GOLDER

YYYY-MM-DD	2018-09-25
DESIGNED	DF
PREPARED	CD
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
1670320	3000	A	A1

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\BC_Hydro\Peace_River_GMS\99_PROJECTS\1670320_PeaceRiver_GMS\02_PRODUCTION\2017\MXD\Report\1670320_FIG_A1_to_A6_PEACE_RIVER_SECTIONS.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm



LEGEND

- RIVER KILOMETRE AS MEASURED DOWNSTREAM FROM W.A.C. BENNETT DAM
- FLOW DIRECTION
- 0110 BOAT ELECTROSHOCKING SITE

SITE HABITAT CLASSIFICATION

- UNASSIGNED HABITAT CLASSIFICATION
- A2 WITH PHYSICAL COVER
- A2 WITHOUT PHYSICAL COVER
- A3 WITH PHYSICAL COVER
- A3 WITHOUT PHYSICAL COVER
- LOCAL ROAD
- HIGHWAY

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

- CONTOUR (ft)
- URBAN AREA
- FOREST AREA
- PROVINCIAL PARK AND PROTECTED AREA

DRAFT

0 800 1,600

1:40,000 METRES

REFERENCES

1. TRANSPORTATION, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. RAILROAD OBTAINED FROM IHS ENERGY.
3. RIVER KILOMETER MARKERS OBTAINED FROM BC HYDRO.
4. DAM SECTION AND ISLANDS OBTAINED FROM FROM GEOBASE®.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS

CLIENT
BC HYDRO

PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

TITLE
SECTION 3 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

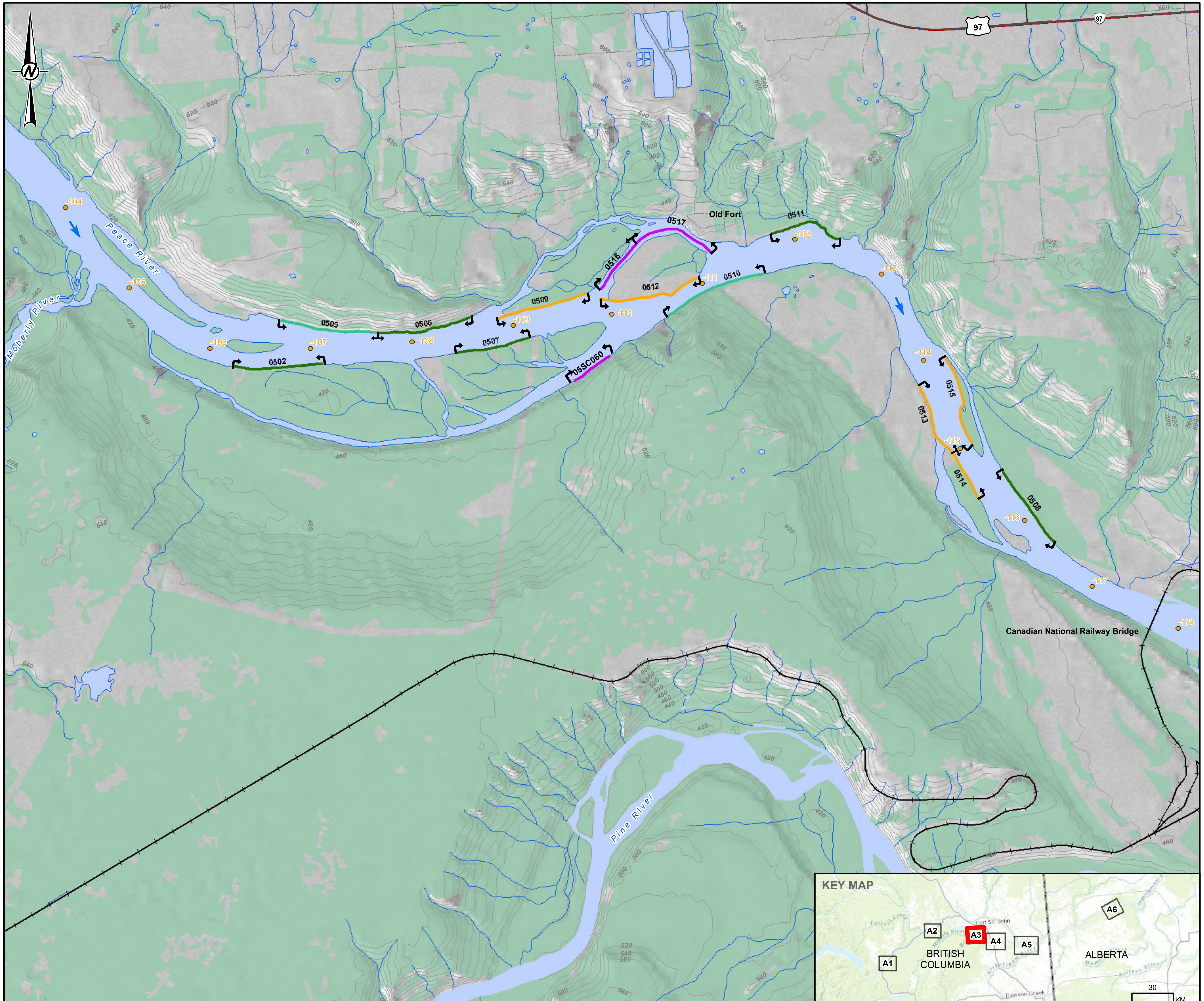
CONSULTANT
GOLDER

YYYY-MM-DD	2018-09-25
DESIGNED	DF
PREPARED	CD
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
1670320	3000	A	A2

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

25mm



LEGEND

- RIVER KILOMETRE AS MEASURED DOWNSTREAM FROM W.A.C. BENNETT DAM
- FLOW DIRECTION
- 0110 BOAT ELECTROSHOCKING SITE

SITE HABITAT CLASSIFICATION

- UNASSIGNED HABITAT CLASSIFICATION
- A1 WITH PHYSICAL COVER
- A2 WITH PHYSICAL COVER
- A3 WITHOUT PHYSICAL COVER

TRANSPORTATION

- ARTERIAL ROAD
- LOCAL ROAD
- HIGHWAY
- RAILROAD

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

- CONTOUR (ft)
- URBAN AREA
- FOREST AREA
- PROVINCIAL PARK AND PROTECTED AREA

DRAFT

0 800 1,600

1:40,000 METRES

REFERENCES
1. TRANSPORTATION, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. RAILROAD OBTAINED FROM IHS ENERGY.
3. RIVER KILOMETER MARKERS OBTAINED FROM BC HYDRO.
4. DAM SECTION AND ISLANDS OBTAINED FROM FROM GEOBASE®.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS

CLIENT
BC HYDRO

PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

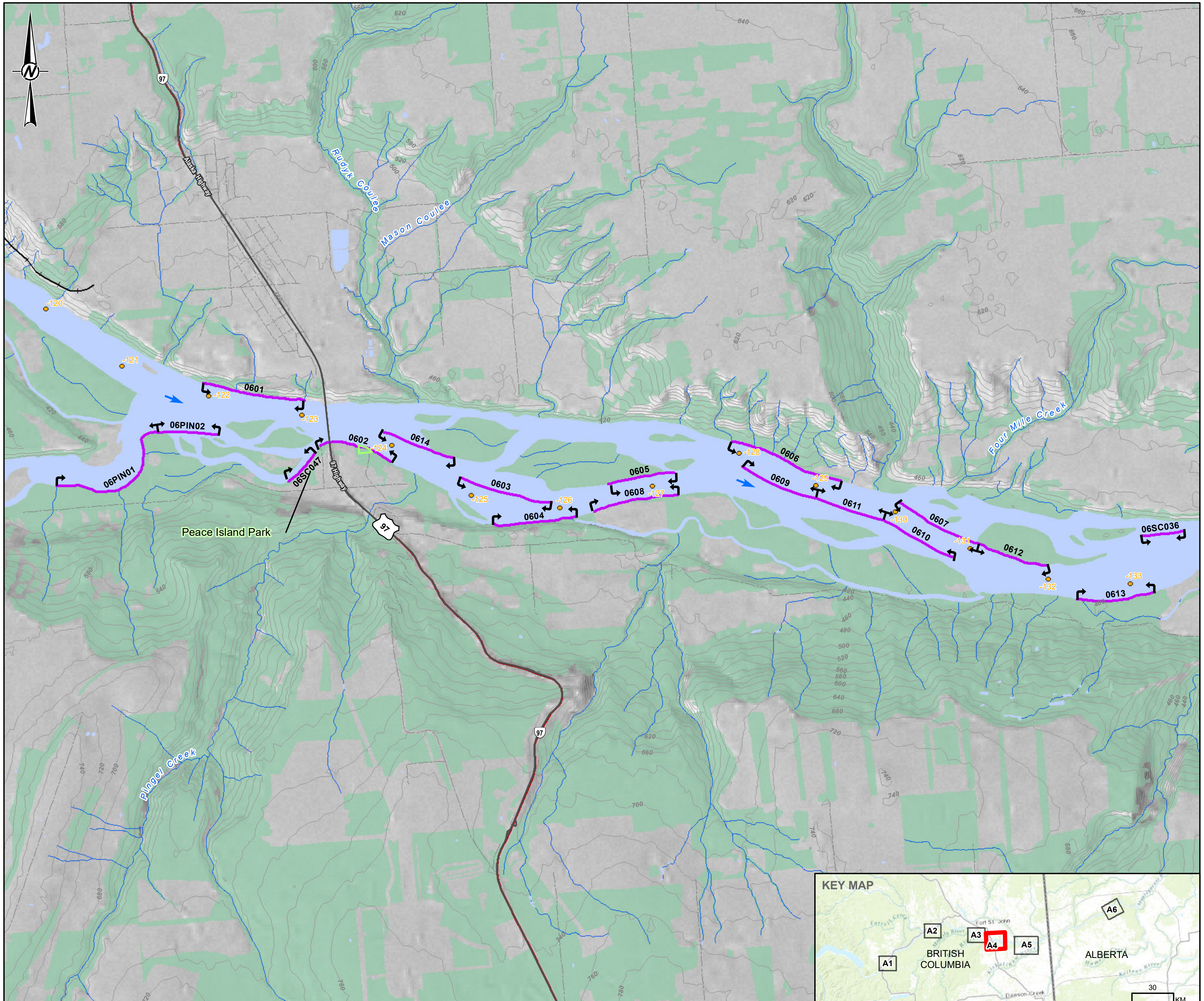
TITLE
SECTION 5 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT

GOLDER

YYYY-MM-DD	2018-09-25
DESIGNED	DF
PREPARED	CD
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
1670320	3000	A	A3



LEGEND

- RIVER KILOMETRE AS MEASURED DOWNSTREAM FROM W.A.C. BENNETT DAM
- FLOW DIRECTION
- 0110 BOAT ELECTROSHOCKING SITE

SITE HABITAT CLASSIFICATION

- UNASSIGNED HABITAT CLASSIFICATION

TRANSPORTATION

- ARTERIAL ROAD
- LOCAL ROAD
- HIGHWAY
- RAILROAD

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

- CONTOUR (ft)
- URBAN AREA
- FOREST AREA
- PROVINCIAL PARK AND PROTECTED AREA

DRAFT

0 890 1,780

1:45,000 METRES

REFERENCES
1. TRANSPORTATION, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. RAILROAD OBTAINED FROM IHS ENERGY.
3. RIVER KILOMETER MARKERS OBTAINED FROM BC HYDRO.
4. DAM SECTION AND ISLANDS OBTAINED FROM FROM GEOBASE®.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS

CLIENT
BC HYDRO

PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

TITLE
SECTION 6 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT

GOLDER

YYYY-MM-DD	2018-09-25
DESIGNED	DF
PREPARED	CD
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
1670320	3000	A	A4

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

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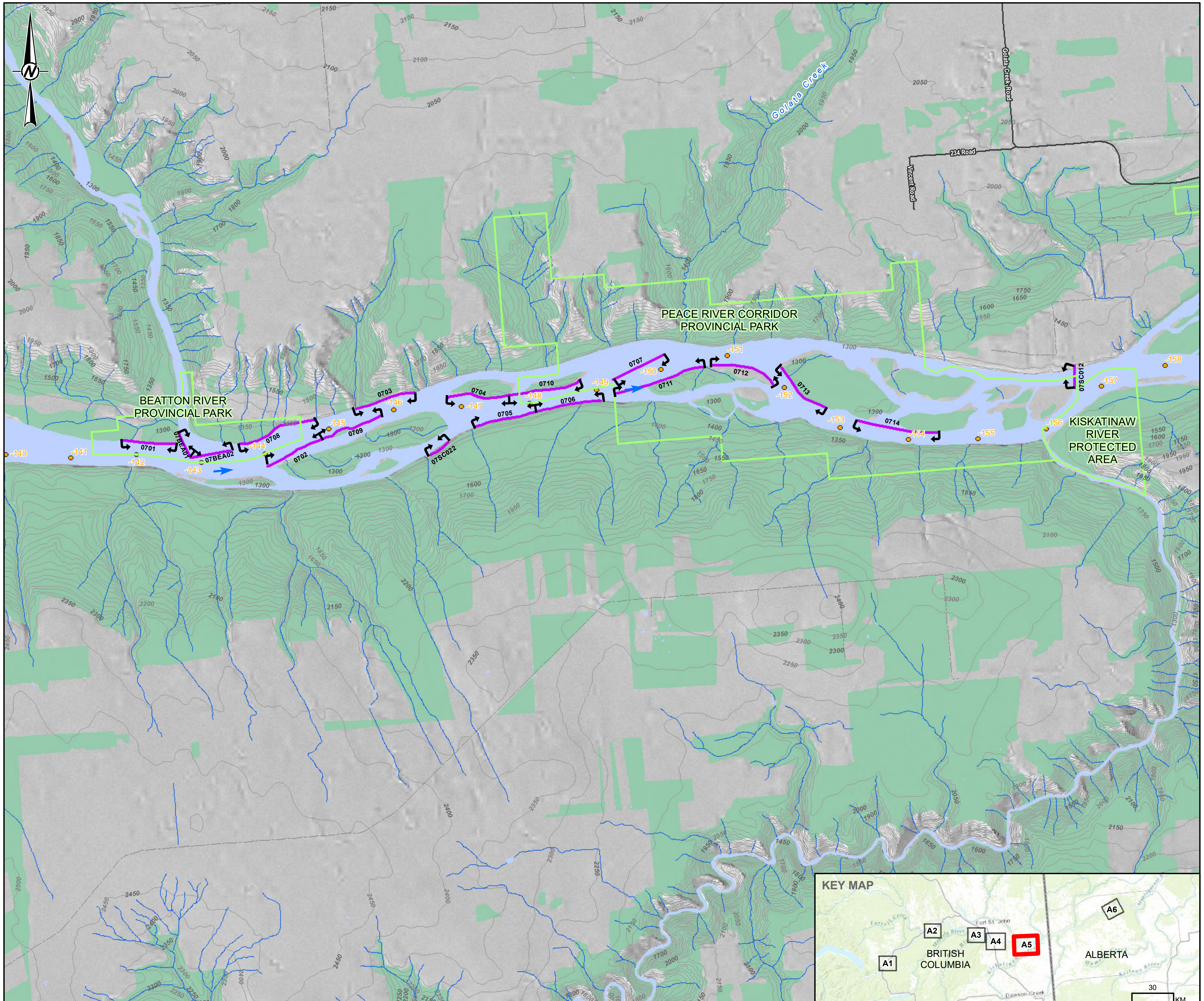


LEGEND

- RIVER KILOMETRE AS MEASURED DOWNSTREAM FROM W.A.C. BENNETT DAM
- FLOW DIRECTION
- 0110 BOAT ELECTROSHOCKING SITE

SITE HABITAT CLASSIFICATION

- UNASSIGNED HABITAT CLASSIFICATION

TRANSPORTATION

- ARTERIAL ROAD
- LOCAL ROAD

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

- CONTOUR (ft)
- URBAN AREA
- FOREST AREA
- PROVINCIAL PARK AND PROTECTED AREA

DRAFT

0 1,100 2,200

1:60,000 METRES

REFERENCES

1. TRANSPORTATION, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. RAILROAD OBTAINED FROM IHS ENERGY.
3. RIVER KILOMETER MARKERS OBTAINED FROM BC HYDRO.
4. DAM SECTION AND ISLANDS OBTAINED FROM FROM GEOBASE®.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS

CLIENT
BC HYDRO

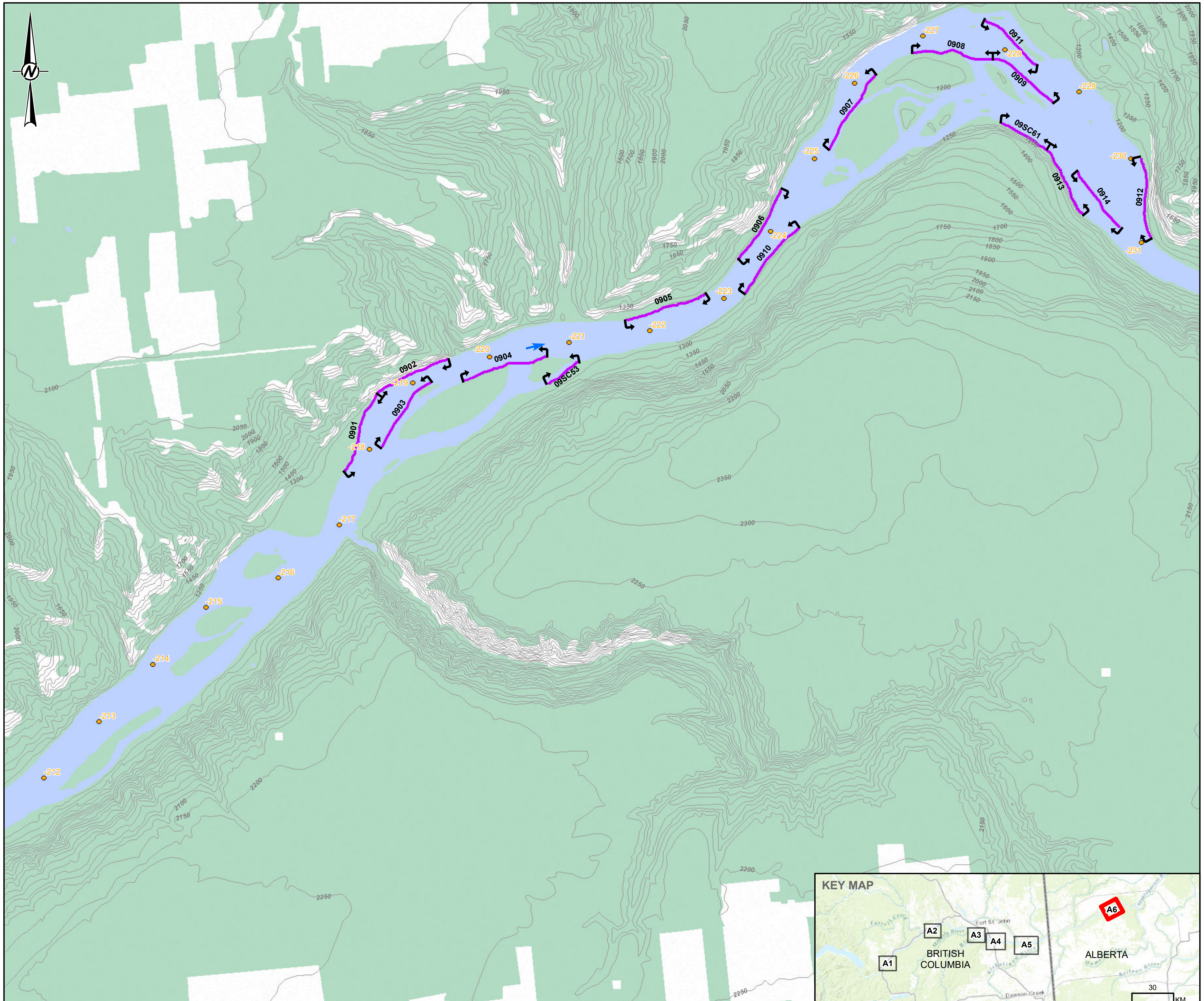
PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

TITLE
SECTION 7 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-09-25
DESIGNED	DF
PREPARED	CD
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
1670320	3000	A	A5



LEGEND

- RIVER KILOMETRE AS MEASURED DOWNSTREAM FROM W.A.C. BENNETT DAM
- FLOW DIRECTION
- 0110 BOAT ELECTROSHOCKING SITE

SITE HABITAT CLASSIFICATION

- UNASSIGNED HABITAT CLASSIFICATION

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

- CONTOUR (ft)
- URBAN AREA
- FOREST AREA
- PROVINCIAL PARK AND PROTECTED AREA

DRAFT

0 990 1,980

1:50,000 METRES

REFERENCES

1. TRANSPORTATION, HYDROLOGY AND TOPOGRPHY LAYERS CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. RAILROAD OBTAINED FROM IHS ENERGY.
3. RIVER KILOMETER MARKERS OBTAINED FROM BC HYDRO.
4. DAM SECTION AND ISLANDS OBTAINED FROM FROM GEOBASE®.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 BC ENVIRONMENT ALBERS

CLIENT
BC HYDRO

PROJECT
PEACE RIVER FISH COMMUNITY MONITORING PROGRAM (MON-2)

TITLE
SECTION 9 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT
GOLDER

YYYY-MM-DD	2018-09-25
DESIGNED	DF
PREPARED	CD
REVIEWED	
APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
1670320	3000	A	A6

APPENDIX B

Historical Datasets

Table B1 **Summary of historical datasets by sample section as delineated in Mainstream (2012). The summary is limited to studies that used similar capture techniques (i.e., boat electroshocking) during similar times of the year (i.e., August to October) when compared to the current program.**

Year	Study Period	Effort (# of Days)	Section									
			1a	1	2	3	4	5	6	7	8	9
2002	21-Aug to 1-Oct	43		P&E and Gazey 2003	P&E and Gazey 2003	P&E and Gazey 2003	P&E and Gazey 2003					
2003	22-Aug to 2-Oct	48		Mainstream and Gazey 2004	Mainstream and Gazey 2004	Mainstream and Gazey 2004	Mainstream and Gazey 2004					
2004	24-Aug to 6-Oct	36		Mainstream and Gazey 2005		Mainstream and Gazey 2005		Mainstream and Gazey 2005				
2005	17-Aug to 26-Sep	33		Mainstream and Gazey 2006		Mainstream and Gazey 2006		Mainstream and Gazey 2006				
2006	16-Aug to 21-Sep	36		Mainstream and Gazey 2007	Mainstream and Gazey 2007	Mainstream and Gazey 2007						
2007	22-Aug to 24-Sep	30		Mainstream and Gazey 2008		Mainstream and Gazey 2008		Mainstream and Gazey 2008				
2008	20-Aug to 20-Sep	32		Mainstream and Gazey 2009		Mainstream and Gazey 2009		Mainstream and Gazey 2009				
2009	18-Aug to 27-Sep	37	Mainstream 2010a	Mainstream and Gazey 2010; Mainstream 2010a	Mainstream 2010a	Mainstream and Gazey 2010; Mainstream 2010a		Mainstream and Gazey 2010; Mainstream 2010a	Mainstream 2010a	Mainstream 2010a		
2010	24-Aug to 19-Oct	40	Mainstream 2011a	Mainstream and Gazey 2011; Mainstream 2011a	Mainstream 2011a	Mainstream and Gazey 2011; Mainstream 2011a		Mainstream and Gazey 2011; Mainstream 2011a	Mainstream 2011a	Mainstream 2011a	Mainstream 2011a	
2011	24-Aug to 19-Oct	37	Mainstream 2013a	Mainstream and Gazey 2012; Mainstream 2013a	Mainstream 2013a	Mainstream and Gazey 2012; Mainstream 2013a		Mainstream and Gazey 2012; Mainstream 2013a	Mainstream 2013a	Mainstream 2013a	Mainstream 2013a	Mainstream 2013a
2012	23-Aug to 21-Sep	30		Mainstream and Gazey 2013		Mainstream and Gazey 2013		Mainstream and Gazey 2013				
2013	24-Aug to 26-Sep	30		Mainstream and Gazey 2014		Mainstream and Gazey 2014		Mainstream and Gazey 2014				
2014	25-Aug to 4-Oct	35		Golder and Gazey 2015		Golder and Gazey 2015		Golder and Gazey 2015				
2015	25-Aug to 7-Oct	39		Golder and Gazey 2016		Golder and Gazey 2016		Golder and Gazey 2016	Golder and Gazey 2016	Golder and Gazey 2016		Golder and Gazey 2016
2016	23-Aug to 1-Oct	39		Golder and Gazey 2017		Golder and Gazey 2017		Golder and Gazey 2017	Golder and Gazey 2017	Golder and Gazey 2017		Golder and Gazey 2017
2017	21-Aug to 4-Oct	39		Current Study Year		Current Study Year		Current Study Year	Current Study Year	Current Study Year		Current Study Year

APPENDIX C

Discharge and Temperature

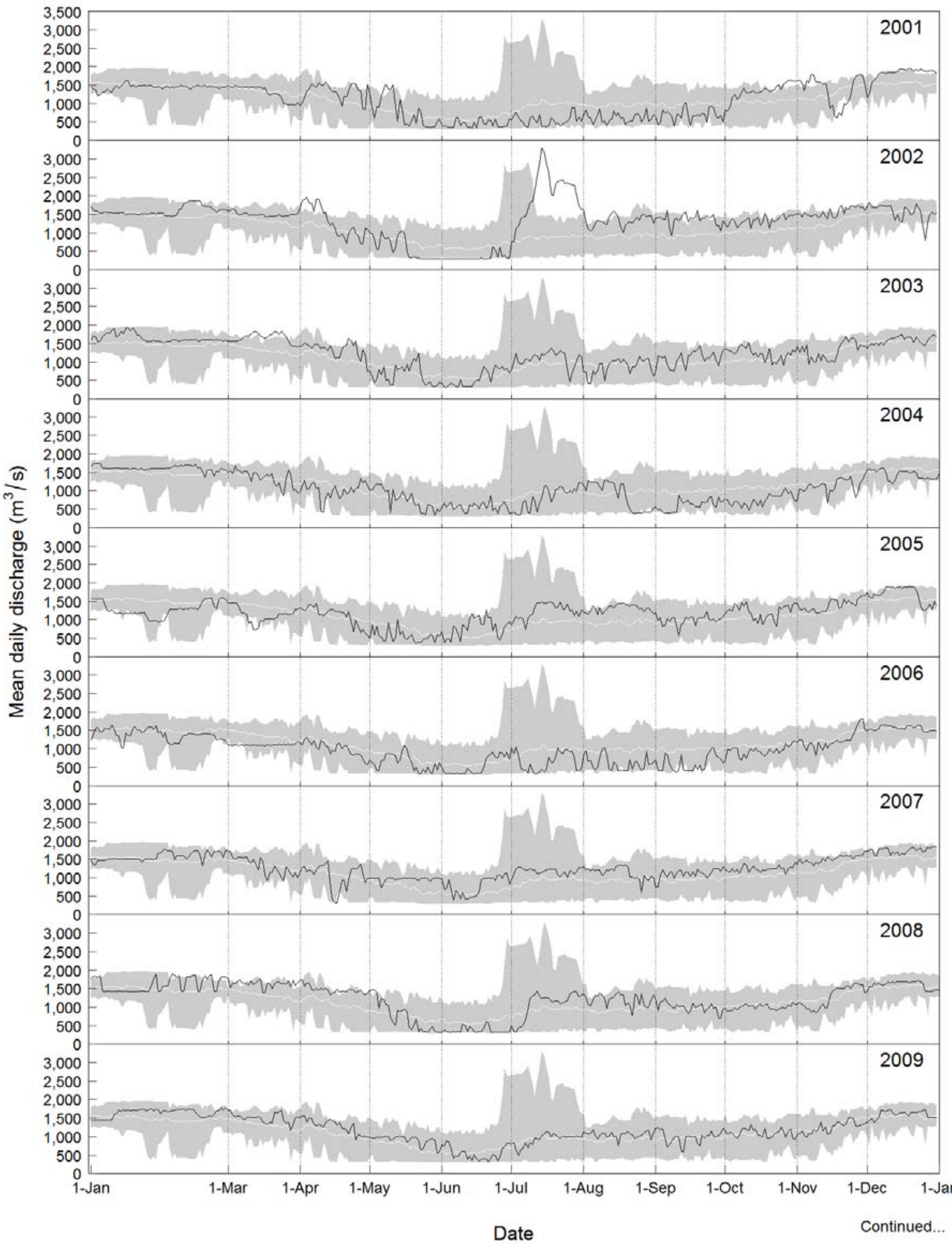


Figure C1: ***Mean daily discharge (m³/s) for the Peace River at Peace Canyon Dam (PCD; black line), 2001 to 2017. The shaded area represents minimum and maximum mean daily discharge recorded at PCD during other study years between 2001 and 2016. The white line represents average mean daily discharge over the same time period.***

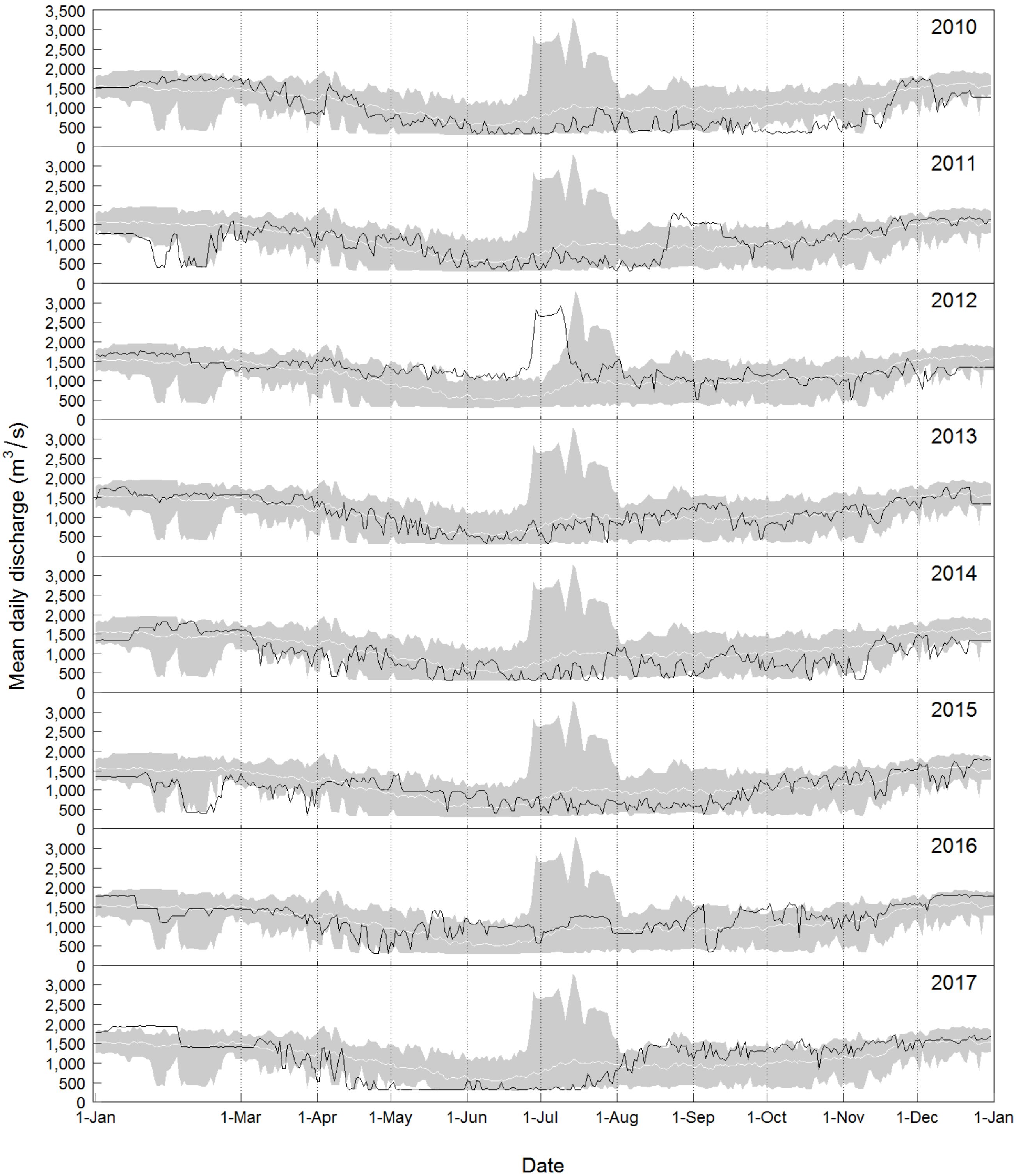


Figure C1: ***Concluded.***

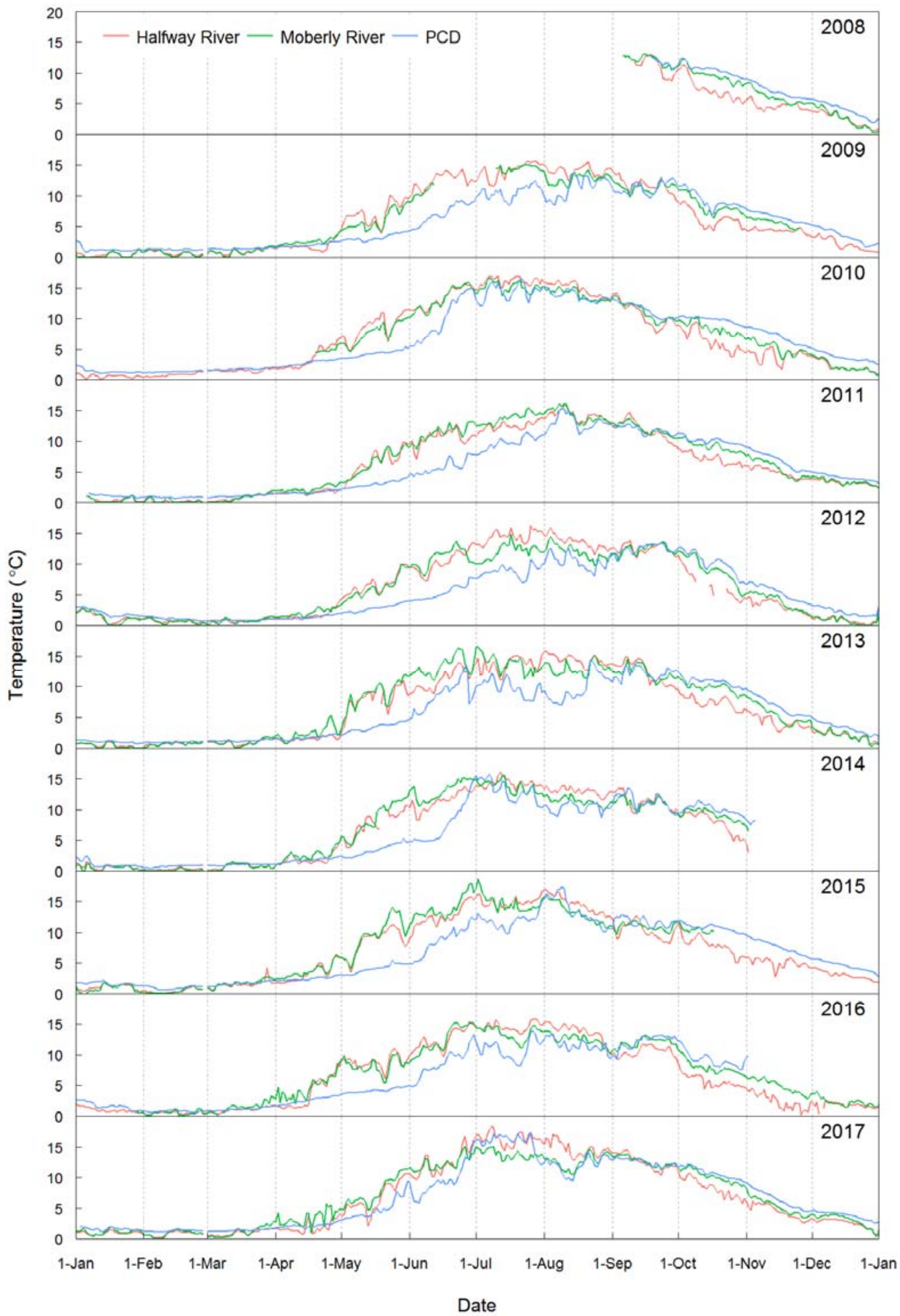


Figure C2: Mean daily water temperatures (°C) for the Peace River downstream of Peace Canyon Dam (PCD; blue line), downstream of the Halfway River confluence (red line) and downstream of the Moberly River confluence (green line), 2008 to 2017. Data were collected under from the Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9).

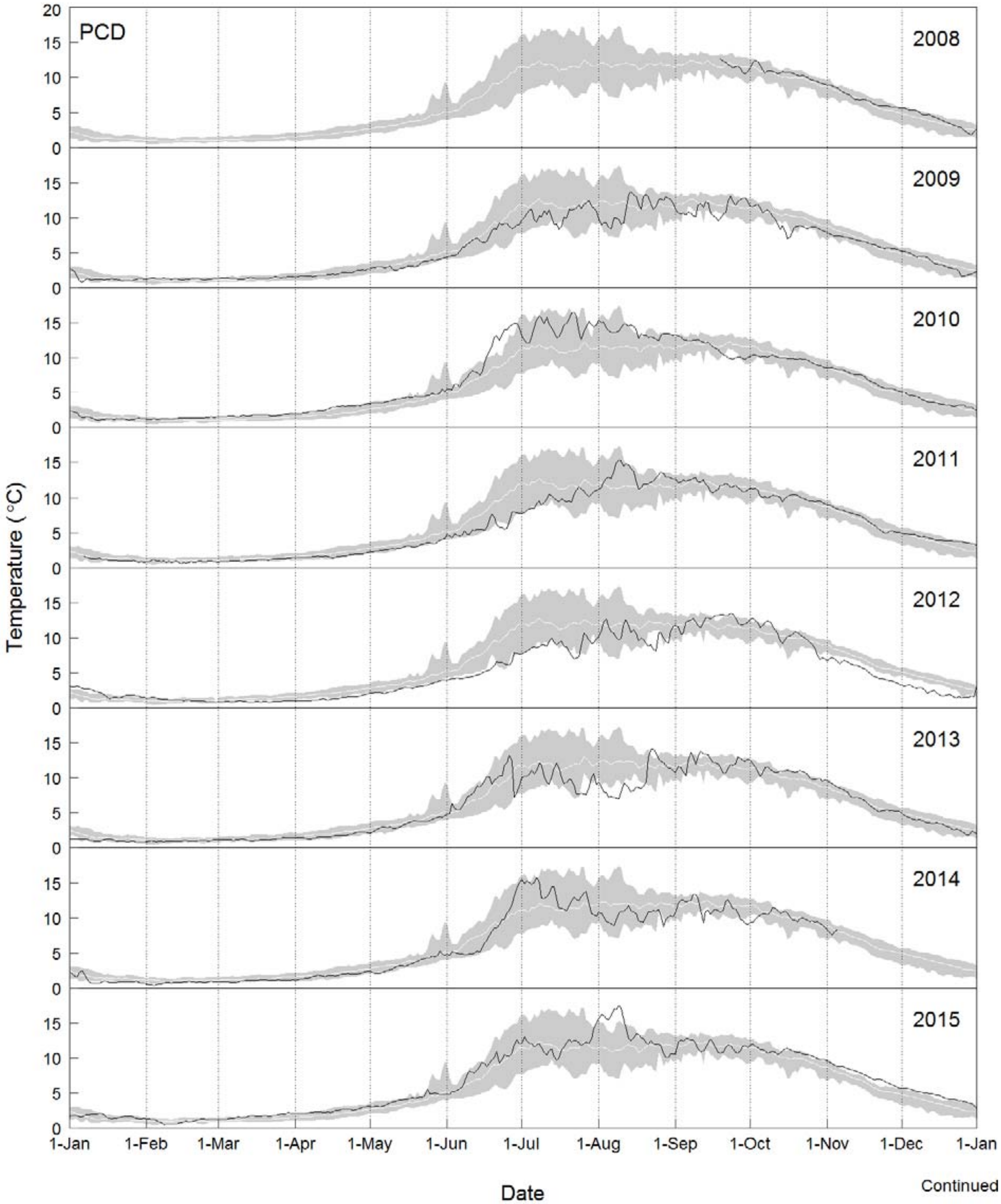


Figure C3: ***Mean daily water temperature (°C) for the Peace River at Peace Canyon Dam (PCD; black line), 2008 to 2017. The shaded area represents minimum and maximum water temperatures recorded at PCD during other study years between 2008 and 2016. The white line represents average mean daily water temperatures over the same time period. Data were collected under from the Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9).***

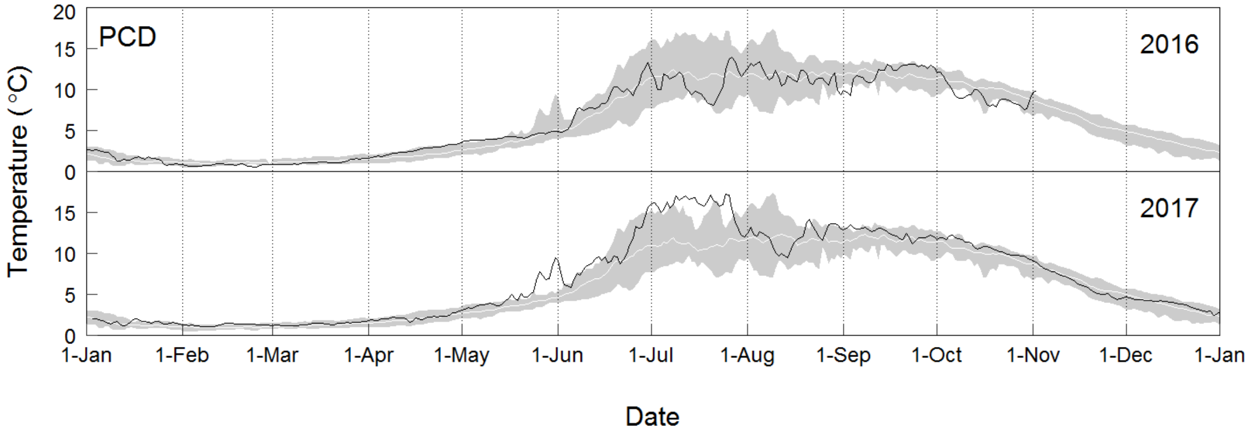
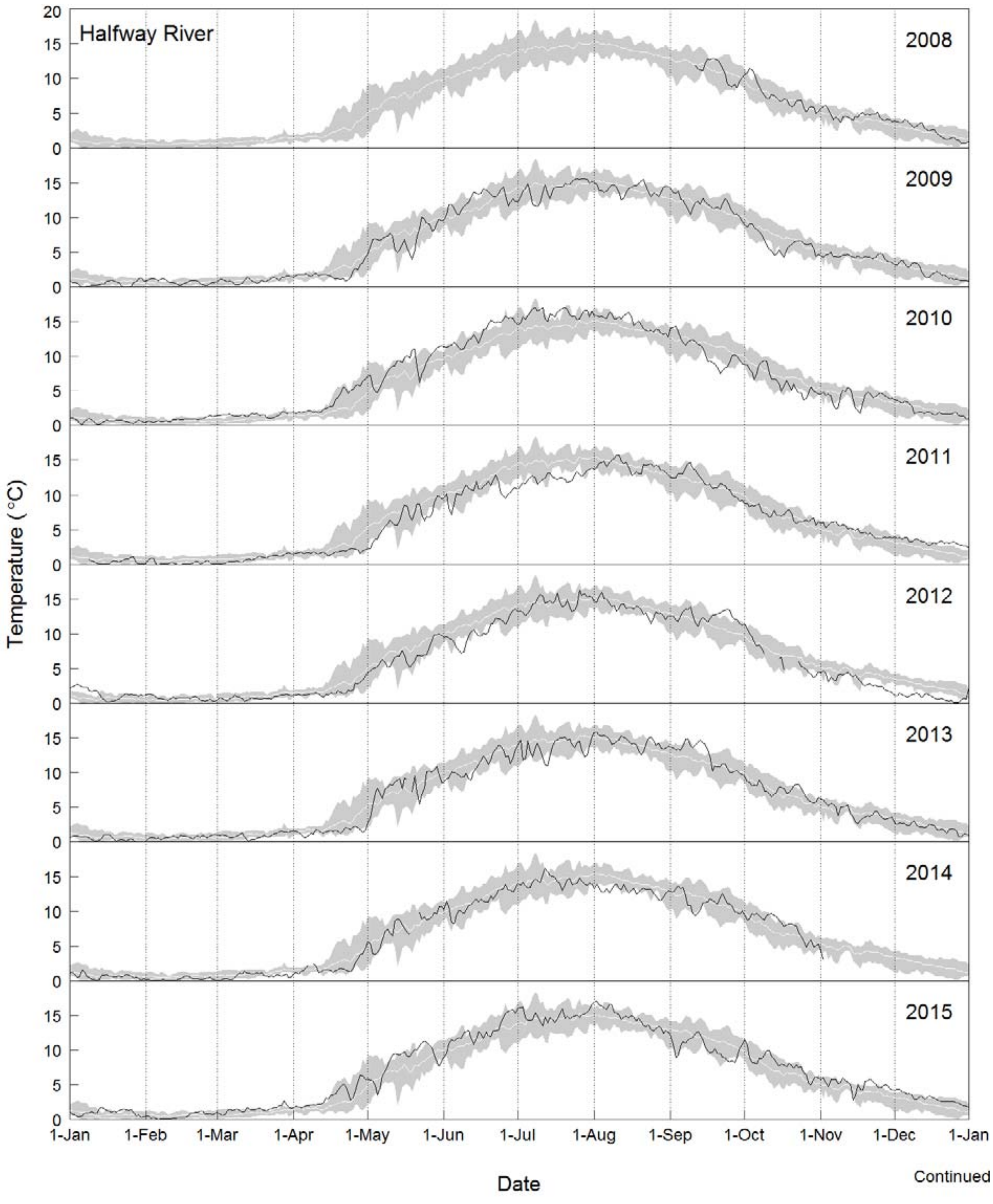


Figure C3: Concluded.



Continued

Figure C4: ***Mean daily water temperature (°C) for the Peace River downstream of the Halfway River confluence (black line), 2008 to 2017. The shaded area represents minimum and maximum water temperatures recorded at the site during other study years between 2008 and 2016. The white line represents average mean daily water temperatures over the same time period. Data were collected under from the Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9).***

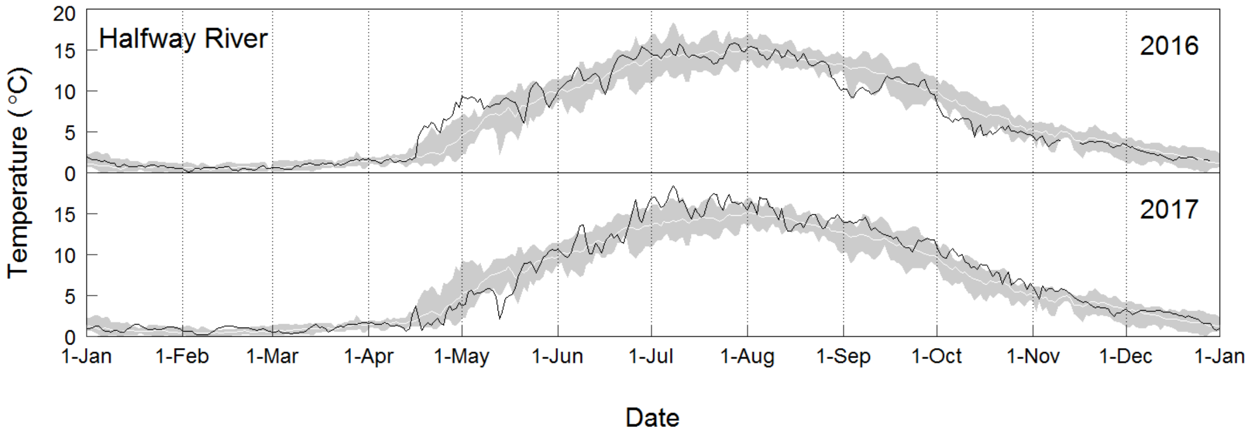


Figure C4: Concluded

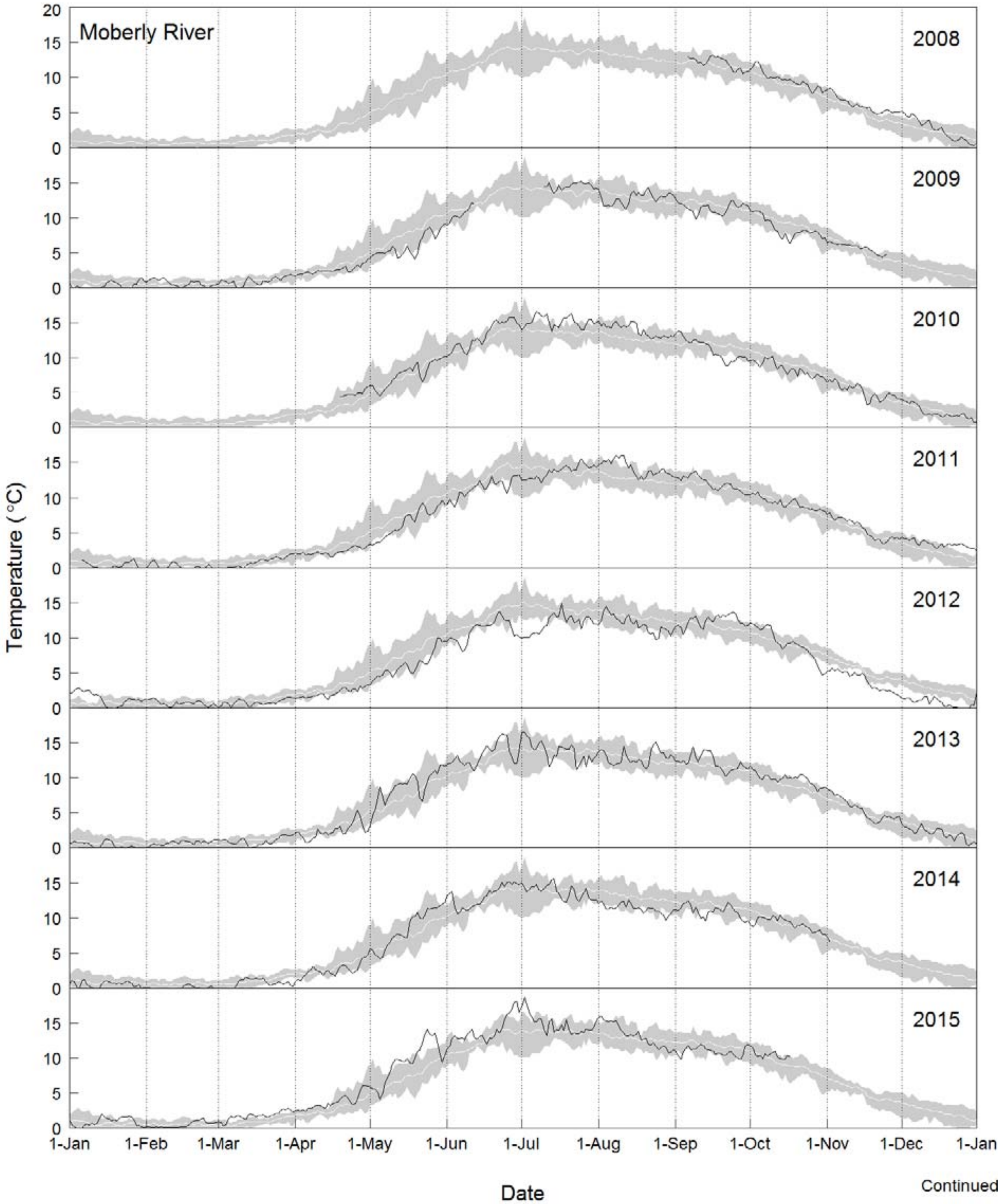


Figure C5: ***Mean daily water temperature (°C) for the Peace River downstream of the Moberly River confluence (black line), 2008 to 2016. The shaded area represents minimum and maximum water temperatures recorded at the site during other study years between 2008 and 2017. The white line represents average mean daily water temperatures over the same time period. Data were collected under from the Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9).***

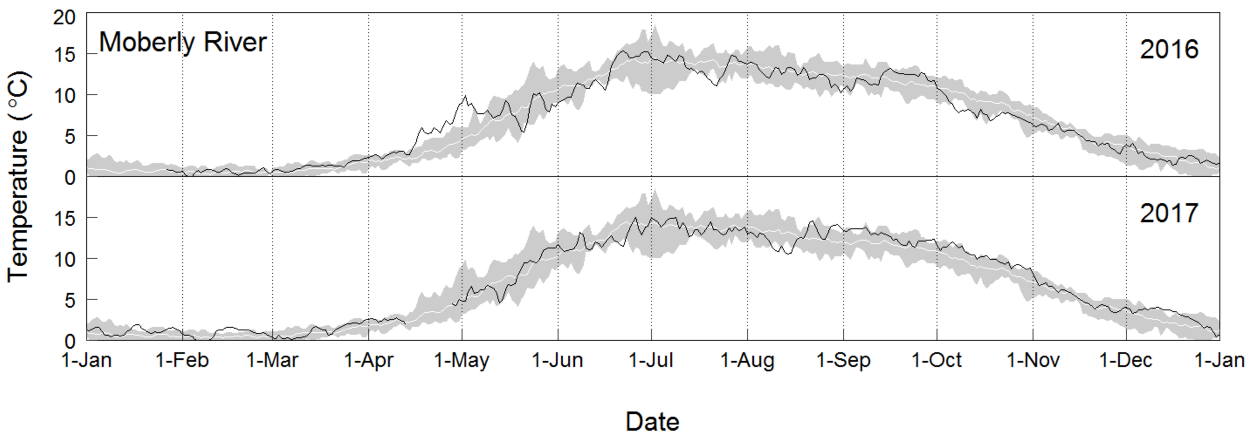


Figure C5: Concluded

n:\active_2014\1492\1400753 - gmsmon-2 - peace river fish indexing\07 deliverables\2017 annual report\final\appendices\appendix c - discharge and temperature\1400753 - appendix c - discharge and temperature data.docx

APPENDIX D

Habitat Data

Table D1 Lengths of boat electroshocking sites by habitat type in the Peace River, 2017. Bank habitat data were not available for Sections 6, 7, or 9.

Section	Site[a]	Length (m) of Site							Total Length (m)
		Physical Cover Present[b]				Physical Cover Absent[b]			
		A1[c]	A2[c]	A3[c]	Total	A2[c]	A3[c]	Total	
1	0101				0		600	600	**600**
	0102				0		975	975	**975**
	0103	1200			1200			0	**1200**
	0104				0		500	500	**500**
	0105		1100		1100			0	**1100**
	0107	550			550			0	**550**
	0108				0		850	850	**850**
	0109				0		975	975	**975**
	0110	650			650			0	**650**
	0111	1000			1000			0	**1000**
	0112	1070			1070			0	**1070**
	0113		750		750			0	**750**
	0114		950		950			0	**950**
	0116				0		985	985	**985**
	0119	750			750			0	**750**
Section 1 Total		**5220**	**2800**	**0**	**8020**	**0**	**4885**	**4885**	**12905**
3	0301		1800		1800			0	**1800**
	0302		1900		1900			0	**1900**
	0303		1450		1450			0	**1450**
	0304				0	1350		1350	**1350**
	0305				0	1550		1550	**1550**
	0306				0		1000	1000	**1000**
	0307				0		950	950	**950**
	0308				0		1350	1350	**1350**
	0309				0		950	950	**950**
	0310			1200	1200			0	**1200**
	0311			1250	1250			0	**1250**
	0312				0	1170		1170	**1170**
	0314		975		975			0	**975**
	0315			1700	1700			0	**1700**
	0316		1475		1475			0	**1475**
Section 3 Total		**0**	**7600**	**4150**	**11750**	**4070**	**4250**	**8320**	**20070**
5	0502		950		950			0	**950**
	0505	1000			1000			0	**1000**
	0506		1000		1000			0	**1000**
	0507		780		780			0	**780**
	0508		925		925			0	**925**
	0509				0		975	975	**975**
	0510	1130			1130			0	**1130**
	0511		720		720			0	**720**
	0512				0		1280	1280	**1280**
	0513				0		770	770	**770**
	0514				0		560	560	**560**
	0515				0		970	970	**970**
	0516				0	800		800	**800**
	0517				0	700		700	**700**
	05SC060	530			530			0	**530**
Section 5 Total		**2660**	**4375**	**0**	**7035**	**1500**	**4555**	**6055**	**13090**
Grand Total		**7880**	**14775**	**4150**	**26805**	**5570**	**13690**	**19260**	**46065**

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Nearshore habitat with physical cover as assigned by P&E and Gazey (2003).

[c] Nearshore habitat with no physical cover as assigned by P&E and Gazey (2003).

[d] Bank Habitat Type as assigned by R.L.&L. (2001). See Appendix D, Table D2 for a description of each bank habitat type.

Table D2 Descriptions of categories used in the Bank Habitat Types Classification System as summarized from R.L.&L. (2001).

Category	Code	Description
Armoured/Stable	A1	Banks generally stable and at repose with cobble/small boulder/gravel substrates predominating; uniform shoreline configuration with few/minor bank irregularities; velocities adjacent to bank generally low-moderate, instream cover limited to substrate roughness (i.e., cobble/small boulder interstices).
	A2	Banks generally stable and at repose with cobble/small boulder and large boulder substrates predominating; irregular shoreline configuration generally consisting of a series of armoured cobble/boulder outcrops that produce Backwater habitats; velocities adjacent to bank generally moderate with low velocities provided in BW habitats: instream cover provided by BW areas and substrate roughness; overhead cover provided by depth and woody debris; occasionally associated with C2, E4, and E5 banks.
	A3	Similar to A2 in terms of bank configuration and composition although generally with higher composition of large boulders/bedrock fractures; very irregular shoreline produced by large boulders and bed rock outcrops; velocities adjacent to bank generally moderate to high; instream cover provided by numerous small BW areas, eddy pools behind submerged boulders, and substrate interstices; overhead cover provided by depth; exhibits greater depths offshore than found in A1 or A2 banks; often associated with C1 banks.
	A4	Gently sloping banks with predominantly small and large boulders (boulder garden) often embedded in finer materials; shallow depths offshore, generally exhibits moderate to high velocities; instream cover provided by “pocket eddies” behind boulders; overhead cover provided by surface turbulence.
	A5	Bedrock banks, generally steep in profile resulting in deep water immediately offshore; often with large bedrock fractures in channel that provide instream cover; usually associated with moderate to high current velocities; overhead cover provided by depth.
	A6	Man-made banks usually armoured with large boulder or concrete rip-rap; depths offshore generally deep and usually found in areas with moderate to high velocities; instream cover provided by rip-rap interstices; overhead cover provided by depth and turbulence.
Depositional	D1	Low relief, gently sloping bank type with shallow water depths offshore; substrate consists predominantly of fines (i.e., sand/silt); low current velocities offshore; instream cover generally absent or, if present, consisting of shallow depressions produced by dune formation (i.e., in sand substrates) or embedded cobble/boulders and vegetative debris; this bank type was generally associated with bar formations or large backwater areas.
	D2	Low relief, gently sloping bank type with shallow water depths offshore; substrate consists of coarse materials (i.e., gravels/cobbles); low-moderate current velocities offshore; areas with higher velocities usually producing riffle areas; overhead cover provided by surface turbulence in riffle areas; instream cover provided by substrate roughness; often associated with bar formations and shoal habitat.
	D3	Similar to D2 but with coarser substrates (i.e., large cobble/small boulder) more dominant; boulders often embedded in cobble/gravel matrix; generally found in areas with higher average flow velocities than D1 or D2 banks; instream cover abundantly available in form of substrate roughness; overhead cover provided by surface turbulence; often associated with fast riffle transitional bank type that exhibits characteristics of both Armoured and Depositional bank types.
SPECIAL HABITAT FEATURES		
BACKWATER POOLS	-	These areas represent discrete areas along the channel margin where backwater irregularities produce localized areas of counter-current flows or areas with reduced flow velocities relative to the mainstem; can be quite variable in size and are often an integral component of Armoured and erosional bank types. The availability and suitability of Backwater pools are determined by flow level. To warrant separate identification as a discrete unit, must be a minimum of 10 m in length; widths highly variable depending on bank irregularity that produces the pool. Three classes are identified:
	BW-P1	Highest quality pool habitat type for adult and subadult cohorts for feeding/holding functions. Maximum depth exceeding 2.5 m, average depth 2.0 m or greater; high availability of instream cover types (e.g., submerged boulders, bedrock fractures, depth, woody debris); usually with Moderate to High countercurrent flows that provide overhead cover in the form of surface turbulence.
	BW-P2	Moderate quality pool type for adult and subadult cohorts for feeding/holding; also provides moderate quality habitat for smaller juveniles for rearing. Maximum depths between 2.0 to 2.5 m, average depths generally in order of 1.5 m. Moderate availability of instream cover types; usually with Low to Moderate countercurrent flow velocities that provide limited overhead cover.

Continued.

Table D2 Concluded.

	BW-P3	Low quality pool type for adult/subadult classes; moderate-high quality habitat for y-o-y and small juveniles for rearing. Maximum depth <1.0 m. Low availability of instream cover types; usually with Low-Nil current velocities.
EDDY POOL	EDDY	Represent large (<30 m in diameter) areas of counter current flows with depths generally >5 m; produced by major bank irregularities and are available at all flow stages although current velocities within eddy are dependent on flow levels. High quality areas for adult and subadult life stages. High availability of instream cover.
SNYE	SN	A side channel area that is separated from the mainstem at the upstream end but retains a connection at the lower end. SN habitats generally present only at lower flow stages since area is a flowing side channel at higher flows: characterized by low-nil velocity, variable depths (generally <3 m) and predominantly depositional substrates (i.e., sand/silt/gravel); often supports growths of aquatic vegetation; very important areas for rearing and feeding.

Velocity Classifications:

Low: <0.5 m/s
Moderate: 0.5 to 1.0 m/s
High: >1.0 m/s

Table D3 Summary of habitat variables recorded at boat electroshocking sites in the Peace River, 21 August to 04 October 2017.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
1	119	1	25	13.1	180	Mostly Cloudy		Medium	High		120		5	10				20	
1	119	2	20	12.3	190	Mostly Cloudy	high	Medium	High		160	5		5				15	
1	119	3	26	11.8	190	Clear	high	Medium	Medium		n/a	5	5	2				15	
1	119	4	14	12.6	190	Mostly Cloudy		Medium	Medium		200	76	3			1		20	
1	119	5	14		190	Overcast	water level		Medium		200	20						50	
1	119	6	14	11.2	220			High	High		n/a	68	2					30	
1	116	1	17	11.5	180	Partly Cloudy	water level	Medium	Medium		175	5						5	
1	116	2	25	12.6	190	Mostly Cloudy	high	Medium	Medium		160	90		5					
1	116	3	25		190	Clear		High	High		n/a							5	
1	116	4		12.2	200	Partly Cloudy		Medium	Medium		200	30	1			1	30	1	
1	116	5	12	10.7	190	Overcast	water level		Medium		200	40				5		3	
1	116	6	17	11.5	160	Mostly Cloudy		High	High		n/a	85		10		5			
1	114	1	19	11.6	180	Partly Cloudy	¿1.0m drop i	Medium	Medium		175	5		1	5			10	
1	114	2	20	12.4	190	Mostly Cloudy	high	High	Medium		160	2	2	2				10	
1	114	3	25	12.3	190	Clear	high	High	High		n/a	10				2		20	
1	114	4	14	12.1	200	Mostly Cloudy			Medium		n/a	60				1			
1	114	5	14	10.6	190	Overcast	water level		Medium		200	15						10	
1	114	6	17	11.3	170	Mostly Cloudy		High	High		n/a	50		5		10	20	15	
1	113	1	21	12.4	180	Partly Cloudy	high	Medium	Medium		130	5		5	2		5		
1	113	2	20	12.7	190	Mostly Cloudy	high	High	Medium		160	10		1				5	
1	113	3	25	12.3	190	Clear	slight decre	High	High		n/a	50							
1	113	4	15	12.2	200	Partly Cloudy		Medium	Medium		200	30							
1	113	5	12	10.7	190	Overcast	water level		Medium		200	40	1			5			
1	113	6	20	11.4	160	Mostly Cloudy		High	Medium		n/a	90				10			
1	112	1	21	13.0	180	Partly Cloudy	high	Medium	Medium		125	5		1				5	
1	112	2	22	12.5	190	Mostly Cloudy	high	Medium	Medium		160	1		1				2	
1	112	3	20	12.1	190	Clear	slight decre	High	High		n/a	60						15	
1	112	4	14	12.2	200	Mostly Cloudy		Medium	Medium		200	80	1			1		2	
1	112	5	14	10.6	190	Overcast	water level		Medium		200	20						10	
1	112	6	19	11.3	160	Mostly Cloudy			Medium		n/a	90				10			
1	111	1	21	12.5	180	Partly Cloudy	high		Medium		130	5		2	2			5	
1	111	2	22	12.5	190	Mostly Cloudy	high	Medium	Medium		160	5	1	1				5	
1	111	3	20	12.1	190	Clear	high	High	High		n/a	50						20	
1	111	4	11	12.1	200	Mostly Cloudy		Medium	Medium		200	30	1					2	
1	111	5	14	10.7	190	Overcast	water level		Medium		200	15						50	
1	111	6	21	11.3	160	Mostly Cloudy		Medium	Medium		n/a	100							
1	110	1	21	12.5	180	Partly Cloudy	high	Medium	Medium		125	5			2		5	5	
1	110	2	17	12.4	190	Partly Cloudy	high	Medium	Medium		160	5		1				20	
1	110	3	20	12.2	190	Clear	high	High	Medium		n/a	10	1	1				10	
1	110	4	9	11.9	200	Partly Cloudy		Medium	Medium		200	20	1				10		
1	110	5	14	10.6	190	Overcast	water level		Medium		200	15				3		50	
1	110	6	18	11.7	160	Partly Cloudy		High	Medium		n/a	90			10				
1	109	1	18		180	Partly Cloudy	high	High	Low		130	5	1	1	5	2	2	2	82
1	109	2	20	12.6	190	Partly Cloudy	high	High	Medium		160	5		5	10			1	
1	109	3	12	11.8	190	Clear		High	High		n/a	90			10				
1	109	4	14	12.3	190	Mostly Cloudy		Medium	Medium		200	94	1			5			
1	109	5	14	10.7	190	Overcast	water level		Medium		200	50	2			3		10	

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (μS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
1	109	6	18	11.4				High	Medium		n/a	100							
1	108	1	15	12.4	180		high	Medium	Low		125	5			2		5	1	
1	108	2	19	12.5	190	Partly Cloudy	high	High	Low		160	2		1					
1	108	3	7	11.7	190	Partly Cloudy	high	High	Medium		n/a	10							
1	108	4	15	12.2	190	Mostly Cloudy		Medium	Medium		200	97				3			
1	108	5	14	10.7	190	Overcast	water level		Medium		200	50				2		15	
1	108	6	18	11.3	170	Mostly Cloudy		High	Medium		n/a	98				2			
1	107	1	25	12.9	180	Mostly Cloudy		Medium	High		120			20				70	
1	107	2	17	12.4	190	Partly Cloudy		Medium			160	5		2				20	
1	107	3	20	12.1	190	Clear	high	High	Medium		n/a	5	2	1				30	
1	107	4		11.8	200	Partly Cloudy			Medium		200	18	1					5	
1	107	5	14	10.6	190	Overcast	water level		Medium		n/a	20						75	
1	107	6	18			Partly Cloudy		High	Medium		n/a	100							
1	105	1	15	13.0	180	Overcast	high	Medium	Medium		120	5	5	5			5	5	
1	105	2	20	12.6	150	Mostly Cloudy	increasing	Medium	High		200	20	1					10	
1	105	3	11	11.8	190	Clear	high	Medium	Medium		n/a	10	1	5				2	
1	105	4	7	11.8	190	Clear	water lower	Medium	High		n/a	93	2	5					
1	105	5	10	10.6	190	Overcast	water level		High		200	30	3	2				1	
1	105	6	9	11.0	200	Partly Cloudy		Medium	High		n/a	69	1	10			20		
1	104	1	18	12.8	180	Overcast		Medium	Medium		120	50				20			
1	104	2	19	12.5	150	Mostly Cloudy	increasing	Medium	Medium		200	20					10		
1	104	3	15	11.8	190	Clear	high	Medium	Medium		n/a	10		5				3	
1	104	4	10	12.0	190	Clear	water lower	High	Medium		n/a	90				10			
1	104	5	12	10.6	190	Overcast	water level		Medium		200	30			1	3			
1	104	6	9	11.1	200	Partly Cloudy		Medium	Medium		n/a	45				5	50		
1	103	1	15	13.0	180	Overcast		High	High		120		2	5				30	
1	103	2	20	12.6	150	Mostly Cloudy	water increa	Medium	Medium		200	10	3	1			5	10	
1	103	3	9	11.8	190	Clear	high	High	Medium		n/a	15						20	
1	103	4	7	11.9	190	Clear	lower compar	Medium	Medium		n/a	97	2					1	
1	103	5	10	10.6	190	Overcast	water level		High		200	30	5					10	
1	103	6	9	11.1	200	Fog		Medium	High		n/a	89	1					10	
1	102	1	18	13.4	180	Mostly Cloudy	high	Medium	Medium		120	5		5			5	5	
1	102	2	15	12.2	190	Mostly Cloudy	high	Low	High		160	50		10					
1	102	3	25	11.8	190	Clear	high	Medium	High		n/a	20		10				2	
1	102	4	14	12.2	190	Mostly Cloudy		Medium	High		200	70		30					
1	102	5	14	10.6	190	Overcast	water level		High		200	50							
1	102	6		11.2	160	Mostly Cloudy		Medium	High		n/a	70		30					
1	101	1	18	13.1	180	Overcast	high	Medium	High		120	5		5			1	1	
1	101	2	15	12.2	190	Overcast	high	Low	High		160	50		10					
1	101	3	17	11.8	190	Clear	high	Medium	High		n/a	20		10					
1	101	4			190	Partly Cloudy		Medium	High		n/a	60		40					
1	101	5	12	10.6	190	Overcast	water level		High		200	50		10					
1	101	6	12	11.1	200	Mostly Cloudy		Medium	High		n/a	70		30					
3	316	1	15	11.7	180	Clear	high	High	Medium		100		2	5				5	
3	316	2	15	11.9	180	Partly Cloudy	stable	Medium	Medium		200	10	2	2				10	
3	316	3	27	13.1	180	Clear		High	High		50	10	5			30		15	
3	316	4	15	11.9	190	Clear		Medium	Medium		120	30	2			2		1	
3	316	5	8	10.9	200	Partly Cloudy		Medium	Medium		160	5	1			2		2	

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%) Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
3	316	6		11.1		Mostly Cloudy			Medium		200	80	10			10			
3	315	1	15	11.4	180	Overcast	water droppi	Medium	Medium		180	20		1			20	10	
3	315	2	15	11.9	180	Partly Cloudy	stable	Medium	Medium		200	5	2		1	1	1	20	
3	315	3	27	12.9	180	Clear		High	High		50	10				20		40	
3	315	4	14	11.5	190	Clear		High	Medium		120	30	3			2		10	
3	315	5	8	10.5	200	Partly Cloudy			Medium		160	15	1			2		10	
3	315	6	13	11.1		Overcast		High	Medium		n/a	86	2			10			
3	314	1	14		180	Overcast	water level	Medium	Medium		140							15	
3	314	2	15	11.8	180	Partly Cloudy	same	Medium	Medium		200	5	1		1	5		30	
3	314	3	28	12.7	180	Clear	flows increa	High	High		50		10			20		40	
3	314	4	4	10.6	190	Fog		Medium	Medium		200	20				3		50	
3	314	5	7	10.4	200	Partly Cloudy			Medium		160	15				1		40	
3	314	6	14	11.0		Overcast		High	Medium		n/a	90	5			5			
3	312	1	17	13.0	200	Partly Cloudy	flow increas	Medium	Medium		95	10		2			10	10	
3	312	2	17	13.1	190	Partly Cloudy	water higher	Medium	Medium		110	5					5	1	
3	312	3	24	12.9	180	Overcast	high	High	High		140	15					5	5	
3	312	4	6	10.9	190	Clear		Medium	Medium		200	20					10	2	
3	312	5	10	10.4	190			Medium			90	40						35	
3	312	6	12	11.2	240				Medium		190	85				10	5		
3	311	1	15	11.2	200	Partly Cloudy	lowest water	Medium	Medium		125	10		2			2		
3	311	2	10	11.8	190	Overcast		Medium	Medium		100	5	1	5				1	
3	311	3	22	12.8	180	Overcast	high	High	High		140	20		5				5	
3	311	4	14	11.8	190	Mostly Cloudy			Medium		120	25	1					5	
3	311	5	8	10.0	190	Overcast		Medium	Medium		90		1					60	
3	311	6	11	11.1	240	Overcast		Medium	Medium		n/a	50	10	10		20		10	
3	310	1	17	11.2	200	Partly Cloudy	water levels	Medium	Medium		125	10		2				50	
3	310	2	17	12.9	190	Partly Cloudy	rising	Medium	Medium		110	2	2				2	5	
3	310	3	27	12.7	180	Partly Cloudy		High	High		140	65	10			20		5	
3	310	4	2	11.0		Clear		Medium	Medium		200	30						1	
3	310	5	8	10.4	190	Overcast			Medium		90	5	1			3		30	
3	310	6	12	11.2		Overcast		Medium	Medium		n/a	85	5			10		5	
3	309	1	15	11.2	200	Partly Cloudy	low	Medium	Medium		125	20	1	5			20	5	
3	309	2	15	12.9	190	Partly Cloudy	rising	Medium	Medium		110	15	1				15	5	
3	309	3	27	12.6	180	Partly Cloudy		High	Medium		140	65	10			20		5	
3	309	4	14	12.2	190	Mostly Cloudy		Medium	Medium		120		1				20	10	
3	309	5	8	10.4	190	Overcast		Medium	Medium		90	40	1					15	
3	309	6	11	11.2				High	Medium		n/a	35	1			10	50	4	
3	308	1	15	11.7	180	Overcast	high	High	Medium		100		2	2				1	
3	308	2	15	12.5	180	Partly Cloudy	water rising	Medium	Medium		200	20				2			
3	308	3	25	12.4	180	Partly Cloudy	higher	High	High		140	20						5	
3	308	4	12	11.8	190	Clear		Medium	Medium		200	30				1	5	1	
3	308	5	10	10.6	190	Overcast		Medium	Medium		90	15				2		25	
3	308	6	12	11.2	170	Overcast		High	Medium		190	85				10		5	
3	307	1	17	11.3	200	Mostly Cloudy	water level	Medium	Medium		140	10		3				10	
3	307	2	17	12.3	180	Partly Cloudy	higher	Medium	Medium		200	10				2	10		
3	307	3	15	12.2	180	Partly Cloudy	higher	High	Medium		130	30							
3	307	4	12	11.4	190	Clear		High	Medium		n/a	30					30		
3	307	5	10	10.6	190	Overcast		Medium	Medium		90	15							

[a] See Appendix A, Figures A1 to A3 for sample site locations.
[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.
[c] Field Observation.
[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.
[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%) Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
3	0307	6	14	11.2	180	Mostly Cloudy		High	Medium		n/a	40				10	50		
3	0306	1	13	11.2	200	Partly Cloudy	lowest level	Medium	Medium		125	10		1			20		
3	0306	2	10	11.9	190	Overcast		High	Medium		140							1	
3	0306	3	20	12.6	180	Overcast	high	High	High		140	20							
3	0306	4	15	11.8	190	Mostly Cloudy		Medium	Medium		120		1						
3	0306	5	8	9.9	190	Overcast		Medium	Medium		90		3						
3	0306	6		10.9					Low		190	90	10						
3	0305	1	21	13.6	180	Clear		High	Medium		40							1	
3	0305	2	20	12.8	190	Partly Cloudy	low	Medium	Medium		60	5							
3	0305	3	20	12.5	180	Overcast	none	High	High		140	20		5					
3	0305	4	14	11.4	190	Partly Cloudy		Medium	Medium		120	20	1			1			
3	0305	5	8	9.8	190	Overcast		Medium	Medium		90							1	
3	0305	6	14	10.8	240	Partly Cloudy		High	Medium		n/a	95				5			
3	0304	1	13	11.2	180	Overcast	flow droppin	Medium	Medium		180	25			1	1	25	5	
3	0304	2	14		190	Overcast	low	Medium	Medium		120	5						5	
3	0304	3	10	11.5	190	Overcast	low	High	Medium		n/a	10		2					
3	0304	4	12	11.4	190	Partly Cloudy		Medium	Medium		160	30	2			2	5		
3	0304	5	5	10.1	200	Mostly Cloudy			Medium		160		1			2		5	
3	0304	6		10.9		Partly Cloudy		Medium	Medium		n/a	90	5				5		
3	0303	1	21	12.6	180	Clear		Medium	Medium		110	1	2		1			2	
3	0303	2	18	12.2	190	Partly Cloudy	low	Medium	Medium		120	10							
3	0303	3	20	12.0	180	Overcast		High	High		140	15							
3	0303	4	12	11.6	190	Mostly Cloudy			Medium		200		1				70		
3	0303	5	7	10.1	190	Overcast	water level	Medium	Medium		160	30						10	
3	0303	6	12	10.9	190	Clear		High	Medium		n/a	90	5			5			
3	0302	1	20	12.1	180	Clear		Medium	Medium		110	5		1	1			10	
3	0302	2	14	11.4	190	Overcast	low	Medium	Medium		90	5	5	1					
3	0302	3	12	11.9	180	Overcast	high	High	High		140	20						5	
3	0302	4	7	11.4	190	Mostly Cloudy		Medium	Medium		200	20	3				10	20	
3	0302	5	6	10.1	190	Overcast	water level	Medium	Medium		160	25						5	
3	0302	6	10	10.7	190	Partly Cloudy			High		n/a	60	15			5		20	
3	0301	1	13	11.2	180	Overcast	low	Medium	Medium		180	3	1	1	5		10	20	
3	0301	2	15	11.5	190	Overcast	low		Medium		90	10	1	1					
3	0301	3	10	11.4	190	Mostly Cloudy	very low		Low		200	10							
3	0301	4	4	10.9	190	Partly Cloudy		High	Medium		160	20	2			1		20	
3	0301	5	5	10.2	200	Partly Cloudy		Medium	Medium		160	30	2					10	
3	0301	6	11	10.8	190	Partly Cloudy		High	Medium		n/a	90	5					5	
5	109OSB	5	12	10.3	180	Clear			High		n/a	50					50		
5	109OSA	5	12	10.5	180	Clear			High		n/a	50					50		
5	05SC060	1	15	11.3	200	Partly Cloudy		Medium	Low		90				90		10		
5	05SC060	2	20	14.8	230	Partly Cloudy	stable	high	Low		160				80		20		
5	05SC060	3	17	12.0	220	Partly Cloudy		Medium	Low		150				100				
5	05SC060	4	8	9.6	200	Clear	drop from 13	High	Low		160				100				
5	05SC060	5	22	12.1	190	Mostly Cloudy	stable at 11	High	Low		230				100				
5	05SC060	6	14	8.8	180	Clear	stable at 14	High	Low		170				100				
5	0517	1	15	11.0	200	Partly Cloudy		high	Low		70				95		5		
5	0517	2	19	11.8	180	Clear		high	Medium		80	50			5	5	40		
5	0517	3	16	11.2		Partly Cloudy		Medium	Low		130	35	5	5	10	10	35		

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
5	517	4	15						Medium		80	70	5			15	5	5	
5	517	5	22	11.2	170	Partly Cloudy		High	Low		170	50	7			30	13		
5	517	6	13	10.2	190	Mostly Cloudy	stable at 14	High			135	65			5	20		10	
5	516	1	16	11.5	200	Partly Cloudy	stable at 17	high	Medium		90	55	5			20	10	10	
5	516	2	19	11.5	190	Partly Cloudy		high	Medium		140	58			2	5	30	5	
5	516	3	14	11.1		Partly Cloudy		Medium	Low		n/a	80				10	10		
5	516	4	14	11.0		Partly Cloudy		High	Medium		n/a	70		5		5		20	
5	516	5	22	11.0	170	Partly Cloudy		High	Medium		170	50	1			1	45	3	
5	516	6	13	10.1	190	Mostly Cloudy	stable at 14	High	High		135	50				10	30	10	
5	515	1	20	12.2	200	Clear		high	Medium		100	15	10		5	20	50		
5	515	2	11	11.3	210	Partly Cloudy		high	Medium		n/a	50				10	40		
5	515	3	15	10.9	190	Clear		Low	Medium		n/a	20				5	75		
5	515	4	7	10.1	190	Clear		High	Medium		90	48	2		15	35			
5	515	5		11.4	170	Mostly Cloudy		Medium	Medium		170	80	5			15			
5	515	6	3	9.9	240	Mostly Cloudy	stable at 14	Medium	Medium		150	55			15	20	10		
5	514	1	21	12.4	200	Clear		high	Medium		90	35			5	35	25		
5	514	2	20	11.6	210	Partly Cloudy			Medium		140	50				10	40		
5	514	3	10	11.1	200	Overcast		Medium	Medium		110	75				5	20		
5	514	4	7	10.6	200				Medium		60	70	2			15	13		
5	514	5	16	11.4							n/a	65	2			15	18		
5	514	6	-2	9.8	240	Overcast	stable at 14	High	Medium		160	85				10	5		
5	513	1	20	12.4	200	Clear		high	Medium		n/a	45			5	5	45		
5	513	2		11.3	210	Clear		high	Medium		120	80				10	10		
5	513	3	10	11.1	200	Overcast	stable at 11	High	Low		110	50					50		
5	513	4	7	10.5	200			High	Medium		60	60				25	15		
5	513	5	17	11.2	170	Mostly Cloudy		High	Medium		170	90				10			
5	513	6	-2	9.9	240	Mostly Cloudy	stable at 14	Medium	Medium		160	90	5			5			
5	512	1	17	10.8	200	Partly Cloudy		Medium	Medium		80	85					10	5	
5	512	2	20	11.7	180	Clear		high	High		n/a	45		5		5	40	5	
5	512	3	8	10.4	190	Clear		Low	High		110	60					35	5	
5	512	4	10	10.0	170	Clear		High			120	75	5			5	10	5	
5	512	5	20	11.1	170	Partly Cloudy			High		170	80	5					15	
5	512	6	13	10.2	190	Partly Cloudy		High			110	85		3		2	3	7	
5	511	1	17	12.0	190	Clear		high	Medium		100	50			5	5	35	5	
5	511	2	19	12.1	180	Clear		high	Medium		140	90				5		5	
5	511	3	8	10.5	190	Partly Cloudy		Low	Medium		110	40		1			54	5	
5	511	4	12	10.3	170	Partly Cloudy		Medium	Medium		115	80					20		
5	511	5	22	11.4	170			Medium	High		120	80	5					15	
5	511	6	13	10.4	210						160	80	2	1	5	10	2		
5	510	1	17	11.4	200	Partly Cloudy		high	Medium		80	20	2			48	15	5	
5	510	2	20	12.0		Clear		high	Medium		90	95				5			
5	510	3	8	11.0	190	Partly Cloudy		Low	High		110	45	1	1			50	3	
5	510	4	15	11.2		Partly Cloudy		High	Medium		n/a	75	5			20			
5	510	5	20	11.3		Partly Cloudy		High	Medium		200	75	10					15	
5	510	6	13	10.4	180	Partly Cloudy		High	Medium		n/a	85	5			5		5	
5	509	1	15	10.8	200	Partly Cloudy		Medium	Medium		60	73	1			1	30	5	
5	509	2	15	11.2	190			Medium	Medium		140	88				2	10		
5	509	3	15	11.0	190	Mostly Cloudy			Medium		150	90				5		5	

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
5	0509	4	14	10.9	200	Partly Cloudy		High	Medium		95	85	5			10			
5	0509	5	20	11.0	170	Partly Cloudy		Medium	High		170	50					45	5	
5	0509	6	13	10.1	210	Mostly Cloudy	stable at 14	High	Medium		160	85				15			
5	0508	1	21	12.5	200	Clear		high	Medium		90	35	5		5	20	35		
5	0508	2	20			Partly Cloudy		high	Medium		90	63	2			4	30	1	
5	0508	3	10	11.1	200	Overcast	stable at 11	High	Low		90	24	1			1	70	4	
5	0508	4	2	10.5	200				Medium		90	60			20	20			
5	0508	5	15	11.4		Mostly Cloudy			Medium		180	85	5			10			
5	0508	6	-2	8.9	210	Fog	stable at 14		Medium		180	90	5			5			
5	0507	1	15	10.8		Partly Cloudy			Medium		n/a	68	1				30	1	
5	0507	2		11.1	190	Clear		high	Medium		150	80	4			5	10	1	
5	0507	3	8	10.2	200	Clear		High	Medium		110	75				5	20		
5	0507	4	10	10.7		Partly Cloudy		High	Medium		80	65	5			20	10		
5	0507	5	20	10.9		Partly Cloudy		High	Medium		n/a	95	2			3			
5	0507	6	10	10.2	210	Mostly Cloudy	stable at 14	High	Medium		150	85	5			10			
5	0506	1	15	10.5	190	Mostly Cloudy		Medium	High		80	90						10	
5	0506	2		11.1	210	Clear		high	Medium		140	25	5	10				60	
5	0506	3	14	10.8	190	Mostly Cloudy		Medium	Medium		110	50						50	
5	0506	4	9	9.7		Mostly Cloudy		Medium	Medium		n/a	40		10				50	
5	0506	5	20	18.8	170	Partly Cloudy		Medium	High		170	50						50	
5	0506	6	10	10.0	210		stable at 14	High	High		160	85						15	
5	0505	1	15	10.0	190	Mostly Cloudy		Medium	High		70	70		20				10	
5	0505	2	5	11.2	210	Mostly Cloudy		Medium	High		140	90						10	
5	0505	3	10	10.5		Mostly Cloudy	stable at 11	Medium	High		150	50		20			20	10	
5	0505	4		9.7	210						150	30		20				50	
5	0505	5	12	10.7	180	Overcast	stable at 11	Medium	High		170	25		30			15	30	
5	0505	6	5	10.0	210	Mostly Cloudy	stable at 14	High			160	80						20	
5	0502	1	15	9.8	190	Overcast			Medium		80	95	5						
5	0502	2	7	11.0	200	Partly Cloudy		Medium	High		140	50	10	5		10	10	5	
5	0502	3		10.4	200				High		110	65	5	20		10			
5	0502	4	8	9.6	180	Mostly Cloudy		Medium			120	70	5	20		5			
5	0502	5		10.7	170	Partly Cloudy		Medium	High		170	80						20	
5	0502	6	5	10.0	210	Overcast	stable at 14	High	High		150	85						15	
6	06SC047	1	20	14.7	330	Mostly Cloudy		high	Low		100		10		10	10	65		
6	06SC047	2	20	14.1	290	Clear	stable, high	high	Low		n/a		2		13	5	50		
6	06SC047	3		13.4	330	Clear	stable at 13		Low		120		5		5	30	30	1	
6	06SC047	4	13	11.9	340	Mostly Cloudy	stable at 13	High	Low		90	5					40	5	
6	06SC047	5	12	8.9	256	Partly Cloudy			Low		30		5			15		5	
6	06SC047	6		5.5	280	Clear		High	Low		80						10	10	
6	06SC036	1	22	15.0	200	Partly Cloudy			Low		50		1					10	
6	06SC036	2		12.3	200	Clear		Medium	Low		100		10					90	
6	06SC036	3	27	15.9	240	Clear		high	Low		70		5				5		
6	06SC036	4	15	13.5	200	Partly Cloudy		High	Low		170	20			5			20	
6	06SC036	5	12	10.5	180	Partly Cloudy		High	Low		110		1		2		47	50	
6	06SC036	6	11	10.9	190	Clear		High	Low		n/a				50			50	
6	06PIN02	1	20	14.0	350	Mostly Cloudy	WATER HIGH	Medium	Medium		150	50	25			10	10	5	
6	06PIN02	2	17	13.5	330	Partly Cloudy		high	Medium		140	25	25				10	40	
6	06PIN02	3	24	13.8	310	Clear		high	Low		200	70	20				5	5	

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
6	06PIN02	4	8	11.4		Partly Cloudy		Medium	Medium		50	40	30				10	20	
6	06PIN02	5	14	8.2	240	Partly Cloudy		High	Medium		22	25	10			5		10	
6	06PIN02	6	10	6.4	210	Partly Cloudy		High	High		80	50	20	20			5	5	
6	06PIN01	1	20	14.5	350	Mostly Cloudy		high	Medium		150	40	20			10	5	25	
6	06PIN01	2	17	13.5	330	Partly Cloudy	High water	high	Low		130	16	20		3	10	1	50	
6	06PIN01	3	25	13.8	310	Clear			Low		200	10	30				20	40	
6	06PIN01	4	7	11.1	340	Mostly Cloudy	stable at 13	High	Medium		60		10				15	75	
6	06PIN01	5	15	8.1	220	Partly Cloudy		High	Medium		25	13	20	2		15		20	
6	06PIN01	6	14	7.2	230	Clear		High	Low		80	20	20			10		50	
6	0614	1	20	12.9	180	Mostly Cloudy		Medium	Low		n/a		1			10	89		
6	0614	2	20	13.0		Partly Cloudy			Medium		60	30	2			10	68		
6	0614	3	20	12.0	190	Clear	stable at 13	low	Low		110	10	2		3		85		
6	0614	4	13	11.9	200	Partly Cloudy		High	Low		n/a	50					50		
6	0614	5	14	10.2	190	Partly Cloudy	stable at 13	High	Low		110	30					50		
6	0614	6		10.3	200			High	Medium		250	30					60		
6	0613	1	22	13.3	220	Partly Cloudy		high	Medium		60	44	1			20	35		
6	0613	2	17	12.5	220	Clear	stable at 14	high	Medium		120	80				10		10	
6	0613	3	29	13.1	210	Clear		high	Medium		110	100							
6	0613	4	15	11.1	210	Partly Cloudy		High	Medium		40	50							
6	0613	5	16	10.1	190	Partly Cloudy			Medium		70	30	5			15			
6	0613	6	12	9.3		Clear		High	Medium		n/a	75	15			10			
6	0612	1	20	12.6	220	Partly Cloudy		Medium	Medium		50	20	2			3	25		
6	0612	2	20	13.2	240	Partly Cloudy	increase fro	high	Medium		90	75					25		
6	0612	3	30	12.6		Clear		high	Medium		100	70					30		
6	0612	4		11.7		Partly Cloudy			Medium		n/a	50	2				48		
6	0612	5	16	10.6	170	Partly Cloudy		High	Medium		110	75	5			20			
6	0612	6	15	10.6	180	Clear		High	Medium		n/a	60	2				33	5	
6	0611	1	18	13.2	220	Partly Cloudy		high	Low		40	55	5			10	30		
6	0611	2	22	14.0	240	Overcast	drop from 16	high	Low		90	30					70		
6	0611	3	26	12.6	230	Clear	drop from 13	high	Low		100	53					40	2	
6	0611	4	10	11.1	220	Partly Cloudy	stable at 12	High	Low		40	25					25	5	
6	0611	5	17	9.8	210	Mostly Cloudy	stable at 13		Medium		50	50					50		
6	0611	6	18	8.8	220	Clear		High	Medium		100	45					50	5	
6	0610	1	20	13.0	220	Partly Cloudy		high	Low		45	5	2		10		60		
6	0610	2	22	13.8	240	Overcast	drop from 16	Medium	Low		90	45	3				50	2	
6	0610	3	26	13.0	230	Clear	drop from 13	high	Low		100	50	5				45		
6	0610	4	15	11.2	220	Partly Cloudy	stable at 12	High	Medium		40	23	1				70	1	
6	0610	5	17	9.8	210	Mostly Cloudy	stable at 13	High	Medium		50	48	2				50		
6	0610	6	17	8.7	220	Clear		High	Medium		n/a	43	2				50	5	
6	0609	1	25	13.8		Partly Cloudy	High 1800 cm	high	Low		70	5	1			14	80		
6	0609	2	22	13.8	240	Mostly Cloudy	drop from 16		Low		90	44	1				65		
6	0609	3	15	12.5	230	Clear	drop from 13	high	Low		100	30	1			4	40		
6	0609	4	7	11.0	220	Partly Cloudy	stable at 12	High	Low		40	10					30		
6	0609	5	20	9.8		Partly Cloudy	stable at 13	High	Low		50	39	1				60		
6	0609	6	17	8.9	220	Clear		High	Low		100	34	1				60	5	
6	0608	1	25	13.0	220		High 1800 cm	high	Medium		70	20	5			1	70	4	
6	0608	2	17	13.0	240	Partly Cloudy		high	Medium		70	65	5			10	20		
6	0608	3	22	12.6	210	Clear		high	Medium		120	75	5			10	10		

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
6	0608	4	13	12.0	230	Mostly Cloudy		High	Medium		100	60	2				15		
6	0608	5	15	9.4		Partly Cloudy		High	Medium		50	40	5			15			
6	0608	6	12	8.3	220	Clear			Medium		130	65	10		5	10	10		
6	0607	1	20	12.2	220	Mostly Cloudy		high	Medium		40		1			14	85		
6	0607	2	20	13.3	240	Overcast	drop from 16	high	Low		90	39	1				60		
6	0607	3	27	12.5		Clear	drop from 13	high	Low		n/a	45	5				50		
6	0607	4	15	11.7	200	Mostly Cloudy	stable at 12	High	Medium		200	45	5				50		
6	0607	5	15	10.6	170	Partly Cloudy	stable at 13	Medium	Medium		110	50	1				42	2	
6	0607	6	15	10.7		Clear		High	Medium		n/a	45	1				54		
6	0606	1	25	13.5	190	Partly Cloudy	High 1800 cm	high	Medium		80	20				40		40	
6	0606	2	20	12.7	240				Medium		n/a	95					5		
6	0606	3	17	11.6	210	Partly Cloudy	water droppi				70	85				15			
6	0606	4	5	11.1	210	Mostly Cloudy	stable at 12	High	Medium		180	90					10		
6	0606	5	20	10.6	180	Partly Cloudy		High	Medium		100	90				10			
6	0606	6	17	10.7	210	Clear			Medium		n/a	90				10			
6	0605	1	25	13.0		Partly Cloudy		high	Medium		n/a	50				30	10	10	
6	0605	2	17	12.3	240	Overcast			Medium		100	65					30	5	
6	0605	3	20	12.4	190	Clear	stable at 13	high	Medium		n/a	60	1			4	30	5	
6	0605	4		11.5		Mostly Cloudy		High	Medium		180	50					50		
6	0605	5	15	10.0		Clear	stable at 13	High	Medium		110	50					48	2	
6	0605	6	13	10.2	200				Low		230	90	5					5	
6	0604	1	25	13.0	220	Partly Cloudy		high	Medium		90		5			70		25	
6	0604	2	16	12.8	240	Mostly Cloudy			Medium		70	76	4			15		5	
6	0604	3	22	12.6	190	Clear		high	Medium		110	50	5			25			
6	0604	4	15	11.9	230	Partly Cloudy		High	Medium		100	90	10						
6	0604	5	15	9.1		Partly Cloudy		High	Medium		50	25	15			25		10	
6	0604	6	12	8.1	220	Clear			High		130	30	30			10	15	15	
6	0603	1	18	12.5	200	Partly Cloudy	High 1800 cm	high	Medium		70					60	40		
6	0603	2	20	12.3	190	Mostly Cloudy		high	Medium		60	50				10	40		
6	0603	3	22	11.9	190	Clear		high	Medium		110	70				5	25		
6	0603	4	15	11.4	180	Partly Cloudy		Medium	High		170	90					10		
6	0603	5	14	9.9		Partly Cloudy		Medium			130	100							
6	0603	6		10.1	200	Clear		High	Medium		n/a	50	1				49		
6	0602	1	20	13.2	220	Mostly Cloudy		high	High		70		20	5		5		10	
6	0602	2	20	13.0		Clear		high	Medium		80	44	20	1		25		10	
6	0602	3	21	12.0	240	Clear	stable at 13	high	High		120	55	25					20	
6	0602	4	13	11.5	280	Mostly Cloudy		Medium	High		80		20	20			20	40	
6	0602	5	12	8.7	220	Fog			High		40	50	5			5		5	
6	0602	6	1	7.3	260	Partly Cloudy		High	High		100	40	20	5		10		25	
6	0601	1	20	14.1	200	Mostly Cloudy	High Water	high	Medium		70	60				5		35	
6	0601	2	20	11.8	180	Clear		high	High		80	40				30		30	
6	0601	3	17	11.4	200	Clear	stable at 13	Medium	Medium		120	69	5	1		20		5	
6	0601	4	10	11.0		Mostly Cloudy		Medium	Medium		100	90	5					5	
6	0601	5	14	10.3	210	Partly Cloudy		High	High		110	50						10	
6	0601	6	1	10.0	220	Partly Cloudy		High	High		120	45				5		50	
7	07SC022	1	20	12.0	200	Partly Cloudy		high	Low		50		10					5	
7	07SC022	2	11	11.7	140	Overcast	stable	high	Low		140	2	3					95	
7	07SC022	3	16	12.0	210		stable at 13		Low		90		5				20	75	

[a] See Appendix A, Figures A1 to A3 for sample site locations.
[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.
[c] Field Observation.
[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.
[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
7	07SC022	4	15	11.1	190	Partly Cloudy	increase to	High	Low		90		10		40				
7	07SC022	5	16	11.0	200	Mostly Cloudy		Medium	Low		90		5				5	30	
7	07SC022	6	6	10.3	220	Overcast		High	Low		90		1				20	30	
7	07SC012	1	15	12.0		Overcast		high	Medium		30		2					5	
7	07SC012	2	16	12.1	210	Partly Cloudy		high	Low		100	25	5				20	50	
7	07SC012	3	26	13.0	180	Partly Cloudy		High	Low		90		10					10	
7	07SC012	4	6	10.4	210	Clear	increase to	High	Low		140	25					60	5	
7	07SC012	5	12	11.3	180	Partly Cloudy		High	Low		90						40	10	
7	07SC012	6	4	10.6	210	Overcast		High	Low		40		5			10		10	
7	07BEA02	1	13	10.8	210	Partly Cloudy		high	Low		40		5					5	
7	07BEA02	2	18	13.0	340				Medium		40	5	1				5	50	
7	07BEA02	3	17	12.7	220			High	Low		50	10	5				80	5	
7	07BEA02	4	10	10.7	270	Clear		Medium	Low		100	70					5	5	
7	07BEA02	5	15	11.0	230	Partly Cloudy		High	Medium		70	25	2					3	
7	07BEA02	6	5	10.4	370	Mostly Cloudy			Medium		60	80					10	10	
7	07BEA01	1		18.5	290				Low		40	50					50		
7	07BEA01	2	18	13.5	340	Partly Cloudy			Low		40	33					34		
7	07BEA01	3	16	13.7	400	Overcast	stable at 13		Low		50	30					70		
7	07BEA01	4	5	10.4	470	Clear		Medium	Low		60	50							
7	07BEA01	5	12	11.3	480	Mostly Cloudy		Medium	Low		45	30					30		
7	07BEA01	6	5	10.3	550	Overcast		High	Low		60	20					30		
7	0714	1	15	11.7	210	Overcast		high	Medium		40	20	2			10		10	
7	0714	2	18	12.0	190	Partly Cloudy		high	Medium		140	75					20	5	
7	0714	3	26	13.0	170	Partly Cloudy		High	Medium		130	50				5			
7	0714	4	10	10.6	210	Clear	increase to				140	100							
7	0714	5	15	11.2	170	Mostly Cloudy		Medium	Medium		100	50					50		
7	0714	6	4	10.7	210	Mostly Cloudy		Medium	Medium		90	50				10	20		
7	0713	1	15	11.4	210	Overcast		Medium	Medium		30	30	1			20	10		
7	0713	2	18	12.0	190	Partly Cloudy		high	Medium		140	70					30		
7	0713	3	24	12.6	170	Partly Cloudy		High	Medium		120	50	5			5	40		
7	0713	4	12	10.8	210	Partly Cloudy		High	Medium		140	85	5				10		
7	0713	5	16	11.2	170	Mostly Cloudy		High	Medium		100	99	1						
7	0713	6		10.7	170	Overcast		High	Medium		40	32	5			10		2	
7	0712	1	15	11.4	210	Overcast			Medium		30	25	5			25	20		
7	0712	2	18	12.2	210	Partly Cloudy			Medium		140	75	4				20	1	
7	0712	3	22	12.6	170	Partly Cloudy		High	Medium		120	55	10			5	30		
7	0712	4	12	10.8		Partly Cloudy	increase to	High	Medium		n/a	18	2				60		
7	0712	5	15	11.0	180	Partly Cloudy		High	Medium		110	45	2				53		
7	0712	6	5	10.5	210	Overcast		High	Low		n/a	40	5			10			
7	0711	1	15	11.2	210				Medium		40	25	5			20	20		
7	0711	2	17	12.0	210	Mostly Cloudy		high	Medium		140	67	3				30		
7	0711	3	20	12.5		Partly Cloudy		High	Medium		n/a	50	5				45		
7	0711	4	16	10.8	200	Partly Cloudy	increase to	Low	Medium		90	95	5						
7	0711	5	15	11.0	180	Mostly Cloudy		High	Medium		110	89	1				10		
7	0711	6	5	10.4	200	Overcast		High	Medium		n/a	50	3			7	5		
7	0710	1	20	10.9	190	Partly Cloudy		Medium	Medium		40	20	2				70	1	
7	0710	2	13	11.7	210	Overcast		Medium	Low		130	10					85	5	
7	0710	3	20	12.2	190	Partly Cloudy			Low		125	20					80		

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
7	710	4	15	11.6	190	Clear			Low		n/a	50					50		
7	710	5	15	11.2	170	Mostly Cloudy		Medium	Low		120		1				75		
7	710	6	5	10.6	200	Overcast		High	Medium		n/a	50							
7	709	1	15	10.9	200	Partly Cloudy		Medium	Medium		40	40				15	10		
7	709	2	20	12.8	190			Medium	Medium		90	50					50		
7	709	3	20	12.1	200	Overcast			Medium		130	80	10			10			
7	709	4	15	11.0	190	Clear		High	Medium		100	95	3			2			
7	709	5	17	10.7	190	Mostly Cloudy		High	Medium		100	85	15						
7	709	6	5	10.2	220	Overcast		High	Medium		120	50					50		
7	708	1	13	10.7	210	Partly Cloudy		high	Medium		40	20	5			10		20	
7	708	2		12.8	190	Partly Cloudy		high	Medium		n/a	88	5	2				5	
7	708	3	20	12.2	190	Mostly Cloudy		high	Medium		100	40	10			10	5	10	
7	708	4	10	10.9	200	Clear			Medium		110	20	5					50	
7	708	5	15	11.1	180	Mostly Cloudy		Medium	Medium		90	65	5					30	
7	708	6		10.3	220				Low		100	90	10						
7	707	1	22	11.1	200	Partly Cloudy		high	Medium		40	35					50	5	
7	707	2	15	11.6	210	Mostly Cloudy		high			140	20					70	10	
7	707	3	20	12.1	210	Partly Cloudy	stable at 13	High	Low		120	50				5	40	5	
7	707	4	18	11.1	180	Mostly Cloudy			Medium		120	70	5			5			
7	707	5	15	11.1	170	Mostly Cloudy		High	Medium		120	45					45	10	
7	707	6	5	10.6		Overcast		High			n/a	60	5			5			
7	706	1	21			Partly Cloudy		Medium	Medium		40	30	5				30	30	
7	706	2		11.8	140	Overcast		Medium	Low		140	65	25					10	
7	706	3	16	12.2	210	Partly Cloudy		High	Low		110	30	5				35	30	
7	706	4	18	11.1		Mostly Cloudy		High	Medium		n/a	50	20			5		5	
7	706	5	16	11.0	200	Mostly Cloudy		High	Low		80	30	15				20	25	
7	706	6	5	10.3	220				Medium		80	30	15			5		15	
7	705	1	22	11.7	200	Partly Cloudy		high	Medium		50	25	5				30	30	
7	705	2		13.0	210	Clear		Medium	Medium		70	75	15					10	
7	705	3	16	12.1	210	Partly Cloudy	stable at 13	Medium	Medium		110	20	5	2		3	20	50	
7	705	4	16	11.2	190	Clear			Medium		80	95	2					3	
7	705	5	16	11.0	200	Mostly Cloudy			Medium		80	90	10						
7	705	6	6	10.3	220	Overcast			Medium		80	30	10				30	30	
7	704	1	20	10.9	190	Partly Cloudy		Medium	Medium		40	20	5				60		
7	704	2		12.6	190	Clear		low	Medium		85	80	10					10	
7	704	3	25	12.1	200	Partly Cloudy		High	Medium		130	70	5			5	10		
7	704	4	16	11.3	190	Clear		Medium	Medium		140	83	2	5			5	5	
7	704	5	16	11.2	170	Mostly Cloudy		High	High		115	95	5						
7	704	6	6	10.5	210	Overcast		High	Medium		90	50	1				49		
7	703	1	16	11.3	200				Medium		40	30	10			15	10		
7	703	2	20	12.9	190	Partly Cloudy		Medium	Medium		90	75	1				24		
7	703	3	20	12.2	200	Mostly Cloudy		High	Medium		130	20	5	65			10		
7	703	4	16	11.4	190	Clear			Medium		140	45			2	3		10	
7	703	5	16	11.3	180				Low		100	85	3			12			
7	703	6	6	10.5	210	Overcast	increase to	High	Medium		120	35					30	5	
7	702	1	15	10.9	210	Partly Cloudy		high	Medium		30	20	5				30		
7	702	2	20	12.7		Partly Cloudy		Medium	Medium		120	70					30		
7	702	3	20			Overcast		high	Medium		n/a	85	5				10		

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Continued.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
7	0702	4	13	10.8	190	Clear		Medium	Medium		100	98	2						
7	0702	5	15	10.7	180	Mostly Cloudy		High	Medium		100	95	5						
7	0702	6	5	10.1	210	Overcast		High			120	80	10				10		
7	0701	1	22	12.9	200	Partly Cloudy		high	Medium		45						50		
7	0701	2	18	12.5	190	Partly Cloudy		Medium	Medium		100	49	1			1	49		
7	0701	3	16	12.1	190	Clear	stable at 13		Low		110		1				99		
7	0701	4	4	10.5	220	Clear		Medium	Medium		140	90					5	5	
7	0701	5	13	11.0	190	Partly Cloudy		High	Low		90	20					80		
7	0701	6	6	10.3	200	Mostly Cloudy	increase to	High	Low		100	5					90	5	
9	09SC061	1	15	13.1	210	Mostly Cloudy	low	High	Low		85	5	1				5	5	
9	09SC061	2	13	12.7	210	Clear	stable	High	Low		130	20	2						
9	09SC061	3	10	12.2	210	Overcast	low	High	Medium		110	10	5					5	
9	09SC061	4	14	11.3	180	Overcast		High	Low		140		1					30	
9	09SC061	5	7	10.8	210	Fog		High	Low		100		1		1		59	20	
9	09SC061	6	7	9.6	210	Clear		High	Low		110	10					30	10	
9	09SC053	1	15	12.6	180	Partly Cloudy	water down	High	Low		95	5					1	15	
9	09SC053	2	20	14.4	210			High	Low		120		5					20	
9	09SC053	3	13	12.8	180	Partly Cloudy	low	Medium	Low		95	10	2					10	
9	09SC053	4	16		180	Partly Cloudy		High	Low		110		2		1				
9	09SC053	5	17	11.8	190	Overcast		High	Low		120	1			1		5	5	
9	09SC053	6	2	8.6	240	Clear		High	Low		135		5		10	5			
9	0914	1	15	13.1	210	Mostly Cloudy	low	Medium	Medium		80	30		5			30	2	
9	0914	2	14	12.9	210	Clear	stable/low	Medium	Medium		130	20							
9	0914	3	11	12.1	210	Mostly Cloudy		High	Medium		n/a	10						15	
9	0914	4	14	11.3	180	Overcast		Medium	Medium		140	10					5	5	
9	0914	5	10	11.0	200	Overcast		High	Medium		100	50						50	
9	0914	6	8	9.7	200				Medium		110	50			5	20			
9	0913	1	15	13.1	210	Mostly Cloudy	low	Medium	Medium		80	1		1			1	10	
9	0913	2	12	12.7	210	Clear	stable/low	High	Medium		130	5	2					10	
9	0913	3	10	12.1	210	Mostly Cloudy		High	Medium		110	10	5					30	
9	0913	4	14		180	Overcast		High	Medium		140		1					70	
9	0913	5	10	10.6	200						100	50	10			5		10	
9	0913	6	5	9.7	200	Clear		High	High		110	20	5					60	
9	0912	1	17	13.1	210	Partly Cloudy	low	Medium	Medium		80	10						5	
9	0912	2	16	13.1	210	Clear	stable/low	Medium	Medium		130	20					10	20	
9	0912	3	14	12.1	210	Partly Cloudy		High	Medium		110	10	5					10	
9	0912	4	14	11.4	180	Overcast		Medium	Medium		140	5						20	
9	0912	5	10	11.0	200				Medium		100	40					50	10	
9	0912	6	8	9.9	200	Clear		High	Medium		110	100							
9	0911	1	15	13.1	210	Mostly Cloudy	low	High	Low		80	5					5	5	
9	0911	2	8	12.6	200	Clear	stable	High	Low		130	5					5		
9	0911	3	14	13.0	180	Partly Cloudy	low	Medium	Medium		95	15					5		
9	0911	4	14	11.3	180	Overcast		High	Medium		140	5						20	
9	0911	5	11	11.1	200						120	79	1				10	10	
9	0911	6	8	9.8	200	Clear		High	Medium		110	55					35	10	
9	0910	1	19	13.6	180	Partly Cloudy	low	Medium	Low		95	5						15	
9	0910	2	21	13.3	210	Partly Cloudy	decreasing	High	Low		120	5						25	
9	0910	3	13	12.7	180	Partly Cloudy	low	Low	Low		50							25	

[a] See Appendix A, Figures A1 to A3 for sample site locations.

[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.

[c] Field Observation.

[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.

[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

Continued...

Table D3 Concluded.

Section	Site[a]	Session	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µS /cm)	Cloud Cover[b]	Estimated Flow Category[c]	Water Clarity	Instream Velocity[d]	Water Clarity[e]	Secchi Bar Depth (m)	Cover Types (%)							
												Substrate Interstices	Woody Debris	Turbulence	Aquatic Vegetation	Terrestrial Vegetation	Shallow Water	Deep Water	Other Cover
9	910	4	12	11.5	180	Mostly Cloudy		Medium	Medium		140.0	2	2					10	
9	910	5	15	11.3	190	Overcast		High	Low		120.0	50	1				39	10	
9	910	6	5	9.4	200	Clear			Low		110.0	10	5				25	10	
9	909	1	20	13.9	180	Partly Cloudy	low	High	Low		95.0	5					5	2	
9	909	2	21	13.3	210	Partly Cloudy	decreasing	Medium	Low		120.0	10						3	
9	909	3	20	13.8	190	Partly Cloudy		High	Medium		40.0	10						1	
9	909	4	12		180	Overcast		High	Medium		140.0							5	
9	909	5	7	10.8	200	Overcast		High			130.0	98				2			
9	909	6	8	9.7	200	Clear		High	Medium		110.0	20					80		
9	908	1	20	13.8	180	Partly Cloudy	low	Medium	Low		95.0	10					10	1	
9	908	2	21	13.6	210	Partly Cloudy	lower	Medium	Medium		120.0	20						1	
9	908	3	20	13.7	190	Partly Cloudy		High	Medium		90.0	10						1	
9	908	4	13	11.2	180	Overcast		High	Medium		140.0							30	
9	908	5	12	11.3	190	Clear		High	Low		120.0	50	1				49		
9	908	6	8	9.7	200	Clear		High	Medium		110.0	30					70		
9	907	1	19	14.0	180	Partly Cloudy	low	Medium	Medium		95.0	15					5		
9	907	2	21	13.4	210	Partly Cloudy	decreasing	High	Low		120.0	15					5	5	
9	907	3	13	13.1		Partly Cloudy	low		Medium		50.0	30						1	
9	907	4	14	11.2	180	Overcast		High	Medium		140.0	5						15	
9	907	5	15	11.3	190	Partly Cloudy		High	Low		120.0	50					45	5	
9	907	6	5	9.8	200	Clear		High	Medium		110.0	50					50		
9	906	1	15	13.1	180	Partly Cloudy	low	Medium	Medium		95.0	10					10	5	
9	906	2	20	13.1	210	Partly Cloudy	decreasing	High	Low		120.0	2					10		
9	906	3	13	13.1	180	Partly Cloudy	low	Low	Medium		50.0	25		25					
9	906	4	12	11.5	180	Overcast		High	Medium		140.0								
9	906	5	15	11.4	190	Overcast		High	Low		110.0	20					80		
9	906	6	5	9.8	200	Clear			Low		110.0						100		
9	905	1	17	13.2	180	Partly Cloudy	low	Medium	Medium		95.0	10					10	10	
9	905	2	20	13.3	210	Partly Cloudy	lower	Medium	Low		120.0	5					2	30	
9	905	3	13	12.6	180	Partly Cloudy	low	Low	Medium		95.0	5		20					
9	905	4	10		200	Overcast		Medium	Medium		140.0	5	2					25	
9	905	5	17	11.4	190	Overcast		High	Medium		110.0	60					30	10	
9	905	6	5	12.7	210	Clear		High	Medium		110.0	60	2						
9	904	1	15	12.6	180	Partly Cloudy	low	Medium	Low		95.0	20					20	1	
9	904	2	17	12.7	210	Partly Cloudy	stable	High	Low		120.0	10					10	10	
9	904	3	12	12.5	180	Partly Cloudy	low	Medium	Medium		95.0	40						5	
9	904	4	18	11.9	180	Partly Cloudy		High	Medium		110.0					1		2	
9	904	5	10	11.4	190	Overcast		High	Low		120.0	45					50	5	
9	904	6	-1	9.3	240	Clear		High	Medium		110.0	88				2		10	
9	903	1	13	12.4	180	Partly Cloudy	lower than y	Medium	Low		95.0	10					5	2	
9	903	2	16	12.8	210	Clear	stable	High	Low		120.0	10							
9	903	3	10	12.4	180	Partly Cloudy	low	Medium	Medium		95.0	10					10		
9	903	4	20	12.2	180	Clear		High	Medium		110.0	50	1						
9	903	5	17	11.3	190	Partly Cloudy		High	Low		120.0	50					50		
9	903	6	-2	9.3	240	Clear		High	Medium		110.0	100							
9	902	1	18	13.0	190	Mostly Cloudy	high	Medium	Medium		50.0	1	1	1				5	
9	902	2	10	12.3	210	Mostly Cloudy	stable	Medium	Low		120.0	2	1	2			2	15	
9	902	3	12	12.5	180	Partly Cloudy	low	Medium	Medium		95.0	10						5	

[a] See Appendix A, Figures A1 to A3 for sample site locations.
[b] Clear = <10%; Partly Cloudy = 10-50%; Mostly Cloudy = 50-90%; Overcast = >90%.
[c] Field Observation.
[d] High = >1.0 m/s; Medium = 0.5-1.0 m/s; Low = <0.5 m/s.
[e] High = >3.0 m; Medium = 1.0-3.0 m; Low = <1.0 m.

APPENDIX E

Catch and Effort Data

Table E1 Number of fish caught during boat electroshocking surveys and their frequency of occurrence in sections 1, 3, and 5 of Peace River, 2002 to 2017.

	2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017	
Species	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]	n[a]	%[b]
Sportfish		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Arctic Grayling	13	<1	54	1	271	2	280	2	93	1	344	3	202	2	116	1	59	1	135	1	43	<1	27	<1	10	<1	48	1	85	1	80	1
Bull Trout	105	2	91	2	122	1	175	2	76	1	156	1	170	1	144	1	97	1	205	1	186	2	181	2	144	2	169	2	205	3	180	3
Burbot					5	<1	2	<1	5	<1	4	<1			2	<1	2	<1			3	<1	1	<1	1	<1			3	<1	2	<1
Kokanee	24	<1	5	<1	18	<1	43	<1	16	<1	154	1	49	<1	28	<1	25	<1	73	1	99	1	27	<1	20	<1	20	<1	21	<1	51	1
Lake Trout					1	<1	1	<1			2	<1			3	<1	1	<1	2	<1	4	<1	5	<1	2	<1	3	<1	1	<1	1	<1
Lake Whitefish	2	<1	2	<1	13	<1			1	<1	4	<1	1	<1	3	<1			7	<1	3	<1					1	<1	3	<1		
Mountain Whitefish	5496	97	5686	96	10 418	95	10 660	95	6365	96	10 436	93	11 565	95	10 005	95	10 595	97	13 100	95	10 824	95	8429	96	7274	96	6731	95	7110	93	6006	92
Northern Pike					1	<1	4	<1	1	<1	7	<1	8	<1	8	<1	4	<1	11	<1	7	<1	5	<1	4	<1			4	<1	11	<1
Rainbow Trout	50	1	63	1	107	1	94	1	39	1	102	1	169	1	165	2	131	1	171	1	139	1	67	1	106	1	105	1	176	2	115	2
Walleye	3	<1			6	<1	5	<1			17	<1	58	<1	17	<1	3	<1	49	<1	48	<1	43	<1	19	<1	12	<1	34	<1	61	1
Yellow Perch											1	<1															8	<1	2	<1	2	<1
Sportfish subtotal	5693	91	5901	93	10 962	92	11 264	91	6596	96	11 227	93	12 222	92	10 491	93	10 917	96	13 753	95	11 356	91	8785	89	7580	87	7097	70	7644	74	6509	70
Non-sportfish		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Flathead Chub																			1	<1											1	<1
Lake Chub																									4	<1	1	<1	2	<1	3	<1
Northern Pikeminnow	20	4	25	5	57	6	34	3	6	2	24	3	28	2	16	2	13	3	21	3	41	4	37	4	39	4	102	3	122	4	78	3
Peamouth	3	1																			1	<1	1	<1							4	<1
Redside Shiner	2	<1																							1	<1	15	1	71	3	49	2
Sculpin spp.[d]	2	<1																							78	7	44	1	53	2	42	2
Spottail Shiner																											5	<1	4	<1	2	<1
Sucker spp.[d]	533	95	435	95	879	94	1088	97	238	98	835	97	1103	98	787	98	500	97	723	97	1118	96	1011	96	963	89	2825	94	2481	91	2593	93
Non-sportfish subtotal	560	9	460	7	936	8	1122	9	244	4	859	7	1131	8	803	7	513	4	745	5	1160	9	1049	11	1085	13	2992	30	2733	26	2772	30
All species	6253		6361		11 898		12 386		6840		12 086		13 353		11 294		11 430		14 498		12 516		9834		8667		10 092		10 384		9289	

[a] Includes fish captured and identified to species; does not include fish recaptured within the year.

[b] Percent composition of sportfish or non-sportfish catch.

[c] Species combined for table or not identified to species.

Table E2 Number of fish caught during boat electroshocking surveys and their frequency of occurrence in sections 6, 7, and 9 of Peace River, 2017.

	2015		2016		2017	
Species	*n*[a]	%[b]	*n*[a]	%[b]	*n*[a]	%[b]
Sportfish		*0*		*0*		*0*
Arctic Grayling	7	*<1*	26	*1*	7	*<1*
Bull Trout	88	*3*	90	*3*	57	*2*
Burbot	3	*<1*	34	*1*	4	*<1*
Goldeye	1	*<1*	8	*<1*	3	*<1*
Kokanee	1	*<1*	2	*<1*	5	*<1*
Lake Trout	1	*<1*				
Mountain Whitefish	3250	*93*	2766	*88*	2205	*84*
Northern Pike	13	*<1*	12	*<1*	26	*1*
Rainbow Trout	24	*1*	10	*<1*	7	*<1*
Walleye	103	*3*	197	*6*	310	*12*
Yellow Perch	3	*<1*			2	*<1*
Sportfish subtotal	3494	*44*	3145	*48*	2626	*40*
Non-sportfish		*0*		*0*		*0*
Finescale Dace	1	*<1*				
Flathead Chub	3	*<1*	18	*1*	34	*1*
Lake Chub	41	*1*	26	*1*	62	*2*
Northern Pikeminnow	151	*3*	88	*3*	117	*3*
Peamouth					1	*<1*
Redside Shiner	137	*3*	95	*3*	133	*3*
Sculpin spp.[d]	6	*<1*	55	*2*	9	*<1*
Spottail Shiner	10	*<1*	9	*<1*	8	*<1*
Sucker spp.[d]	4074	*92*	3036	*91*	3473	*89*
Troutperch	5	*<1*	9	*<1*	26	*1*
Non-sportfish subtotal	4428	*56*	3336	*51*	3863	*59*
All species	7931		6490		6525	

[a] Includes fish captured and identified to species; does not include fish recaptured within the year.
[b] Percent composition of sportfish or non-sportfish catch.
[c] Species combined for table or not identified to species.

Table E3 Summary of boat electroshocking sportfish catch (includes fish captured and observed and identified to species) and catch-per-unit-effort (CPUE = no. fish/km/hour) in the Peace River, 21 August to 04 October 2017.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																									
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 1	1	00101	21-Aug-17	226	0.60															203	5389.38									203	5389.38
		00102	21-Aug-17	340	0.98															183	1987.33									183	1987.33
		00103	21-Aug-17	574	1.19															34	179.95									34	179.95
		00104	21-Aug-17	374	0.50			1	19.25					1	19.25					47	904.81									49	943.32
		00105	21-Aug-17	402	1.10															35	284.94									35	284.94
		00107	21-Aug-17	379	0.55			1	17.27					3	51.81					15	259.05									19	328.14
		00108	22-Aug-17	532	0.85			1	7.96											175	1393.19									176	1401.15
		00109	22-Aug-17	534	0.98	1	6.91	2	13.83											102	705.27									105	726.02
		00110	22-Aug-17	578	0.65			1	9.58					2	19.16					53	507.85			3	28.75					59	565.34
		00111	22-Aug-17	431	0.80			3	31.32											62	647.33			4	41.76					69	720.42
		00112	22-Aug-17	617	1.07	1	5.45	1	5.45											90	490.77			3	16.36					95	518.03
		00113	22-Aug-17	408	0.75															156	1835.29									156	1835.29
		00114	23-Aug-17	491	0.95			1	7.72											57	439.92									58	447.64
		00116	23-Aug-17	420	0.98			1	8.7											73	635.24									74	643.94
		00119	21-Aug-17	381	0.75			2	25.2					8	100.79					45	566.93									55	692.91
	Session Summary			**446**	**12.70**	**2**	**1.27**	**14**	**8.9**	**0**	**0**	**0**	**0**	**14**	**8.9**	**0**	**0**	**0**	**0**	**1330**	**845.31**	**0**	**0**	**10**	**6.36**	**0**	**0**	**0**	**0**	**1370**	**870.73**
Section 1	2	00101	30-Aug-17	221	0.60															69	1873.3									69	1873.3
		00102	30-Aug-17	302	0.98															80	978.09									80	978.09
		00103	29-Aug-17	590	1.20			3	15.25											11	55.93									14	71.19
		00104	29-Aug-17	360	0.50									1	20					52	1040			1	20					54	1080
		00105	29-Aug-17	440	1.10			5	37.19											32	238.02									37	275.21
		00107	30-Aug-17	449	0.55			1	14.58					28	408.18					13	189.51			4	58.31					46	670.58
		00108	30-Aug-17	524	0.85			1	8.08											27	218.23									28	226.31
		00109	30-Aug-17	515	0.98			2	14.34											50	358.48									52	372.82
		00110	30-Aug-17	590	0.65									3	28.16					37	347.33			2	18.77					42	394.26
		00111	30-Aug-17	566	1.00															60	381.63									60	381.63
		00112	30-Aug-17	551	1.07	1	6.11	1	6.11					2	12.21					44	268.67			2	12.21					50	305.31
		00113	30-Aug-17	383	0.75															47	589.03			1	12.53					48	601.57
		00114	30-Aug-17	516	0.95			2	14.69											59	433.29									61	447.98
		00116	30-Aug-17	442	0.98			1	8.27											61	504.4									62	512.67
		00119	30-Aug-17	522	0.75	2	18.39	2	18.39					5	45.98					34	312.64			14	128.74					57	524.14
	Session Summary			**465**	**12.90**	**3**	**1.8**	**18**	**10.8**	**0**	**0**	**0**	**0**	**39**	**23.41**	**0**	**0**	**0**	**0**	**676**	**405.7**	**0**	**0**	**24**	**14.4**	**0**	**0**	**0**	**0**	**760**	**456.11**
Section 1	3	00101	05-Sep-17	253	0.60															161	3818.18									161	3818.18
		00102	05-Sep-17	332	0.98															79	878.59									79	878.59
		00103	05-Sep-17	576	1.20			1	5.21											28	145.83									29	151.04
		00104	05-Sep-17	352	0.50			1	20.45					1	20.45					19	388.64									21	429.55
		00105	05-Sep-17	443	1.10			5	36.94											22	162.53			2	14.78					29	214.24
		00107	05-Sep-17	393	0.55									3	49.97			1	16.66	2	33.31			5	83.28					11	183.21
		00108	06-Sep-17	656	0.85															48	309.9			1	6.46					49	316.36
		00109	06-Sep-17	659	0.98	1	5.6							1	5.6					79	442.63									81	453.83
		00110	05-Sep-17	593	0.64									2	18.97					3	28.46									5	47.43
		00111	06-Sep-17	758	1.00															34	161.48			2	9.5					36	170.98
		00112	06-Sep-17	692	1.07															29	141			9	43.76					38	184.76
		00113	06-Sep-17	477	0.75	2	20.13	2	20.13											55	553.46			2	20.13					61	613.84
		00114	06-Sep-17	641	0.95															51	301.5			3	17.74					54	319.24
		00116	06-Sep-17	572	0.98			1	6.39											46	293.92									47	300.31
		00119	05-Sep-17	474	0.75			2	20.25					2	20.25					25	253.16			4	40.51					33	334.18
	Session Summary			**525**	**12.90**	**3**	**1.59**	**12**	**6.38**	**0**	**0**	**0**	**0**	**9**	**4.78**	**0**	**0**	**1**	**0.53**	**681**	**361.99**	**0**	**0**	**28**	**14.88**	**0**	**0**	**0**	**0**	**734**	**390.17**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																							
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 1	4	00101	12-Sep-17	336	0.60															305	5446.43									305	5446.43
		00102	12-Sep-17	445	0.98			1	8.3											234	1941.57									235	1949.87
		00103	12-Sep-17	745	1.20			1	4.03					5	20.13					86	346.31			1	4.03					93	374.5
		00104	12-Sep-17	406	0.50									3	53.2					60	1064.04									63	1117.24
		00105	12-Sep-17	492	1.10			1	6.65											32	212.86									33	219.51
		00107	13-Sep-17	441	0.55									1	14.84					17	252.32			2	29.68					20	296.85
		00108	12-Sep-17	725	0.85	1	5.84	2	11.68					1	5.84					51	297.93									55	321.3
		00109	12-Sep-17	725	0.98	1	5.09	3	15.28					1	5.09	1	5.09			215	1094.96									221	1125.52
		00110	13-Sep-17	641	0.65									5	43.2					27	233.29			1	8.64					33	285.13
		00111	13-Sep-17	639	1.00	1	5.63	1	5.63					2	11.27					72	405.63			5	28.17					81	456.34
		00112	13-Sep-17	646	1.07			1	5.21											101	526.03			5	26.04					107	557.28
		00113	13-Sep-17	388	0.75			2	24.74											39	482.47									41	507.22
		00114	13-Sep-17	545	0.95															109	757.89			4	27.81					113	785.71
		00116	13-Sep-17	465	0.98															64	503.03									64	503.03
		00119	12-Sep-17	719	0.75			1	6.68					1	6.68					62	413.91			3	20.03					67	447.29
	Session Summary			**557**	**12.90**	**3**	**1.5**	**13**	**6.51**	**0**	**0**	**0**	**0**	**19**	**9.52**	**1**	**0.5**	**0**	**0**	**1474**	**738.51**	**0**	**0**	**21**	**10.52**	**0**	**0**	**0**	**0**	**1531**	**767.07**
Section 1	5	00101	19-Sep-17	229	0.60															100	2620.09									100	2620.09
		00102	19-Sep-17	304	0.98															109	1323.89									109	1323.89
		00103	19-Sep-17	614	1.20									1	4.89					26	127.04			1	4.89					28	136.81
		00104	19-Sep-17	272	0.50															20	529.41									20	529.41
		00105	19-Sep-17	403	1.10															34	276.11									34	276.11
		00107	19-Sep-17	399	0.55			2	32.81					2	32.81					23	377.31			1	16.4					28	459.33
		00108	19-Sep-17	498	0.85															37	314.67					2	17.01			39	331.68
		00109	19-Sep-17	505	0.98			1	7.31					1	7.31					55	402.13									57	416.76
		00110	19-Sep-17	553	0.65			1	10.02											40	400.61			2	20.03					43	430.66
		00111	19-Sep-17	571	1.00			2	12.61											34	214.36			2	12.61					38	239.58
		00112	19-Sep-17	564	1.07									1	5.97					58	345.99			2	11.93					61	363.89
		00113	19-Sep-17	339	0.75															30	424.78									30	424.78
		00114	19-Sep-17	531	0.95															64	456.74			1	7.14					65	463.87
		00116	19-Sep-17	474	0.98															46	354.69									46	354.69
		00119	19-Sep-17	441	0.75			1	10.88											31	337.41									32	348.3
	Session Summary			**446**	**12.90**	**0**	**0**	**7**	**4.38**	**0**	**0**	**0**	**0**	**5**	**3.13**	**0**	**0**	**0**	**0**	**707**	**442.38**	**0**	**0**	**9**	**5.63**	**2**	**1.25**	**0**	**0**	**730**	**456.77**
Section 1	6	00101	29-Sep-17	311	0.60			1	19.29											79	1524.12			1	19.29					81	1562.7
		00102	29-Sep-17	362	0.98															95	968.98									95	968.98
		00103	29-Sep-17	736	1.20			1	4.08											35	142.66									36	146.74
		00104	29-Sep-17	380	0.50									1	18.95					42	795.79									43	814.74
		00105	29-Sep-17	505	1.10															38	246.26									38	246.26
		00107	29-Sep-17	441	0.55									1	14.84					32	474.95			2	29.68					35	519.48
		00108	29-Sep-17	719	0.85			2	11.78											40	235.62									42	247.4
		00109	29-Sep-17	591	0.98			1	6.25											65	406.09									66	412.34
		00110	29-Sep-17	565	0.65			2	19.61					2	19.61					47	460.72			2	19.61					53	519.54
		00111	29-Sep-17	621	1.00			2	11.59											51	295.65			1	5.8					54	313.04
		00112	29-Sep-17	660	1.07	1	5.1	2	10.2					2	10.2					100	509.77			1	5.1					106	540.36
		00113	29-Sep-17	431	0.75															51	567.98									51	567.98
		00114	29-Sep-17	616	0.95															108	664.39									108	664.39
		00116	29-Sep-17	592	0.98			2	12.35											105	648.24									107	660.58
		00119	29-Sep-17	588	0.75			1	8.16											44	359.18			9	73.47					54	440.82
	Session Summary			**541**	**12.90**	**1**	**0.52**	**14**	**7.22**	**0**	**0**	**0**	**0**	**6**	**3.1**	**0**	**0**	**0**	**0**	**932**	**480.76**	**0**	**0**	**16**	**8.25**	**0**	**0**	**0**	**0**	**969**	**499.85**
Section Total All Samples				**44702**	**77.20**	**12**	**0**	**78**	**0**	**0**	**0**	**0**	**0**	**92**	**0**	**1**	**0**	**1**	**0**	**5800**	**0**	**0**	**0**	**108**	**0**	**2**	**0**	**0**	**0**	**6094**	**0**
Section Average All Samples				**497**	**0.86**	**0**	**1.13**	**1**	**7.32**	**0**	**0**	**0**	**0**	**1**	**8.63**	**0**	**0.09**	**0**	**0.09**	**64**	**544.16**	**0**	**0**	**1**	**10.13**	**0**	**0.19**	**0**	**0**	**68**	**571.75**
Section Standard Error of Mean						**0.04**	**0.34**	**0.11**	**0.97**	**0**	**0**	**0**	**0**	**0.34**	**4.76**	**0.01**	**0.06**	**0.01**	**0.19**	**5.51**	**97.33**	**0**	**0**	**0.24**	**2.16**	**0.02**	**0.19**	**0**	**0**	**5.42**	**96.42**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h): Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 3	1	00301	24-Aug-17	1123	1.80	8	14.25	2	3.56					1	1.78					66	117.54			10	17.81					87	154.94
		00302	23-Aug-17	765	1.90	1	2.48													49	121.36									50	123.84
		00303	23-Aug-17	646	1.45			2	7.69											32	122.98									34	130.67
		00304	24-Aug-17	1131	1.35	1	2.36	1	2.36											186	438.55			2	4.72					190	447.98
		00305	23-Aug-17	757	1.55			1	3.07											71	217.84	2	6.14	1	3.07					75	230.11
		00306	25-Aug-17	772	1.00			2	9.33											63	293.78									65	303.11
		00307	25-Aug-17	600	0.95			3	18.95											229	1446.32									232	1465.26
		00308	27-Aug-17	732	1.35															94	342.44									94	342.44
		00309	25-Aug-17	545	0.95			1	6.95											126	876.1			1	6.95					128	890
		00310	25-Aug-17	754	1.20															45	179.05									45	179.05
		00311	25-Aug-17	782	1.25			2	7.37											56	206.24			1	3.68					59	217.29
		00312	25-Aug-17	714	1.17			4	17.24											43	185.3									47	202.54
		00314	24-Aug-17	906	0.98	2	8.15													31	126.34			2	8.15					35	142.64
		00315	24-Aug-17	1433	1.70	11	16.26	1	1.48											111	164.03					2	2.96			125	184.72
		00316	27-Aug-17	767	1.48			2	6.36											35	111.37			6	19.09					43	136.83
	Session Summary			**828**	**20.10**	**23**	**4.98**	**21**	**4.54**	**0**	**0**	**0**	**0**	**1**	**0.22**	**0**	**0**	**0**	**0**	**1237**	**267.58**	**2**	**0.43**	**23**	**4.98**	**2**	**0.43**	**0**	**0**	**1309**	**283.15**
Section 3	2	00301	01-Sep-17	1165	1.78	3	5.21	4	6.94											36	62.5			2	3.47	2	3.47			47	81.59
		00302	01-Sep-17	1006	1.90			1	1.88											74	139.37			1	1.88					76	143.14
		00303	01-Sep-17	734	1.45			2	6.77											29	98.09									31	104.86
		00304	01-Sep-17	696	1.35															8	30.65			1	3.83	1	3.83			10	38.31
		00305	01-Sep-17	1071	1.55	1	2.17	4	8.67					1	2.17					93	201.68	1	2.17							100	216.86
		00306	02-Sep-17	690	1.00			4	20.87											50	260.87									54	281.74
		00307	31-Aug-17	563	0.95															47	316.35									47	316.35
		00308	31-Aug-17	820	1.35			1	3.25											82	266.67									83	269.92
		00309	31-Aug-17	566	0.95			1	6.7											84	562.4			1	6.7					86	575.79
		00310	31-Aug-17	761	1.20															43	169.51									43	169.51
		00311	02-Sep-17	709	1.25			4	16.25											84	341.21					1	4.06			89	361.52
		00312	31-Aug-17	821	1.17			2	7.5											84	314.81					3	11.24			89	333.55
		00314	31-Aug-17	729	0.98															34	172.21			2	10.13					36	182.34
		00315	31-Aug-17	1218	1.70	4	6.95							1	1.74					34	59.11					2	3.48			41	71.28
		00316	31-Aug-17	761	1.48	7	22.45	2	6.41											72	230.92			1	3.21					82	262.99
	Session Summary			**821**	**20.10**	**15**	**3.27**	**25**	**5.45**	**0**	**0**	**0**	**0**	**2**	**0.44**	**0**	**0**	**0**	**0**	**854**	**186.3**	**1**	**0.22**	**8**	**1.75**	**9**	**1.96**	**0**	**0**	**914**	**199.39**
Section 3	3	00301	09-Sep-17	1297	1.80	2	3.08	2	3.08					4	6.17					39	60.14			6	9.25	3	4.63			56	86.35
		00302	07-Sep-17	863	1.90															57	125.14			1	2.2	1	2.2			59	129.54
		00303	07-Sep-17	821	1.45															50	151.2									50	151.2
		00304	09-Sep-17	838	1.35			2	6.36											66	210.02					1	3.18			69	219.57
		00305	07-Sep-17	857	1.55															119	322.51									119	322.51
		00306	07-Sep-17	694	1.00			3	15.56											51	264.55									54	280.12
		00307	08-Sep-17	735	0.95			1	5.16											46	237.16					1	5.16			48	247.48
		00308	08-Sep-17	883	1.35															61	184.22									61	184.22
		00309	08-Sep-17	700	0.95															54	292.33	1	5.41	1	5.41	1	5.41			57	308.57
		00310	08-Sep-17	861	1.20															57	198.61			1	3.48					58	202.09
		00311	07-Sep-17	732	1.25			1	3.93											86	338.36					1	3.93			88	346.23
		00312	07-Sep-17	775	1.17			3	11.91											53	210.42					2	7.94			58	230.27
		00314	08-Sep-17	735	0.98	1	5.02	2	10.05											23	115.54			2	10.05	1	5.02			29	145.68
		00315	08-Sep-17	1292	1.70			1	1.64											84	137.68	1	1.64	1	1.64					87	142.6
		00316	08-Sep-17	938	1.48	1	2.6	1	2.6											71	184.74			7	18.21					80	208.16
	Session Summary			**868**	**20.10**	**4**	**0.83**	**16**	**3.3**	**0**	**0**	**0**	**0**	**4**	**0.83**	**0**	**0**	**0**	**0**	**917**	**189.22**	**2**	**0.41**	**19**	**3.92**	**11**	**2.27**	**0**	**0**	**973**	**200.77**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h): Arctic Grayling No.	Arctic Grayling CPUE	Bull Trout No.	Bull Trout CPUE	Burbot No.	Burbot CPUE	Goldeye No.	Goldeye CPUE	Kokanee No.	Kokanee CPUE	Lake Trout No.	Lake Trout CPUE	Lake Whitefish No.	Lake Whitefish CPUE	Mountain Whitefish No.	Mountain Whitefish CPUE	Northern Pike No.	Northern Pike CPUE	Rainbow Trout No.	Rainbow Trout CPUE	Walleye No.	Walleye CPUE	Yellow Perch No.	Yellow Perch CPUE	All Species No.	All Species CPUE
Section 3	4	00301	16-Sep-17	1246	1.80	1	1.61													72	115.57			10	16.05					83	133.23
		00302	14-Sep-17	1058	1.90			2	3.58											200	358.17									202	361.76
		00303	14-Sep-17	899	1.45			1	2.76											103	284.45									104	287.22
		00304	16-Sep-17	1089	1.35	2	4.9	1	2.45											100	244.87			2	4.9	2	4.9			107	262.01
		00305	14-Sep-17	1004	1.55			1	2.31											161	372.45			1	2.31	2	4.63			165	381.7
		00306	14-Sep-17	714	1.00	1	5.04													49	247.06									50	252.1
		00307	15-Sep-17	680	0.95															16	89.16									16	89.16
		00308	15-Sep-17	767	1.35															46	159.93					1	3.48			47	163.41
		00309	14-Sep-17	670	0.95															90	509.03			1	5.66	1	5.66			92	520.35
		00310	15-Sep-17	822	1.20									1	3.65					63	229.93									64	233.58
		00311	14-Sep-17	808	1.25			3	10.69											104	370.69									107	381.39
		00312	15-Sep-17	875	1.17			1	3.52					3	10.55					37	130.11			1	3.52	2	7.03			44	154.73
		00314	17-Sep-17	697	0.96			1	5.41											14	75.72			1	5.41	1	5.41			17	91.94
		00315	15-Sep-17	1237	1.70	1	1.71													42	71.9			3	5.14					46	78.75
		00316	15-Sep-17	889	1.48	4	10.98	1	2.75					2	5.49					12	32.95			4	10.98					23	63.14
	Session Summary			**897**	**20.10**	**9**	**1.8**	**11**	**2.2**	**0**	**0**	**0**	**0**	**6**	**1.2**	**0**	**0**	**0**	**0**	**1109**	**221.43**	**0**	**0**	**23**	**4.59**	**9**	**1.8**	**0**	**0**	**1167**	**233.02**
Section 3	5	00301	21-Sep-17	1007	1.80	2	3.97	3	5.96											38	75.47			5	9.93					48	95.33
		00302	20-Sep-17	973	1.90			1	1.95											59	114.89									60	116.84
		00303	20-Sep-17	725	1.45			2	6.85											104	356.15									106	363
		00304	21-Sep-17	846	1.35															69	217.49									69	217.49
		00305	20-Sep-17	873	1.55			2	5.32											134	356.5			1	2.66					137	364.48
		00306	20-Sep-17	659	1.00															46	251.29									46	251.29
		00307	20-Sep-17	531	0.95															81	578.06									81	578.06
		00308	20-Sep-17	723	1.35			1	3.69											89	328.26									90	331.95
		00309	20-Sep-17	655	0.95	1	5.79													125	723.18					2	11.57			128	740.54
		00310	20-Sep-17	832	1.20			2	7.21											140	504.81									142	512.02
		00311	20-Sep-17	701	1.25															36	147.9									36	147.9
		00312	20-Sep-17	754	1.17															80	326.46					1	4.08			81	330.54
		00314	21-Sep-17	647	0.98															31	176.91									31	176.91
		00315	21-Sep-17	1194	1.66															58	105.35			3	5.45	1	1.82			62	112.61
		00316	21-Sep-17	1132	1.48	7	15.09													60	129.36			8	17.25					75	161.71
	Session Summary			**817**	**20.00**	**10**	**2.2**	**11**	**2.42**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1150**	**253.37**	**0**	**0**	**17**	**3.75**	**4**	**0.88**	**0**	**0**	**1192**	**262.62**
Section 3	6	00301	30-Sep-17	1091	1.80			2	3.67											60	109.99									62	113.66
		00302	30-Sep-17	945	1.90	1	2.01	2	4.01											100	200.5									103	206.52
		00303	30-Sep-17	754	1.45															70	230.49					1	3.29			71	233.79
		00304	30-Sep-17	821	1.35			1	3.25											71	230.61					3	9.74			75	243.61
		00305	30-Sep-17	976	1.55			2	4.76											122	290.32									124	295.08
		00306	30-Sep-17	741	1.00			1	4.86											47	228.34									48	233.2
		00307	30-Sep-17	621	0.95			1	6.1											38	231.88									39	237.99
		00308	30-Sep-17	635	1.35															59	247.77									59	247.77
		00309	30-Sep-17	679	0.95															65	362.76					2	11.16			67	373.92
		00310	30-Sep-17	859	1.20			1	3.49											98	342.26									99	345.75
		00311	30-Sep-17	817	1.25															131	461.79									131	461.79
		00312	30-Sep-17	934	1.17			2	6.59											96	316.26									98	322.85
		00314	30-Sep-17	665	0.98															41	227.65			2	11.1	1	5.55			44	244.3
		00315	30-Sep-17	1149	1.70			2	3.69											47	86.62			3	5.53					52	95.84
		00316	30-Sep-17	817	1.48	1	2.99	2	5.97											58	173.27			3	8.96	1	2.99			65	194.18
	Session Summary			**834**	**20.10**	**2**	**0.43**	**16**	**3.44**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1103**	**236.87**	**0**	**0**	**8**	**1.72**	**8**	**1.72**	**0**	**0**	**1137**	**244.17**
Section Total All Samples				**75969**	**120.34**	**63**	**0**	**100**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**6370**	**0**	**5**	**0**	**98**	**0**	**43**	**0**	**0**	**0**	**6692**	**0**
Section Average All Samples				**844**	**1.34**	**1**	**2.23**	**1**	**3.54**	**0**	**0**	**0**	**0**	**0**	**0.46**	**0**	**0**	**0**	**0**	**71**	**225.78**	**0**	**0.18**	**1**	**3.47**	**0**	**1.52**	**0**	**0**	**74**	**237.2**
Section Standard Error of Mean						**0.2**	**0.42**	**0.12**	**0.49**	**0**	**0**	**0**	**0**	**0.06**	**0.16**	**0**	**0**	**0**	**0**	**4.22**	**20.38**	**0.03**	**0.09**	**0.22**	**0.5**	**0.09**	**0.3**	**0**	**0**	**4.2**	**20.35**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Arctic Grayling No.	Arctic Grayling CPUE	Bull Trout No.	Bull Trout CPUE	Burbot No.	Burbot CPUE	Goldeye No.	Goldeye CPUE	Kokanee No.	Kokanee CPUE	Lake Trout No.	Lake Trout CPUE	Lake Whitefish No.	Lake Whitefish CPUE	Mountain Whitefish No.	Mountain Whitefish CPUE	Northern Pike No.	Northern Pike CPUE	Rainbow Trout No.	Rainbow Trout CPUE	Walleye No.	Walleye CPUE	Yellow Perch No.	Yellow Perch CPUE	All Species No.	All Species CPUE
						Number Caught (CPUE = no. fish/km/h)																									
Section 5	1	00502	26-Aug-17	640	0.93			1	6.05											33	199.6					1	6.05			35	211.69
		00505	26-Aug-17	960	1.00	1	3.75	2	7.5											4	15			3	11.25	1	3.75			11	41.25
		00506	26-Aug-17	661	1.00															5	27.23									5	27.23
		00507	26-Aug-17	501	0.78			1	9.21											13	119.76	1	9.21							15	138.19
		00508	28-Aug-17	723	0.92	2	10.77													70	376.81	2	10.77			1	5.38			75	403.72
		00509	26-Aug-17	492	0.98					1	7.5									36	270.17									37	277.67
		00510	28-Aug-17	778	1.13	1	4.09													44	180.18			1	4.09	2	8.19			48	196.56
		00511	28-Aug-17	529	0.72			2	18.9					1	9.45					10	94.52									13	122.87
		00512	26-Aug-17	575	1.28			1	4.89											111	542.93					1	4.89			113	552.72
		00513	28-Aug-17	536	0.77	1	8.72													18	157.01					1	8.72			20	174.45
		00514	28-Aug-17	451	0.56															26	370.61	2	28.51							28	399.11
		00515	28-Aug-17	583	0.97			2	12.73											21	133.68					1	6.37			24	152.78
		00516	28-Aug-17	441	0.80															18	183.67			1	10.2					19	193.88
		00517	26-Aug-17	514	0.70															13	130.07									13	130.07
	Session Summary			**599**	**12.50**	**5**	**2.4**	**9**	**4.33**	**1**	**0.48**	**0**	**0**	**1**	**0.48**	**0**	**0**	**0**	**0**	**422**	**202.9**	**5**	**2.4**	**5**	**2.4**	**8**	**3.85**	**0**	**0**	**456**	**219.25**
Section 5	2	00502	03-Sep-17	485	0.92	1	8.07													56	451.82									57	459.88
		00505	03-Sep-17	1036	1.00			1	3.47											5	17.37			3	10.42					9	31.27
		00506	03-Sep-17	758	1.00			1	4.75											8	37.99									9	42.74
		00507	03-Sep-17	538	0.78															25	214.47									25	214.47
		00508	04-Sep-17	713	0.92	1	5.46	1	5.46											37	201.96	1	5.46	1	5.46					41	223.8
		00509	03-Sep-17	633	0.98			1	5.83											43	250.82					1	5.83			45	262.49
		00510	03-Sep-17	859	1.13	2	7.42													50	185.44	1	3.71			3	11.13			56	207.69
		00511	03-Sep-17	517	0.72															16	154.74									16	154.74
		00512	03-Sep-17	731	1.28															31	119.27					1	3.85			32	123.12
		00513	04-Sep-17	506	0.77			1	9.24											30	277.19			1	9.24					32	295.67
		00514	04-Sep-17	516	0.56															4	49.83									4	49.83
		00515	04-Sep-17	621	0.97															25	149.41									25	149.41
		00516	03-Sep-17	360	0.80															22	275									22	275
		00517	03-Sep-17	610	0.70			2	16.86											14	118.03									16	134.89
		005SC060	03-Sep-17	937	0.53																	1	7.25			1	7.25	2	14.5	4	29
	Session Summary			**655**	**13.10**	**4**	**1.68**	**7**	**2.94**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**366**	**153.56**	**3**	**1.26**	**5**	**2.1**	**6**	**2.52**	**2**	**0.84**	**393**	**164.89**
Section 5	3	00502	12-Sep-17	545	0.95			1	6.95											64	445	1	6.95							66	458.91
		00505	12-Sep-17	1145	1.00			1	3.14	1	3.14			1	3.14					13	40.87			7	22.01	1	3.14			24	75.46
		00506	12-Sep-17	743	1.00															20	96.9			1	4.85					21	101.75
		00507	12-Sep-17	542	0.78															34	289.53	12	102.19							46	391.71
		00508	12-Sep-17	785	0.92	1	4.96													46	228.06	1	4.96							48	237.98
		00509	12-Sep-17	605	0.98			1	6.1											95	579.78					1	6.1			97	591.99
		00510	10-Sep-17	716	1.13	2	8.9	3	13.35											62	275.87			2	8.9					69	307.02
		00511	10-Sep-17	463	0.70	1	11.11							1	11.11					27	299.91									29	322.12
		00512	10-Sep-17	614	1.28															28	128.26									28	128.26
		00513	12-Sep-17	527	0.77															40	354.86									40	354.86
		00514	12-Sep-17	470	0.56			1	13.68											38	519.76									39	533.43
		00515	10-Sep-17	751	0.97			1	4.94											52	256.98									53	261.92
		00516	12-Sep-17	480	0.80			3	28.12											23	215.62	1	9.38							27	253.12
		00517	12-Sep-17	589	0.70															27	235.75									27	235.75
		005SC060	12-Sep-17	812	0.53																							3	25.1	3	25.1
	Session Summary			**652**	**13.10**	**4**	**1.69**	**11**	**4.64**	**1**	**0.42**	**0**	**0**	**2**	**0.84**	**0**	**0**	**0**	**0**	**569**	**239.83**	**15**	**6.32**	**10**	**4.21**	**2**	**0.84**	**3**	**1.26**	**617**	**260.06**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																									
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 5	4	00502	17-Sep-17	561	0.95	2	13.51	1	6.75											70	472.84									73	493.1
		00505	17-Sep-17	1088	1.00			7	23.16											15	49.63			1	3.31					23	76.1
		00506	17-Sep-17	900	1.00			5	20											7	28									12	48
		00507	22-Sep-17	615	0.78	2	15.01													88	660.41									90	675.42
		00508	22-Sep-17	748	0.92															45	234.14									45	234.14
		00509	22-Sep-17	552	0.98															39	260.87									39	260.87
		00510	22-Sep-17	814	1.13			1	3.91											66	258.31			1	3.91					68	266.14
		00511	23-Sep-17	655	0.72	1	7.63	1	7.63											44	335.88									46	351.15
		00512	23-Sep-17	786	1.28															71	254.06	1	3.58			4	14.31			76	271.95
		00513	22-Sep-17	488	0.77									1	9.58					38	364.06									39	373.64
		00514	22-Sep-17	374	0.56	1	17.19													26	446.91					3	51.57			30	515.66
		00515	23-Sep-17	576	0.97															71	457.47					2	12.89			73	470.36
		00516	22-Sep-17	409	0.80															34	374.08									34	374.08
		00517	22-Sep-17	603	0.70															27	230.28									27	230.28
	Session Summary			**655**	**12.60**	**6**	**2.62**	**15**	**6.54**	**0**	**0**	**0**	**0**	**1**	**0.44**	**0**	**0**	**0**	**0**	**641**	**279.61**	**1**	**0.44**	**2**	**0.87**	**9**	**3.93**	**0**	**0**	**675**	**294.44**
Section 5	5	00502	27-Sep-17	496	0.95			4	30.56											79	603.57									83	634.13
		00505	27-Sep-17	1054	1.00			1	3.42											4	13.66									5	17.08
		00506	27-Sep-17	996	1.00			3	10.84	1	3.61									17	61.45			2	7.23					23	83.13
		00507	27-Sep-17	595	0.78	1	7.76							1	7.76					58	449.9									60	465.42
		00508	27-Sep-17	680	0.92															143	818.44									143	818.44
		00509	27-Sep-17	230	0.98			1	16.05											26	417.39									27	433.44
		00510	27-Sep-17	772	1.13															62	255.86	1	4.13							63	259.98
		00511	27-Sep-17	489	0.72			3	30.67											27	276.07									30	306.75
		00512	27-Sep-17	671	1.28															46	192.81					4	16.77			50	209.58
		00513	27-Sep-17	534	0.77															40	350.21									40	350.21
		00514	27-Sep-17	442	0.56	1	14.54													45	654.49									46	669.04
		00515	27-Sep-17	648	0.97			1	5.73											44	252					1	5.73			46	263.46
		00516	27-Sep-17	396	0.80															30	340.91									30	340.91
		00517	27-Sep-17	540	0.70	1	9.52	1	9.52											38	361.9					2	19.05			42	400
		0109OSA	23-Sep-17	388	0.73															17	216.07									17	216.07
		0109OSB	23-Sep-17	426	0.78															18	195.02									18	195.02
	Session Summary			**585**	**14.10**	**3**	**1.31**	**14**	**6.11**	**1**	**0.44**	**0**	**0**	**1**	**0.44**	**0**	**0**	**0**	**0**	**694**	**302.89**	**1**	**0.44**	**2**	**0.87**	**7**	**3.06**	**0**	**0**	**723**	**315.55**
Section 5	6	00502	03-Oct-17	503	0.95	1	7.53	1	7.53											84	632.83									86	647.9
		00505	03-Oct-17	1042	1.00			4	13.82											17	58.73			2	6.91	1	3.45			24	82.92
		00506	03-Oct-17	820	1.00			1	4.39	2	8.78									20	87.8									23	100.98
		00507	03-Oct-17	501	0.78	3	27.64	1	9.21											71	654.08									75	690.93
		00508	03-Oct-17	695	0.92															64	358.39									64	358.39
		00509	03-Oct-17	595	0.98															48	297.87									48	297.87
		00510	03-Oct-17	760	1.13			1	4.19											54	226.36					1	4.19			56	234.75
		00511	03-Oct-17	509	0.72															19	186.64									19	186.64
		00512	03-Oct-17	692	1.28															46	186.96					1	4.06			47	191.02
		00513	03-Oct-17	551	0.77			1	8.49											39	330.92									40	339.41
		00514	03-Oct-17	431	0.56															54	805.44	1	14.92							55	820.35
		00515	03-Oct-17	576	0.97			2	12.89											45	289.95									47	302.84
		00516	03-Oct-17	409	0.80	1	11													47	517.11									48	528.12
		00517	03-Oct-17	581	0.70															41	362.92									41	362.92
	Session Summary			**619**	**12.60**	**5**	**2.31**	**11**	**5.08**	**2**	**0.92**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**649**	**299.56**	**1**	**0.46**	**2**	**0.92**	**3**	**1.38**	**0**	**0**	**673**	**310.64**
Section Total All Samples				**55182**	**77.86**	**27**	**0**	**67**	**0**	**5**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**3341**	**0**	**26**	**0**	**26**	**0**	**35**	**0**	**5**	**0**	**3537**	**0**
Section Average All Samples				**627**	**0.88**	**0**	**1.99**	**1**	**4.94**	**0**	**0.37**	**0**	**0**	**0**	**0.37**	**0**	**0**	**0**	**0**	**38**	**246.38**	**0**	**1.92**	**0**	**1.92**	**0**	**2.58**	**0**	**0.37**	**40**	**260.83**
Section Standard Error of Mean						**0.07**	**0.53**	**0.13**	**0.78**	**0.03**	**0.14**	**0**	**0**	**0.02**	**0.22**	**0**	**0**	**0**	**0**	**2.74**	**19.72**	**0.14**	**1.22**	**0.1**	**0.37**	**0.09**	**0.7**	**0.04**	**0.33**	**2.73**	**19.88**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h) Arctic Grayling No.	CPUE	Bull Trout No.	CPUE	Burbot No.	CPUE	Goldeye No.	CPUE	Kokanee No.	CPUE	Lake Trout No.	CPUE	Lake Whitefish No.	CPUE	Mountain Whitefish No.	CPUE	Northern Pike No.	CPUE	Rainbow Trout No.	CPUE	Walleye No.	CPUE	Yellow Perch No.	CPUE	All Species No.	CPUE
Section 6	1	00601	21-Aug-17	761	1.20			2	7.88											20	78.84									22	86.73
		00602	21-Aug-17	716	0.90			5	27.93									1	5.59	1	5.59	1	5.59			1	5.59			9	50.28
		00603	22-Aug-17	745	1.30			2	7.43											22	81.78									24	89.21
		00604	22-Aug-17	628	0.98															20	116.4									20	116.4
		00605	22-Aug-17	533	0.80			1	8.44											18	151.97									19	160.41
		00606	22-Aug-17	937	1.40			1	2.74											18	49.4	1	2.74							20	54.89
		00607	23-Aug-17	763	1.00															49	231.19									49	231.19
		00608	22-Aug-17	511	1.00															15	105.68									15	105.68
		00609	22-Aug-17	853	1.00															13	54.87					2	8.44			15	63.31
		00610	23-Aug-17	729	0.85			1	5.81											15	87.15	7	40.67							23	133.62
		00611	23-Aug-17	591	0.90															11	74.45									11	74.45
		00612	23-Aug-17	522	0.85															35	283.98									35	283.98
		00613	23-Aug-17	833	0.90															12	57.94					2	9.66			14	67.6
		00614	21-Aug-17	623	0.98															10	59.27									10	59.27
		006PIN01	21-Aug-17	1471	1.50																	1	1.63							1	1.63
		006PIN02	21-Aug-17	399	1.00																	1	9.02							1	9.02
		006SC036	23-Aug-17	453	0.45															3	52.98					2	35.32			5	88.3
		006SC047	21-Aug-17	472	0.55															1	13.87	1	13.87							2	27.73
	Session Summary			**697**	**17.60**	**0**	**0**	**12**	**3.52**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0.29**	**263**	**77.18**	**12**	**3.52**	**0**	**0**	**7**	**2.05**	**0**	**0**	**295**	**86.57**
Section 6	2	00601	29-Aug-17	800	1.20			1	3.75											25	93.75			1	3.75					27	101.25
		00602	29-Aug-17	654	0.90			2	12.23											3	18.35					1	6.12			6	36.7
		00603	29-Aug-17	810	1.30															23	78.63					1	3.42			24	82.05
		00604	30-Aug-17	635	1.00															8	45.35					1	5.67			9	51.02
		00605	30-Aug-17	506	0.80															32	284.58					1	8.89			33	293.48
		00606	30-Aug-17	1102	1.40															36	84									36	84
		00607	30-Aug-17	847	1.00															32	136.01									32	136.01
		00608	30-Aug-17	610	1.00															22	129.84									22	129.84
		00609	30-Aug-17	768	1.00															5	23.44									5	23.44
		00610	30-Aug-17	735	0.85															7	40.34									7	40.34
		00611	30-Aug-17	762	0.90															10	52.49					2	10.5			12	62.99
		00612	30-Aug-17	573	0.85															45	332.61									45	332.61
		00613	31-Aug-17	647	0.90															2	12.36					2	12.36			4	24.73
		00614	29-Aug-17	854	0.98															10	43.24									10	43.24
		006PIN01	29-Aug-17	1407	1.50															1	1.71	3	5.12							4	6.82
		006PIN02	29-Aug-17	573	1.00															1	6.28					1	6.28			2	12.57
		006SC036	31-Aug-17	481	0.47																					1	15.92			1	15.92
	Session Summary			**751**	**17.00**	**0**	**0**	**3**	**0.85**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**262**	**73.88**	**3**	**0.85**	**1**	**0.28**	**10**	**2.82**	**0**	**0**	**279**	**78.67**
Section 6	3	00601	05-Sep-17	782	1.20															37	141.94			2	7.67					39	149.62
		00602	05-Sep-17	675	0.90			2	11.85											1	5.93									3	17.78
		00603	05-Sep-17	725	1.30															26	99.31					1	3.82			27	103.13
		00604	05-Sep-17	671	1.00															10	53.65									10	53.65
		00605	05-Sep-17	707	0.80															26	165.49					2	12.73			28	178.22
		00606	06-Sep-17	882	1.40															21	61.22	1	2.92	1	2.92	1	2.92			24	69.97
		00607	06-Sep-17	1010	1.00															16	57.03					2	7.13			18	64.16
		00608	05-Sep-17	531	1.00															26	176.27									26	176.27
		00609	06-Sep-17	927	1.00															7	27.18					5	19.42			12	46.6
		00610	06-Sep-17	751	0.85															7	39.48					3	16.92			10	56.4
		00611	06-Sep-17	802	0.90									1	4.99					12	59.85					1	4.99			14	69.83
		00612	06-Sep-17	646	0.85	1	6.56	1	6.56											69	452.38									71	465.49
		00613	06-Sep-17	1022	0.90			1	3.91											18	70.45					2	7.83			21	82.19
		00614	05-Sep-17	801	0.98															6	27.66	1	4.61			1	4.61			8	36.88
		006PIN01	04-Sep-17	1904	1.50																	6	7.56			1	1.26			7	8.82
		006PIN02	04-Sep-17	591	1.00															1	6.09					1	6.09			2	12.18
		006SC036	06-Sep-17	503	0.40																					2	35.79			2	35.79
	Session Summary			**819**	**17.00**	**1**	**0.26**	**4**	**1.03**	**0**	**0**	**0**	**0**	**1**	**0.26**	**0**	**0**	**0**	**0**	**283**	**73.17**	**8**	**2.07**	**3**	**0.78**	**22**	**5.69**	**0**	**0**	**322**	**83.26**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																									
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 6	4	00601	13-Sep-17	804	1.20															26	97.01									26	97.01
		00602	13-Sep-17	675	0.90			2	11.85											8	47.41	1	5.93							11	65.19
		00603	13-Sep-17	800	1.30			1	3.46											29	100.38	1	3.46			2	6.92			33	114.23
		00604	13-Sep-17	713	1.00															24	121.18									24	121.18
		00605	13-Sep-17	582	0.80	1	7.73													64	494.85									65	502.58
		00606	14-Sep-17	990	1.40															56	145.45									56	145.45
		00607	14-Sep-17	721	1.00			2	9.99											37	184.74					1	4.99			40	199.72
		00608	13-Sep-17	590	1.00															45	274.58									45	274.58
		00609	14-Sep-17	858	1.00															20	83.92					4	16.78			24	100.7
		00610	14-Sep-17	617	0.83															12	84.36									12	84.36
		00611	14-Sep-17	630	0.90															16	101.59									16	101.59
		00612	14-Sep-17	636	0.85															62	412.87									62	412.87
		00613	14-Sep-17	797	0.90	1	5.02													35	175.66									36	180.68
		00614	13-Sep-17	854	0.98															18	77.82	1	4.32			2	8.65			21	90.79
		006PIN01	13-Sep-17	1601	1.50															9	13.49	2	3			2	3			13	19.49
		006PIN02	13-Sep-17	691	1.00															10	52.1					2	10.42			12	62.52
		006SC036	14-Sep-17	855	0.50							1	8.42									2	16.84							3	25.26
		006SC047	13-Sep-17	638	0.50															2	22.57									2	22.57
	Session Summary			**781**	**17.60**	**2**	**0.52**	**5**	**1.31**	**0**	**0**	**1**	**0.26**	**0**	**0**	**0**	**0**	**0**	**0**	**473**	**123.88**	**7**	**1.83**	**0**	**0**	**13**	**3.4**	**0**	**0**	**501**	**131.21**
Section 6	5	00601	23-Sep-17	834	1.20															40	143.88			1	3.6					41	147.48
		00602	24-Sep-17	609	0.90			2	13.14											10	65.68					1	6.57			13	85.39
		00603	24-Sep-17	649	1.30															79	337.09					2	8.53			81	345.62
		00604	24-Sep-17	695	1.00			1	5.18											24	124.32	1	5.18							26	134.68
		00605	24-Sep-17	456	0.80			1	9.87											72	710.53									73	720.39
		00606	24-Sep-17	879	1.40			1	2.93											82	239.88			1	2.93					84	245.73
		00607	24-Sep-17	627	1.00			1	5.74											26	149.28					2	11.48			29	166.51
		00608	24-Sep-17	456	1.00			1	7.89											53	418.42									54	426.32
		00609	24-Sep-17	709	1.00															10	50.78									10	50.78
		00610	24-Sep-17	618	0.85															33	226.16									33	226.16
		00611	24-Sep-17	609	0.90			1	6.57											18	118.23					1	6.57			20	131.36
		00612	24-Sep-17	544	0.85	1	7.79													75	583.91									76	591.7
		00613	24-Sep-17	673	0.90															50	297.18									50	297.18
		00614	24-Sep-17	669	0.98			2	11.04											29	160.06					2	11.04			33	182.13
		006PIN01	23-Sep-17	1011	1.50	1	2.37			1	2.37									63	149.55									65	154.3
		006PIN02	23-Sep-17	529	1.00															92	626.09									92	626.09
		006SC047	24-Sep-17	580	0.55															3	33.86									3	33.86
	Session Summary			**656**	**17.10**	**2**	**0.64**	**10**	**3.21**	**1**	**0.32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**759**	**243.58**	**1**	**0.32**	**2**	**0.64**	**8**	**2.57**	**0**	**0**	**783**	**251.28**
Section 6	6	00601	04-Oct-17	681	1.20			2	8.81											45	198.24					1	4.41			48	211.45
		00602	04-Oct-17	669	0.90			2	11.96											21	125.56	1	5.98			2	11.96			26	155.46
		00603	04-Oct-17	667	1.30															48	199.28					1	4.15			49	203.44
		00604	04-Oct-17	680	1.00			1	5.29											67	354.71									68	360
		00605	04-Oct-17	481	0.80															86	804.57									86	804.57
		00606	04-Oct-17	968	1.40															90	239.08					1	2.66			91	241.74
		00607	04-Oct-17	724	1.00															41	203.87					2	9.94			43	213.81
		00608	04-Oct-17	576	1.00															102	637.5									102	637.5
		00609	04-Oct-17	800	1.00															43	193.5	1	4.5			1	4.5			45	202.5
		00610	04-Oct-17	690	0.85															39	239.39					2	12.28			41	251.66
		00611	04-Oct-17	652	0.90															43	263.8					1	6.13			44	269.94
		00612	04-Oct-17	610	0.85															61	423.53					2	13.89			63	437.42
		00613	04-Oct-17	685	0.90															58	338.69					1	5.84			59	344.53
		00614	04-Oct-17	614	0.98															35	210.47	1	6.01			3	18.04			39	234.53
		006PIN01	03-Oct-17	1307	1.50															64	117.52									64	117.52
		006PIN02	03-Oct-17	452	1.00															22	175.22					2	15.93			24	191.15
		006SC036	04-Oct-17	631	0.50																					1	11.41			1	11.41
		006SC047	04-Oct-17	585	0.55															3	33.57									3	33.57
	Session Summary			**693**	**17.60**	**0**	**0**	**5**	**1.48**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**868**	**256.2**	**3**	**0.89**	**0**	**0**	**20**	**5.9**	**0**	**0**	**896**	**264.46**
Section Total All Samples				**76905**	**103.88**	**5**	**0**	**39**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**2908**	**0**	**34**	**0**	**6**	**0**	**80**	**0**	**0**	**0**	**3076**	**0**
Section Average All Samples				**732**	**0.99**	**0**	**0.24**	**0**	**1.85**	**0**	**0.05**	**0**	**0.05**	**0**	**0.05**	**0**	**0**	**0**	**0.05**	**28**	**137.67**	**0**	**1.61**	**0**	**0.28**	**1**	**3.79**	**0**	**0**	**29**	**145.63**
Section Standard Error of Mean						**0.02**	**0.13**	**0.08**	**0.43**	**0.01**	**0.02**	**0.01**	**0.08**	**0.01**	**0.05**	**0**	**0**	**0.01**	**0.05**	**2.42**	**15.94**	**0.1**	**0.46**	**0.03**	**0.1**	**0.1**	**0.66**	**0**	**0**	**2.39**	**15.78**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																									
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 7	1	00701	23-Aug-17	717	0.78					1	6.4									4	25.58									5	31.98
		00702	25-Aug-17	528	0.95															45	322.97									45	322.97
		00703	25-Aug-17	633	0.95			1	5.99	1	5.99									25	149.66									27	161.64
		00704	25-Aug-17	618	1.00															24	139.81									24	139.81
		00705	25-Aug-17	710	0.98			1	5.15	1	5.15									10	51.48									12	61.77
		00706	25-Aug-17	866	1.00															4	16.63					1	4.16			5	20.79
		00707	25-Aug-17	557	0.98															9	59.36									9	59.36
		00708	25-Aug-17	646	1.24															22	98.87									22	98.87
		00709	25-Aug-17	610	1.00															17	100.33					3	17.7			20	118.03
		00710	25-Aug-17	816	1.40															15	47.27									15	47.27
		00711	24-Aug-17	913	1.39	1	2.84	1	2.84											69	195.73									71	201.41
		00712	24-Aug-17	556	1.06															18	109.43	1	6.08							19	115.51
		00713	24-Aug-17	583	0.98	2	12.6													49	308.75									51	321.35
		00714	24-Aug-17	800	1.27															38	134.12									38	134.12
		007BEA01	23-Aug-17	518	0.43															1	16.16					3	48.49			4	64.65
		007SC012	24-Aug-17	291	0.22															2	112.46									2	112.46
	Session Summary			**648**	**15.70**	**3**	**1.06**	**3**	**1.06**	**3**	**1.06**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**352**	**124.56**	**1**	**0.35**	**0**	**0**	**7**	**2.48**	**0**	**0**	**369**	**130.57**
Section 7	2	00701	31-Aug-17	584	0.78															4	31.41									4	31.41
		00702	31-Aug-17	488	0.95															6	46.59									6	46.59
		00703	31-Aug-17	571	0.95															14	92.91									14	92.91
		00704	31-Aug-17	599	1.00															17	102.17					2	12.02			19	114.19
		00705	31-Aug-17	625	1.00															6	34.56			1	5.76					7	40.32
		00706	02-Sep-17	955	1.00															1	3.77					4	15.08			5	18.85
		00707	02-Sep-17	745	0.98			1	4.93											12	59.17					1	4.93			14	69.03
		00708	31-Aug-17	660	1.24															3	13.2					3	13.2			6	26.39
		00709	31-Aug-17	592	1.00															7	42.57	1	6.08							8	48.65
		00710	02-Sep-17	975	1.40															2	5.27					3	7.91			5	13.19
		00711	02-Sep-17	953	1.39	1	2.72	1	2.72											38	103.27					1	2.72			41	111.42
		00712	02-Sep-17	830	1.06									1	4.07					19	77.38					1	4.07			21	85.53
		00713	02-Sep-17	572	0.98			1	6.42											39	250.46									40	256.89
		00714	02-Sep-17	884	1.27			1	3.19											20	63.88					1	3.19			22	70.27
		007BEA01	31-Aug-17	432	0.43																					1	19.38			1	19.38
		007BEA02	31-Aug-17	265	0.60																					8	181.13			8	181.13
		007SC012	02-Sep-17	384	0.22																					1	42.61			1	42.61
	Session Summary			**654**	**16.30**	**1**	**0.34**	**4**	**1.35**	**0**	**0**	**0**	**0**	**1**	**0.34**	**0**	**0**	**0**	**0**	**188**	**63.49**	**1**	**0.34**	**1**	**0.34**	**26**	**8.78**	**0**	**0**	**222**	**74.97**
Section 7	3	00701	07-Sep-17	763	0.78									1	6.01					3	18.03					1	6.01			5	30.05
		00702	07-Sep-17	541	0.95															38	266.17									38	266.17
		00703	07-Sep-17	794	0.95															8	38.18					1	4.77	1	4.77	10	47.73
		00704	07-Sep-17	680	1.00															26	137.65									26	137.65
		00705	08-Sep-17	701	1.00															18	92.44									18	92.44
		00706	08-Sep-17	909	0.98															5	20.1			1	4.02	3	12.06			9	36.19
		00707	08-Sep-17	694	0.98															14	74.1					1	5.29			15	79.4
		00708	07-Sep-17	772	1.24															18	67.69									18	67.69
		00709	07-Sep-17	794	1.00															9	40.81					1	4.53			10	45.34
		00710	07-Sep-17	1100	1.40															8	18.7					1	2.34			9	21.04
		00711	08-Sep-17	887	1.39															20	58.4					2	5.84			22	64.24
		00712	08-Sep-17	846	1.06															9	35.96									9	35.96
		00713	08-Sep-17	582	0.98															24	151.48					1	6.31			25	157.8
		00714	08-Sep-17	892	1.27															9	28.49					2	6.33			11	34.82
		007BEA01	07-Sep-17	389	0.43																					1	21.52			1	21.52
		007BEA02	07-Sep-17	458	0.60															2	26.2	1	13.1	2	26.2	7	91.7	1	13.1	13	170.31
		007SC012	08-Sep-17	384	0.22															1	42.61					2	85.23			3	127.84
	Session Summary			**717**	**16.20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0.31**	**0**	**0**	**0**	**0**	**212**	**65.71**	**1**	**0.31**	**3**	**0.93**	**23**	**7.13**	**2**	**0.62**	**242**	**75**

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Arctic Grayling No.	Arctic Grayling CPUE	Bull Trout No.	Bull Trout CPUE	Burbot No.	Burbot CPUE	Goldeye No.	Goldeye CPUE	Kokanee No.	Kokanee CPUE	Lake Trout No.	Lake Trout CPUE	Lake Whitefish No.	Lake Whitefish CPUE	Mountain Whitefish No.	Mountain Whitefish CPUE	Northern Pike No.	Northern Pike CPUE	Rainbow Trout No.	Rainbow Trout CPUE	Walleye No.	Walleye CPUE	Yellow Perch No.	Yellow Perch CPUE	All Species No.	All Species CPUE
Section 7	4	00701	15-Sep-17	766	0.78															2	11.97	1	5.99			1	5.99			4	23.95
		00702	15-Sep-17	601	0.95															34	214.38					1	6.31			35	220.68
		00703	15-Sep-17	902	0.95															14	58.82					3	12.6			17	71.42
		00704	15-Sep-17	712	1.00															27	136.52					2	10.11			29	146.63
		00705	15-Sep-17	754	1.00			2	9.55											9	42.97					1	4.77			12	57.29
		00706	16-Sep-17	982	1.00															10	36.66					2	7.33			12	43.99
		00707	16-Sep-17	646	0.98															24	136.48									24	136.48
		00708	15-Sep-17	912	1.24															27	85.95					3	9.55			30	95.5
		00709	15-Sep-17	830	1.00															18	78.07									18	78.07
		00710	15-Sep-17	990	1.40																					3	7.79			3	7.79
		00711	16-Sep-17	929	1.39			1	2.79											53	147.76									54	150.54
		00712	16-Sep-17	894	1.06															16	60.5					3	11.34			19	71.84
		00713	16-Sep-17	633	0.98															35	203.11									35	203.11
		00714	16-Sep-17	1028	1.27															19	52.19									19	52.19
		007BEA01	15-Sep-17	512	0.43															2	32.7					9	147.17			11	179.87
		007BEA02	15-Sep-17	410	0.60																					26	380.49			26	380.49
		007SC012	16-Sep-17	465	0.22															1	35.19					2	70.38			3	105.57
		007SC022	16-Sep-17	476	0.36															2	42.02									2	42.02
	Session Summary			**747**	**16.60**	**0**	**0**	**3**	**0.87**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**293**	**85.06**	**1**	**0.29**	**0**	**0**	**56**	**16.26**	**0**	**0**	**353**	**102.48**
Section 7	5	00701	25-Sep-17	683	0.78																	2	13.43			4	26.86			6	40.29
		00702	25-Sep-17	507	0.94															32	241.72									32	241.72
		00703	25-Sep-17	621	0.95															24	146.45									24	146.45
		00704	25-Sep-17	568	1.00															45	285.21					1	6.34			46	291.55
		00705	25-Sep-17	641	1.00			1	5.62											9	50.55					1	5.62			11	61.78
		00707	25-Sep-17	671	0.98															8	43.8					1	5.47			9	49.27
		00708	25-Sep-17	739	1.24			1	3.93					1	3.93					40	157.14					2	7.86			44	172.86
		00709	25-Sep-17	572	1.00															22	138.46					1	6.29			23	144.76
		00710	25-Sep-17	840	1.40			1	3.06											6	18.37					1	3.06			8	24.49
		00711	25-Sep-17	832	1.39															53	164.98					2	6.23			55	171.21
		00712	25-Sep-17	690	1.06			1	4.9											18	88.18									19	93.08
		00713	25-Sep-17	553	0.98									1	6.64					44	292.28									45	298.93
		00714	25-Sep-17	810	1.27															34	118.52									34	118.52
		007BEA01	25-Sep-17	405	0.43															1	20.67					3	62.02	2	41.34	6	124.03
		007BEA02	25-Sep-17	384	0.60															3	46.88	1	15.62			14	218.75			18	281.25
		007SC012	25-Sep-17	321	0.22																					1	50.98			1	50.98
	Session Summary			**615**	**15.30**	**0**	**0**	**4**	**1.53**	**0**	**0**	**0**	**0**	**2**	**0.77**	**0**	**0**	**0**	**0**	**339**	**129.7**	**3**	**1.15**	**0**	**0**	**31**	**11.86**	**2**	**0.77**	**381**	**145.77**
Section 7	6	00701	01-Oct-17	720	0.78	1	6.37	2	12.74											3	19.11					4	25.48			10	63.69
		00702	01-Oct-17	594	0.95															34	216.91									34	216.91
		00703	01-Oct-17	747	0.95															24	121.75									24	121.75
		00704	01-Oct-17	660	1.00			1	5.45											27	147.27									28	152.73
		00705	01-Oct-17	737	1.00															10	48.85	2	9.77			4	19.54			16	78.15
		00706	01-Oct-17	975	1.00															6	22.15					1	3.69			7	25.85
		00707	01-Oct-17	680	0.98															16	86.43									16	86.43
		00708	01-Oct-17	644	1.24															34	153.28					1	4.51			35	157.78
		00709	01-Oct-17	733	1.00			1	4.91											12	58.94	1	4.91							14	68.76
		00710	01-Oct-17	912	1.40															6	16.92					5	14.1			11	31.02
		00711	01-Oct-17	927	1.39															36	100.58									36	100.58
		00712	01-Oct-17	719	1.06															17	79.92					1	4.7			18	84.62
		00713	01-Oct-17	594	0.98															19	117.5					1	6.18			20	123.69
		00714	01-Oct-17	869	1.27															23	74.73					1	3.25			24	77.98
		007BEA01	01-Oct-17	367	0.43															2	45.62					8	182.5			10	228.12
		007BEA02	01-Oct-17	373	0.60															5	80.43					12	193.03			17	273.46
		007SC012	01-Oct-17	379	0.22															1	43.18									1	43.18
	Session Summary			**684**	**16.30**	**1**	**0.32**	**4**	**1.29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**275**	**88.8**	**3**	**0.97**	**0**	**0**	**38**	**12.27**	**0**	**0**	**321**	**103.65**
Section Total All Samples				**68571**	**96.31**	**5**	**0**	**18**	**0**	**3**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**1659**	**0**	**10**	**0**	**4**	**0**	**181**	**0**	**4**	**0**	**1888**	**0**
Section Average All Samples				**679**	**0.95**	**0**	**0.28**	**0**	**0.99**	**0**	**0.17**	**0**	**0**	**0**	**0.22**	**0**	**0**	**0**	**0**	**16**	**91.33**	**0**	**0.55**	**0**	**0.22**	**2**	**9.96**	**0**	**0.22**	**19**	**103.94**
Section Standard Error of Mean						**0.03**	**0.14**	**0.04**	**0.22**	**0.02**	**0.1**	**0**	**0**	**0.02**	**0.1**	**0**	**0**	**0**	**0**	**1.49**	**7.55**	**0.04**	**0.28**	**0.02**	**0.27**	**0.34**	**5.52**	**0.02**	**0.43**	**1.42**	**8.13**

Number Caught (CPUE = no. fish/km/h)

Table E3 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																									
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 9	1	00901	27-Aug-17	601	1.10															3	16.34									3	16.34
		00902	27-Aug-17	598	1.00															3	18.06					1	6.02			4	24.08
		00903	28-Aug-17	681	1.10															5	24.03									5	24.03
		00904	28-Aug-17	778	1.10															1	4.21	1	4.21			2	8.41			4	16.83
		00905	28-Aug-17	773	1.10																					2	8.47			2	8.47
		00906	28-Aug-17	782	1.00															2	9.21					1	4.6			3	13.81
		00907	28-Aug-17	921	1.20															2	6.51					5	16.29			7	22.8
		00908	28-Aug-17	626	1.10															7	36.6									7	36.6
		00909	28-Aug-17	635	0.95															4	23.87					1	5.97			5	29.84
		00910	28-Aug-17	1128	1.10																					2	5.8			2	5.8
		00911	29-Aug-17	594	1.00																							1	6.06	1	6.06
		00912	29-Aug-17	628	1.10															4	20.85									4	20.85
		00914	29-Aug-17	543	0.95															1	6.98									1	6.98
		009SC053	28-Aug-17	459	0.26																					2	60.33			2	60.33
		009SC061	29-Aug-17	751	0.68																					1	7.1			1	7.1
	Session Summary			**700**	**14.70**	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**32**	***11.2***	**1**	***0.35***	**0**	***0***	**17**	***5.95***	**1**	***0.35***	**51**	***17.84***
Section 9	2	00901	03-Sep-17	756	1.10															4	17.32					2	8.66			6	25.97
		00902	03-Sep-17	765	1.00							1	4.71							3	14.12									4	18.82
		00903	03-Sep-17	731	1.10															4	17.91					5	22.39			9	40.29
		00904	03-Sep-17	755	1.10															3	13					3	13			6	26.01
		00905	03-Sep-17	902	1.10			1	3.63																	1	3.63			2	7.26
		00906	03-Sep-17	986	1.00															1	3.65					7	25.56			8	29.21
		00907	03-Sep-17	967	1.20															2	6.2					2	6.2			4	12.41
		00908	03-Sep-17	675	1.10			1	4.85											2	9.7									3	14.55
		00909	03-Sep-17	764	0.95															4	19.84					1	4.96			5	24.8
		00910	03-Sep-17	1310	1.10																					9	22.48			9	22.48
		00911	04-Sep-17	639	1.00															7	39.44					4	22.54			11	61.97
		00912	04-Sep-17	712	1.10															10	45.97					2	9.19			12	55.16
		00913	04-Sep-17	674	0.90															3	17.8					1	5.93			4	23.74
		00914	04-Sep-17	560	0.95															1	6.77									1	6.77
		009SC053	03-Sep-17	468	0.26																	1	29.59							1	29.59
		009SC061	04-Sep-17	827	0.68															2	12.9	1	6.45			2	12.9			5	32.25
	Session Summary			**781**	**15.60**	**0**	***0***	**2**	***0.59***	**0**	***0***	**1**	***0.3***	**0**	***0***	**0**	***0***	**0**	***0***	**46**	***13.59***	**2**	***0.59***	**0**	***0***	**39**	***11.52***	**0**	***0***	**90**	***26.59***
Section 9	3	00901	10-Sep-17	693	1.10															6	28.34									6	28.34
		00902	10-Sep-17	843	1.00							1	4.27							2	8.54					3	12.81			6	25.62
		00903	10-Sep-17	781	1.10															2	8.38					1	4.19			3	12.57
		00904	10-Sep-17	842	1.10															1	3.89					1	3.89			2	7.77
		00905	10-Sep-17	710	1.10							2	9.22							3	13.83	1	4.61			1	4.61			7	32.27
		00906	10-Sep-17	853	1.00																					5	21.1			5	21.1
		00907	10-Sep-17	1074	1.20															5	13.97					4	11.17			9	25.14
		00908	09-Sep-17	614	1.10															5	26.65					1	5.33			6	31.98
		00910	10-Sep-17	1161	1.10															1	2.82					2	5.64			3	8.46
		00911	10-Sep-17	809	1.00									1	4.45					5	22.25					1	4.45			7	31.15
		00912	11-Sep-17	715	1.10															11	50.35					2	9.15			13	59.5
		00913	11-Sep-17	660	0.90															4	24.24					1	6.06			5	30.3
		00914	11-Sep-17	641	0.95			1	5.91																	3	17.74			4	23.65
		009SC061	11-Sep-17	772	0.68															1	6.91									1	6.91
	Session Summary			**798**	**14.40**	**0**	***0***	**1**	***0.31***	**0**	***0***	**3**	***0.94***	**1**	***0.31***	**0**	***0***	**0**	***0***	**46**	***14.41***	**1**	***0.31***	**0**	***0***	**25**	***7.83***	**0**	***0***	**77**	***24.12***

Table E3 Concluded.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																									
						Arctic Grayling		Bull Trout		Burbot		Goldeye		Kokanee		Lake Trout		Lake Whitefish		Mountain Whitefish		Northern Pike		Rainbow Trout		Walleye		Yellow Perch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 9	4	00901	17-Sep-17	682	1.10															3	14.4									3	14.4
		00902	17-Sep-17	765	1.00			2	9.41															1	4.71	1	4.71			4	18.82
		00903	17-Sep-17	687	1.10															1	4.76					2	9.53			3	14.29
		00904	17-Sep-17	702	1.10			2	9.32											5	23.31					1	4.66			8	37.3
		00905	18-Sep-17	754	1.10															7	30.38									7	30.38
		00906	18-Sep-17	819	1.00															1	4.4					4	17.58			5	21.98
		00907	18-Sep-17	800	1.20															1	3.75					1	3.75			2	7.5
		00908	18-Sep-17	549	1.10															1	5.96					1	5.96			2	11.92
		00909	18-Sep-17	597	0.95															5	31.74					1	6.35			6	38.09
		00910	18-Sep-17	1043	1.10																					2	6.28			2	6.28
		00911	18-Sep-17	631	1.00															4	22.82									4	22.82
		00912	18-Sep-17	706	1.10															9	41.72									9	41.72
		00913	18-Sep-17	565	0.90															3	21.24									3	21.24
		00914	18-Sep-17	532	0.95			1	7.12																	1	7.12			2	14.25
		009SC053	17-Sep-17	521	0.26																					2	53.15			2	53.15
		009SC061	18-Sep-17	730	0.68																					1	7.31			1	7.31
	Session Summary			**693**	**15.60**	**0**	***0***	**5**	***1.67***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**40**	***13.32***	**0**	***0***	**1**	***0.33***	**17**	***5.66***	**0**	***0***	**63**	***20.98***
Section 9	5	00901	26-Sep-17	859	1.10															5	19.05					3	11.43			8	30.48
		00902	26-Sep-17	679	1.00															5	26.51					2	10.6			7	37.11
		00903	26-Sep-17	787	1.10					1	4.16									3	12.48					3	12.48			7	29.11
		00904	26-Sep-17	738	1.10															2	8.87					1	4.43			3	13.3
		00905	26-Sep-17	819	1.10															4	15.98					1	4			5	19.98
		00906	26-Sep-17	821	1.00																					3	13.15			3	13.15
		00907	26-Sep-17	827	1.20															2	7.26					1	3.63			3	10.88
		00908	26-Sep-17	655	1.10															5	24.98									5	24.98
		00909	26-Sep-17	770	0.95															3	14.76					1	4.92			4	19.69
		00910	26-Sep-17	1095	1.10															1	2.99					3	8.97			4	11.96
		00911	26-Sep-17	652	1.00															2	11.04					2	11.04			4	22.09
		00912	26-Sep-17	685	1.10															6	28.67					1	4.78			7	33.44
		00913	26-Sep-17	603	0.90															2	13.27									2	13.27
		00914	26-Sep-17	556	0.95																					1	6.82			1	6.82
		009SC053	26-Sep-17	465	0.26																					1	29.78			1	29.78
		009SC061	26-Sep-17	706	0.68			1	7.55											1	7.55					1	7.55			3	22.66
	Session Summary			**732**	**15.60**	**0**	***0***	**1**	***0.32***	**1**	***0.32***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**41**	***12.93***	**0**	***0***	**0**	***0***	**24**	***7.57***	**0**	***0***	**67**	***21.12***
Section 9	6	00901	02-Oct-17	831	1.10															4	15.75									4	15.75
		00902	02-Oct-17	665	1.00			1	5.41											2	10.83									3	16.24
		00903	02-Oct-17	706	1.10			1	4.64											5	23.18									6	27.81
		00904	02-Oct-17	701	1.10															11	51.36									11	51.36
		00905	02-Oct-17	854	1.10			1	3.83											7	26.83					1	3.83			9	34.49
		00906	02-Oct-17	836	1.00																					2	8.61			2	8.61
		00907	02-Oct-17	918	1.20															1	3.27					1	3.27			2	6.54
		00908	02-Oct-17	755	1.10															4	17.34					1	4.33			5	21.67
		00909	02-Oct-17	711	0.95															3	15.99					2	10.66			5	26.65
		00910	02-Oct-17	1203	1.10			1	2.72																					1	2.72
		00911	02-Oct-17	602	1.00															3	17.94	1	5.98							4	23.92
		00912	02-Oct-17	657	1.10															8	39.85									8	39.85
		00913	02-Oct-17	581	0.90															3	20.65									3	20.65
		00914	02-Oct-17	541	0.95															1	7									1	7
		009SC053	02-Oct-17	529	0.26																	1	26.17							1	26.17
	Session Summary			**739**	**15.00**	**0**	***0***	**4**	***1.3***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**52**	***16.89***	**2**	***0.65***	**0**	***0***	**7**	***2.27***	**0**	***0***	**65**	***21.11***
Section Total All Samples				**68047**	**91.03**	**0**	***0***	**13**	***0***	**1**	***0***	**4**	***0***	**1**	***0***	**0**	***0***	**0**	***0***	**257**	***0***	**6**	***0***	**1**	***0***	**129**	***0***	**1**	***0***	**413**	***0***
Section Average All Samples				**740**	**0.99**	**0**	***0***	**0**	***0.69***	**0**	***0.05***	**0**	***0.21***	**0**	***0.05***	**0**	***0***	**0**	***0***	**3**	***13.74***	**0**	***0.32***	**0**	***0.05***	**1**	***6.89***	**0**	***0.05***	**4**	***22.07***
Section Standard Error of Mean						**0**	***0***	**0.04**	***0.21***	**0.01**	***0.05***	**0.03**	***0.12***	**0.01**	***0.05***	**0**	***0***	**0**	***0***	**0.27**	***1.32***	**0.03**	***0.44***	**0.01**	***0.05***	**0.17**	***1.03***	**0.01**	***0.07***	**0.29**	***1.38***
All Sections Total All Samples				**389376**	**566.62**	***21700***	***0.35***	***112***	***0***	***315***	***0.01***	***10***	***0***	***5***	***0***	***116***	***0***	***1***	***0***	***2***	***0***	***20335***	***0.33***	***81***	***0***	***243***	***0***	***470***	***0.01***	***10***	***0***
All Sections Average All Samples						***38***	***200.41***	***0***	***1.03***	***1***	***2.91***	***0***	***0.09***	***0***	***0.05***	***0***	***1.07***	***0***	***0.01***	***0***	***0.02***	***36***	***187.8***	***0***	***0.75***	***0***	***2.24***	***1***	***4.34***	***0***	***0.09***
All Sections Standard Error of Mean						***1.64***	***18.76***	***0.04***	***0.13***	***0.04***	***0.25***	***0.01***	***0.03***	***0***	***0.02***	***0.06***	***0.78***	***0***	***0.01***	***0***	***0.03***	***1.64***	***18.75***	***0.03***	***0.23***	***0.06***	***0.39***	***0.08***	***1.06***	***0.01***	***0.09***

Table E4 Summary of boat electroshocking non-sportfish catch (includes fish captured and observed and identified to species) and catch-per-unit-effort (CPUE = no. fish/km/hour) in the Peace River, 21 August to 04 October 2017.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																					
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 1	1	00102	21-Aug-17	340	0.98																	3	***32.58***			3	***32.58***
		00103	21-Aug-17	574	1.19																	11	***58.22***			11	***58.22***
		00104	21-Aug-17	374	0.50							4	***77.01***									28	***539.04***			32	***616.04***
		00107	21-Aug-17	379	0.55													1	***17.27***							1	***17.27***
		00108	22-Aug-17	532	0.85							1	***7.96***									38	***302.52***			39	***310.48***
		00109	22-Aug-17	534	0.98							1	***6.91***									66	***456.35***			67	***463.27***
		00110	22-Aug-17	578	0.65																	25	***239.55***			25	***239.55***
		00111	22-Aug-17	431	0.80																	11	***114.85***			11	***114.85***
		00112	22-Aug-17	617	1.07																	13	***70.89***			13	***70.89***
		00113	22-Aug-17	408	0.75																	23	***270.59***			23	***270.59***
		00114	23-Aug-17	491	0.95																	10	***77.18***			10	***77.18***
		00116	23-Aug-17	420	0.98																	2	***17.4***			2	***17.4***
		00119	21-Aug-17	381	0.75																	8	***100.79***			8	***100.79***
	Session Summary			**466**	**11.00**	**0**	***0***	**0**	***0***	**0**	***0***	**6**	***4.21***	**0**	***0***	**0**	***0***	**1**	***0.7***	**0**	***0***	**238**	***167.15***	**0**	***0***	**245**	***172.06***
Section 1	2	00103	29-Aug-17	590	1.20																	6	***30.51***			6	***30.51***
		00104	29-Aug-17	360	0.50																	26	***520***			26	***520***
		00105	29-Aug-17	440	1.10																	1	***7.44***			1	***7.44***
		00107	30-Aug-17	449	0.55													4	***58.31***			7	***102.04***			11	***160.36***
		00108	30-Aug-17	524	0.85																	54	***436.46***			54	***436.46***
		00109	30-Aug-17	515	0.98																	35	***250.93***			35	***250.93***
		00110	30-Aug-17	590	0.65									1	***9.39***							15	***140.81***			16	***150.2***
		00111	30-Aug-17	566	1.00							1	***6.36***									8	***50.88***			9	***57.24***
		00112	30-Aug-17	551	1.07													1	***6.11***			20	***122.12***			21	***128.23***
		00113	30-Aug-17	383	0.75																	18	***225.59***			18	***225.59***
		00114	30-Aug-17	516	0.95																	23	***168.91***			23	***168.91***
		00116	30-Aug-17	442	0.98																	5	***41.34***			5	***41.34***
		00119	30-Aug-17	522	0.75													1	***9.2***			12	***110.34***			13	***119.54***
	Session Summary			**496**	**11.30**	**0**	***0***	**0**	***0***	**0**	***0***	**1**	***0.64***	**1**	***0.64***	**0**	***0***	**6**	***3.85***	**0**	***0***	**230**	***147.73***	**0**	***0***	**238**	***152.87***
Section 1	3	00102	05-Sep-17	332	0.98																	7	***77.85***			7	***77.85***
		00103	05-Sep-17	576	1.20																	7	***36.46***			7	***36.46***
		00104	05-Sep-17	352	0.50							1	***20.45***									29	***593.18***			30	***613.64***
		00105	05-Sep-17	443	1.10																	5	***36.94***			5	***36.94***
		00107	05-Sep-17	393	0.55																	3	***49.97***			3	***49.97***
		00108	06-Sep-17	656	0.85							1	***6.46***									39	***251.79***			40	***258.25***
		00109	06-Sep-17	659	0.98													1	***5.6***			37	***207.31***			38	***212.91***
		00110	05-Sep-17	593	0.64													1	***9.49***			11	***104.34***			12	***113.83***
		00111	06-Sep-17	758	1.00																	11	***52.24***			11	***52.24***
		00112	06-Sep-17	692	1.07													1	***4.86***			19	***92.38***			20	***97.24***
		00113	06-Sep-17	477	0.75																	25	***251.57***			25	***251.57***
		00114	06-Sep-17	641	0.95									1	***5.91***			7	***41.38***			12	***70.94***			20	***118.24***
		00116	06-Sep-17	572	0.98																	10	***63.9***			10	***63.9***
		00119	05-Sep-17	474	0.75																	2	***20.25***			2	***20.25***
	Session Summary			**544**	**12.30**	**0**	***0***	**0**	***0***	**0**	***0***	**2**	***1.08***	**1**	***0.54***	**0**	***0***	**10**	***5.38***	**0**	***0***	**217**	***116.75***	**0**	***0***	**230**	***123.74***

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h) Flathead Chub No.	Flathead Chub CPUE	Lake Chub No.	Lake Chub CPUE	Longnose Dace No.	Longnose Dace CPUE	Northern Pikeminnow No.	Northern Pikeminnow CPUE	Peamouth No.	Peamouth CPUE	Redside Shiner No.	Redside Shiner CPUE	Sculpin spp. No.	Sculpin spp. CPUE	Spottail Shiner No.	Spottail Shiner CPUE	Sucker spp. No.	Sucker spp. CPUE	Troutperch No.	Troutperch CPUE	All Species No.	All Species CPUE
Section 1	4	00101	12-Sep-17	336	0.60													1	17.86			9	160.71			10	178.57
		00102	12-Sep-17	445	0.98																	30	248.92			30	248.92
		00103	12-Sep-17	745	1.20							1	4.03					12	48.32			2	8.05			15	60.4
		00104	12-Sep-17	406	0.50													13	230.54			13	230.54			26	461.08
		00105	12-Sep-17	492	1.10													6	39.91			6	39.91			12	79.82
		00107	13-Sep-17	441	0.55													4	59.37			2	29.68			6	89.05
		00108	12-Sep-17	725	0.85							1	5.84	1	5.84			3	17.53			8	46.73			13	75.94
		00109	12-Sep-17	725	0.98													4	20.37			26	132.41			30	152.79
		00110	13-Sep-17	641	0.65																	13	112.32			13	112.32
		00111	13-Sep-17	639	1.00																	10	56.34			10	56.34
		00112	13-Sep-17	646	1.07													9	46.87			12	62.5			21	109.37
		00113	13-Sep-17	388	0.75																	46	569.07			46	569.07
		00114	13-Sep-17	545	0.95													3	20.86			6	41.72			9	62.58
		00116	13-Sep-17	465	0.98																	14	110.04			14	110.04
		00119	12-Sep-17	719	0.75							1	6.68													1	6.68
	Session Summary			**557**	**12.90**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**1.5**	**1**	**0.5**	**0**	**0**	**55**	**27.56**	**0**	**0**	**197**	**98.7**	**0**	**0**	**256**	**128.26**
Section 1	5	00102	19-Sep-17	304	0.98																	1	12.15			1	12.15
		00103	19-Sep-17	614	1.20																	2	9.77			2	9.77
		00104	19-Sep-17	272	0.50																	14	370.59			14	370.59
		00105	19-Sep-17	403	1.10																	1	8.12			1	8.12
		00107	19-Sep-17	399	0.55													4	65.62			1	16.4			5	82.02
		00108	19-Sep-17	498	0.85																	13	110.56			13	110.56
		00109	19-Sep-17	505	0.98													1	7.31			3	21.93			4	29.25
		00110	19-Sep-17	553	0.65													1	10.02			1	10.02			2	20.03
		00111	19-Sep-17	571	1.00																	8	50.44			8	50.44
		00112	19-Sep-17	564	1.07																	2	11.93			2	11.93
		00113	19-Sep-17	339	0.75																	11	155.75			11	155.75
		00114	19-Sep-17	531	0.95													2	14.27			3	21.41			5	35.68
		00116	19-Sep-17	474	0.98																	19	146.5			19	146.5
		00119	19-Sep-17	441	0.75																	1	10.88			1	10.88
	Session Summary			**462**	**12.30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**5.07**	**0**	**0**	**80**	**50.68**	**0**	**0**	**88**	**55.75**
Section 1	6	00101	29-Sep-17	311	0.60													1	19.29							1	19.29
		00103	29-Sep-17	736	1.20													2	8.15			1	4.08			3	12.23
		00104	29-Sep-17	380	0.50							1	18.95									9	170.53			10	189.47
		00105	29-Sep-17	505	1.10																	1	6.48			1	6.48
		00107	29-Sep-17	441	0.55													5	74.21			1	14.84			6	89.05
		00108	29-Sep-17	719	0.85													18	106.03			1	5.89			19	111.92
		00109	29-Sep-17	591	0.98													12	74.97			2	12.5			14	87.47
		00110	29-Sep-17	565	0.65							1	9.8					14	137.24			2	19.61			17	166.64
		00111	29-Sep-17	621	1.00													15	86.96			2	11.59			17	98.55
		00112	29-Sep-17	660	1.07													21	107.05			4	20.39			25	127.44
		00113	29-Sep-17	431	0.75																	5	55.68			5	55.68
		00114	29-Sep-17	616	0.95													23	141.49			1	6.15			24	147.64
		00116	29-Sep-17	592	0.98																	3	18.52			3	18.52
		00119	29-Sep-17	588	0.75													2	16.33							2	16.33
	Session Summary			**554**	**11.90**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1.09**	**0**	**0**	**0**	**0**	**113**	**61.71**	**0**	**0**	**32**	**17.47**	**0**	**0**	**147**	**80.27**
Section Total All Samples				**42707**	**71.75**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**3**	**0**	**0**	**0**	**193**	**0**	**0**	**0**	**994**	**0**	**0**	**0**	**1204**	**0**
Section Average All Samples				**515**	**0.86**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.36**	**0**	**0.29**	**0**	**0**	**2**	**18.8**	**0**	**0**	**12**	**96.83**	**0**	**0**	**15**	**117.29**
Section Standard Error of Mean						**0**	**0**	**0**	**0**	**0**	**0**	**0.06**	**1**	**0.02**	**0.15**	**0**	**0**	**0.54**	**4.33**	**0**	**0**	**1.44**	**15.55**	**0**	**0**	**1.42**	**15.8**

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																					
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 3	1	00301	24-Aug-17	1123	1.80							1	1.78									13	23.15			14	24.93
		00302	23-Aug-17	765	1.90																	23	56.97			23	56.97
		00303	23-Aug-17	646	1.45							1	3.84							1	3.84	20	76.87			22	84.55
		00304	24-Aug-17	1131	1.35					1	2.36	3	7.07					2	4.72			84	198.05			90	212.2
		00305	23-Aug-17	757	1.55							1	3.07			2	6.14					37	113.52			40	122.73
		00306	25-Aug-17	772	1.00							2	9.33			1	4.66			2	9.33	17	79.27			22	102.59
		00307	25-Aug-17	600	0.95							1	6.32									69	435.79			70	442.11
		00308	27-Aug-17	732	1.35																	41	149.36			41	149.36
		00309	25-Aug-17	545	0.95																	8	55.63			8	55.63
		00310	25-Aug-17	754	1.20					1	3.98											32	127.32			33	131.3
		00311	25-Aug-17	782	1.25					1	3.68											15	55.24			16	58.93
		00312	25-Aug-17	714	1.17			1	4.31			4	17.24									37	159.45			42	181
		00314	24-Aug-17	906	0.98																	21	85.58			21	85.58
		00315	24-Aug-17	1433	1.70							3	4.43									51	75.37			54	79.8
		00316	27-Aug-17	767	1.48							2	6.36									14	44.55			16	50.91
	Session Summary			**828**	**20.10**	**0**	**0**	**1**	**0.22**	**3**	**0.65**	**18**	**3.89**	**0**	**0**	**3**	**0.65**	**2**	**0.43**	**3**	**0.65**	**482**	**104.26**	**0**	**0**	**512**	**110.75**
Section 3	2	00301	01-Sep-17	1165	1.78																	21	36.46			21	36.46
		00302	01-Sep-17	1006	1.90																	58	109.24			58	109.24
		00303	01-Sep-17	734	1.45																	30	101.48			30	101.48
		00304	01-Sep-17	696	1.35																	1	3.83			1	3.83
		00305	01-Sep-17	1071	1.55							5	10.84			5	10.84	6	13.01			84	182.16			100	216.86
		00306	02-Sep-17	690	1.00																	11	57.39			11	57.39
		00307	31-Aug-17	563	0.95							1	6.73									22	148.08			23	154.81
		00308	31-Aug-17	820	1.35																	41	133.33			41	133.33
		00309	31-Aug-17	566	0.95					1	6.7											6	40.17			7	46.87
		00310	31-Aug-17	761	1.20																	10	39.42			10	39.42
		00311	02-Sep-17	709	1.25							1	4.06									44	178.73			45	182.79
		00312	31-Aug-17	821	1.17					1	3.75	4	14.99			5	18.74					33	123.68			43	161.15
		00314	31-Aug-17	729	0.98																	14	70.91			14	70.91
		00315	31-Aug-17	1218	1.70							3	5.22									20	34.77			23	39.99
		00316	31-Aug-17	761	1.48							2	6.41									13	41.69			15	48.11
	Session Summary			**821**	**20.10**	**0**	**0**	**0**	**0**	**2**	**0.44**	**16**	**3.49**	**0**	**0**	**10**	**2.18**	**6**	**1.31**	**0**	**0**	**408**	**89.01**	**0**	**0**	**442**	**96.42**
Section 3	3	00301	09-Sep-17	1297	1.80																	18	27.76			18	27.76
		00302	07-Sep-17	863	1.90																	23	50.5			23	50.5
		00303	07-Sep-17	821	1.45																	65	196.56			65	196.56
		00304	09-Sep-17	838	1.35							1	3.18									23	73.19			24	76.37
		00305	07-Sep-17	857	1.55							4	10.84									39	105.7			43	116.54
		00306	07-Sep-17	694	1.00							1	5.19									22	114.12			23	119.31
		00307	08-Sep-17	735	0.95																	70	360.9			70	360.9
		00308	08-Sep-17	883	1.35																	69	208.38			69	208.38
		00309	08-Sep-17	700	0.95					1	5.41											11	59.55			12	64.96
		00310	08-Sep-17	861	1.20																	23	80.14			23	80.14
		00311	07-Sep-17	732	1.25																	23	90.49			23	90.49
		00312	07-Sep-17	775	1.17																	20	79.4			20	79.4
		00314	08-Sep-17	735	0.98							2	10.05			1	5.02					12	60.28			15	75.35
		00315	08-Sep-17	1292	1.70																	15	24.59			15	24.59
		00316	08-Sep-17	938	1.48					1	2.6	1	2.6									14	36.43			16	41.63
	Session Summary			**868**	**20.10**	**0**	**0**	**0**	**0**	**2**	**0.41**	**9**	**1.86**	**0**	**0**	**1**	**0.21**	**0**	**0**	**0**	**0**	**447**	**92.23**	**0**	**0**	**459**	**94.71**

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																					
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 3	4	00301	16-Sep-17	1246	1.80																	6	***9.63***			6	***9.63***
		00302	14-Sep-17	1058	1.90													1	***1.79***			71	***127.15***			72	***128.94***
		00303	14-Sep-17	899	1.45													20	***55.23***			43	***118.75***			63	***173.99***
		00304	16-Sep-17	1089	1.35																	49	***119.99***			49	***119.99***
		00305	14-Sep-17	1004	1.55													6	***13.88***			46	***106.41***			52	***120.29***
		00306	14-Sep-17	714	1.00							1	***5.04***					1	***5.04***			6	***30.25***			8	***40.34***
		00307	15-Sep-17	680	0.95													5	***27.86***			19	***105.88***			24	***133.75***
		00308	15-Sep-17	767	1.35							1	***3.48***									30	***104.3***			31	***107.78***
		00309	14-Sep-17	670	0.95																	18	***101.81***			18	***101.81***
		00310	15-Sep-17	822	1.20																	5	***18.25***			5	***18.25***
		00311	14-Sep-17	808	1.25											1	***3.56***					18	***64.16***			19	***67.72***
		00312	15-Sep-17	875	1.17							1	***3.52***									26	***91.43***			27	***94.95***
		00314	17-Sep-17	697	0.96																	14	***75.72***			14	***75.72***
		00315	15-Sep-17	1237	1.70			1	***1.71***									4	***6.85***			20	***34.24***			25	***42.8***
		00316	15-Sep-17	889	1.48													2	***5.49***			8	***21.96***			10	***27.45***
	Session Summary			**897**	**20.10**	**0**	***0***	**1**	***0.2***	**0**	***0***	**3**	***0.6***	**0**	***0***	**1**	***0.2***	**39**	***7.79***	**0**	***0***	**379**	***75.68***	**0**	***0***	**423**	***84.46***
Section 3	5	00301	21-Sep-17	1007	1.80																	5	***9.93***			5	***9.93***
		00302	20-Sep-17	973	1.90																	23	***44.79***			23	***44.79***
		00303	20-Sep-17	725	1.45																	8	***27.4***			8	***27.4***
		00304	21-Sep-17	846	1.35																	14	***44.13***			14	***44.13***
		00305	20-Sep-17	873	1.55																	39	***103.76***			39	***103.76***
		00306	20-Sep-17	659	1.00																	18	***98.33***			18	***98.33***
		00307	20-Sep-17	531	0.95																	44	***314.01***			44	***314.01***
		00308	20-Sep-17	723	1.35																	31	***114.34***			31	***114.34***
		00309	20-Sep-17	655	0.95							1	***5.79***									13	***75.21***			14	***81***
		00310	20-Sep-17	832	1.20																	2	***7.21***			2	***7.21***
		00311	20-Sep-17	701	1.25																	12	***49.3***			12	***49.3***
		00312	20-Sep-17	754	1.17																	27	***110.18***			27	***110.18***
		00314	21-Sep-17	647	0.98																	13	***74.19***			13	***74.19***
		00315	21-Sep-17	1194	1.66							1	***1.82***					2	***3.63***			42	***76.29***			45	***81.73***
		00316	21-Sep-17	1132	1.48							1	***2.16***									4	***8.62***			5	***10.78***
	Session Summary			**817**	**20.00**	**0**	***0***	**0**	***0***	**0**	***0***	**3**	***0.66***	**0**	***0***	**0**	***0***	**2**	***0.44***	**0**	***0***	**295**	***64.99***	**0**	***0***	**300**	***66.1***
Section 3	6	00301	30-Sep-17	1091	1.80													2	***3.67***			5	***9.17***			7	***12.83***
		00302	30-Sep-17	945	1.90																	13	***26.07***			13	***26.07***
		00303	30-Sep-17	754	1.45																	43	***141.59***			43	***141.59***
		00304	30-Sep-17	821	1.35																	32	***103.94***			32	***103.94***
		00305	30-Sep-17	976	1.55																	47	***111.85***			47	***111.85***
		00306	30-Sep-17	741	1.00																	41	***199.19***			41	***199.19***
		00307	30-Sep-17	621	0.95																	21	***128.15***			21	***128.15***
		00308	30-Sep-17	635	1.35																	16	***67.19***			16	***67.19***
		00309	30-Sep-17	679	0.95																	11	***61.39***			11	***61.39***
		00310	30-Sep-17	859	1.20													12	***41.91***			11	***38.42***			23	***80.33***
		00311	30-Sep-17	817	1.25																	38	***133.95***			38	***133.95***
		00312	30-Sep-17	934	1.17													2	***6.59***			28	***92.24***			30	***98.83***
		00314	30-Sep-17	665	0.98																	21	***116.6***			21	***116.6***
		00315	30-Sep-17	1149	1.70													5	***9.22***			7	***12.9***			12	***22.12***
		00316	30-Sep-17	817	1.48													1	***2.99***			16	***47.8***			17	***50.79***
	Session Summary			**834**	**20.10**	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**22**	***4.72***	**0**	***0***	**350**	***75.16***	**0**	***0***	**372**	***79.89***
Section Total All Samples				**75969**	**120.34**	**0**	***0***	**2**	***0***	**7**	***0***	**49**	***0***	**0**	***0***	**15**	***0***	**71**	***0***	**3**	***0***	**2361**	***0***	**0**	***0***	**2508**	***0***
Section Average All Samples				**844**	**1.34**	**0**	***0***	**0**	***0.07***	**0**	***0.25***	**1**	***1.74***	**0**	***0***	**0**	***0.53***	**1**	***2.52***	**0**	***0.11***	**26**	***83.68***	**0**	***0***	**28**	***88.9***
Section Standard Error of Mean						**0**	***0***	**0.02**	***0.05***	**0.03**	***0.12***	**0.11**	***0.37***	**0**	***0***	**0.08**	***0.26***	**0.28**	***0.85***	**0.02**	***0.11***	**1.99**	***7.6***	**0**	***0***	**2.11**	***7.75***

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h) Flathead Chub No.	CPUE	Lake Chub No.	CPUE	Longnose Dace No.	CPUE	Northern Pikeminnow No.	CPUE	Peamouth No.	CPUE	Redside Shiner No.	CPUE	Sculpin spp. No.	CPUE	Spottail Shiner No.	CPUE	Sucker spp. No.	CPUE	Troutperch No.	CPUE	All Species No.	CPUE
Section 5	1	00502	26-Aug-17	640	0.93							1	6.05			4	24.19					4	24.19			9	54.44
		00505	26-Aug-17	960	1.00			1	3.75			1	3.75			3	11.25					13	48.75			18	67.5
		00506	26-Aug-17	661	1.00																	8	43.57			8	43.57
		00507	26-Aug-17	501	0.78											7	64.49	7	64.49			18	165.82			32	294.8
		00508	28-Aug-17	723	0.92							3	16.15			15	80.74	4	21.53			28	150.72			50	269.15
		00509	26-Aug-17	492	0.98							1	7.5									14	105.07			15	112.57
		00510	28-Aug-17	778	1.13																	21	85.99			21	85.99
		00511	28-Aug-17	529	0.72											1	9.45					9	85.07			10	94.52
		00512	26-Aug-17	575	1.28																	18	88.04			18	88.04
		00513	28-Aug-17	536	0.77							1	8.72			10	87.23	1	8.72	1	8.72	11	95.95			24	209.34
		00514	28-Aug-17	451	0.56											5	71.27					16	228.06			21	299.33
		00515	28-Aug-17	583	0.97											7	44.56	3	19.1			40	254.64			50	318.3
		00516	28-Aug-17	441	0.80																	3	30.61			3	30.61
		00517	26-Aug-17	514	0.70											6	60.03					20	200.11			26	260.14
		005SC060	26-Aug-17	667	0.53																	11	112.02			11	112.02
	Session Summary			**603**	**13.10**	**0**	**0**	**1**	**0.46**	**0**	**0**	**7**	**3.19**	**0**	**0**	**58**	**26.43**	**15**	**6.84**	**1**	**0.46**	**234**	**106.64**	**0**	**0**	**316**	**144.01**
Section 5	2	00502	03-Sep-17	485	0.92											1	8.07					29	233.98			30	242.04
		00505	03-Sep-17	1036	1.00																	11	38.22			11	38.22
		00506	03-Sep-17	758	1.00																	6	28.5			6	28.5
		00507	03-Sep-17	538	0.78																	9	77.21			9	77.21
		00508	04-Sep-17	713	0.92					1	5.46					14	76.42	3	16.38			38	207.42			56	305.67
		00509	03-Sep-17	633	0.98											4	23.33					28	163.32			32	186.66
		00510	03-Sep-17	859	1.13											3	11.13					20	74.18			23	85.3
		00511	03-Sep-17	517	0.72																	6	58.03			6	58.03
		00512	03-Sep-17	731	1.28																	20	76.95			20	76.95
		00513	04-Sep-17	506	0.77							1	9.24			1	9.24					21	194.04			23	212.51
		00514	04-Sep-17	516	0.56																	19	236.71			19	236.71
		00515	04-Sep-17	621	0.97																	32	191.24			32	191.24
		00516	03-Sep-17	360	0.80																	11	137.5			11	137.5
		00517	03-Sep-17	610	0.70																	8	67.45			8	67.45
		005SC060	03-Sep-17	937	0.53																	1	7.25			1	7.25
	Session Summary			**655**	**13.10**	**0**	**0**	**0**	**0**	**1**	**0.42**	**1**	**0.42**	**0**	**0**	**23**	**9.65**	**3**	**1.26**	**0**	**0**	**259**	**108.66**	**0**	**0**	**287**	**120.41**
Section 5	3	00502	12-Sep-17	545	0.95																	29	201.64			29	201.64
		00505	12-Sep-17	1145	1.00							1	3.14									8	25.15			9	28.3
		00506	12-Sep-17	743	1.00																	7	33.92			7	33.92
		00507	12-Sep-17	542	0.78																	20	170.31			20	170.31
		00508	12-Sep-17	785	0.92							2	9.92			1	4.96	1	4.96			22	109.07			26	128.9
		00509	12-Sep-17	605	0.98																	27	164.78			27	164.78
		00510	10-Sep-17	716	1.13							1	4.45									22	97.89			23	102.34
		00511	10-Sep-17	463	0.70																	12	133.29			12	133.29
		00512	10-Sep-17	614	1.28																	29	132.84			29	132.84
		00513	12-Sep-17	527	0.77													1	8.87			5	44.36			6	53.23
		00514	12-Sep-17	470	0.56													6	82.07			23	314.59			29	396.66
		00515	10-Sep-17	751	0.97					2	9.88											33	163.08			35	172.97
		00516	12-Sep-17	480	0.80																	22	206.25			22	206.25
		00517	12-Sep-17	589	0.70																	9	78.58			9	78.58
		005SC060	12-Sep-17	812	0.53											4	33.46	1	8.37	1	8.37	2	16.73			8	66.92
	Session Summary			**652**	**13.10**	**0**	**0**	**0**	**0**	**2**	**0.84**	**4**	**1.69**	**0**	**0**	**5**	**2.11**	**9**	**3.79**	**1**	**0.42**	**270**	**113.8**	**0**	**0**	**291**	**122.65**

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																					
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 5	4	00502	17-Sep-17	561	0.95																	40	***270.19***			40	***270.19***
		00505	17-Sep-17	1088	1.00							1	***3.31***									1	***3.31***			2	***6.62***
		00506	17-Sep-17	900	1.00							5	***20***									7	***28***			12	***48***
		00507	22-Sep-17	615	0.78											6	***45.03***					24	***180.11***			30	***225.14***
		00508	22-Sep-17	748	0.92	1	***5.2***									6	***31.22***					31	***161.29***			38	***197.72***
		00509	22-Sep-17	552	0.98											4	***26.76***	5	***33.44***			19	***127.09***			28	***187.29***
		00510	22-Sep-17	814	1.13									1	***3.91***	5	***19.57***					37	***144.81***			43	***168.29***
		00511	23-Sep-17	655	0.72											5	***38.17***					37	***282.44***			42	***320.61***
		00512	23-Sep-17	786	1.28											3	***10.73***					46	***164.6***			49	***175.33***
		00513	22-Sep-17	488	0.77							1	***9.58***									20	***191.61***			21	***201.19***
		00514	22-Sep-17	374	0.56											1	***17.19***					29	***498.47***			30	***515.66***
		00515	23-Sep-17	576	0.97											5	***32.22***					57	***367.27***			62	***399.48***
		00516	22-Sep-17	409	0.80											3	***33.01***					35	***385.09***			38	***418.09***
		00517	22-Sep-17	603	0.70							1	***8.53***			8	***68.23***					33	***281.45***			42	***358.21***
		005SC060	23-Sep-17	622	0.53											5	***54.6***					2	***21.84***			7	***76.44***
	Session Summary			**653**	**13.10**	**1**	***0.42***	**0**	***0***	**0**	***0***	**8**	***3.37***	**1**	***0.42***	**51**	***21.46***	**5**	***2.1***	**0**	***0***	**418**	***175.91***	**0**	***0***	**484**	***203.69***
Section 5	5	00502	27-Sep-17	496	0.95													5	***38.2***			4	***30.56***			9	***68.76***
		00506	27-Sep-17	996	1.00																	2	***7.23***			2	***7.23***
		00507	27-Sep-17	595	0.78																	2	***15.51***			2	***15.51***
		00508	27-Sep-17	680	0.92																	65	***372.02***			65	***372.02***
		00509	27-Sep-17	230	0.98																	17	***272.91***			17	***272.91***
		00510	27-Sep-17	772	1.13													9	***37.14***							9	***37.14***
		00511	27-Sep-17	489	0.72																	13	***132.92***			13	***132.92***
		00512	27-Sep-17	671	1.28																	17	***71.26***			17	***71.26***
		00513	27-Sep-17	534	0.77													2	***17.51***			46	***402.74***			48	***420.25***
		00514	27-Sep-17	442	0.56																	30	***436.33***			30	***436.33***
		00515	27-Sep-17	648	0.97																	45	***257.73***			45	***257.73***
		00516	27-Sep-17	396	0.80																	46	***522.73***			46	***522.73***
		00517	27-Sep-17	540	0.70							1	***9.52***									42	***400***			43	***409.52***
		005SC060	27-Sep-17	591	0.53																	4	***45.97***			4	***45.97***
		0109OSA	23-Sep-17	388	0.73																	1	***12.71***			1	***12.71***
	Session Summary			**565**	**12.80**	**0**	***0***	**0**	***0***	**0**	***0***	**1**	***0.5***	**0**	***0***	**0**	***0***	**16**	***7.96***	**0**	***0***	**334**	***166.26***	**0**	***0***	**351**	***174.72***
Section 5	6	00502	03-Oct-17	503	0.95							1	***7.53***									9	***67.8***			10	***75.34***
		00505	03-Oct-17	1042	1.00													2	***6.91***			4	***13.82***			6	***20.73***
		00506	03-Oct-17	820	1.00																	3	***13.17***			3	***13.17***
		00507	03-Oct-17	501	0.78																	4	***36.85***			4	***36.85***
		00508	03-Oct-17	695	0.92													4	***22.4***			26	***145.6***			30	***168***
		00509	03-Oct-17	595	0.98													1	***6.21***			13	***80.67***			14	***86.88***
		00510	03-Oct-17	760	1.13																	8	***33.54***			8	***33.54***
		00511	03-Oct-17	509	0.72																	12	***117.88***			12	***117.88***
		00512	03-Oct-17	692	1.28																	17	***69.09***			17	***69.09***
		00513	03-Oct-17	551	0.77													5	***42.43***			8	***67.88***			13	***110.31***
		00514	03-Oct-17	431	0.56													7	***104.41***			30	***447.46***			37	***551.87***
		00515	03-Oct-17	576	0.97													1	***6.44***			59	***380.15***			60	***386.6***
		00516	03-Oct-17	409	0.80																	29	***319.07***			29	***319.07***
		00517	03-Oct-17	581	0.70																	10	***88.52***			10	***88.52***
		005SC060	03-Oct-17	784	0.53																	1	***8.66***			1	***8.66***
	Session Summary			**630**	**13.10**	**0**	***0***	**0**	***0***	**0**	***0***	**1**	***0.44***	**0**	***0***	**0**	***0***	**20**	***8.72***	**0**	***0***	**233**	***101.64***	**0**	***0***	**254**	***110.8***
Section Total All Samples				**56366**	**78.20**	**1**	***0***	**1**	***0***	**3**	***0***	**22**	***0***	**1**	***0***	**137**	***0***	**68**	***0***	**2**	***0***	**1748**	***0***	**0**	***0***	**1983**	***0***
Section Average All Samples				**626**	**0.87**	**0**	***0.07***	**0**	***0.07***	**0**	***0.22***	**0**	***1.62***	**0**	***0.07***	**2**	***10.07***	**1**	***5***	**0**	***0.15***	**19**	***128.55***	**0**	***0***	**22**	***145.83***
Section Standard Error of Mean						**0.01**	***0.06***	**0.01**	***0.04***	**0.02**	***0.12***	**0.07**	***0.39***	**0.01**	***0.04***	**0.32**	***2.3***	**0.19**	***1.82***	**0.02**	***0.13***	**1.55**	***13.41***	**0**	***0***	**1.68**	***14.4***

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Flathead Chub No.	Flathead Chub CPUE	Lake Chub No.	Lake Chub CPUE	Longnose Dace No.	Longnose Dace CPUE	Northern Pikeminnow No.	Northern Pikeminnow CPUE	Peamouth No.	Peamouth CPUE	Redside Shiner No.	Redside Shiner CPUE	Sculpin spp. No.	Sculpin spp. CPUE	Spottail Shiner No.	Spottail Shiner CPUE	Sucker spp. No.	Sucker spp. CPUE	Troutperch No.	Troutperch CPUE	All Species No.	All Species CPUE
						Number Caught (CPUE = no. fish/km/h)																					
Section 6	1	00601	21-Aug-17	761	1.20																	9	35.48			9	35.48
		00602	21-Aug-17	716	0.90											7	39.11					3	16.76			10	55.87
		00603	22-Aug-17	745	1.30					1	3.72											70	260.2			71	263.91
		00604	22-Aug-17	628	0.98																	13	75.66			13	75.66
		00605	22-Aug-17	533	0.80					4	33.77					3	25.33					66	557.22			73	616.32
		00606	22-Aug-17	937	1.40							7	19.21			41	112.52					40	109.77			88	241.5
		00607	23-Aug-17	763	1.00																	40	188.73			40	188.73
		00608	22-Aug-17	511	1.00							2	14.09									24	169.08			26	183.17
		00609	22-Aug-17	853	1.00											7	29.54	14	59.09			19	80.19	1	4.22	41	173.04
		00610	23-Aug-17	729	0.85			1	5.81	16	92.96					3	17.43					24	139.43			44	255.63
		00611	23-Aug-17	591	0.90					1	6.77	1	6.77			2	13.54					42	284.26			46	311.34
		00612	23-Aug-17	522	0.85			1	8.11	2	16.23					1	8.11					5	40.57			9	73.02
		00613	23-Aug-17	833	0.90							1	4.83			6	28.97					7	33.8			14	67.6
		00614	21-Aug-17	623	0.98							1	5.93									43	254.85			44	260.77
		006PIN02	21-Aug-17	399	1.00							1	9.02			3	27.07					1	9.02			5	45.11
		006SC036	23-Aug-17	453	0.45							2	35.32			6	105.96					17	300.22	2	35.32	27	476.82
		006SC047	21-Aug-17	472	0.55							1	13.87									4	55.47			5	69.34
	Session Summary			**651**	**16.10**	**0**	**0**	**2**	**0.69**	**24**	**8.24**	**16**	**5.5**	**0**	**0**	**79**	**27.13**	**14**	**4.81**	**0**	**0**	**427**	**146.66**	**3**	**1.03**	**565**	**194.06**
Section 6	2	00601	29-Aug-17	800	1.20											2	7.5					17	63.75			19	71.25
		00602	29-Aug-17	654	0.90											35	214.07							1	6.12	36	220.18
		00603	29-Aug-17	810	1.30																	51	174.36			51	174.36
		00604	30-Aug-17	635	1.00							1	5.67			1	5.67					4	22.68			6	34.02
		00605	30-Aug-17	506	0.80													1	8.89			60	533.6			61	542.49
		00606	30-Aug-17	1102	1.40											8	18.67	1	2.33			55	128.34	1	2.33	65	151.67
		00607	30-Aug-17	847	1.00					2	8.5							1	4.25			85	361.28			88	374.03
		00608	30-Aug-17	610	1.00																	14	82.62			14	82.62
		00609	30-Aug-17	768	1.00					1	4.69											3	14.06			4	18.75
		00610	30-Aug-17	735	0.85					1	5.76	1	5.76									1	5.76			3	17.29
		00611	30-Aug-17	762	0.90											3	15.75									3	15.75
		00612	30-Aug-17	573	0.85			1	7.39	4	29.57					3	22.17					15	110.87	1	7.39	24	177.39
		00613	31-Aug-17	647	0.90							2	12.36			2	12.36			5	30.91	10	61.82			19	117.47
		00614	29-Aug-17	854	0.98	1	4.32					1	4.32			1	4.32					67	289.68			70	302.65
		006PIN01	29-Aug-17	1407	1.50											5	8.53					1	1.71			6	10.23
		006PIN02	29-Aug-17	573	1.00											4	25.13					4	25.13			8	50.26
		006SC036	31-Aug-17	481	0.47											2	31.85					19	302.56	1	15.92	22	350.33
		006SC047	29-Aug-17	511	0.55							1	12.81			65	832.59					1	12.81			67	858.21
	Session Summary			**738**	**17.60**	**1**	**0.28**	**1**	**0.28**	**8**	**2.22**	**6**	**1.66**	**0**	**0**	**131**	**36.31**	**3**	**0.83**	**5**	**1.39**	**407**	**112.8**	**4**	**1.11**	**566**	**156.87**
Section 6	3	00601	05-Sep-17	782	1.20							2	7.67									34	130.43			36	138.11
		00602	05-Sep-17	675	0.90																	1	5.93	1	5.93	2	11.85
		00603	05-Sep-17	725	1.30																	70	267.37			70	267.37
		00604	05-Sep-17	671	1.00							7	37.56									19	101.94			26	139.49
		00605	05-Sep-17	707	0.80					8	50.92							1	6.36			43	273.69			52	330.98
		00606	06-Sep-17	882	1.40	1	2.92					2	5.83			71	207					20	58.31			94	274.05
		00607	06-Sep-17	1010	1.00					1	3.56					1	3.56					115	409.9			117	417.03
		00608	05-Sep-17	531	1.00																	28	189.83			28	189.83
		00609	06-Sep-17	927	1.00					1	3.88	3	11.65			8	31.07			25	97.09	27	104.85			64	248.54
		00610	06-Sep-17	751	0.85			1	5.64	1	5.64	2	11.28			4	22.56	1	5.64			3	16.92	1	5.64	13	73.31
		00611	06-Sep-17	802	0.90							1	4.99									10	49.88			11	54.86
		00612	06-Sep-17	646	0.85			1	6.56	2	13.11											41	268.8			44	288.47
		00613	06-Sep-17	1022	0.90	1	3.91	1	3.91			4	15.66			27	105.68					8	31.31			41	160.47
		00614	05-Sep-17	801	0.98					1	4.61											74	341.11	2	9.22	77	354.94
		006PIN01	04-Sep-17	1904	1.50											34	42.86					2	2.52			36	45.38
		006SC036	06-Sep-17	503	0.40							1	17.89			4	71.57			1	17.89	63	1127.24			69	1234.59
		006SC047	05-Sep-17	696	0.54											1	9.67					1	9.67			2	19.34
	Session Summary			**826**	**16.50**	**2**	**0.53**	**3**	**0.79**	**14**	**3.7**	**22**	**5.81**	**0**	**0**	**150**	**39.62**	**2**	**0.53**	**26**	**6.87**	**559**	**147.66**	**4**	**1.06**	**782**	**206.56**

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																					
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 6	4	00601	13-Sep-17	804	1.20																	39	145.52			39	145.52
		00602	13-Sep-17	675	0.90																	2	11.85			2	11.85
		00603	13-Sep-17	800	1.30																	39	135	1	3.46	40	138.46
		00604	13-Sep-17	713	1.00							3	15.15									16	80.79			19	95.93
		00605	13-Sep-17	582	0.80																	61	471.65			61	471.65
		00606	14-Sep-17	990	1.40					1	2.6					17	44.16					35	90.91			53	137.66
		00607	14-Sep-17	721	1.00																	51	254.65			51	254.65
		00608	13-Sep-17	590	1.00																	19	115.93			19	115.93
		00609	14-Sep-17	858	1.00									1	4.2	3	12.59	3	12.59			39	163.64	3	12.59	49	205.59
		00610	14-Sep-17	617	0.83	1	7.03	1	7.03	1	7.03	2	14.06									25	175.74			30	210.89
		00611	14-Sep-17	630	0.90																	26	165.08			26	165.08
		00612	14-Sep-17	636	0.85											10	66.59	1	6.66	1	6.66	33	219.76			45	299.67
		00613	14-Sep-17	797	0.90							1	5.02			31	155.58					20	100.38			52	260.98
		00614	13-Sep-17	854	0.98					1	4.32							3	12.97			44	190.24			48	207.53
		006PIN01	13-Sep-17	1601	1.50											61	91.44					7	10.49			68	101.94
		006PIN02	13-Sep-17	691	1.00																	8	41.68			8	41.68
		006SC036	14-Sep-17	855	0.50							1	8.42			14	117.89			2	16.84	4	33.68			21	176.84
		006SC047	13-Sep-17	638	0.50					1	11.29	1	11.29			1	11.29					1	11.29			4	45.14
	Session Summary			**781**	**17.60**	**1**	**0.26**	**1**	**0.26**	**4**	**1.05**	**8**	**2.1**	**1**	**0.26**	**137**	**35.88**	**7**	**1.83**	**3**	**0.79**	**469**	**122.83**	**4**	**1.05**	**635**	**166.31**
Section 6	5	00601	23-Sep-17	834	1.20							1	3.6					3	10.79			13	46.76			17	61.15
		00602	24-Sep-17	609	0.90																	3	19.7			3	19.7
		00603	24-Sep-17	649	1.30											1	4.27					71	302.95			72	307.22
		00604	24-Sep-17	695	1.00							1	5.18									11	56.98			12	62.16
		00605	24-Sep-17	456	0.80																	77	759.87			77	759.87
		00606	24-Sep-17	879	1.40											10	29.25	46	134.57			44	128.72			100	292.54
		00607	24-Sep-17	627	1.00							2	11.48									65	373.21			67	384.69
		00608	24-Sep-17	456	1.00							2	15.79									24	189.47			26	205.26
		00609	24-Sep-17	709	1.00			1	5.08			1	5.08			2	10.16					62	314.81	2	10.16	68	345.28
		00610	24-Sep-17	618	0.85	1	6.85															22	150.77			23	157.62
		00611	24-Sep-17	609	0.90	1	6.57	1	6.57			1	6.57									23	151.07			26	170.77
		00612	24-Sep-17	544	0.85																	30	233.56			30	233.56
		00613	24-Sep-17	673	0.90	1	5.94					2	11.89									22	130.76			25	148.59
		00614	24-Sep-17	669	0.98																	128	706.45			128	706.45
		006PIN01	23-Sep-17	1011	1.50							1	2.37									9	21.36			10	23.74
		006PIN02	23-Sep-17	529	1.00																	6	40.83			6	40.83
		006SC036	25-Sep-17	914	0.50																	4	31.51	2	15.75	6	47.26
		006SC047	24-Sep-17	580	0.55																	1	11.29	1	11.29	2	22.57
	Session Summary			**670**	**17.60**	**3**	**0.92**	**2**	**0.61**	**0**	**0**	**11**	**3.36**	**0**	**0**	**13**	**3.97**	**49**	**14.96**	**0**	**0**	**615**	**187.75**	**5**	**1.53**	**698**	**213.09**
Section 6	6	00601	04-Oct-17	681	1.20																	14	61.67			14	61.67
		00602	04-Oct-17	669	0.90													1	5.98			1	5.98			2	11.96
		00603	04-Oct-17	667	1.30																	50	207.59			50	207.59
		00604	04-Oct-17	680	1.00																	24	127.06			24	127.06
		00605	04-Oct-17	481	0.80													1	9.36			89	832.64			90	842
		00606	04-Oct-17	968	1.40																	68	180.64			68	180.64
		00607	04-Oct-17	724	1.00																	80	397.79			80	397.79
		00608	04-Oct-17	576	1.00																	21	131.25			21	131.25
		00609	04-Oct-17	800	1.00							1	4.5									73	328.5			74	333
		00610	04-Oct-17	690	0.85																	7	42.97			7	42.97
		00611	04-Oct-17	652	0.90																	17	104.29	1	6.13	18	110.43
		00612	04-Oct-17	610	0.85	1	6.94			1	6.94											74	513.79	1	6.94	77	534.62
		00613	04-Oct-17	685	0.90							1	5.84					2	11.68			4	23.36			7	40.88
		00614	04-Oct-17	614	0.98																	65	390.88			65	390.88
		006PIN01	03-Oct-17	1307	1.50							1	1.84									1	1.84			2	3.67
		006PIN02	03-Oct-17	452	1.00							1	7.96					2	15.93			1	7.96			4	31.86
		006SC036	04-Oct-17	631	0.50							1	11.41			50	570.52					10	114.1			61	696.04
		006SC047	04-Oct-17	585	0.55																	1	11.19			1	11.19
	Session Summary			**693**	**17.60**	**1**	**0.3**	**0**	**0**	**1**	**0.3**	**5**	**1.48**	**0**	**0**	**50**	**14.76**	**6**	**1.77**	**0**	**0**	**600**	**177.1**	**2**	**0.59**	**665**	**196.28**
Section Total All Samples				**76964**	**102.97**	**8**	**0**	**9**	**0**	**51**	**0**	**68**	**0**	**1**	**0**	**560**	**0**	**81**	**0**	**34**	**0**	**3077**	**0**	**22**	**0**	**3911**	**0**
Section Average All Samples				**726**	**0.97**	**0**	**0.39**	**0**	**0.43**	**0**	**2.46**	**1**	**3.27**	**0**	**0.05**	**5**	**26.97**	**1**	**3.9**	**0**	**1.64**	**29**	**148.18**	**0**	**1.06**	**37**	**188.35**
Section Standard Error of Mean						**0.03**	**0.15**	**0.03**	**0.17**	**0.18**	**1.09**	**0.12**	**0.66**	**0.01**	**0.04**	**1.32**	**10.01**	**0.45**	**1.4**	**0.24**	**0.98**	**2.72**	**18.75**	**0.05**	**0.45**	**2.87**	**20.54**

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 7	1	00701	23-Aug-17	717	0.78							1	6.4									12	76.75			13	83.15
		00702	25-Aug-17	528	0.95			2	14.35									1	7.18			17	122.01			20	143.54
		00703	25-Aug-17	633	0.95																	21	125.72			21	125.72
		00704	25-Aug-17	618	1.00	1	5.83					1	5.83									12	69.9			14	81.55
		00705	25-Aug-17	710	0.98							1	5.15									7	36.03			8	41.18
		00706	25-Aug-17	866	1.00											1	4.16					13	54.04			14	58.2
		00707	25-Aug-17	557	0.98			1	6.6			1	6.6									5	32.98			7	46.17
		00708	25-Aug-17	646	1.24	1	4.49															11	49.44			12	53.93
		00709	25-Aug-17	610	1.00																	25	147.54			25	147.54
		00710	25-Aug-17	816	1.40	1	3.15					1	3.15									28	88.24			30	94.54
		00711	24-Aug-17	913	1.39																	21	59.57			21	59.57
		00712	24-Aug-17	556	1.06													1	6.08			12	72.96			13	79.04
		00713	24-Aug-17	583	0.98							1	6.3									7	44.11			8	50.41
		00714	24-Aug-17	800	1.27																	9	31.76			9	31.76
		007BEA01	23-Aug-17	518	0.43	1	16.16	4	64.65			1	16.16			6	96.97					6	96.97			18	290.92
		007BEA02	25-Aug-17	274	0.43			1	30.56									2	61.11			5	152.78			8	244.44
		007SC012	24-Aug-17	291	0.22	2	112.46															2	112.46			4	224.93
		007SC022	25-Aug-17	406	0.36											2	49.26					5	123.15			7	172.41
	Session Summary			**613**	**16.40**	**6**	**2.15**	**8**	**2.86**	**0**	**0**	**7**	**2.51**	**0**	**0**	**9**	**3.22**	**4**	**1.43**	**0**	**0**	**218**	**78.06**	**0**	**0**	**252**	**90.24**
Section 7	2	00701	31-Aug-17	584	0.78							1	7.85			5	39.26					14	109.94			20	157.05
		00702	31-Aug-17	488	0.95																	11	85.42			11	85.42
		00703	31-Aug-17	571	0.95	1	6.64									6	39.82					32	212.37			39	258.83
		00704	31-Aug-17	599	1.00							1	6.01									69	414.69			70	420.7
		00705	31-Aug-17	625	1.00							2	11.52			1	5.76					8	46.08			11	63.36
		00706	02-Sep-17	955	1.00							5	18.85			1	3.77					9	33.93			15	56.54
		00707	02-Sep-17	745	0.98			1	4.93													16	78.89			17	83.82
		00708	31-Aug-17	660	1.24	2	8.8	2	8.8							1	4.4			13	57.18	10	43.99			28	123.17
		00709	31-Aug-17	592	1.00																	22	133.78			22	133.78
		00710	02-Sep-17	975	1.40																	13	34.29			13	34.29
		00711	02-Sep-17	953	1.39							1	2.72									66	179.37			67	182.08
		00712	02-Sep-17	830	1.06											1	4.07					18	73.31			19	77.38
		00713	02-Sep-17	572	0.98							1	6.42									24	154.13			25	160.55
		00714	02-Sep-17	884	1.27																	39	124.57			39	124.57
		007BEA01	31-Aug-17	432	0.43																	1	19.38			1	19.38
		007BEA02	31-Aug-17	265	0.60	2	45.28									1	22.64					7	158.49			10	226.42
		007SC012	02-Sep-17	384	0.22																	5	213.07			5	213.07
		007SC022	02-Sep-17	359	0.36											14	389.97					1	27.86			15	417.83
	Session Summary			**637**	**16.60**	**5**	**1.7**	**3**	**1.02**	**0**	**0**	**11**	**3.74**	**0**	**0**	**30**	**10.21**	**0**	**0**	**13**	**4.43**	**365**	**124.26**	**0**	**0**	**427**	**145.37**
Section 7	3	00701	07-Sep-17	763	0.78											1	6.01			2	12.02	19	114.2	1	6.01	23	138.24
		00702	07-Sep-17	541	0.95											2	14.01					36	252.16			38	266.17
		00703	07-Sep-17	794	0.95																	21	100.23			21	100.23
		00704	07-Sep-17	680	1.00	1	5.29					2	10.59			20	105.88					36	190.59			59	312.35
		00705	08-Sep-17	701	1.00											1	5.14					1	5.14			2	10.27
		00706	08-Sep-17	909	0.98							2	8.04			4	16.08					6	24.12			12	48.25
		00707	08-Sep-17	694	0.98							1	5.29									16	84.69			17	89.98
		00708	07-Sep-17	772	1.24	1	3.76					1	3.76			20	75.21					54	203.08			76	285.81
		00709	07-Sep-17	794	1.00					1	4.53											27	122.42			28	126.95
		00710	07-Sep-17	1100	1.40											1	2.34					17	39.74			18	42.08
		00711	08-Sep-17	887	1.39					1	2.92					4	11.68					37	108.04			42	122.63
		00712	08-Sep-17	846	1.06																	9	35.96			9	35.96
		00713	08-Sep-17	582	0.98							1	6.31			12	75.74					20	126.24			33	208.29
		00714	08-Sep-17	892	1.27																	20	63.31			20	63.31
		007BEA02	07-Sep-17	458	0.60	1	13.1					1	13.1									4	52.4	1	13.1	7	91.7
		007SC012	08-Sep-17	384	0.22			1	42.61													1	42.61			2	85.23
		007SC022	08-Sep-17	499	0.36											2	40.08			10	200.4					12	240.48
	Session Summary			**723**	**16.20**	**3**	**0.92**	**1**	**0.31**	**2**	**0.61**	**8**	**2.46**	**0**	**0**	**67**	**20.59**	**0**	**0**	**12**	**3.69**	**324**	**99.59**	**2**	**0.61**	**419**	**128.78**

Number Caught (CPUE = no. fish/km/h)

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Flathead Chub No.	Flathead Chub CPUE	Lake Chub No.	Lake Chub CPUE	Longnose Dace No.	Longnose Dace CPUE	Northern Pikeminnow No.	Northern Pikeminnow CPUE	Peamouth No.	Peamouth CPUE	Redside Shiner No.	Redside Shiner CPUE	Sculpin spp. No.	Sculpin spp. CPUE	Spottail Shiner No.	Spottail Shiner CPUE	Sucker spp. No.	Sucker spp. CPUE	Troutperch No.	Troutperch CPUE	All Species No.	All Species CPUE
						Number Caught (CPUE = no. fish/km/h)																					
Section 7	4	00701	15-Sep-17	766	0.78																	5	29.93			5	29.93
		00702	15-Sep-17	601	0.95			1	6.31	1	6.31					3	18.92					24	151.33			29	182.85
		00703	15-Sep-17	902	0.95											1	4.2	4	16.8			12	50.41			17	71.42
		00704	15-Sep-17	712	1.00																	47	237.64	1	5.06	48	242.7
		00705	15-Sep-17	754	1.00							1	4.77									15	71.62			16	76.39
		00706	16-Sep-17	982	1.00							2	7.33									19	69.65			21	76.99
		00707	16-Sep-17	646	0.98	1	5.69									3	17.06					40	227.46			44	250.21
		00708	15-Sep-17	912	1.24																	39	124.15			39	124.15
		00709	15-Sep-17	830	1.00																	16	69.4			16	69.4
		00710	15-Sep-17	990	1.40																	9	23.38			9	23.38
		00711	16-Sep-17	929	1.39							2	5.58									69	192.36			71	197.94
		00712	16-Sep-17	894	1.06																	33	124.78			33	124.78
		00713	16-Sep-17	633	0.98																	30	174.1			30	174.1
		00714	16-Sep-17	1028	1.27																	13	35.71	1	2.75	14	38.45
		007BEA02	15-Sep-17	410	0.60																	6	87.8			6	87.8
		007SC012	16-Sep-17	465	0.22											1	35.19					2	70.38			3	105.57
		007SC022	16-Sep-17	476	0.36							1	21.01			1	21.01									2	42.02
	Session Summary			**761**	**16.20**	**1**	**0.29**	**1**	**0.29**	**1**	**0.29**	**6**	**1.75**	**0**	**0**	**9**	**2.63**	**4**	**1.17**	**0**	**0**	**379**	**110.67**	**2**	**0.58**	**403**	**117.68**
Section 7	5	00701	25-Sep-17	683	0.78																	6	40.29			6	40.29
		00702	25-Sep-17	507	0.94													3	22.66			9	67.98			12	90.65
		00703	25-Sep-17	621	0.95																	46	280.7			46	280.7
		00704	25-Sep-17	568	1.00																	51	323.24			51	323.24
		00705	25-Sep-17	641	1.00							1	5.62			1	5.62					16	89.86			18	101.09
		00706	25-Sep-17	877	1.00							1	4.1			17	69.78					15	61.57			33	135.46
		00707	25-Sep-17	671	0.98							1	5.47									19	104.02			20	109.49
		00708	25-Sep-17	739	1.24							1	3.93									28	110			29	113.93
		00709	25-Sep-17	572	1.00																	39	245.45			39	245.45
		00710	25-Sep-17	840	1.40																	12	36.73			12	36.73
		00711	25-Sep-17	832	1.39							1	3.11									40	124.52			41	127.63
		00712	25-Sep-17	690	1.06																	27	132.27			27	132.27
		00713	25-Sep-17	553	0.98							1	6.64									22	146.14			23	152.78
		00714	25-Sep-17	810	1.27											1	3.49					25	87.15			26	90.63
		007BEA01	25-Sep-17	405	0.43																	1	20.67			1	20.67
		007BEA02	25-Sep-17	384	0.60																	9	140.62			9	140.62
		007SC012	25-Sep-17	321	0.22																	5	254.89			5	254.89
		007SC022	25-Sep-17	372	0.36							1	26.88									5	134.41			6	161.29
	Session Summary			**616**	**16.60**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**2.46**	**0**	**0**	**19**	**6.69**	**3**	**1.06**	**0**	**0**	**375**	**132.02**	**0**	**0**	**404**	**142.23**
Section 7	6	00701	01-Oct-17	720	0.78																	50	318.47			50	318.47
		00702	01-Oct-17	594	0.95					1	6.38											23	146.73			24	153.11
		00703	01-Oct-17	747	0.95																	43	218.14			43	218.14
		00704	01-Oct-17	660	1.00																	53	289.09			53	289.09
		00705	01-Oct-17	737	1.00																	7	34.19			7	34.19
		00706	01-Oct-17	975	1.00			1	3.69			2	7.38			2	7.38	1	3.69			7	25.85			13	48
		00707	01-Oct-17	680	0.98			1	5.4			1	5.4									8	43.22			10	54.02
		00708	01-Oct-17	644	1.24																	13	58.61			13	58.61
		00709	01-Oct-17	733	1.00							1	4.91									32	157.16			33	162.07
		00710	01-Oct-17	912	1.40																	23	64.85			23	64.85
		00711	01-Oct-17	927	1.39							1	2.79			1	2.79	1	2.79			22	61.47			25	69.85
		00712	01-Oct-17	719	1.06																	24	112.83			24	112.83
		00713	01-Oct-17	594	0.98			1	6.18													17	105.13			18	111.32
		00714	01-Oct-17	869	1.27			1	3.25													16	51.99			17	55.24
		007BEA01	01-Oct-17	367	0.43																	7	159.69			7	159.69
		007BEA02	01-Oct-17	373	0.60																	6	96.51			6	96.51
		007SC012	01-Oct-17	379	0.22			1	43.18													4	172.7			5	215.88
		007SC022	01-Oct-17	385	0.36							1	25.97													1	25.97
	Session Summary			**668**	**16.60**	**0**	**0**	**5**	**1.62**	**1**	**0.32**	**6**	**1.95**	**0**	**0**	**3**	**0.97**	**2**	**0.65**	**0**	**0**	**355**	**115.25**	**0**	**0**	**372**	**120.77**
Section Total All Samples				**70842**	**98.68**	**15**	**0**	**18**	**0**	**4**	**0**	**45**	**0**	**0**	**0**	**137**	**0**	**13**	**0**	**25**	**0**	**2016**	**0**	**4**	**0**	**2277**	**0**
Section Average All Samples				**668**	**0.93**	**0**	**0.82**	**0**	**0.98**	**0**	**0.22**	**0**	**2.46**	**0**	**0**	**1**	**7.48**	**0**	**0.71**	**0**	**1.37**	**19**	**110.1**	**0**	**0.22**	**21**	**124.35**
Section Standard Error of Mean						**0.04**	**1.16**	**0.05**	**0.89**	**0.02**	**0.1**	**0.07**	**0.51**	**0**	**0**	**0.36**	**4.09**	**0.05**	**0.64**	**0.15**	**1.96**	**1.53**	**7.65**	**0.02**	**0.15**	**1.6**	**8.66**

Table E4 Continued.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																					
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 9	1	00901	27-Aug-17	601	1.10																	6	32.67			6	32.67
		00902	27-Aug-17	598	1.00	1	6.02					2	12.04			1	6.02					12	72.24			16	96.32
		00903	28-Aug-17	681	1.10	1	4.81															59	283.54			60	288.35
		00904	28-Aug-17	778	1.10			2	8.41													13	54.69			15	63.1
		00905	28-Aug-17	773	1.10	1	4.23															37	156.65			38	160.88
		00906	28-Aug-17	782	1.00	1	4.6					1	4.6									19	87.47			21	96.68
		00907	28-Aug-17	921	1.20							1	3.26									44	143.32			45	146.58
		00908	28-Aug-17	626	1.10	1	5.23	1	5.23							6	31.37					33	172.52			41	214.35
		00909	28-Aug-17	635	0.95																	48	286.45			48	286.45
		00910	28-Aug-17	1128	1.10			2	5.8							1	2.9					14	40.62			17	49.32
		00911	29-Aug-17	594	1.00	1	6.06	13	78.79			1	6.06									18	109.09			33	200
		00912	29-Aug-17	628	1.10	1	5.21															7	36.48			8	41.69
		00913	29-Aug-17	654	0.90			2	12.23			1	6.12									6	36.7			9	55.05
		00914	29-Aug-17	543	0.95	1	6.98	1	6.98																	2	13.96
		009SC053	28-Aug-17	459	0.26											1	30.17			1	30.17	5	150.83			7	211.16
		009SC061	29-Aug-17	751	0.68			1	7.1			1	7.1									10	71.02			12	85.22
	Session Summary			**697**	**15.60**	**8**	**2.65**	**22**	**7.28**	**0**	**0**	**7**	**2.32**	**0**	**0**	**9**	**2.98**	**0**	**0**	**1**	**0.33**	**331**	**109.59**	**0**	**0**	**378**	**125.15**
Section 9	2	00901	03-Sep-17	756	1.10			27	116.88							103	445.89					12	51.95			142	614.72
		00902	03-Sep-17	765	1.00	1	4.71	1	4.71			2	9.41			25	117.65					4	18.82			33	155.29
		00903	03-Sep-17	731	1.10																	19	85.06			19	85.06
		00904	03-Sep-17	755	1.10							1	4.33			2	8.67					18	78.03			21	91.03
		00905	03-Sep-17	902	1.10			11	39.91							12	43.54					31	112.48			54	195.93
		00906	03-Sep-17	986	1.00																	21	76.67			21	76.67
		00907	03-Sep-17	967	1.20											1	3.1					11	34.13			12	37.23
		00908	03-Sep-17	675	1.10					1	4.85											8	38.79			9	43.64
		00909	03-Sep-17	764	0.95																	33	163.68			33	163.68
		00910	03-Sep-17	1310	1.10											3	7.49					10	24.98			13	32.48
		00911	04-Sep-17	639	1.00			1	5.63	1	5.63	1	5.63									45	253.52			48	270.42
		00912	04-Sep-17	712	1.10			1	4.6													7	32.18			8	36.77
		00913	04-Sep-17	674	0.90											1	5.93					8	47.48			9	53.41
		00914	04-Sep-17	560	0.95							1	6.77			4	27.07					20	135.34			25	169.17
		009SC061	04-Sep-17	827	0.68			3	19.35							1	6.45	2	12.9			7	45.14			13	83.84
	Session Summary			**802**	**15.40**	**1**	**0.29**	**44**	**12.83**	**2**	**0.58**	**5**	**1.46**	**0**	**0**	**152**	**44.3**	**2**	**0.58**	**0**	**0**	**254**	**74.04**	**0**	**0**	**460**	**134.08**
Section 9	3	00901	10-Sep-17	693	1.10			1	4.72							4	18.89					9	42.5			14	66.12
		00902	10-Sep-17	843	1.00			2	8.54			2	8.54			5	21.35					4	17.08			13	55.52
		00903	10-Sep-17	781	1.10											2	8.38					11	46.09			13	54.48
		00904	10-Sep-17	842	1.10			10	38.87							29	112.72					9	34.98			48	186.57
		00905	10-Sep-17	710	1.10																	12	55.31			12	55.31
		00906	10-Sep-17	853	1.00																	15	63.31			15	63.31
		00907	10-Sep-17	1074	1.20			3	8.38							1	2.79					29	81.01			33	92.18
		00908	09-Sep-17	614	1.10			1	5.33													27	143.91			28	149.24
		00909	09-Sep-17	606	0.95			1	6.25													38	237.62			39	243.88
		00910	10-Sep-17	1161	1.10			1	2.82							10	28.19					14	39.46			25	70.47
		00911	10-Sep-17	809	1.00	1	4.45					1	4.45			30	133.5					37	164.65			69	307.05
		00912	11-Sep-17	715	1.10																	5	22.89			5	22.89
		00913	11-Sep-17	660	0.90											2	12.12					2	12.12			4	24.24
		00914	11-Sep-17	641	0.95																	12	70.94			12	70.94
		009SC053	10-Sep-17	500	0.26															1	27.69					1	27.69
		009SC061	11-Sep-17	772	0.68											6	41.45					4	27.63			10	69.08
	Session Summary			**767**	**15.60**	**1**	**0.3**	**19**	**5.72**	**0**	**0**	**3**	**0.9**	**0**	**0**	**89**	**26.78**	**0**	**0**	**1**	**0.3**	**228**	**68.6**	**0**	**0**	**341**	**102.6**

Table E4 Concluded.

Section	Session	Site	Date	Time Sampled (s)	Length Sampled (km)	Number Caught (CPUE = no. fish/km/h)																			
						Flathead Chub		Lake Chub		Longnose Dace		Northern Pikeminnow		Peamouth		Redside Shiner		Sculpin spp.		Spottail Shiner		Sucker spp.		Troutperch		All Species	
						No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE	No.	CPUE
Section 9	4	00901	17-Sep-17	682	1.10					2	***9.6***									1	***4.8***	7	***33.59***			10	***47.99***
		00902	17-Sep-17	765	1.00							1	***4.71***			2	***9.41***					7	***32.94***			10	***47.06***
		00903	17-Sep-17	687	1.10																	9	***42.87***			9	***42.87***
		00904	17-Sep-17	702	1.10							1	***4.66***									3	***13.99***			4	***18.65***
		00905	18-Sep-17	754	1.10																	11	***47.75***			11	***47.75***
		00906	18-Sep-17	819	1.00																	16	***70.33***			16	***70.33***
		00907	18-Sep-17	800	1.20																	12	***45***			12	***45***
		00908	18-Sep-17	549	1.10																	9	***53.65***			9	***53.65***
		00909	18-Sep-17	597	0.95																	7	***44.43***			7	***44.43***
		00910	18-Sep-17	1043	1.10																	12	***37.65***			12	***37.65***
		00911	18-Sep-17	631	1.00			1	***5.71***													10	***57.05***			11	***62.76***
		00912	18-Sep-17	706	1.10																	5	***23.18***			5	***23.18***
		00914	18-Sep-17	532	0.95																	4	***28.49***			4	***28.49***
		009SC053	17-Sep-17	521	0.26																	3	***79.73***			3	***79.73***
		009SC061	18-Sep-17	730	0.68																	8	***58.45***			8	***58.45***
	Session Summary			**701**	**14.70**	**0**	***0***	**1**	***0.35***	**2**	***0.7***	**2**	***0.7***	**0**	***0***	**2**	***0.7***	**0**	***0***	**1**	***0.35***	**123**	***42.97***	**0**	***0***	**131**	***45.77***
Section 9	5	00901	26-Sep-17	859	1.10																	13	***49.53***			13	***49.53***
		00902	26-Sep-17	679	1.00			1	***5.3***							1	***5.3***					15	***79.53***			17	***90.13***
		00903	26-Sep-17	787	1.10																	11	***45.74***			11	***45.74***
		00904	26-Sep-17	738	1.10																	1	***4.43***			1	***4.43***
		00905	26-Sep-17	819	1.10																	13	***51.95***			13	***51.95***
		00906	26-Sep-17	821	1.00																	23	***100.85***			23	***100.85***
		00907	26-Sep-17	827	1.20																	13	***47.16***			13	***47.16***
		00908	26-Sep-17	655	1.10	1	***5***									1	***5***					11	***54.96***			13	***64.95***
		00909	26-Sep-17	770	0.95																	7	***34.45***			7	***34.45***
		00910	26-Sep-17	1095	1.10			2	***5.98***													27	***80.7***			29	***86.67***
		00911	26-Sep-17	652	1.00											1	***5.52***					27	***149.08***			28	***154.6***
		00912	26-Sep-17	685	1.10																	16	***76.44***			16	***76.44***
		00913	26-Sep-17	603	0.90											2	***13.27***					1	***6.63***			3	***19.9***
		00914	26-Sep-17	556	0.95																	14	***95.42***			14	***95.42***
		009SC053	26-Sep-17	465	0.26																	5	***148.88***			5	***148.88***
		009SC061	26-Sep-17	706	0.68			1	***7.55***													1	***7.55***			2	***15.11***
	Session Summary			**732**	**15.60**	**1**	***0.32***	**4**	***1.26***	**0**	***0***	**0**	***0***	**0**	***0***	**5**	***1.58***	**0**	***0***	**0**	***0***	**198**	***62.42***	**0**	***0***	**208**	***65.57***
Section 9	6	00901	02-Oct-17	831	1.10																	5	***19.69***			5	***19.69***
		00902	02-Oct-17	665	1.00																	15	***81.2***			15	***81.2***
		00903	02-Oct-17	706	1.10																	6	***27.81***			6	***27.81***
		00904	02-Oct-17	701	1.10																	1	***4.67***			1	***4.67***
		00905	02-Oct-17	854	1.10			1	***3.83***													16	***61.32***			17	***65.15***
		00906	02-Oct-17	836	1.00																	11	***47.37***			11	***47.37***
		00907	02-Oct-17	918	1.20																	2	***6.54***			2	***6.54***
		00908	02-Oct-17	755	1.10					1	***4.33***													1	***4.33***	2	***8.67***
		00909	02-Oct-17	711	0.95													1	***5.33***			1	***5.33***			2	***10.66***
		00910	02-Oct-17	1203	1.10																	2	***5.44***			2	***5.44***
		00911	02-Oct-17	602	1.00																	11	***65.78***			11	***65.78***
		00912	02-Oct-17	657	1.10																	12	***59.78***			12	***59.78***
		00913	02-Oct-17	581	0.90																	6	***41.31***			6	***41.31***
		00914	02-Oct-17	541	0.95																	8	***56.04***			8	***56.04***
		009SC053	02-Oct-17	529	0.26													1	***26.17***							1	***26.17***
		009SC061	02-Oct-17	674	0.68																	1	***7.91***			1	***7.91***
	Session Summary			**735**	**15.60**	**0**	***0***	**1**	***0.31***	**1**	***0.31***	**0**	***0***	**0**	***0***	**0**	***0***	**2**	***0.63***	**0**	***0***	**97**	***30.46***	**1**	***0.31***	**102**	***32.03***
Section Total All Samples				**69448**	**92.65**	**11**	***0***	**91**	***0***	**5**	***0***	**17**	***0***	**0**	***0***	**257**	***0***	**4**	***0***	**3**	***0***	**1231**	***0***	**1**	***0***	**1620**	***0***
Section Average All Samples				**739**	**0.99**	**0**	***0.58***	**1**	***4.78***	**0**	***0.26***	**0**	***0.89***	**0**	***0***	**3**	***13.51***	**0**	***0.21***	**0**	***0.16***	**13**	***64.72***	**0**	***0.05***	**17**	***85.18***
Section Standard Error of Mean						**0.03**	***0.18***	**0.35**	***1.6***	**0.03**	***0.14***	**0.05**	***0.25***	**0**	***0***	**1.2**	***5.21***	**0.03**	***0.31***	**0.02**	***0.44***	**1.21**	***6.17***	**0.01**	***0.05***	**1.98**	***9.08***
All Sections Total All Samples				**392296**	**564.59**	***13503***	***0.22***	***35***	***0***	***121***	***0***	***70***	***0***	***215***	***0***	***5***	***0***	***1106***	***0.02***	***430***	***0.01***	***67***	***0***	***11427***	***0.19***	***27***	***0***
All Sections Average All Samples						***24***	***124.88***	***0***	***0.32***	***0***	***1.12***	***0***	***0.65***	***0***	***1.99***	***0***	***0.05***	***2***	***10.23***	***1***	***3.98***	***0***	***0.62***	***20***	***105.68***	***0***	***0.25***
All Sections Standard Error of Mean						***0.89***	***5.88***	***0.01***	***0.22***	***0.06***	***0.32***	***0.03***	***0.21***	***0.04***	***0.24***	***0***	***0.02***	***0.34***	***2.25***	***0.13***	***0.8***	***0.05***	***0.42***	***0.8***	***5.31***	***0.01***	***0.09***

Table E5 Summary of the number (N) of fish captured and recaptured in sampled sections of the Peace River, 21 August to 04 October 2017.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Arctic Grayling	Section 1	1	3	2	-	0
		2	3	3	0	0
		3	2	2	0	0
		4	3	3	0	0
		5	0	0	0	0
		6	1	1	0	0
	Section 1 subtotal		12	11	1	0
	Section 3	1	15	15	-	0
		2	10	8	1	1
		3	5	4	1	0
		4	5	5	0	0
		5	11	7	3	1
		6	2	2	0	0
	Section 3 subtotal		48	41	5	2
	Section 5	1	4	4	-	0
		2	4	4	0	0
		3	5	4	1	0
		4	6	6	0	0
		5	3	3	0	0
		6	5	5	0	0
	Section 5 subtotal		27	26	1	0
	Section 6	1	0	0	-	0
		2	0	0	0	0
		3	1	1	0	0
		4	1	1	0	0
		5	1	1	0	0
		6	0	0	0	0
	Section 6 subtotal		3	3	0	0
	Section 7	1	2	1	-	0
		2	2	1	1	0
		3	0	0	0	0
		4	1	0	1	0
		5	1	0	1	0
		6	1	1	0	0
	Section 7 subtotal		7	3	3	0
	Section 9	1	0	0	-	0
		2	0	0	0	0
		3	0	0	0	0
		4	0	0	0	0
		5	0	0	0	0
		6	0	0	0	0
	Section 9 subtotal		0	0	0	0
Arctic Grayling Total			97	84	10	2

Continued...

Table E5 Continued.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Bull Trout	Section 1	1	10	10	-	0
		2	15	15	0	0
		3	10	8	1	1
		4	12	9	3	0
		5	6	5	1	0
		6	9	7	1	1
	Section 1 subtotal		62	54	6	2
	Section 3	1	19	18	-	1
		2	22	18	0	4
		3	12	10	1	1
		4	12	7	3	2
		5	9	8	1	0
		6	15	11	2	2
	Section 3 subtotal		89	72	7	10
	Section 5	1	7	7	-	0
		2	7	5	0	2
		3	9	7	0	2
		4	9	5	3	1
		5	7	4	1	2
		6	10	6	3	1
	Section 5 subtotal		49	34	7	8
	Section 6	1	10	7	-	3
		2	4	3	1	0
		3	4	3	1	0
		4	6	2	3	1
		5	11	9	1	1
		6	7	5	2	0
	Section 6 subtotal		42	29	8	5
	Section 7	1	2	2	-	0
		2	5	4	1	0
		3	1	0	1	0
		4	4	2	1	1
		5	2	1	1	0
		6	5	4	1	0
	Section 7 subtotal		19	13	5	1
	Section 9	1	0	0	-	0
		2	2	2	0	0
		3	2	1	1	0
		4	2	2	0	0
		5	1	1	0	0
		6	3	3	0	0
	Section 9 subtotal		10	9	1	0
Bull Trout Total			271	211	34	26

Continued...

Table E5 Continued.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Largescale Sucker	Section 1	1	9	8	-	1
		2	14	13	1	0
		3	37	36	0	1
		4	6	5	1	0
		5	11	10	0	1
		6	5	5	0	0
	Section 1 subtotal		82	77	2	3
	Section 3	1	49	47	-	2
		2	44	40	2	2
		3	39	37	1	1
		4	44	39	3	2
		5	43	42	1	0
		6	41	39	1	1
	Section 3 subtotal		260	244	8	8
	Section 5	1	19	18	-	1
		2	9	8	1	0
		3	36	36	0	0
		4	46	44	0	2
		5	35	34	0	1
		6	26	25	0	1
	Section 5 subtotal		171	165	1	5
	Section 6	1	27	26	-	1
		2	21	19	0	2
		3	26	23	1	2
		4	37	34	1	2
		5	59	57	1	1
		6	29	27	1	1
	Section 6 subtotal		199	186	4	9
	Section 7	1	30	28	-	2
		2	14	13	0	1
		3	35	32	2	1
		4	10	6	2	2
		5	21	20	0	1
		6	27	26	1	0
	Section 7 subtotal		137	125	5	7
	Section 9	1	16	16	-	0
		2	10	10	0	0
		3	8	8	0	0
		4	3	3	0	0
		5	5	5	0	0
		6	5	5	0	0
	Section 9 subtotal		47	47	0	0
Largescale Sucker Total			896	844	20	32

Continued...

Table E5 Continued.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Longnose Sucker	Section 1	1	97	94	-	3
		2	110	98	2	10
		3	85	78	3	4
		4	74	68	4	2
		5	26	22	3	1
		6	13	13	0	0
	Section 1 subtotal		405	373	12	20
	Section 3	1	247	226	-	18
		2	195	178	8	9
		3	213	197	8	8
		4	149	131	10	8
		5	126	107	10	9
		6	111	100	7	4
	Section 3 subtotal		1041	939	46	56
	Section 5	1	118	108	-	9
		2	95	90	3	2
		3	101	92	2	7
		4	166	155	8	3
		5	87	79	5	3
		6	61	54	2	5
	Section 5 subtotal		628	578	21	29
	Section 6	1	233	216	-	15
		2	212	190	5	17
		3	220	196	9	15
		4	210	199	5	6
		5	280	252	17	11
		6	165	140	14	11
	Section 6 subtotal		1320	1193	51	75
	Section 7	1	120	114	-	5
		2	160	154	3	3
		3	156	138	9	7
		4	172	158	4	10
		5	192	169	15	8
		6	192	173	13	6
	Section 7 subtotal		992	906	45	39
	Section 9	1	220	199	-	8
		2	175	166	5	4
		3	166	150	8	8
		4	88	80	6	2
		5	125	109	13	3
		6	68	62	6	0
	Section 9 subtotal		842	766	40	25
Longnose Sucker Total			5228	4755	215	244

Continued...

Table E5 Continued.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Mountain Whitefish	Section 1	1	419	350	-	66
		2	305	254	13	37
		3	316	275	13	27
		4	531	470	18	42
		5	288	244	9	35
		6	358	319	12	27
	Section 1 subtotal		2217	1912	68	234
	Section 3	1	462	324	-	129
		2	316	243	16	56
		3	475	349	26	100
		4	484	366	35	83
		5	461	327	41	93
		6	428	344	28	56
	Section 3 subtotal		2626	1953	150	517
	Section 5	1	152	129	-	23
		2	174	145	2	27
		3	259	213	5	41
		4	274	212	19	43
		5	302	237	26	39
		6	284	248	12	24
	Section 5 subtotal		1445	1184	64	197
	Section 6	1	121	86	-	35
		2	137	102	6	28
		3	149	127	4	17
		4	220	173	12	35
		5	344	287	28	29
		6	448	379	32	37
	Section 6 subtotal		1419	1154	82	181
	Section 7	1	157	144	-	13
		2	67	63	2	2
		3	96	81	7	8
		4	137	111	15	11
		5	148	127	12	9
		6	158	133	14	11
	Section 7 subtotal		763	659	50	54
	Section 9	1	16	14	-	2
		2	32	27	1	2
		3	32	26	0	0
		4	26	19	2	5
		5	27	21	1	5
		6	31	23	5	3
	Section 9 subtotal		164	130	9	17
Mountain Whitefish Total			8634	6992	423	1200

Continued...

Table E5 Continued.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Rainbow Trout	Section 1	1	2	2	-	0
		2	10	10	0	0
		3	18	17	0	1
		4	7	7	0	0
		5	6	6	0	0
		6	6	6	0	0
	Section 1 subtotal		49	48	0	1
	Section 3	1	10	9	-	1
		2	4	2	1	1
		3	15	13	1	1
		4	14	11	2	1
		5	11	8	3	0
		6	6	6	0	0
	Section 3 subtotal		60	49	7	4
	Section 5	1	4	4	-	0
		2	3	2	1	0
		3	5	3	0	2
		4	3	1	1	1
		5	0	0	0	0
		6	1	0	1	0
	Section 5 subtotal		16	10	3	3
	Section 6	1	0	0	-	0
		2	0	0	0	0
		3	3	2	0	1
		4	0	0	0	0
		5	2	2	0	0
		6	0	0	0	0
	Section 6 subtotal		5	4	0	1
	Section 7	1	0	0	-	0
		2	0	0	0	0
		3	1	1	0	0
		4	1	0	1	0
		5	1	0	1	0
		6	0	0	0	0
	Section 7 subtotal		3	1	2	0
	Section 9	1	0	0	-	0
		2	0	0	0	0
		3	0	0	0	0
		4	1	1	0	0
		5	0	0	0	0
		6	0	0	0	0
	Section 9 subtotal		1	1	0	0
Rainbow Trout Total			134	113	12	9

Continued...

Table E5 Concluded.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
White Sucker	Section 1	1	5	5	-	0
		2	18	17	0	1
		3	17	16	1	0
		4	10	8	2	0
		5	6	4	1	1
		6	9	8	1	0
	Section 1 subtotal		65	58	5	2
	Section 3	1	3	3	-	0
		2	0	0	0	0
		3	2	2	0	0
		4	4	3	0	1
		5	1	1	0	0
		6	2	2	0	0
	Section 3 subtotal		12	11	0	1
	Section 5	1	10	7	-	3
		2	2	1	0	1
		3	2	2	0	0
		4	6	6	0	0
		5	3	3	0	0
		6	0	0	0	0
	Section 5 subtotal		23	19	0	4
	Section 6	1	3	3	-	0
		2	3	3	0	0
		3	27	26	0	1
		4	4	4	0	0
		5	3	3	0	0
		6	8	7	0	1
	Section 6 subtotal		48	46	0	2
	Section 7	1	0	0	-	0
		2	0	0	0	0
		3	3	3	0	0
		4	2	2	0	0
		5	0	0	0	0
		6	0	0	0	0
	Section 7 subtotal		5	5	0	0
	Section 9	1	6	6	-	0
		2	2	2	0	0
		3	3	2	0	1
		4	6	5	0	1
		5	9	9	0	0
		6	2	2	0	0
	Section 9 subtotal		28	26	0	2
White Sucker	**Total**		181	165	5	11

APPENDIX F

Life History Information

Table F1: Multiple comparison results for comparing slopes of weight-length regressions. Years that do not share a letter are significantly different (P<0.05; within section only). P-values were adjusted using Tukey's HSD procedure.

Species	Section	Year															
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Arctic Grayling	1, 3, 5	abc	abc	bc	abc	abc	a	abc	ab	c	abc	a	ab	abc	abc	abc	abc
Arctic Grayling	6, 7, 9	-	-	-	-	-	-	-	a	a	a	-	-	-	a	a	a
Bull Trout	1, 3, 5	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Bull Trout	6, 7, 9	-	-	-	-	-	-	-	a	a	a	-	-	-	a	a	a
Largescale Sucker	1, 3, 5	ab	ab	b	ab	bc	b	bc	b	abc	ab	ab	a	c	bc	b	b
Largescale Sucker	6, 7, 9	-	-	-	-	-	-	-	bc	a	c	-	-	-	c	c	ab
Longnose Sucker	1, 3, 5	ab	bcde	bcde	bcd	f	abc	bcd	bcd	def	abcd	ab	a	ef	b	cde	b
Longnose Sucker	6, 7, 9	-	-	-	-	-	-	-	bc	a	cd	-	-	-	c	de	b
Mountain Whitefish	1, 3, 5	c	de	j	e	f	g	f	f	g	d	a	b	h	i	gh	d
Mountain Whitefish	6, 7, 9	-	-	-	-	-	-	-	c	b	ab	-	-	-	d	c	a
Rainbow Trout	1, 3, 5	abcde	abcd	bcde	abcde	abcde	abc	bcd	cde	abcd	a	abcd	abcd	e	bcde	de	ab
Rainbow Trout	6, 7, 9	-	-	-	-	-	-	-	a	a	a	-	-	-	a	a	a
Walleye	1, 3, 5	-	-	a	ab	-	b	abc	ab	ab	ab	ab	ab	abc	b	abc	ab
Walleye	6, 7, 9	-	-	-	-	-	-	-	ab	ab	b	-	-	-	a	abc	a
White Sucker	1, 3, 5	-	-	a	-	-	a	a	a	a	a	a	a	a	a	a	a
White Sucker	6, 7, 9	-	-	-	-	-	-	-	b	ab	b	-	-	-	b	abc	a

Table F2: Multiple comparison results for comparing response values at mean of transformed fork length following weight-length regressions. Years that do not share a letter are significantly different (P<0.05; within section only). P-values were adjusted using Tukey's HSD procedure.

Species	Section	Year															
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Arctic Grayling	1, 3, 5	*abcde*	*e*	*b*	*de*	*cde*	*cde*	*bc*	*e*	*bcd*	*a*	*bcde*	*abcde*	*bcde*	*bcde*	*ab*	*a*
Arctic Grayling	6, 7, 9	-	-	-	-	-	-	-	*a*	*a*	*a*	-	-	-	*a*	*a*	*a*
Bull Trout	1, 3, 5	*cde*	*abcd*	*bcde*	*bcde*	*bcde*	*de*	*abcd*	*bcde*	*e*	*abc*	*de*	*bcde*	*de*	*ab*	*a*	*a*
Bull Trout	6, 7, 9	-	-	-	-	-	-	-	*c*	*c*	*bc*	-	-	-	*c*	*ab*	*a*
Largescale Sucker	1, 3, 5	*abc*	*abc*	*cdef*	*bcdef*	*abcdef*	*df*	*abcde*	*bcdef*	*def*	*bcdef*	*abcdef*	*abc e*	*ab*	*f*	*bcde*	*a*
Largescale Sucker	6, 7, 9	-	-	-	-	-	-	-	*ab*	*c*	*bc*	-	-	-	*c*	*a*	*a*
Longnose Sucker	1, 3, 5	*a*	*abcde*	*h*	*gh*	*abcd*	*i*	*gh*	*defg*	*abcde*	*bcdef*	*efg*	*ab*	*cdef*	*h*	*fg*	*abc*
Longnose Sucker	6, 7, 9	-	-	-	-	-	-	-	*b*	*c*	*c*	-	-	-	*c*	*b*	*a*
Mountain Whitefish	1, 3, 5	*c*	*fg*	*j*	*efg*	*g*	*h*	*e*	*h*	*i*	*a*	*c*	*d*	*l*	*k*	*ef*	*b*
Mountain Whitefish	6, 7, 9	-	-	-	-	-	-	-	*c*	*d*	*b*	-	-	-	*e*	*c*	*a*
Rainbow Trout	1, 3, 5	*abcd*	*abc*	*cde*	*cde*	*abcde*	*de*	*bcd*	*e*	*bcd*	*a*	*e*	*de*	*cde*	*bcd*	*ab*	*a*
Rainbow Trout	6, 7, 9	-	-	-	-	-	-	-	*a*	*a*	*a*	-	-	-	*a*	*a*	*a*
Walleye	1, 3, 5	-	-	*ab*	*ab*	-	*ab*	*ab*	*ab*	*ab*	*ab*	*ab*	*a*	*ab*	*ab*	*b*	*ab*
Walleye	6, 7, 9	-	-	-	-	-	-	-	*a*	*a*	*a*	-	-	-	*b*	*b*	*a*
White Sucker	1, 3, 5	-	-	*abcde*	-	-	*abcde*	*cde*	*de*	*bcde*	*abc*	*a*	*a*	*abcd*	*e*	*cde*	*ab*
White Sucker	6, 7, 9	-	-	-	-	-	-	-	*b*	*b*	*b*	-	-	-	*b*	*ab*	*a*

Table F3: Multiple comparison results for comparing slopes of weight-length regressions. Years with P-values below 0.05 reflect a significant difference in slopes between section bins within that year.

Species	Year					
	2009	2010	2011	2015	2016	2017
Arctic Grayling	0.966	<0.001	0.075	0.150	0.219	0.307
Bull Trout	0.317	0.230	0.081	0.867	0.229	0.591
Largescale Sucker	0.139	0.558	0.012	0.340	0.093	0.121
Longnose Sucker	0.059	<0.001	0.267	0.026	0.039	0.001
Mountain Whitefish	<0.001	<0.001	0.070	0.001	0.384	0.411
Rainbow Trout	0.207	0.552	0.509	0.612	0.850	0.082
Walleye	0.271	0.138	0.070	0.016	0.407	0.135
White Sucker	0.608	0.805	0.816	0.057	0.018	0.002

Table F4: Multiple comparison results for comparing response values at mean of transformed fork length following weight-length regressions. Years with P-values less than 0.05 indicate significant differences between sections bins.

Species	Year					
	2009	2010	2011	2015	2016	2017
Arctic Grayling	0.966	<0.001	0.075	0.150	0.219	0.307
Bull Trout	0.317	0.230	0.081	0.867	0.229	0.591
Largescale Sucker	0.139	0.558	0.012	0.340	0.093	0.121
Longnose Sucker	0.059	<0.001	0.267	0.026	0.039	0.001
Mountain Whitefish	<0.001	<0.001	0.070	0.001	0.384	0.411
Rainbow Trout	0.207	0.552	0.509	0.612	0.850	0.082
Walleye	0.271	0.138	0.070	0.016	0.407	0.135
White Sucker	0.608	0.805	0.816	0.057	0.018	0.002

APPENDIX G

Population Analysis Output

Introduction

In 2017, Bayes sequential modelling as part of the Peace River Large Fish Indexing Survey was conducted by Bill Gazey of W.J. Gazey Research. Appendix G was written by W.J. Gazey Research and provides additional information on the model and its corresponding output.

Mountain Whitefish

Characteristics that Impact Population Estimates

For the 2017 study, PIT tags were applied to fish with lengths greater than 199 mm; however, in past studies, tag application was restricted to fish with lengths greater than 249 mm. To obtain population estimates consistent with past studies and to minimize electroshocking size selectivity bias, only fish marked and sampled with lengths greater than 249 mm were used to obtain population estimates. Histograms of Mountain Whitefish lengths at release and recapture are plotted in Figure G1. Inspection of the figure reveals that smaller fish (200-275 mm) were not recaptured with the same frequency as larger individuals. Comparisons of cumulative proportions of lengths at release and recapture (Figure G2) illustrates that the distributions were similar for lengths greater than 275 mm. A consistent, but statistically nonsignificant, underrepresentation of recaptured small Mountain Whitefish (250-275 mm FL) has been noted in all previous studies. A comparison of lengths at release and recapture accumulated into 25 mm bins (not shown) for the 2017 study was not significantly different (test for independence, $P > 0.05$).

For the reasons detailed in Section 2.1.6, unmarked Mountain Whitefish captured in Sessions 5 and 6 were assigned size bins of “less than 150 mm”, “150 - 199 mm”, “200- 299 mm”, and “greater than 299 mm”. To compute the number of fish greater than 249 mm in each section, the “200 - 299 mm” bin was prorated based on the proportion of observed fish between 250 and 299 mm captured in Sessions 1 to 4 in the associated section.

Time at large of recaptured Mountain Whitefish regressed on the growth increment (length at release minus length at recapture) is plotted in Figure G3. The negative growth trend was not statistically significant ($P = 0.24$). The boarder histogram of the growth increment provides an indication of measurement error (residual standard deviation of 3.2 mm for each measurement), which was slightly larger than the historical mean of 2.8 mm.

The summary of movements of recaptured Mountain Whitefish between sections during the 2017 survey is listed in Table G1, along with estimates of the movement proportions adjusted for the number of fish examined (Equation 4; Figure G4). Figure G5 provides a bar plot of the distances traveled within each section for marked fish released in 2017. Positive values indicate fish were recaptured upstream of the release site and negative values indicate fish were recaptured downstream of the release site. Note that most fish were recaptured in the same site-of-release. Consistent with movement patterns in previous studies, Mountain Whitefish had remarkable fidelity to a site.

Empirical Model Selection

The number of captures by encounter history (six sessions) and section used for the Cormack-Jolly-Seber (CJS) analysis are listed in Table G2. Capture probabilities were evaluated by session (time-varying) and pooled over Sessions 1 to 4 and 5 to 6 within each section. Survival was evaluated by session (time-varying) and as constant within each section. Constant survival provided the best fit to the data based on Akaike information criteria (AIC) in all sections (Table G3). Capture probability by session provided the best fit in Sections 3, 5, and 9. Pooled capture probability provided the best fit in all other sections. Survival estimates were not significantly different than 1.0 in all sections for the best fitting models (not shown; $P > 0.7$). Based on these results, no apparent mortality for Mountain Whitefish was applied within 2017.

A direct test of catchability is provided with population estimates using AD Model Builder with Equations 1 to 8 in Table G4 (input data corrected for movement listed in Table G1, which was also used for the Bayesian model). The Bayesian population model assumed constant catchability for samples taken during the year. There was not sufficient data to reliably estimate the time-varying catchability model for Section 9. Neither time-varying nor constant catchability models provided markedly better fits to the data in Sections 3, 5 and 6. In Section 7, the constant catchability model fit much better. However, in Section 1, the time-varying model provided a substantially better fit to the data. Population estimates for the time-varying model generally exceeded the constant model. The logarithmic population deviation estimates for the time-varying catchability model (Equation 2) are plotted by section and date in Figure G6. The deviations were highly variable but Section 1 displayed an upward trend over time.

Bayes Sequential Model for a Closed Population

Mark-recapture data were extracted by section from the database using PIT tags applied during 2017 and PIT tags that were observed during 2017 that were originally applied in 2004 through 2016 and a minimum length of 250 mm. Table G5 lists Mountain Whitefish examined for marks and recaptures by date and section. The releases, adjusted for movement between sections (Equation 4), by section and date, are given in Table G6. The compilations of marks available (Equation 6), fish examined (Equation 7), and recaptures (Equation 8), assuming no instantaneous mortality rate or undetected mark rate, are listed in Table G7. The subsequent population estimates using the Bayesian closed model are given in Table G8. The sequential posterior probability plots by section are provided in Figure G7. The final posterior distributions for the three sections are drawn in Figure G8.

The sequence of posterior probability plots can be used as an indicator of closure or change in the population size over the study period (Gazey and Staley 1986). Trends in the posterior plots can also be caused by trends in catchability (changes in population size and catchability are confounded). Inspection of the posterior probability plot sequences (Figure G7) appear stable (no marked trend or sequence to larger or smaller population sizes), and were consistent with a convergence to a modal population size except for Section 1. Section 1 displayed a trend in catchability and/or immigration of unmarked fish consistent with the trend illustrated in Figure G7.

Arctic Grayling

Mark-recapture data were extracted by section from the database using all available marks (smallest length 200 mm). A fish released in Section 1 was recaptured in Section 3; otherwise, there was no movement between sections (Table G9). Table G10 lists Arctic Grayling examined for marks and recaptures by date and section. The releases are provided in Table G11. The compilations of marks available (Equation 6), fish examined (Equation 7), and recaptures (Equation 8), assuming no mortality and 0% undetected mark rate, are listed in Table G12. Only Section 3 had sufficient captures to enable population estimates. The sequential posterior probability plots for the population estimates are provided in Figure G8 and the population estimates in Table G13. Given the sparse data, minimal population estimates were also calculated (see Figure G10). There was a 0.95 probability of at least 136 fish in Section 3.

Bull Trout

Mark-recapture data for Bull Trout with a minimum length of 250 mm were extracted by section from the database. Two fish released in Section 6 were recaptured in Section 7; otherwise, there was no movement between sections (Table G14).Table G13 lists Bull Trout examined for marks and recaptures by date and section. The releases by section and date are given in Table G16. The compilations of marks available (Equation 6), fish examined (Equation 7), and recaptures (Equation 8), assuming no mortality and 0% undetected mark rate, are listed in Table G17. The data were too sparse (1 recapture) to generate diagnostic measures or a population estimate for Section 9. The population estimates using the Bayesian model are given in Table G18 and the associated sequential posterior probability plots are provided in Figure G11. None of the posterior probability plots display trends over time. The final posterior distributions are drawn in Figure G12.

Largescale Sucker

Mark-recapture data for Largescale Sucker with a minimum length of 250 mm were extracted by section from the database. The movement of recaptured Largescale Sucker between sections during 2016 is listed in Table G19 along with the estimates of the migration proportions adjusted for the number of fish examined (Equation 4). Table G20 lists Largescale Sucker examined for marks and recaptures by date and section. Releases by section and date are given in Table G21. Only Sections 3, 6 and 7 had sufficient recaptures to enable population estimates. The compilations of marks available (Equation 6), fish examined (Equation 7), and recaptures (Equation 8), assuming no mortality and 0% undetected mark rate, are listed in Table G22. The population estimates using the Bayesian model are given in Table G23 and the associated sequential posterior probability plots are provided in Figure G13. None of the posterior probability plots display trends over time. The final posterior distributions are drawn in Figure G14.

Longnose Sucker

Mark-recapture data for Longnose Sucker with a minimum length of 250 mm were extracted by section from the database. The movement of recaptured Longnose Sucker between sections during 2017 is listed in Table G24 along with the estimates of the migration proportions adjusted for the number of fish examined (Equation 4). Table G25 lists Longnose Sucker examined for marks and recaptures by date and section. The releases by section and date are given in Table G26. The compilation of marks available (Equation 6), fish examined

(Equation 7), and recaptures (Equation 8), assuming no mortality and 0% undetected mark rate, are listed in Table G27. The population estimates using the Bayesian model are given in Table G28 and the associated sequential posterior probability plots are provided in Figure G15. The posterior probability plots do not display trends over time. The final posterior distributions are drawn in Figure G16.

Rainbow Trout

Mark-recapture data for Rainbow Trout with a minimum length of 250 mm were extracted by section from the database. There was no movement between sections. Table G29 lists Rainbow Trout examined for marks and recaptures by date and section. The releases by section and date are given in Table G30. Only Sections 3 and 5 had sufficient recaptures to enable population estimates. The compilations of marks available (Equation 6), fish examined (Equation 7), and recaptures (Equation 8), assuming no mortality and 0% undetected mark rate, are listed in Table G31. The population estimates using the Bayesian model are given in Table G32, and the associated sequential posterior probability plots are provided in Figure G17. None of the posterior probability plots display trends over time. The final posterior distributions are drawn in Figure G18.

Walleye

Mark-recapture data for Walleye with a minimum length of 250 mm were extracted by section from the database. One fish released in Section 6 were recaptured in Section 7; otherwise, there was no movement between sections (Table G33). Table G34 lists Walleye examined for marks and recaptures by date and section.
The releases by section and date are given in Table G34. The compilations of marks available (Equation 6), fish examined (Equation 7), and recaptures (Equation 8) assuming no mortality and 0% undetected mark rate are listed in Table G35. Only Sections 7 and 9 had sufficient recaptures to enable population estimates.
The population estimates using the Bayesian model are given in Table G36 and the associated sequential posterior probability plots are provided in Figure G19. None of the posterior probability plots display trends over time. The final posterior distributions are drawn in Figure G20.

Table G1: Mountain Whitefish recaptures and migration proportions adjusted (inverse weight) for fish examined by section during 2017.

Release Section	Recapture Section						
	1	3	5	6	7	9	Total
1	52	0	1	1	0	0	54
3	0	113	1	3	1	0	118
5	0	0	47	3	0	0	50
6	0	0	2	62	1	0	65
7	0	0	0	3	42	0	45
9	0	0	0	1	0	7	8
Sample:	1,690	2,121	1,019	1,143	618	126	6,717
Recap. %	3.08	5.33	5.00	6.39	7.12	5.56	5.06
Proportions:							
1	0.943	0.000	0.030	0.027	0.000	0.000	1.000
3	0.000	0.911	0.017	0.045	0.028	0.000	1.000
5	0.000	0.000	0.946	0.054	0.000	0.000	1.000
6	0.000	0.000	0.034	0.938	0.028	0.000	1.000
7	0.000	0.000	0.000	0.037	0.963	0.000	1.000
9	0.000	0.000	0.000	0.016	0.000	0.984	1.000

Table G2: Mountain Whitefish captures by encounter history and section used for the Cormack-Jolly-Seber analysis. For the first column, a '1' indicates a capture and a '0' indicates no capture in the session

Encounter History Pattern by Session	Section					
	1	3	5	6	7	9
000011	3	4	2	2	0	0
000101	7	10	5	7	3	3
000110	8	24	8	9	4	0
000111	0	0	1	0	1	0
001001	1	8	3	11	2	3
001010	6	13	12	12	1	0
001011	1	0	1	1	0	0
001100	7	14	9	6	4	0
001101	0	0	0	0	1	0
001110	1	1	2	1	0	0
001111	0	0	0	1	0	0
010001	2	9	6	7	3	0
010010	3	12	6	4	2	1
010011	0	0	0	0	1	0
010100	3	10	8	6	3	0
010101	0	0	1	1	0	0
010110	1	1	1	0	0	0
011000	7	14	3	8	4	0
011001	0	1	1	0	1	0
011010	0	1	0	0	0	0
011100	0	3	0	1	0	0
011110	0	0	0	1	0	0
100001	6	9	2	5	5	1
100010	2	11	5	8	0	1
100011	0	5	1	1	1	0
100100	11	14	8	10	5	1
100101	0	1	0	0	1	0
100110	0	0	1	1	1	0
101000	4	16	3	4	4	0
101001	0	2	1	1	0	0
101010	0	3	0	1	0	0
101011	0	0	0	1	0	0
101100	1	1	1	1	0	0
101101	0	1	0	0	0	0
101110	0	1	0	0	0	0
110000	13	22	5	5	5	0
110001	1	1	1	1	0	0
110010	0	1	0	2	0	0
110011	1	0	0	0	0	0
110100	1	1	0	0	0	1
110111	0	0	0	1	0	0
111000	1	3	0	0	0	0
111101	0	1	0	0	0	0

Table G3: Evaluation of various Mountain Whitefish survival Cormack-Jolly-Seber models using MARK based on delta Akaike information criteria (ΔAIC).

Model	ΔAIC	AIC Weights	Model Like.	Num. Par
Section 1				
{S(.)p(2 levels)}	0.0	0.693	1.000	3
{S(.)p(t)}	1.8	0.281	0.405	6
{S(t)p(t)}	7.9	0.014	0.020	9
{S(t)p(2 levels)}	8.0	0.013	0.019	7
Section 3				
{S(.)p(t)}	0.0	0.514	1.000	6
{S(.)p(2 levels)}	0.7	0.359	0.698	3
{S(t)p(2 levels)}	3.2	0.103	0.200	7
{S(t)p(t)}	6.1	0.025	0.049	9
Section 5				
{S(.)p(t)}	0.0	0.920	1.000	6
{S(t)p(t)}	6.1	0.045	0.049	9
{S(.)p(2 levels)}	6.8	0.030	0.033	3
{S(t)p(2 levels)}	10.4	0.005	0.005	7
Section 6				
{S(.)p(2 levels)}	0.0	0.887	1.000	3
{S(.)p(t)}	4.6	0.089	0.101	6
{S(t)p(2 levels)}	7.6	0.019	0.022	7
{S(t)p(t)}	10.6	0.004	0.005	9
Section 7				
{S(.)p(2 levels)}	0.0	0.688	1.000	3
{S(.)p(t)}	1.8	0.286	0.416	6
{S(t)p(t)}	7.8	0.014	0.020	9
{S(t)p(2 levels)}	8.0	0.012	0.018	7
Section 9				
{S(.)p(t)}	0.0	0.626	1.000	6
{S(.)p(2 levels)}	1.2	0.338	0.540	3
{S(t)p(t)}	6.1	0.030	0.049	9
{S(t)p(2 levels)}	9.3	0.006	0.010	7

Models:
S(.)p(2 levels) - constant survival, capture probabilities pooled for sessions 1 to 4 and sessions 5 to 6.
S(.)p(t) - constant survival, capture probabilities by session.
S(t)p(2 levels) - survival by session, capture probabilities pooled for sessions 1 to 4 and sessions 5 to 6.
S(t)p(t) - survival by session, capture probabilities by session

Table G4: Mountain Whitefish population estimates using AD Model Builder assuming constant population size (M0t) and time varying catchability (Mtt).

Model	N	SD	Function	Param.	AIC	ΔAIC	Weight	Model Like.
Section 1:								
M_{tt}	25,745	8,851	212.6	8	441.2	0.00	1.000	1.000
M_{0t}	20,020	2,714	228.3	1	458.7	17.43	0.000	<0.001
Section 3:								
M_{tt}	14,361	1,346	401.0	13	828.1	0.00	0.880	1.000
M_{0t}	13,771	1,246	415.0	1	832.1	3.99	0.120	0.136
Section 5:								
M_{0t}	8,167	1,125	177.6	1	357.2	0.00	0.808	1.000
M_{tt}	11,862	4,171	174.0	6	360.1	2.87	0.192	0.238
Section 6:								
M_{0t}	10,097	553	235.8	7	485.5	0.00	0.821	1.000
M_{tt}	6,713	775	243.3	1	488.6	3.05	0.179	0.218
Section 7:								
M_{0t}	3,395	486	148.6	1	299.2	0.00	0.960	1.000
M_{tt}	3,388	794	144.8	8	305.5	6.36	0.040	0.042

Table G5: Sample size and recaptures of Mountain Whitefish by section and date.

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
8/21/2017	102	0	0	0	0	0	19	0	0	0	0	0	121	0
8/22/2017	204	0	0	0	0	0	32	0	0	0	0	0	236	0
8/23/2017	44	0	48	0	0	0	50	0	0	0	0	0	142	0
8/24/2017	0	0	113	0	0	0	0	0	75	0	0	0	188	0
8/25/2017	0	0	169	0	0	0	0	0	57	0	0	0	226	0
8/26/2017	0	0	0	0	45	0	0	0	0	0	0	0	45	0
8/27/2017	0	0	44	0	0	0	0	0	0	0	3	0	47	0
8/28/2017	0	0	0	0	66	0	0	0	0	0	10	0	76	0
8/29/2017	36	2	0	0	0	0	27	1	0	0	2	0	65	3
8/30/2017	208	10	0	0	0	0	81	3	0	0	0	0	289	13
8/31/2017	0	0	104	6	0	0	1	0	10	1	0	0	115	7
9/4/2017	0	0	0	0	30	0	0	0	0	0	13	0	43	0
9/5/2017	120	1	0	0	0	0	41	0	0	0	0	0	161	1
9/6/2017	98	8	0	0	0	0	57	4	0	0	0	0	155	12
9/7/2017	0	0	188	3	0	0	0	0	34	2	0	0	222	5
9/8/2017	0	0	148	14	0	0	0	0	39	5	0	0	187	19
9/9/2017	0	0	47	1	0	0	0	0	0	0	1	0	48	1
9/10/2017	0	0	0	0	36	0	0	0	0	0	9	0	45	0
9/11/2017	0	0	0	0	0	0	0	0	0	0	4	0	4	0
9/12/2017	194	4	0	0	137	2	0	0	0	0	0	0	331	6
9/13/2017	172	11	0	0	0	0	81	1	0	0	0	0	253	12
9/14/2017	0	0	214	10	0	0	78	8	0	0	0	0	292	18
9/15/2017	0	0	98	7	0	0	0	0	53	4	0	0	151	11
9/16/2017	0	0	62	3	0	0	0	0	58	8	0	0	120	11
9/17/2017	0	0	9	1	45	2	0	0	0	0	5	0	59	3
9/18/2017	0	0	0	0	0	0	0	0	0	0	17	1	17	1
9/19/2017	238	6	0	0	0	0	0	0	0	0	0	0	238	6

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
9/20/2017	0	0	278	19	0	0	0	0	0	0	0	0	278	19
9/21/2017	0	0	124	20	0	0	0	0	0	0	0	0	124	20
9/22/2017	0	0	0	0	120	9	0	0	0	0	0	0	120	9
9/23/2017	0	0	0	0	43	1	78	6	0	0	0	0	121	7
9/24/2017	0	0	0	0	0	0	219	22	0	0	0	0	219	22
9/25/2017	0	0	0	0	0	0	0	0	125	9	0	0	125	9
9/26/2017	0	0	0	0	0	0	0	0	0	0	22	1	22	1
9/27/2017	0	0	0	0	217	23	0	0	0	0	0	0	217	23
9/4/2017	0	0	0	0	30	0	0	0	0	0	13	0	43	0
9/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/29/2017	274	10	0	0	0	0	0	0	0	0	0	0	274	10
9/30/2017	0	0	350	26	0	0	0	0	0	0	0	0	350	26
10/1/2017	0	0	0	0	0	0	0	0	129	14	0	0	129	14
10/2/2017	0	0	0	0	0	0	0	0	0	0	30	5	30	5
10/3/2017	0	0	0	0	199	12	64	1	0	0	0	0	263	13
10/4/2017	0	0	0	0	0	0	315	27	0	0	0	0	315	27
Total	**1,690**	**52**	**2,121**	**113**	**1,019**	**51**	**1,143**	**73**	**618**	**44**	**126**	**7**	**6,717**	**340**

Table G6: Mountain Whitefish marks applied by section and date adjusted for migration.

Date	1	3	5	6	7	9	Total
8/23/2016	59.8	3.4	2.8	0.0	0.0	0.0	66
8/24/2016	66.2	3.7	3.1	0.0	0.0	0.0	73
8/25/2016	0.0	83.7	1.8	0.0	2.6	0.0	88
8/26/2016	0.0	54.2	1.1	0.0	1.7	0.0	57
8/27/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/28/2016	0.0	142.6	3.0	0.0	4.4	0.0	150
8/29/2016	0.0	0.0	0.0	0.3	0.8	18.0	19
8/30/2016	0.0	0.0	4.9	121.9	7.4	3.8	138
8/31/2016	0.0	0.0	5.8	145.7	44.5	0.0	196
9/1/2016	0.0	0.0	35.3	2.1	24.6	0.0	62
9/2/2016	191.3	10.8	97.1	1.8	0.0	0.0	301
9/3/2016	291.1	139.1	16.1	0.0	3.8	0.0	450
9/4/2016	0.0	119.8	2.5	0.0	3.7	0.0	126
9/5/2016	0.0	30.4	5.1	110.0	7.5	0.0	153
9/6/2016	0.0	0.0	4.2	103.1	7.1	23.7	138
9/7/2016	0.0	0.0	0.0	4.9	87.1	0.0	92
9/8/2016	191.3	10.8	81.4	1.5	0.0	0.0	285
9/9/2016	288.3	16.3	69.2	1.1	0.0	0.0	375
9/10/2016	0.0	193.9	9.5	132.7	13.9	0.0	350
9/11/2016	0.0	140.7	7.2	104.6	10.5	0.0	263
9/12/2016	0.0	105.5	2.2	0.0	3.3	0.0	111
9/13/2016	0.0	0.0	0.0	2.6	36.9	43.6	83
9/14/2016	0.0	0.0	28.4	2.0	23.2	11.4	65
9/15/2016	205.8	11.6	57.6	1.0	0.0	0.0	276

Date	1	3	5	6	7	9	Total
9/16/2016	0.0	0.0	20.3	42.2	2.5	0.0	65
9/17/2016	147.8	8.3	9.5	66.4	3.9	0.0	236
9/18/2016	0.0	158.8	5.3	48.4	28.5	0.0	241
9/19/2016	0.0	141.7	3.0	1.1	24.3	0.0	170
9/20/2016	0.0	133.1	25.3	2.3	37.2	0.0	198
9/21/2016	0.0	0.0	50.0	1.3	0.7	17.0	69
9/22/2016	0.0	0.0	22.5	0.5	0.2	3.8	27
9/23/2016	43.5	2.5	2.0	0.0	0.0	0.0	48
9/24/2016	0.0	50.4	1.4	9.1	2.1	0.0	63
9/25/2016	0.0	43.7	1.2	7.1	15.0	0.0	67
9/26/2016	0.0	0.0	12.1	8.5	0.8	6.6	28
9/27/2016	30.8	1.7	18.1	0.3	0.0	0.0	51
9/28/2016	0.0	45.6	2.0	25.5	2.9	0.0	76
9/29/2016	0.0	15.2	0.5	5.1	11.2	0.0	32
9/30/2016	0.0	0.0	0.0	0.1	0.2	4.7	5
10/1/2016	0.0	0.0	29.4	0.6	0.0	0.0	30
Total	**1,516**	**1,668**	**641**	**954**	**412**	**133**	**5,323**

Table G7: Mountain Whitefish sample, cumulative marks available for recapture and recaptures by section and date.

Date	Sample	Marks	Recap.		Date	Sample	Marks	Recap.
Section 1:					**Section 6:**			
9/2/2016	212	126	1		9/5/2016	126	271	4
9/3/2016	322	126			9/6/2016	116	271	2
9/8/2016	217	608	3		9/10/2016	153	489	7
9/9/2016	326	608	6		9/11/2016	120	491	4
9/15/2016	230	1088	3		9/16/2016	50	732	4
9/17/2016	181	1088	16		9/17/2016	81	734	8
9/23/2016	295	1442	13		9/18/2016	55	735	2
9/27/2016	298	1485	21		9/24/2016	123	897	8
					9/25/2016	74	897	2
Section 3:					9/26/2016	38	897	2
8/26/2016	57	3			9/27/2016	25	907	
8/28/2016	150	91			9/28/2016	224	914	11
9/3/2016	132	288	2		9/29/2016	65	922	2
9/4/2016	133	288	3					
9/5/2016	39	298	7		**Section 7:**			
9/10/2016	212	588	8		8/31/2016	39	9	
9/11/2016	171	598	23		9/1/2016	26	9	
9/12/2016	114	615	3		9/7/2016	94	93	2
9/18/2016	176	1067	9		9/13/2016	40	208	3
9/19/2016	164	1067	15		9/14/2016	26	219	2
9/20/2016	150	1075	9		9/18/2016	22	282	
9/24/2016	279	1508	28		9/19/2016	22	284	1
9/25/2016	246	1508	26		9/20/2016	36	288	1
9/28/2016	311	1605	20		9/25/2016	107	379	3
9/29/2016	74	1605	7		9/29/2016	107	397	9
Section 5:					**Section 9:**			
9/1/2016	36	12			9/6/2016	25	22	

Date	Sample	Marks	Recap.
Section 1:			
9/2/2016	212	126	1
9/3/2016	322	126	
9/8/2016	217	608	3
9/9/2016	326	608	6
9/15/2016	230	1088	3
9/17/2016	181	1088	16
9/2/2016	90	17	
9/8/2016	78	178	3
9/9/2016	58	182	
9/14/2016	32	350	3
9/15/2016	50	352	1
9/16/2016	20	352	1
9/20/2016	25	468	2
9/21/2016	52	473	
9/22/2016	27	476	3
9/26/2016	56	576	3
9/27/2016	63	577	3
10/1/2016	174	611	10

Date	Sample	Marks	Recap.
Section 6:			
9/5/2016	126	271	4
9/6/2016	116	271	2
9/10/2016	153	489	7
9/11/2016	120	491	4
9/16/2016	50	732	4
9/17/2016	81	734	8
9/13/2016	50	45	4
9/14/2016	12	45	
9/21/2016	19	100	1
9/22/2016	5	100	1
9/26/2016	28	121	2
9/30/2016	32	128	1

Table G8: Mountain Whitefish population estimates by section.

Section	Bayes Mean	MLE	95% HPD		Standard Deviation	CV (%)
			Low	High		
1	27,994	27,100	21,400	35,100	3,539	12.6
3	14,878	14,700	12,700	17,160	1,135	7.6
5	10,602	9,900	7,000	14,700	2,029	19.1
6	15,483	14,950	11,650	19,650	2,073	13.4
7	6,804	6,180	4,100	9,940	1,564	23.0
9	1,883	1,490	805	3,320	697	37.0
Total	**77,644**		**67,814**	**87,474**	**5,015**	**6.5**

Table G9: Sample size and recaptures of Arctic Grayling by section and date.

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
8/23/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/24/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/25/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/26/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2016	0	0	5	0	0	0	0	0	0	0	0	0	5	0
8/29/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/30/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/31/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/1/2016	0	0	0	0	1	0	0	0	0	0	0	0	1	0
9/2/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/3/2016	2	0	8	0	0	0	0	0	0	0	0	0	10	0
9/4/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/5/2016	0	0	1	0	0	0	0	0	0	0	0	0	1	0
9/6/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/7/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/8/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/9/2016	1	0	0	0	0	0	0	0	0	0	0	0	1	0
9/10/2016	0	0	7	1	0	0	0	0	0	0	0	0	7	1

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
9/11/2016	0	0	8	0	0	0	0	0	0	0	0	0	8	0
9/12/2016	0	0	1	0	0	0	0	0	0	0	0	0	1	0
9/13/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/14/2016	0	0	0	0	2	0	0	0	0	0	0	0	2	0
9/15/2016	0	0	0	0	1	0	0	0	0	0	0	0	1	0
9/16/2016	0	0	0	0	0	0	1	0	0	0	0	0	1	0
9/17/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/18/2016	0	0	2	0	0	0	1	0	0	0	0	0	3	0

Table G9 (concluded)

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
9/19/2016	0	0	2	0	0	0	0	0	0	0	0	0	2	0
9/20/2016	0	0	1	0	0	0	0	0	0	0	0	0	1	0
9/21/2016	0	0	0	0	1	0	0	0	0	0	0	0	1	0
9/22/2016	0	0	0	0	1	0	0	0	0	0	0	0	1	0
9/23/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/24/2016	0	0	8	2	0	0	0	0	0	0	0	0	8	2
9/25/2016	0	0	6	1	0	0	0	0	0	0	0	0	6	1
9/26/2016	0	0	0	0	1	0	0	0	0	0	0	0	1	0
9/27/2016	0	0	0	0	3	0	0	0	0	0	0	0	3	0
9/28/2016	0	0	6	0	0	0	0	0	0	0	0	0	6	0
9/29/2016	0	0	2	0	0	0	2	0	0	0	0	0	4	0
9/30/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/1/2016	0	0	0	0	2	0	0	0	0	0	0	0	2	0
Total	**3**	**0**	**57**	**4**	**12**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**76**	**4**

Table G10: Arctic Grayling marks applied by section and date.

Date	1	3	5	6	7	9	Total
8/23/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/24/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/25/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/26/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/27/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/28/2016	0.0	5.0	0.0	0.0	0.0	0.0	5
8/29/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/30/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/31/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/1/2016	0.0	0.0	1.0	0.0	0.0	0.0	1
9/2/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/3/2016	2.0	8.0	0.0	0.0	0.0	0.0	10
9/4/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/5/2016	0.0	1.0	0.0	0.0	0.0	0.0	1
9/6/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/7/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/8/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/9/2016	1.0	0.0	0.0	0.0	0.0	0.0	1
9/10/2016	0.0	6.0	0.0	0.0	0.0	0.0	6
9/11/2016	0.0	7.0	0.0	0.0	0.0	0.0	7
9/12/2016	0.0	1.0	0.0	0.0	0.0	0.0	1
9/13/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/14/2016	0.0	0.0	2.0	0.0	0.0	0.0	2
9/15/2016	0.0	0.0	1.0	0.0	0.0	0.0	1
9/16/2016	0.0	0.0	0.0	1.0	0.0	0.0	1
9/17/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/18/2016	0.0	2.0	0.0	1.0	0.0	0.0	3
9/19/2016	0.0	2.0	0.0	0.0	0.0	0.0	2

Date	1	3	5	6	7	9	Total
9/20/2016	0.0	1.0	0.0	0.0	0.0	0.0	1
9/21/2016	0.0	0.0	1.0	0.0	0.0	0.0	1
9/22/2016	0.0	0.0	1.0	0.0	0.0	0.0	1
9/23/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/24/2016	0.0	6.0	0.0	0.0	0.0	0.0	6
9/25/2016	0.0	5.0	0.0	0.0	0.0	0.0	5
9/26/2016	0.0	0.0	1.0	0.0	0.0	0.0	1
9/27/2016	0.0	0.0	3.0	0.0	0.0	0.0	3
9/28/2016	0.0	6.0	0.0	0.0	0.0	0.0	6
9/29/2016	0.0	2.0	0.0	2.0	0.0	0.0	4
9/30/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
10/1/2016	0.0	0.0	2.0	0.0	0.0	0.0	2
Total	**3**	**52**	**12**	**4**	**0**	**0**	**71**

Table G11: Arctic Grayling sample, cumulative marks available for recapture and recaptures for Section 3.

Date	Sample	Marks	Recap.
Section 3:			
9/3/2016	8	5	
9/5/2016	1	5	
9/10/2016	7	14	1
9/11/2016	8	14	
9/12/2016	1	14	
9/18/2016	2	28	
9/19/2016	2	28	
9/20/2016	1	28	
9/24/2016	8	33	2
9/25/2016	6	33	1
9/28/2016	6	44	
9/29/2016	2	44	

Table G12: Arctic Grayling population estimates for Section 3.

Section	Bayes Mean	MLE	95% HPD		Standard	CV
			Low	High	Deviation	(%)
3	547	310	126	1,276	336	61.5
Total	547		126	1,276	336	61.5

Table G13: Sample size and recaptures of Bull Trout by section and date.

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
8/23/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/24/2016	4	0	0	0	0	0	0	0	0	0	0	0	4	0
8/25/2016	0	0	5	0	0	0	0	0	0	0	0	0	5	0
8/26/2016	0	0	4	0	0	0	0	0	0	0	0	0	4	0
8/27/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2016	0	0	4	0	0	0	0	0	0	0	0	0	4	0
8/29/2016	0	0	0	0	0	0	0	0	0	0	1	0	1	0
8/30/2016	0	0	0	0	0	0	4	0	0	0	1	0	5	0
8/31/2016	0	0	0	0	0	0	5	0	1	0	0	0	6	0
9/1/2016	0	0	0	0	5	0	0	0	0	0	0	0	5	0
9/2/2016	0	0	0	0	2	0	0	0	0	0	0	0	2	0
9/3/2016	8	0	2	0	0	0	0	0	0	0	0	0	10	0
9/4/2016	0	0	4	0	0	0	0	0	0	0	0	0	4	0
9/5/2016	0	0	0	0	0	0	4	0	0	0	0	0	4	0
9/6/2016	0	0	0	0	0	0	2	0	0	0	0	0	2	0
9/7/2016	0	0	0	0	0	0	0	0	2	0	0	0	2	0
9/8/2016	8	0	0	0	5	0	0	0	0	0	0	0	13	0
9/9/2016	8	2	0	0	5	0	0	0	0	0	0	0	13	2
9/10/2016	0	0	4	0	0	0	5	0	0	0	0	0	9	0

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
9/11/2016	0	0	5	0	0	0	3	0	0	0	0	0	8	0
9/12/2016	0	0	4	0	0	0	0	0	0	0	0	0	4	0
9/13/2016	0	0	0	0	0	0	0	0	3	1	1	0	4	1
9/14/2016	0	0	0	0	3	0	0	0	3	0	0	0	6	0
9/15/2016	2	0	0	0	9	0	0	0	0	0	0	0	11	0
9/16/2016	0	0	0	0	3	0	1	0	0	0	0	0	4	0
9/17/2016	8	0	0	0	0	0	4	1	0	0	0	0	12	1
9/18/2016	0	0	5	2	0	0	0	0	1	0	0	0	6	2

Table G13 (concluded)

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
9/19/2016	0	0	5	2	0	0	0	0	2	0	0	0	7	2
9/20/2016	0	0	6	2	3	3	0	0	1	0	0	0	10	5
9/21/2016	0	0	0	0	8	2	0	0	0	0	4	0	12	2
9/22/2016	0	0	0	0	7	1	0	0	0	0	0	0	7	1
9/23/2016	14	1	0	0	0	0	0	0	0	0	0	0	14	1
9/24/2016	0	0	16	4	0	0	6	1	0	0	0	0	22	5
9/25/2016	0	0	9	1	0	0	1	0	4	0	0	0	14	1
9/26/2016	0	0	0	0	3	1	2	0	0	0	1	0	6	1
9/27/2016	2	0	0	0	4	1	2	0	0	0	0	0	8	1
9/28/2016	0	0	17	3	0	0	7	2	0	0	0	0	24	5
9/29/2016	0	0	3	2	0	0	3	0	5	1	0	0	11	3
9/30/2016	0	0	0	0	0	0	0	0	0	0	7	0	7	0
10/1/2016	0	0	0	0	10	3	0	0	0	0	0	0	10	3
Total	**54**	**3**	**93**	**16**	**67**	**11**	**49**	**4**	**22**	**2**	**15**	**0**	**300**	**36**

Table G14: Bull Trout marks applied by section and date adjusted for migration.

Date	1	3	5	6	7	9	Total
8/23/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/24/2016	4.0	0.0	0.0	0.0	0.0	0.0	4
8/25/2016	0.0	5.0	0.0	0.0	0.0	0.0	5
8/26/2016	0.0	4.0	0.0	0.0	0.0	0.0	4
8/27/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/28/2016	0.0	4.0	0.0	0.0	0.0	0.0	4
8/29/2016	0.0	0.0	0.0	0.0	0.0	1.0	1
8/30/2016	0.0	0.0	0.0	4.0	0.0	1.0	5
8/31/2016	0.0	0.0	0.0	5.0	1.0	0.0	6
9/1/2016	0.0	0.0	5.0	0.0	0.0	0.0	5
9/2/2016	0.0	0.0	2.0	0.0	0.0	0.0	2
9/3/2016	8.0	2.0	0.0	0.0	0.0	0.0	10
9/4/2016	0.0	4.0	0.0	0.0	0.0	0.0	4
9/5/2016	0.0	0.0	0.0	4.0	0.0	0.0	4
9/6/2016	0.0	0.0	0.0	2.0	0.0	0.0	2
9/7/2016	0.0	0.0	0.0	0.0	2.0	0.0	2
9/8/2016	8.0	0.0	5.0	0.0	0.0	0.0	13
9/9/2016	6.0	0.0	5.0	0.0	0.0	0.0	11
9/10/2016	0.0	4.0	0.0	5.0	0.0	0.0	9
9/11/2016	0.0	5.0	0.0	3.0	0.0	0.0	8
9/12/2016	0.0	4.0	0.0	0.0	0.0	0.0	4
9/13/2016	0.0	0.0	0.0	0.0	2.0	1.0	3
9/14/2016	0.0	0.0	3.0	0.0	2.0	0.0	5
9/15/2016	2.0	0.0	9.0	0.0	0.0	0.0	11
9/16/2016	0.0	0.0	3.0	1.0	0.0	0.0	4
9/17/2016	8.0	0.0	0.0	3.0	0.0	0.0	11
9/18/2016	0.0	3.0	0.0	0.0	1.0	0.0	4
9/19/2016	0.0	3.0	0.0	0.0	2.0	0.0	5
9/20/2016	0.0	4.0	0.0	0.0	1.0	0.0	5

Date	1	3	5	6	7	9	Total
9/21/2016	0.0	0.0	6.0	0.0	0.0	4.0	10
9/22/2016	0.0	0.0	6.0	0.0	0.0	0.0	6
9/23/2016	13.0	0.0	0.0	0.0	0.0	0.0	13
9/24/2016	0.0	12.0	0.0	5.0	0.0	0.0	17
9/25/2016	0.0	8.0	0.0	1.0	4.0	0.0	13
9/26/2016	0.0	0.0	2.0	2.0	0.0	1.0	5
9/27/2016	2.0	0.0	3.0	0.0	0.0	0.0	5
9/28/2016	0.0	14.0	0.0	5.0	0.0	0.0	19
9/29/2016	0.0	1.0	0.0	3.0	4.0	0.0	8
9/30/2016	0.0	0.0	0.0	0.0	0.0	7.0	7
10/1/2016	0.0	0.0	7.0	0.0	0.0	0.0	7
Total	**51**	**77**	**56**	**43**	**19**	**15**	**261**

Table G15: Bull Trout sample, cumulative marks available for recapture and recaptures by section and date.

Date	Sample	Marks	Recap
Section 1:			
9/3/2016	8	4	
9/8/2016	8	12	
9/9/2016	8	12	2
9/15/2016	2	26	
9/17/2016	8	26	
9/23/2016	14	36	1
9/27/2016	2	49	
Section 3:			
8/28/2016	4	5	
9/3/2016	2	13	
9/4/2016	4	13	
9/10/2016	4	19	
9/11/2016	5	19	
9/12/2016	4	19	
9/18/2016	5	32	2
9/19/2016	5	32	2
9/20/2016	6	32	2
9/24/2016	16	42	4
9/25/2016	9	42	1
9/28/2016	17	62	3
9/29/2016	3	62	2
Section 5:			
8-Sep-16	5	7	
9-Sep-16	5	7	
14-Sep-16	3	17	
15-Sep-16	9	17	
16-Sep-16	3	17	

Date	Sample	Marks	Recap
Section 6:			
9/5/2016	4	9	
9/6/2016	2	9	
9/10/2016	5	15	
9/11/2016	3	15	
9/16/2016	1	23	
9/17/2016	4	23	1
9/24/2016	6	27	1
9/25/2016	1	27	
9/26/2016	2	27	
9/27/2016	2	32	
9/28/2016	7	33	2
9/29/2016	3	35	
Section 7:			
9/7/2016	2	1	
9/13/2016	3	3	1
9/14/2016	3	3	
9/18/2016	1	7	
9/19/2016	2	7	
9/20/2016	1	7	
9/25/2016	4	11	
9/29/2016	5	15	1

Date	Sample	Marks	Recap		Date	Sample	Marks	Recap
20-Sep-16	3	32	3					
21-Sep-16	8	32	2					
22-Sep-16	7	32	1					
26-Sep-16	3	44	1					
27-Sep-16	4	44	1					
1-Oct-16	10	49	3					

Table G16: Bull Trout population estimates by section.

Section	Bayes Mean	MLE	95% HPD		Standard	CV
			Low	High	Deviation	(%)
1	717	372	144	1,648	425	59.3
3	224	199	132	334	55	24.4
5	181	151	93	294	56	31.2
6	421	230	92	1,014	286	67.9
7	358	86	24	1,234	377	105.3
Total	1,901	1,038	645	3,157	641	33.7

Table G17: Largescale Sucker recaptures and migration proportions adjusted (inverse weight) for fish examined by section during 2016.

Release Section	Recapture Section						
	1	3	5	6	7	9	Total
1	0	0	0	0	0	0	0
3	0	9	0	0	0	0	9
5	0	4	7	0	0	0	11
6	0	0	0	6	0	0	6
7	0	0	1	0	4	0	5
9	0	0	0	0	0	1	1
Sample:	103	274	162	194	133	48	914
Recap. %	0.00	4.74	4.94	3.09	3.01	2.08	3.50
Proportions:							
1	1.000	0.000	0.000	0.000	0.000	0.000	1.000
3	0.000	1.000	0.000	0.000	0.000	0.000	1.000
5	0.000	0.253	0.747	0.000	0.000	0.000	1.000
6	0.000	0.000	0.000	1.000	0.000	0.000	1.000
7	0.000	0.000	0.170	0.000	0.830	0.000	1.000
9	0.000	0.000	0.000	0.000	0.000	1.000	1.000

Table G18: Sample size and recaptures of Largescale Sucker by section and date.

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
8/23/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/24/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/25/2016	0	0	9	0	0	0	0	0	0	0	0	0	9	0
8/26/2016	0	0	6	0	0	0	0	0	0	0	0	0	6	0
8/27/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2016	0	0	2	0	0	0	0	0	0	0	0	0	2	0
8/29/2016	0	0	0	0	0	0	0	0	0	0	13	0	13	0
8/30/2016	0	0	0	0	0	0	4	0	0	0	3	0	7	0
8/31/2016	0	0	0	0	0	0	5	0	11	0	0	0	16	0
9/1/2016	0	0	0	0	3	0	0	0	1	0	0	0	4	0
9/2/2016	1	0	0	0	2	0	0	0	0	0	0	0	3	0
9/3/2016	2	0	6	0	0	0	0	0	0	0	0	0	8	0
9/4/2016	0	0	3	0	0	0	0	0	0	0	0	0	3	0
9/5/2016	0	0	0	0	0	0	3	0	0	0	0	0	3	0
9/6/2016	0	0	0	0	0	0	11	0	0	0	1	0	12	0
9/7/2016	0	0	0	0	0	0	0	0	27	0	0	0	27	0
9/8/2016	7	0	0	0	23	0	0	0	0	0	0	0	30	0
9/9/2016	6	0	0	0	15	0	0	0	0	0	0	0	21	0

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
9/10/2016	0	0	26	0	0	0	9	0	0	0	0	0	35	0
9/11/2016	0	0	21	1	0	0	22	1	0	0	0	0	43	2
9/12/2016	0	0	22	0	0	0	0	0	0	0	0	0	22	0
9/13/2016	0	0	0	0	0	0	0	0	19	1	7	0	26	1
9/14/2016	0	0	0	0	14	0	0	0	7	1	2	0	23	1
9/15/2016	15	0	0	0	20	0	0	0	0	0	0	0	35	0
9/16/2016	0	0	0	0	11	0	11	1	0	0	0	0	22	1
9/17/2016	28	0	0	0	0	0	25	0	0	0	0	0	53	0
9/18/2016	0	0	36	0	0	0	15	1	4	0	0	0	55	1

Table G18 (concluded)

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
9/19/2016	0	0	24	0	0	0	0	0	2	0	0	0	26	0
9/20/2016	0	0	29	4	16	2	0	0	13	1	0	0	58	7
9/21/2016	0	0	0	0	14	2	0	0	0	0	6	0	20	2
9/22/2016	0	0	0	0	3	1	0	0	0	0	0	0	3	1
9/23/2016	28	0	0	0	0	0	0	0	0	0	0	0	28	0
9/24/2016	0	0	29	4	0	0	26	1	0	0	0	0	55	5
9/25/2016	0	0	32	2	0	0	12	2	27	1	0	0	71	5
9/26/2016	0	0	0	0	11	1	12	0	0	0	6	0	29	1
9/27/2016	16	0	0	0	9	1	5	0	0	0	0	0	30	1
9/28/2016	0	0	28	2	0	0	23	0	0	0	0	0	51	2
9/29/2016	0	0	1	0	0	0	11	0	22	0	0	0	34	0
9/30/2016	0	0	0	0	0	0	0	0	0	0	10	1	10	1
10/1/2016	0	0	0	0	21	1	0	0	0	0	0	0	21	1
Total	**103**	**0**	**274**	**13**	**162**	**8**	**194**	**6**	**133**	**4**	**48**	**1**	**914**	**32**

Table G19: Largescale Sucker marks applied by section and date adjusted for migration.

Date	1	3	5	6	7	9	Total
8/23/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/24/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/25/2016	0.0	9.0	0.0	0.0	0.0	0.0	9
8/26/2016	0.0	6.0	0.0	0.0	0.0	0.0	6
8/27/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/28/2016	0.0	2.0	0.0	0.0	0.0	0.0	2
8/29/2016	0.0	0.0	0.0	0.0	0.0	13.0	13
8/30/2016	0.0	0.0	0.0	4.0	0.0	3.0	7
8/31/2016	0.0	0.0	1.9	5.0	9.1	0.0	16
9/1/2016	0.0	0.8	2.4	0.0	0.8	0.0	4
9/2/2016	1.0	0.5	1.5	0.0	0.0	0.0	3
9/3/2016	2.0	6.0	0.0	0.0	0.0	0.0	8
9/4/2016	0.0	3.0	0.0	0.0	0.0	0.0	3
9/5/2016	0.0	0.0	0.0	3.0	0.0	0.0	3
9/6/2016	0.0	0.0	0.0	11.0	0.0	1.0	12
9/7/2016	0.0	0.0	4.6	0.0	22.4	0.0	27
9/8/2016	7.0	5.8	17.2	0.0	0.0	0.0	30
9/9/2016	6.0	3.8	11.2	0.0	0.0	0.0	21
9/10/2016	0.0	26.0	0.0	9.0	0.0	0.0	35
9/11/2016	0.0	20.0	0.0	21.0	0.0	0.0	41
9/12/2016	0.0	22.0	0.0	0.0	0.0	0.0	22
9/13/2016	0.0	0.0	3.1	0.0	14.9	7.0	25
9/14/2016	0.0	3.5	11.5	0.0	5.0	2.0	22
9/15/2016	15.0	4.8	14.2	0.0	0.0	0.0	34
9/16/2016	0.0	2.8	8.2	9.0	0.0	0.0	20
9/17/2016	28.0	0.0	0.0	25.0	0.0	0.0	53
9/18/2016	0.0	36.0	0.7	14.0	3.3	0.0	54
9/19/2016	0.0	24.0	0.3	0.0	1.7	0.0	26
9/20/2016	0.0	28.5	12.5	0.0	10.0	0.0	51

Date	1	3	5	6	7	9	Total
9/21/2016	0.0	2.8	8.2	0.0	0.0	6.0	17
9/22/2016	0.0	0.5	1.5	0.0	0.0	0.0	2
9/23/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/24/2016	0.0	2.0	0.0	0.0	0.0	0.0	2
9/25/2016	0.0	0.0	0.2	1.0	0.8	0.0	2
9/26/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/27/2016	1.0	0.0	0.0	0.0	0.0	0.0	1
9/28/2016	0.0	0.0	0.0	2.0	0.0	0.0	2
9/29/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/30/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
10/1/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
Total	**60**	**210**	**99**	**104**	**68**	**32**	**573**

Table G20: Largescale Sucker sample, cumulative marks available for recapture and recaptures by section and date.

Date	Sample	Marks	Recap		Date	Sample	Marks	Recap
Section 3:					**Section 6:**			
8/28/2016	2	9			9/5/2016	3	9	
9/3/2016	6	17			9/6/2016	11	9	
9/4/2016	3	18			9/10/2016	9	23	
9/10/2016	26	27			9/11/2016	22	23	1
9/11/2016	21	33	1		9/16/2016	11	53	1
9/12/2016	22	37			9/17/2016	25	53	
9/18/2016	36	113			9/18/2016	15	53	1
9/19/2016	24	116			9/24/2016	26	101	1
9/20/2016	29	116	4		9/25/2016	12	101	2
9/24/2016	29	207	4		9/26/2016	12	101	
9/25/2016	32	208	2		9/27/2016	5	101	
9/28/2016	28	210	2		9/28/2016	23	102	
9/29/2016	1	210			9/29/2016	11	102	
Section 5:					**Section 7:**			
9/8/2016	23	6			9/7/2016	27	10	
9/9/2016	15	6			9/13/2016	19	32	1
9/14/2016	14	39			9/14/2016	7	32	1
9/15/2016	20	39			9/18/2016	4	52	
9/16/2016	11	42			9/19/2016	2	52	
9/20/2016	16	76	2		9/20/2016	13	52	1
9/21/2016	14	76	2		9/25/2016	27	67	1
9/22/2016	3	77	1		9/29/2016	22	68	
9/26/2016	11	99	1					
9/27/2016	9	99	1					
10/1/2016	21	99	1					

Table G21: Longnose Sucker recaptures and migration proportions adjusted (inverse weight) for fish examined by section during 2016.

Release Section	Recapture Section						
	1	3	5	6	7	9	Total
1	3	0	0	0	0	0	3
3	0	32	2	1	1	0	36
5	0	0	11	2	0	0	13
6	0	0	0	17	6	0	23
7	0	0	0	0	9	0	9
9	0	0	0	0	0	25	25
Sample:	174	811	536	922	621	595	3,659
Recap. %	1.72	3.95	2.43	2.17	2.58	4.20	2.98
Proportions:							
1	1.000	0.000	0.000	0.000	0.000	0.000	1.000
3	0.000	0.860	0.081	0.024	0.035	0.000	1.000
5	0.000	0.000	0.904	0.096	0.000	0.000	1.000
6	0.000	0.000	0.000	0.656	0.344	0.000	1.000
7	0.000	0.000	0.000	0.000	1.000	0.000	1.000
9	0.000	0.000	0.000	0.000	0.000	1.000	1.000

Table G22: Largescale Sucker population estimates by section.

Section	Bayes Mean	MLE	95% HPD		Standard	CV
			Low	High	Deviation	(%)
3	2,827	2,410	1,440	4,550	849	30.0
5	1,406	1,060	540	2,590	606	43.1
6	2,988	2,110	990	5,880	1,350	45.2
7	2,395	1,360	530	5,530	1,431	59.7
Total	**9,616**		**5,251**	**13,981**	**2,227**	**23.2**

Table G23: Sample size and recaptures of Longnose Sucker by section and date.

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
8/23/2016	2	0	0	0	0	0	0	0	0	0	0	0	2	0
8/24/2016	9	0	0	0	0	0	0	0	0	0	0	0	9	0
8/25/2016	0	0	87	0	0	0	0	0	0	0	0	0	87	0
8/26/2016	0	0	99	0	0	0	0	0	0	0	0	0	99	0
8/27/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2016	0	0	28	2	0	0	0	0	0	0	0	0	28	2
8/29/2016	0	0	0	0	0	0	0	0	0	0	76	0	76	0
8/30/2016	0	0	0	0	0	0	59	0	0	0	12	0	71	0
8/31/2016	0	0	0	0	0	0	92	0	45	0	0	0	137	0
9/1/2016	0	0	0	0	18	0	0	0	5	0	0	0	23	0
9/2/2016	11	0	0	0	32	0	0	0	0	0	0	0	43	0
9/3/2016	3	0	15	0	0	0	0	0	0	0	0	0	18	0
9/4/2016	0	0	19	0	0	0	0	0	0	0	0	0	19	0
9/5/2016	0	0	14	0	0	0	21	0	0	0	0	0	35	0
9/6/2016	0	0	0	0	0	0	85	0	0	0	24	0	109	0
9/7/2016	0	0	0	0	0	0	0	0	91	2	0	0	91	2
9/8/2016	11	0	0	0	27	0	0	0	0	0	0	0	38	0
9/9/2016	12	0	0	0	62	0	0	0	0	0	0	0	74	0
9/10/2016	0	0	43	2	0	0	45	1	0	0	0	0	88	3

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
9/11/2016	0	0	54	4	0	0	62	0	0	0	0	0	116	4
9/12/2016	0	0	77	1	0	0	0	0	0	0	0	0	77	1
9/13/2016	0	0	0	0	0	0	0	0	87	1	76	2	163	3
9/14/2016	0	0	0	0	44	0	0	0	31	0	14	0	89	0
9/15/2016	22	0	0	0	72	3	0	0	0	0	0	0	94	3
9/16/2016	0	0	0	0	36	1	68	1	0	0	0	0	104	2
9/17/2016	54	1	0	0	0	0	115	1	0	0	0	0	169	2
9/18/2016	0	0	40	4	0	0	44	0	24	0	0	0	108	4

Table G23 (concluded)

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
9/19/2016	0	0	88	6	0	0	0	0	58	2	0	0	146	8
9/20/2016	0	0	48	1	36	0	0	0	46	1	0	0	130	2
9/21/2016	0	0	0	0	44	4	0	0	0	0	131	3	175	7
9/22/2016	0	0	0	0	17	0	0	0	0	0	20	1	37	1
9/23/2016	41	1	0	0	0	0	0	0	0	0	0	0	41	1
9/24/2016	0	0	42	2	0	0	81	6	0	0	0	0	123	8
9/25/2016	0	0	47	4	0	0	64	5	99	5	0	0	210	14
9/26/2016	0	0	0	0	37	1	46	0	0	0	139	14	222	15
9/27/2016	9	1	0	0	43	2	1	0	0	0	0	0	53	3
9/28/2016	0	0	108	6	0	0	94	5	0	0	0	0	202	11
9/29/2016	0	0	2	0	0	0	45	1	135	5	0	0	182	6
9/30/2016	0	0	0	0	0	0	0	0	0	0	103	5	103	5
10/1/2016	0	0	0	0	68	2	0	0	0	0	0	0	68	2
Total	**174**	**3**	**811**	**32**	**536**	**13**	**922**	**20**	**621**	**16**	**595**	**25**	**3,659**	**109**

Table G24: Longnose Sucker marks applied by section and date adjusted for migration.

Date	1	3	5	6	7	9	Total
8/23/2016	2.0	0.0	0.0	0.0	0.0	0.0	2
8/24/2016	9.0	0.0	0.0	0.0	0.0	0.0	9
8/25/2016	0.0	74.8	7.1	2.1	3.1	0.0	87
8/26/2016	0.0	85.1	8.1	2.3	3.5	0.0	99
8/27/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/28/2016	0.0	22.4	2.1	0.6	0.9	0.0	26
8/29/2016	0.0	0.0	0.0	0.0	0.0	76.0	76
8/30/2016	0.0	0.0	0.0	38.7	20.3	12.0	71
8/31/2016	0.0	0.0	0.0	59.1	75.9	0.0	135
9/1/2016	0.0	0.0	16.3	1.7	5.0	0.0	23
9/2/2016	10.0	0.0	28.9	3.1	0.0	0.0	42
9/3/2016	2.0	12.9	1.2	0.4	0.5	0.0	17
9/4/2016	0.0	16.3	1.5	0.4	0.7	0.0	19
9/5/2016	0.0	12.0	1.1	13.5	7.4	0.0	34
9/6/2016	0.0	0.0	0.0	54.5	28.5	24.0	107
9/7/2016	0.0	0.0	0.0	0.0	89.0	0.0	89
9/8/2016	11.0	0.0	24.4	2.6	0.0	0.0	38
9/9/2016	12.0	0.0	56.1	5.9	0.0	0.0	74
9/10/2016	0.0	35.3	3.3	29.8	16.6	0.0	85
9/11/2016	0.0	43.0	4.1	41.9	23.1	0.0	112
9/12/2016	0.0	65.4	6.2	1.8	2.7	0.0	76
9/13/2016	0.0	0.0	0.0	0.0	83.0	74.0	157
9/14/2016	0.0	0.0	39.8	4.2	31.0	14.0	89
9/15/2016	22.0	0.0	59.7	6.3	0.0	0.0	88
9/16/2016	0.0	0.0	31.7	47.3	23.0	0.0	102
9/17/2016	53.0	0.0	0.0	74.8	39.2	0.0	167
9/18/2016	0.0	31.0	2.9	29.1	39.0	0.0	102
9/19/2016	0.0	69.7	6.6	1.9	57.8	0.0	136
9/20/2016	0.0	39.6	36.3	4.5	46.6	0.0	127

Date	1	3	5	6	7	9	Total
9/21/2016	0.0	0.0	36.2	3.8	0.0	128.0	168
9/22/2016	0.0	0.0	15.4	1.6	0.0	19.0	36
9/23/2016	3.0	0.0	0.0	0.0	0.0	0.0	3
9/24/2016	0.0	1.7	0.2	3.3	1.8	0.0	7
9/25/2016	0.0	0.0	0.0	3.3	4.7	0.0	8
9/26/2016	0.0	0.0	0.9	1.4	0.7	2.0	5
9/27/2016	0.0	0.0	1.8	0.2	0.0	0.0	2
9/28/2016	0.0	3.4	0.3	2.7	1.5	0.0	8
9/29/2016	0.0	0.0	0.0	0.0	6.0	0.0	6
9/30/2016	0.0	0.0	0.0	0.0	0.0	6.0	6
10/1/2016	0.0	0.0	1.8	0.2	0.0	0.0	2
Total	**124**	**513**	**394**	**443**	**612**	**355**	**2,440**

Table G25: Longnose Sucker sample, cumulative marks available for recapture and recaptures by section and date.

Date	Sample	Marks	Recap		Date	Sample	Marks	Recap
Section 1:					**Section 6:**			
9/2/2016	11	11			8/30/2016	59	4	
9/3/2016	3	11			8/31/2016	92	5	
9/8/2016	11	23			9/5/2016	21	108	
9/9/2016	12	23			9/6/2016	85	108	
9/15/2016	22	46			9/10/2016	45	176	1
9/17/2016	54	46	1		9/11/2016	62	179	
9/23/2016	41	121	1		9/16/2016	68	258	1
9/27/2016	9	124	1		9/17/2016	115	262	1
Section 3:					9/18/2016	44	269	
8/28/2016	28	75	2		9/24/2016	81	430	6
9/3/2016	15	182			9/25/2016	64	432	5
9/4/2016	19	182			9/26/2016	46	432	
9/5/2016	14	182			9/27/2016	1	435	
9/10/2016	43	224	2		9/28/2016	94	438	5
9/11/2016	54	224	4		9/29/2016	45	440	1
9/12/2016	77	224	1		**Section 7:**			
9/18/2016	40	367	4		8/31/2016	45	7	
9/19/2016	88	367	6		9/1/2016	5	7	
9/20/2016	48	367	1		9/7/2016	91	110	2
9/24/2016	42	507	2		9/13/2016	87	251	1
9/25/2016	47	507	4		9/14/2016	31	274	
9/28/2016	108	509	6		9/18/2016	24	391	
9/29/2016	2	509			9/19/2016	58	414	2
Section 5:					9/20/2016	46	453	1
1-Sep-16	18	17			9/25/2016	99	597	5
2-Sep-16	32	17			9/29/2016	135	604	5

Date	Sample	Marks	Recap
8-Sep-16	27	66	
9-Sep-16	62	66	
14-Sep-16	44	154	
15-Sep-16	72	160	3
16-Sep-16	36	160	1
20-Sep-16	36	292	
21-Sep-16	44	295	4
22-Sep-16	17	301	
26-Sep-16	37	389	1
27-Sep-16	43	389	2
1-Oct-16	68	392	2

Date	Sample	Marks	Recap
Section 9:			
9/6/2016	24	88	
9/13/2016	76	112	2
9/14/2016	14	112	
9/21/2016	131	200	3
9/22/2016	20	200	1
9/26/2016	139	347	14
9/30/2016	103	349	5

Table G26: Longnose Sucker population estimates by section.

Section	Bayes Mean	MLE	95% HPD		Standard Deviation	CV (%)
			Low	High		
1	8,126	3,420	1,060	22,700	6,650	81.8
3	7,195	6,760	4,880	9,800	1,286	17.9
5	10,552	9,020	5,400	16,960	3,091	29.3
6	12,857	11,680	7,740	18,860	2,901	22.6
7	16,723	14,750	9,230	25,730	4,386	26.2
9	5,469	5,050	3,490	7,750	1,124	20.6
Total	**60,922**		**42,922**	**78,922**	**9,184**	**15.1**

Table G27: Sample size and recaptures of Rainbow Trout by section and date.

	1		3		5		6		7		9		Total	
Date	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap	Sample	Recap
8/23/2016	1	0	0	0	0	0	0	0	0	0	0	0	1	0
8/24/2016	2	0	0	0	0	0	0	0	0	0	0	0	2	0
8/25/2016	0	0	6	0	0	0	0	0	0	0	0	0	6	0
8/26/2016	0	0	4	0	0	0	0	0	0	0	0	0	4	0
8/27/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2016	0	0	19	0	0	0	0	0	0	0	0	0	19	0
8/29/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/30/2016	0	0	0	0	0	0	1	0	0	0	0	0	1	0
8/31/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/1/2016	0	0	0	0	2	0	0	0	0	0	0	0	2	0
9/2/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/3/2016	9	0	5	1	0	0	0	0	0	0	0	0	14	1
9/4/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/5/2016	0	0	6	0	0	0	0	0	0	0	0	0	6	0
9/6/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/7/2016	0	0	0	0	0	0	0	0	1	0	0	0	1	0
9/8/2016	3	0	0	0	1	0	0	0	0	0	0	0	4	0
9/9/2016	3	1	0	0	1	0	0	0	0	0	0	0	4	1
9/10/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	1		3		5		6		7		9		Total	
9/11/2016	0	0	7	0	0	0	1	0	0	0	0	0	8	0
9/12/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/13/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/14/2016	0	0	0	0	1	1	0	0	0	0	0	0	1	1
9/15/2016	3	0	0	0	0	0	0	0	0	0	0	0	3	0
9/16/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/17/2016	2	0	0	0	0	0	2	1	0	0	0	0	4	1
9/18/2016	0	0	3	1	0	0	0	0	0	0	0	0	3	1

Table G27 (concluded)

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
9/19/2016	0	0	8	1	0	0	0	0	1	0	0	0	9	1
9/20/2016	0	0	3	1	0	0	0	0	0	0	0	0	3	1
9/21/2016	0	0	0	0	2	0	0	0	0	0	0	0	2	0
9/22/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/23/2016	3	2	0	0	0	0	0	0	0	0	0	0	3	2
9/24/2016	0	0	4	2	0	0	2	1	0	0	0	0	6	3
9/25/2016	0	0	6	1	0	0	0	0	1	1	0	0	7	2
9/26/2016	0	0	0	0	1	1	0	0	0	0	0	0	1	1
9/27/2016	3	1	0	0	1	0	0	0	0	0	0	0	4	1
9/28/2016	0	0	5	2	0	0	1	1	0	0	0	0	6	3
9/29/2016	0	0	3	1	0	0	0	0	0	0	0	0	3	1
9/30/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/1/2016	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Total	**29**	**4**	**79**	**10**	**10**	**2**	**7**	**3**	**3**	**1**	**0**	**0**	**128**	**20**

Table G28: Rainbow Trout marks applied by section and date adjusted for migration.

Date	1	3	5	6	7	9	Total
8/23/2016	1.0	0.0	0.0	0.0	0.0	0.0	1
8/24/2016	2.0	0.0	0.0	0.0	0.0	0.0	2
8/25/2016	0.0	6.0	0.0	0.0	0.0	0.0	6
8/26/2016	0.0	4.0	0.0	0.0	0.0	0.0	4
8/27/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/28/2016	0.0	19.0	0.0	0.0	0.0	0.0	19
8/29/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
8/30/2016	0.0	0.0	0.0	1.0	0.0	0.0	1
8/31/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/1/2016	0.0	0.0	2.0	0.0	0.0	0.0	2
9/2/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/3/2016	9.0	4.0	0.0	0.0	0.0	0.0	13
9/4/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/5/2016	0.0	6.0	0.0	0.0	0.0	0.0	6
9/6/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/7/2016	0.0	0.0	0.0	0.0	1.0	0.0	1
9/8/2016	3.0	0.0	1.0	0.0	0.0	0.0	4
9/9/2016	2.0	0.0	1.0	0.0	0.0	0.0	3
9/10/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/11/2016	0.0	7.0	0.0	1.0	0.0	0.0	8
9/12/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/13/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/14/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/15/2016	3.0	0.0	0.0	0.0	0.0	0.0	3
9/16/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/17/2016	2.0	0.0	0.0	1.0	0.0	0.0	3
9/18/2016	0.0	2.0	0.0	0.0	0.0	0.0	2
9/19/2016	0.0	7.0	0.0	0.0	1.0	0.0	8
9/20/2016	0.0	2.0	0.0	0.0	0.0	0.0	2

Date	1	3	5	6	7	9	Total
9/21/2016	0.0	0.0	2.0	0.0	0.0	0.0	2
9/22/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/23/2016	1.0	0.0	0.0	0.0	0.0	0.0	1
9/24/2016	0.0	2.0	0.0	1.0	0.0	0.0	3
9/25/2016	0.0	5.0	0.0	0.0	0.0	0.0	5
9/26/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
9/27/2016	2.0	0.0	1.0	0.0	0.0	0.0	3
9/28/2016	0.0	3.0	0.0	0.0	0.0	0.0	3
9/29/2016	0.0	2.0	0.0	0.0	0.0	0.0	2
9/30/2016	0.0	0.0	0.0	0.0	0.0	0.0	0
10/1/2016	0.0	0.0	1.0	0.0	0.0	0.0	1
Total	**25**	**69**	**8**	**4**	**2**	**0**	**108**

Table G29: Rainbow Trout sample, cumulative marks available for recapture and recaptures by section and date.

Date	Sample	Marks	Recap
Section 1:			
9/3/2016	9	3	
9/8/2016	3	12	
9/9/2016	3	12	1
9/15/2016	3	17	
9/17/2016	2	17	
9/23/2016	3	22	2
9/27/2016	3	23	1
Section 3:			
8/28/2016	19	6	
9/3/2016	5	29	1
9/5/2016	6	29	
9/11/2016	7	39	
9/18/2016	3	46	1
9/19/2016	8	46	1
9/20/2016	3	46	1
9/24/2016	4	57	2
9/25/2016	6	57	1
9/28/2016	5	64	2
9/29/2016	3	64	1

Date	Sample	Marks	Recap
Section 5:			
9/8/2016	1	2	
9/9/2016	1	2	
9/14/2016	1	4	1
9/21/2016	2	4	
9/26/2016	1	6	1
9/27/2016	1	6	
10/1/2016	1	7	
Section 6:			
9/11/2016	1	1	
9/17/2016	2	2	1
9/24/2016	2	3	1
9/28/2016	1	4	1

Table G30: Population estimates by section for Rainbow Trout.

Section	Bayes Mean	MLE	95% HPD		Standard Deviation	CV (%)
			Low	High		
1	141	76	33	338	104	74.0
3	290	237	138	489	100	34.6
5	77	18	8	276	87	113.3
6	12	5	5	31	10	86.9
Total	**520**		**188**	**852**	**169**	**32.6**

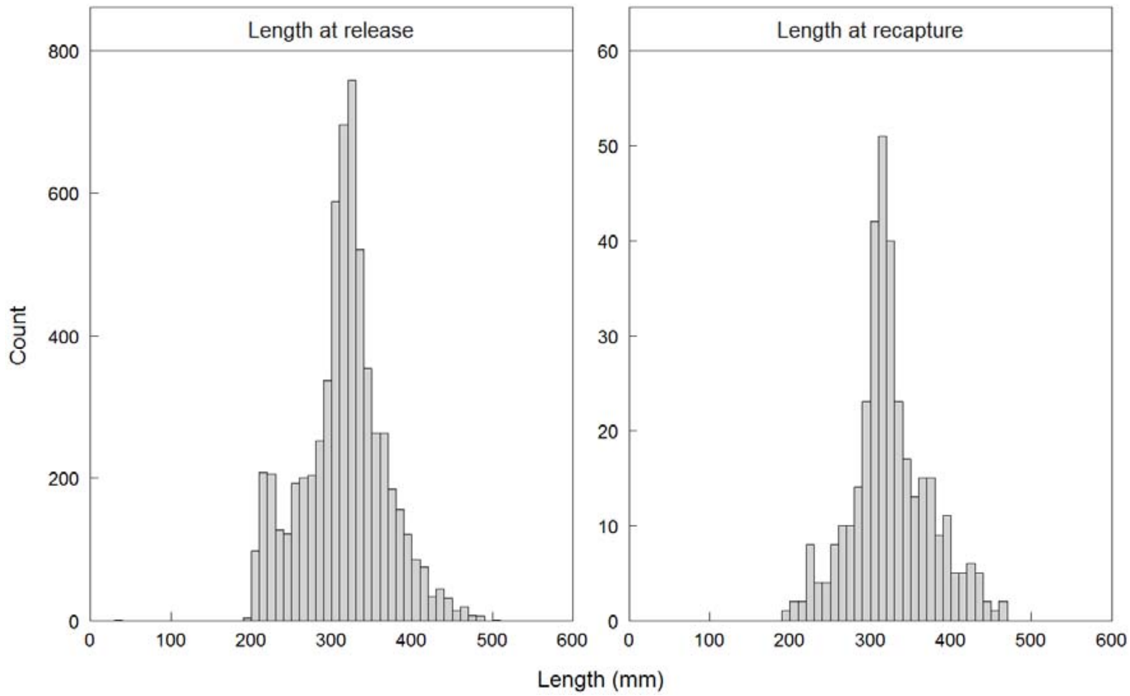


Figure G1 Histogram of Mountain Whitefish lengths at release (left) and recapture (right).

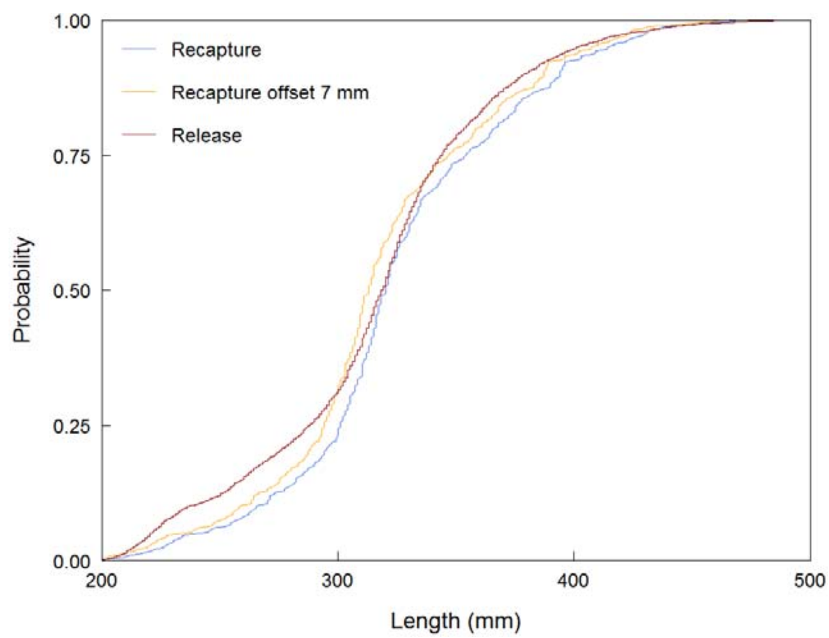


Figure G2 Mountain Whitefish cumulative proportion of length at release and recapture.

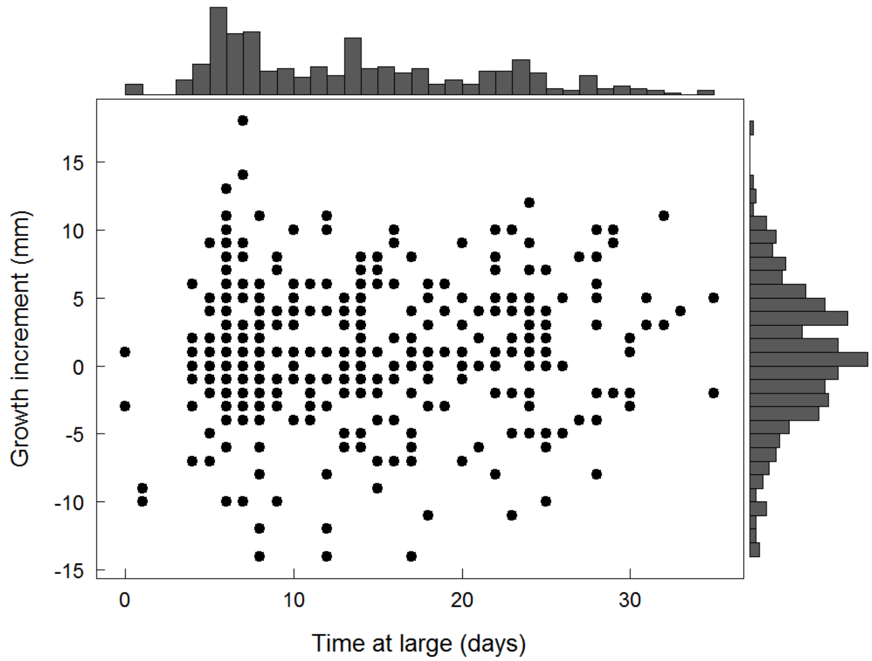


Figure G3 Growth over the study period of Mountain Whitefish with border histograms of time at large and growth increment.

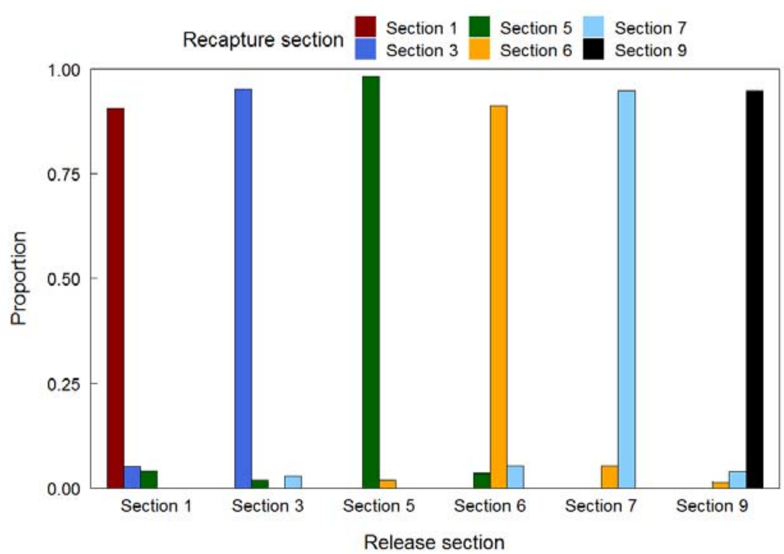


Figure G4 Distribution of recaptured marks in 2016 standardized for sampling effort by section of Mountain Whitefish released in 2016.

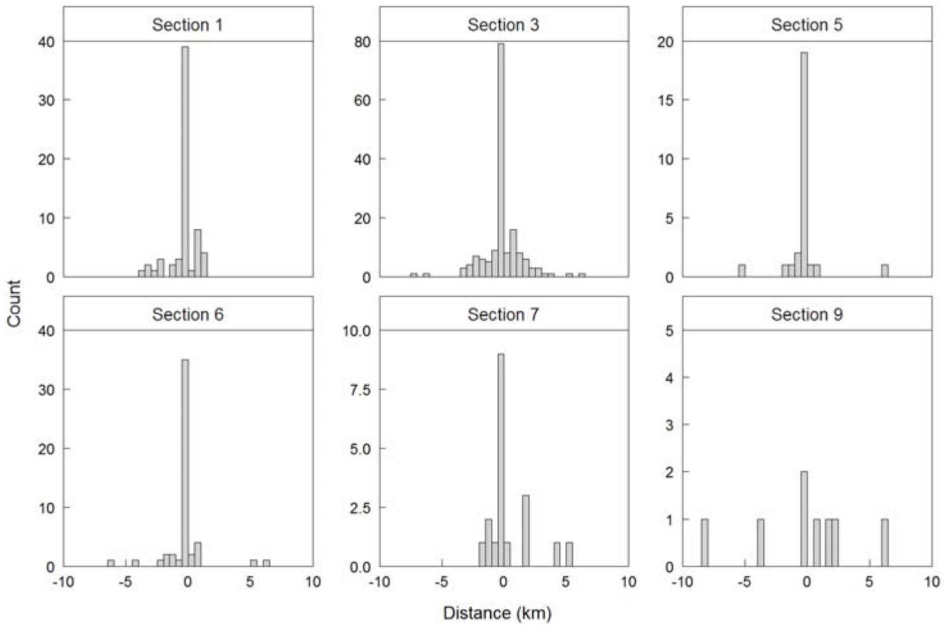


Figure G5 Bar plot of the travel distance of recaptured Mountain Whitefish released in 2016 within each of the sections sampled (positive values indicate upstream movement and negative values downstream movement). Each section is independently scaled.

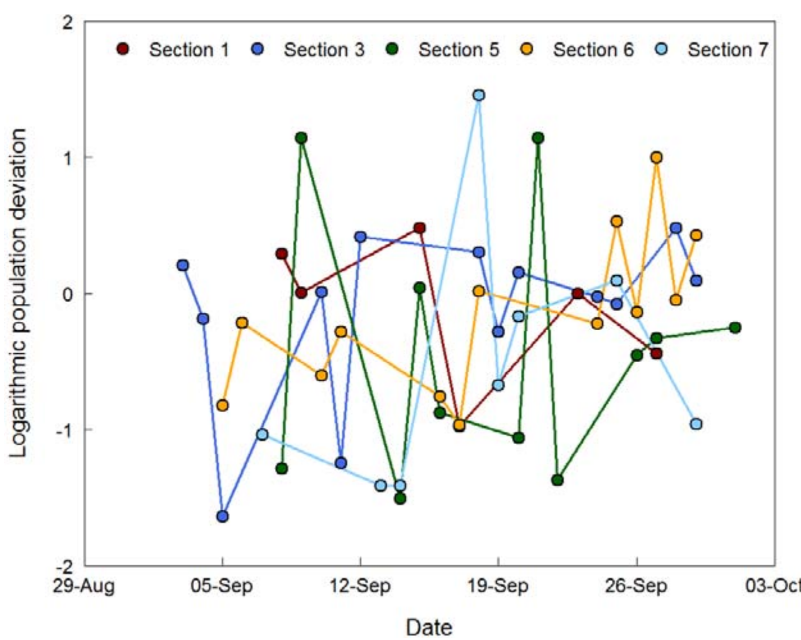


Figure G6 Logarithmic population deviation from the mean by section and date for Mountain Whitefish.

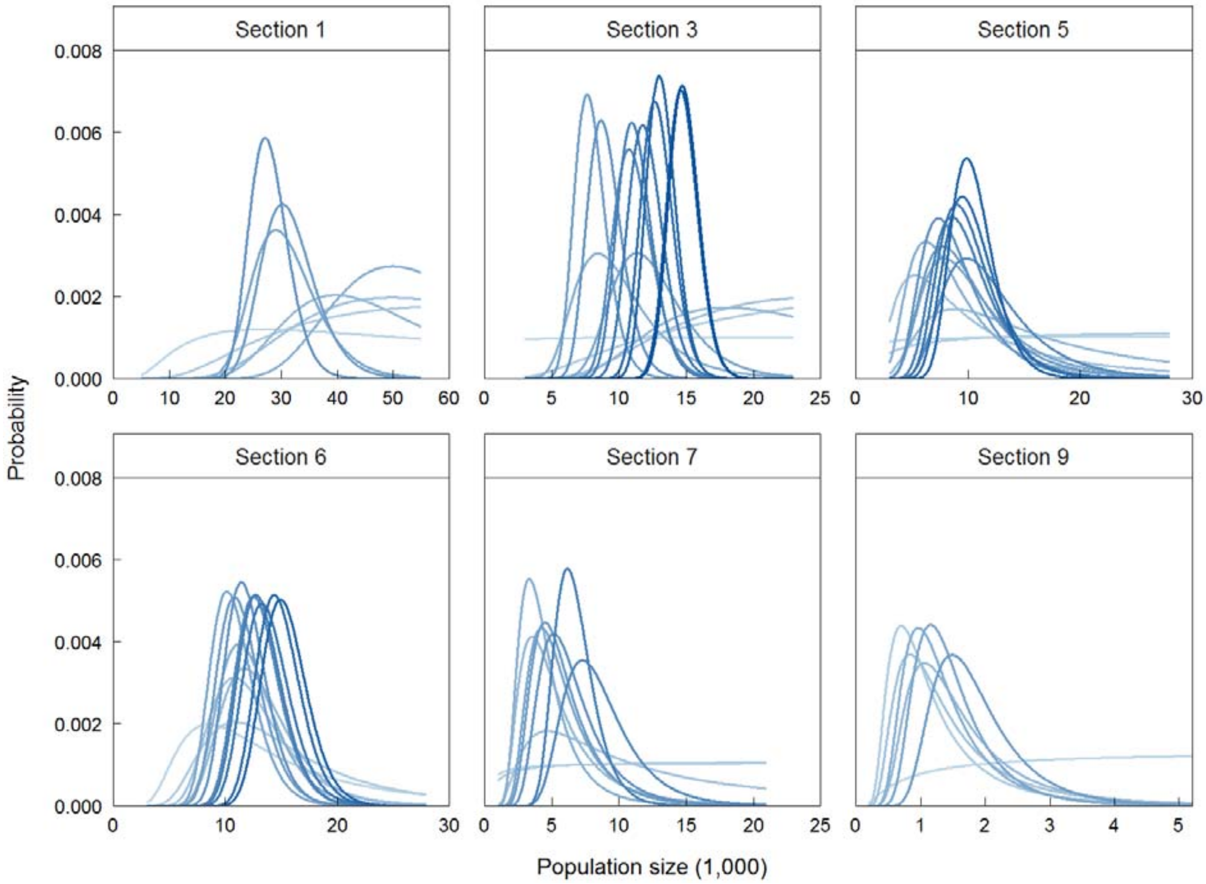


Figure G7 Sequential posterior probability plots of population size by section for Mountain Whitefish in 2016. Each line is the posterior probability updated by a sample day.

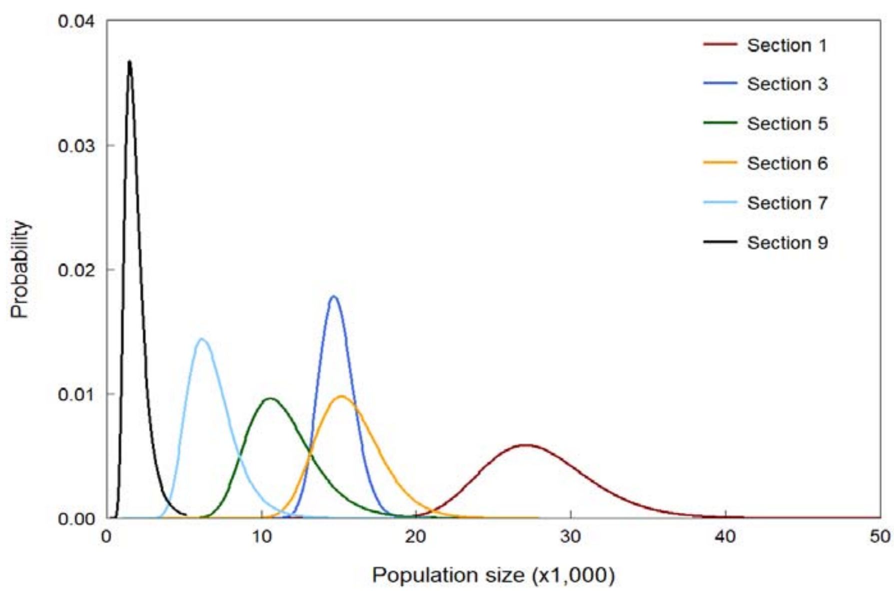


Figure G8 Final posterior distributions by section for Mountain Whitefish in 2016.

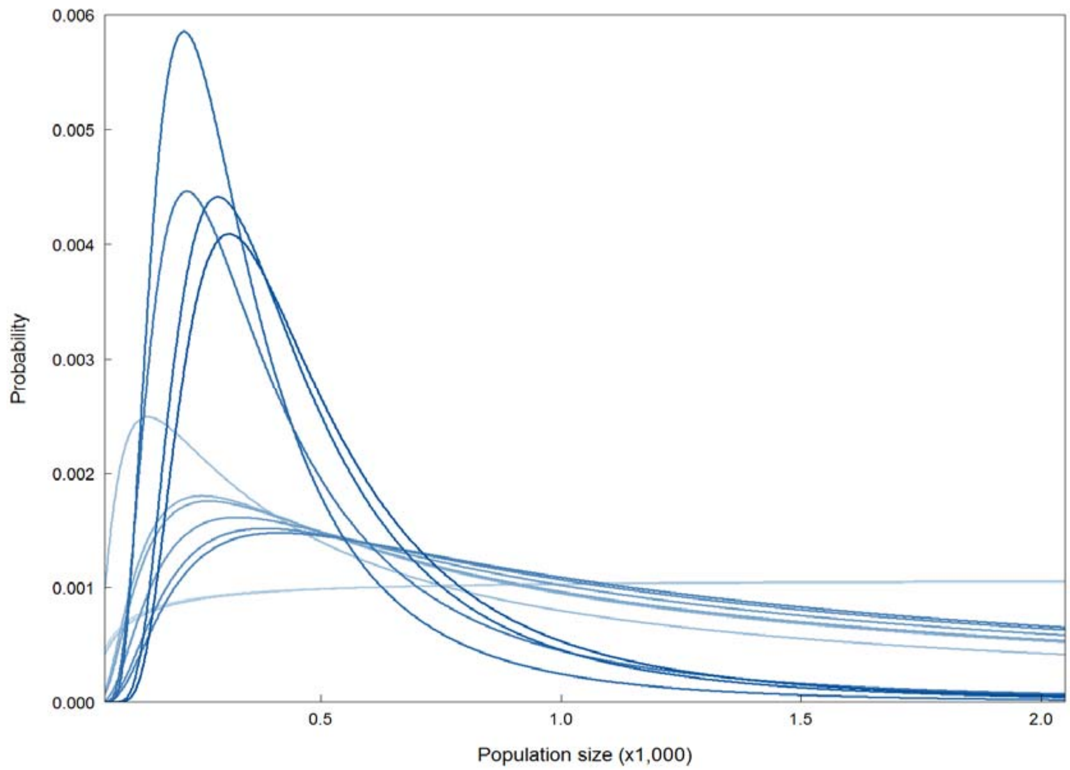


Figure G9 ***Sequential posterior probability plots of population size for Section 3 Arctic Grayling in 2016. Each line is the posterior probability updated by a sample day.***

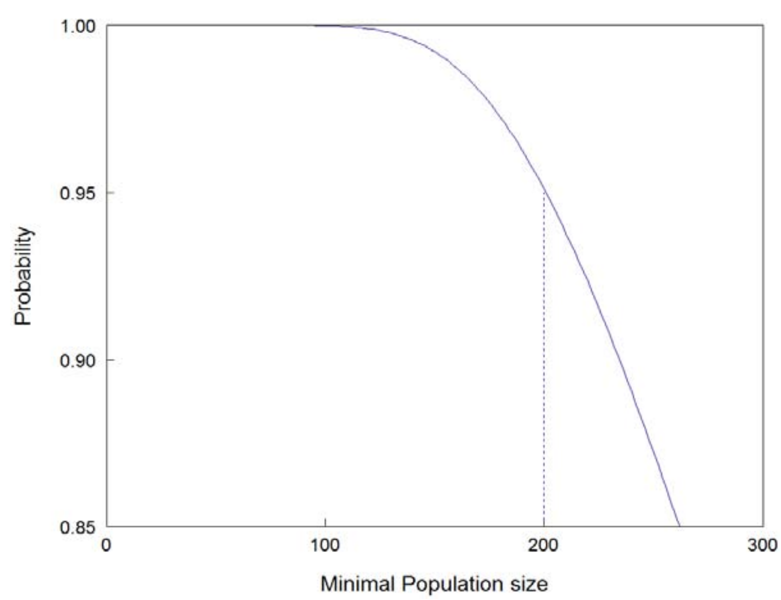


Figure G10 ***Minimal population estimates for Section 3 Arctic Grayling in 2016. The dashed vertical line indicates the 0.95 probability that the population size was at least 200 in Section 3.***

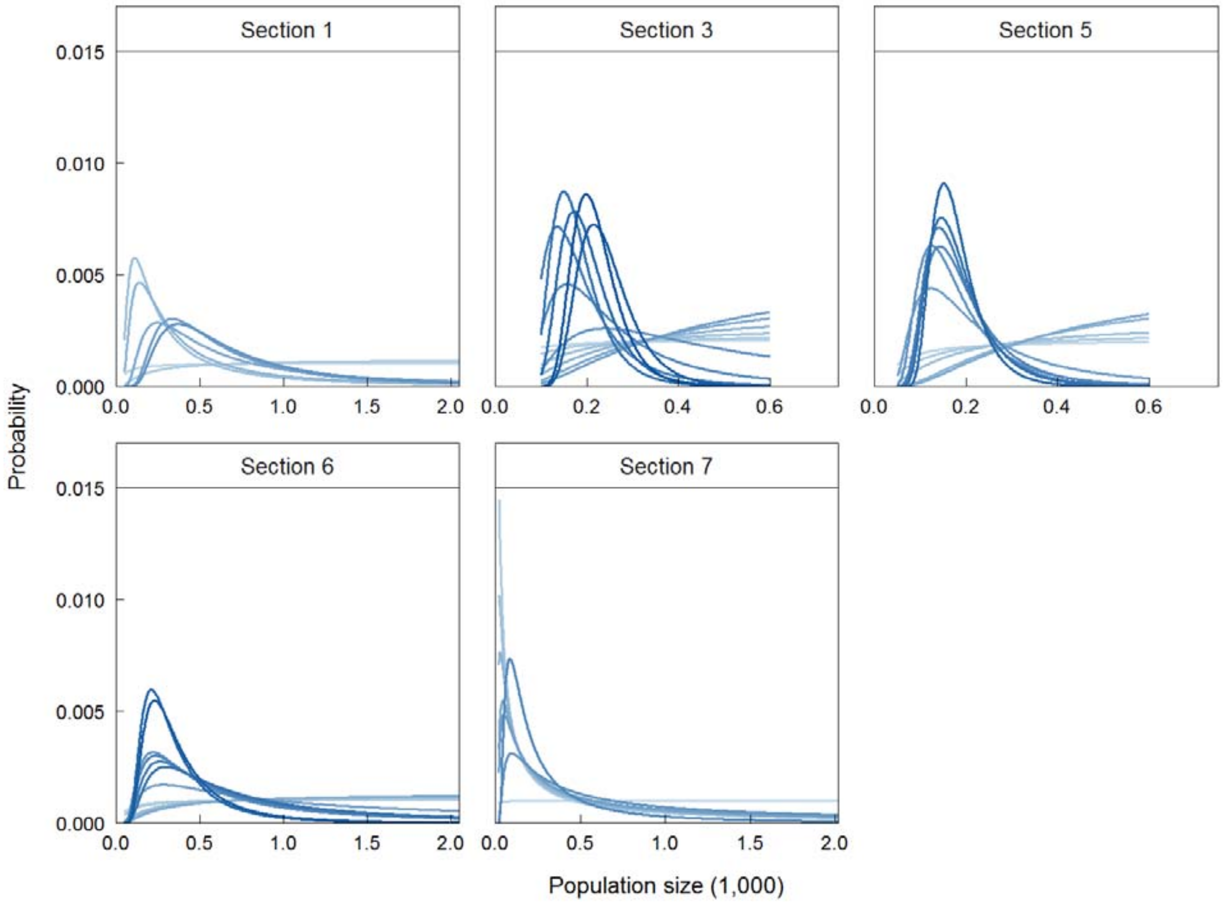


Figure G11 Sequential posterior probability plots of population size by section for Bull Trout in 2016. Each line is the posterior probability updated by a sample day.

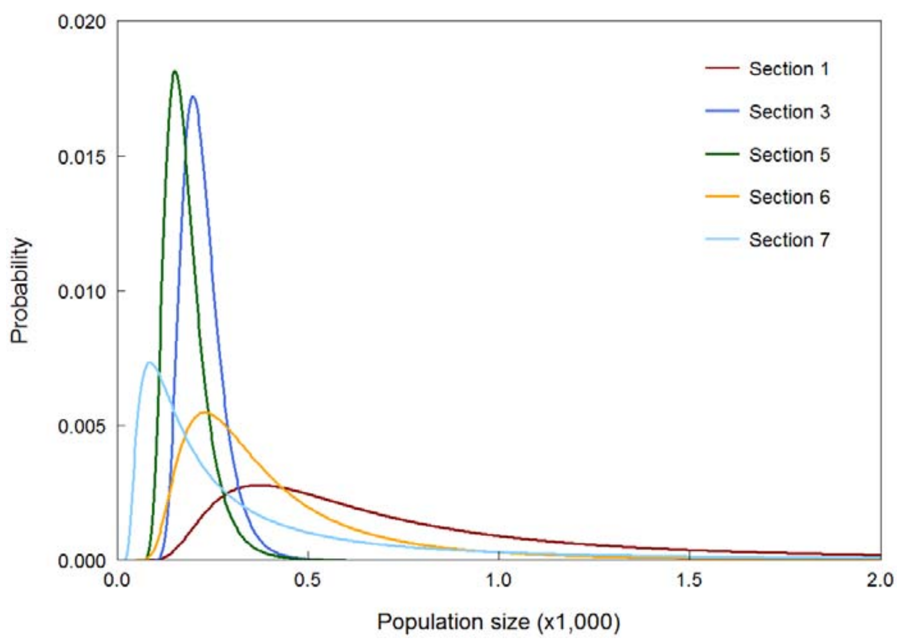


Figure G12 Final posterior distributions by section for Bull Trout.

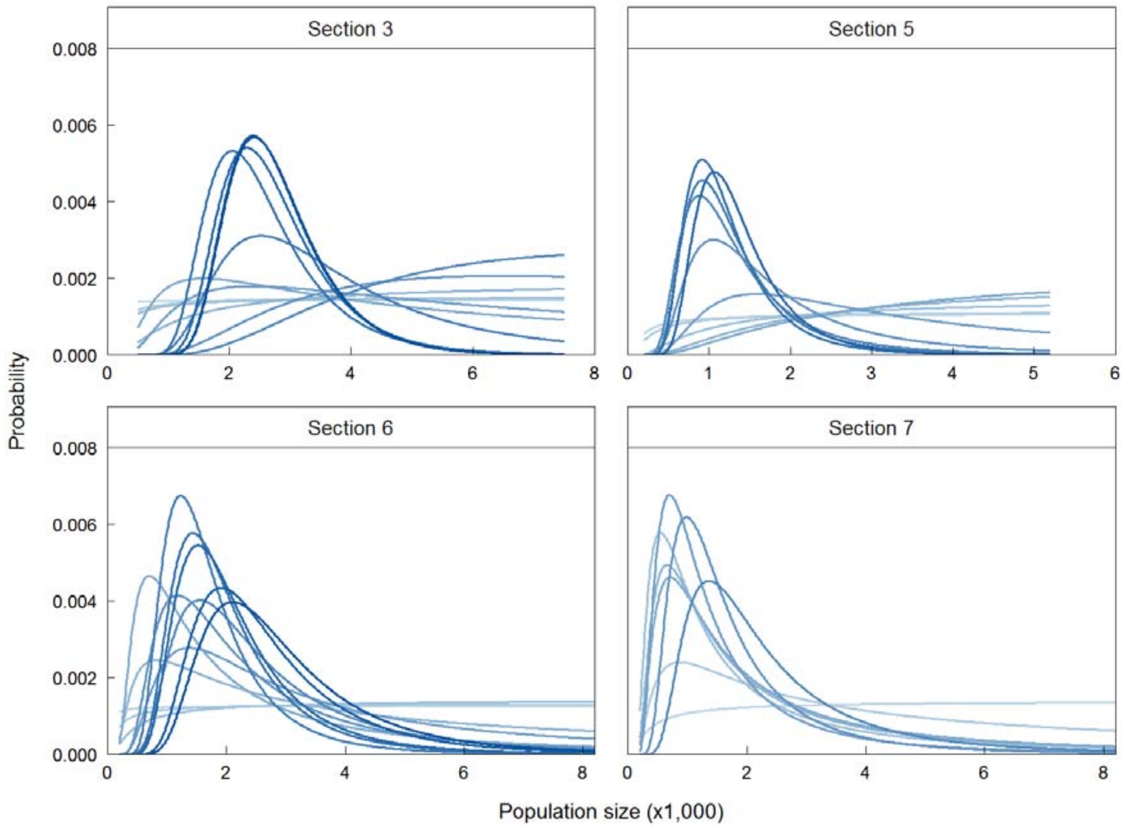


Figure G13 Sequential posterior probability plots of population size by section for Largescale Sucker in 2016. Each line is the posterior probability updated by a sample day.

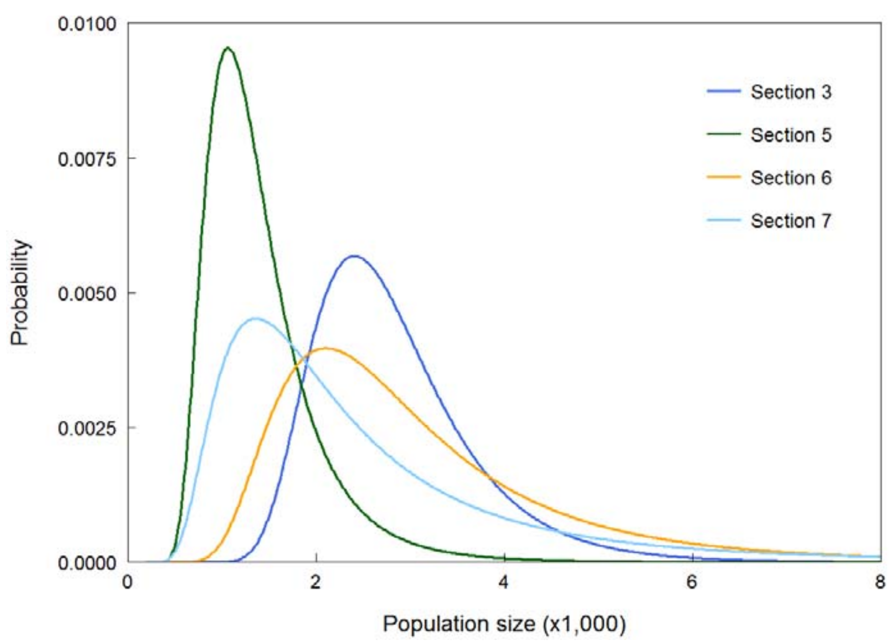


Figure G14 Final posterior distributions by section for Largescale Sucker.

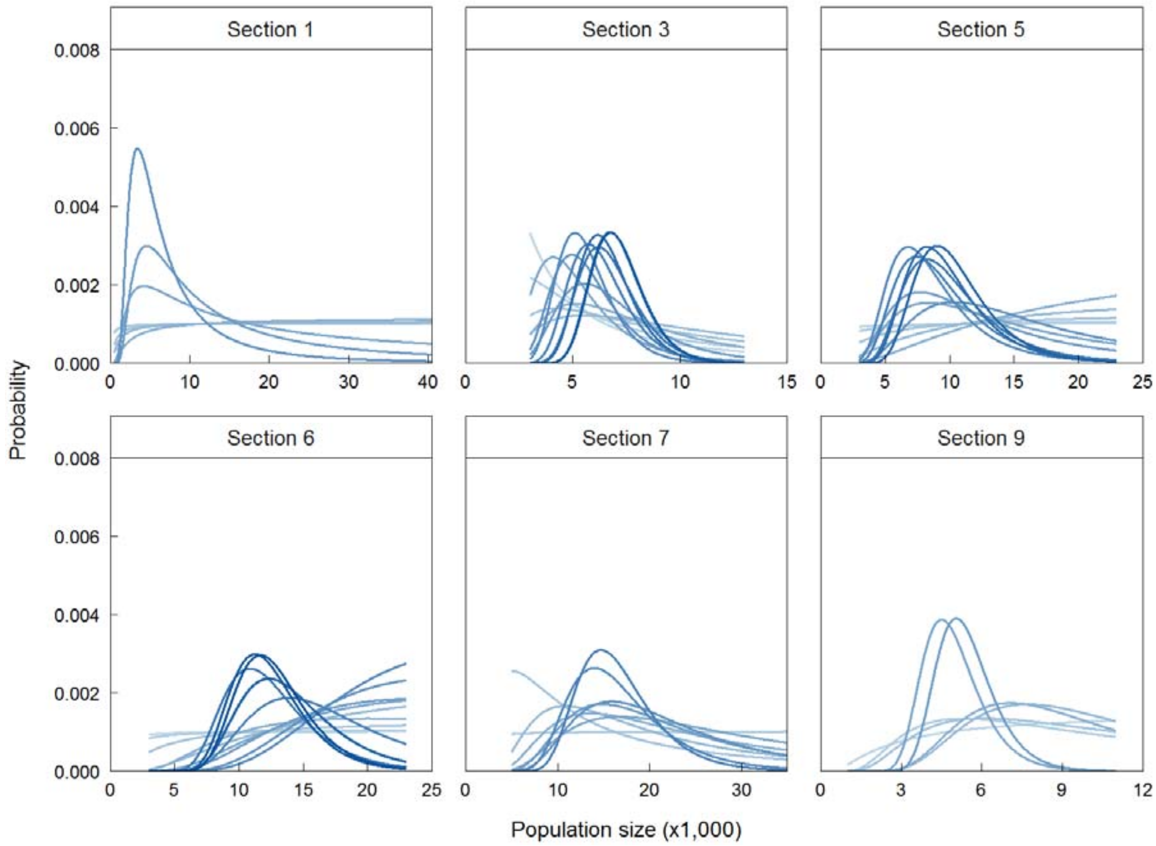


Figure G15 Sequential posterior probability plots of population size by section for Longnose Sucker in 2016. Each line is the posterior probability updated by a sample day.

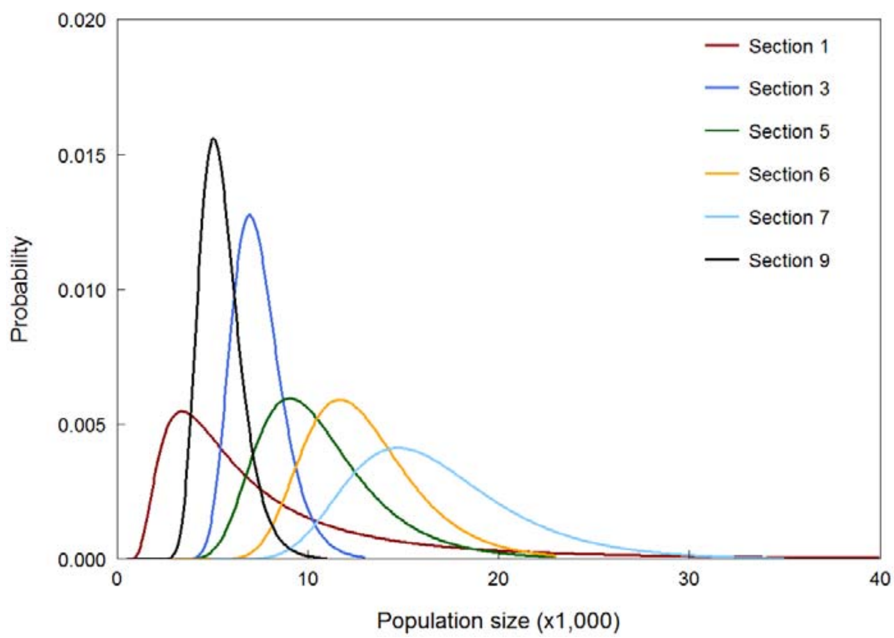


Figure G16 Final posterior distributions by section for Longnose Sucker.

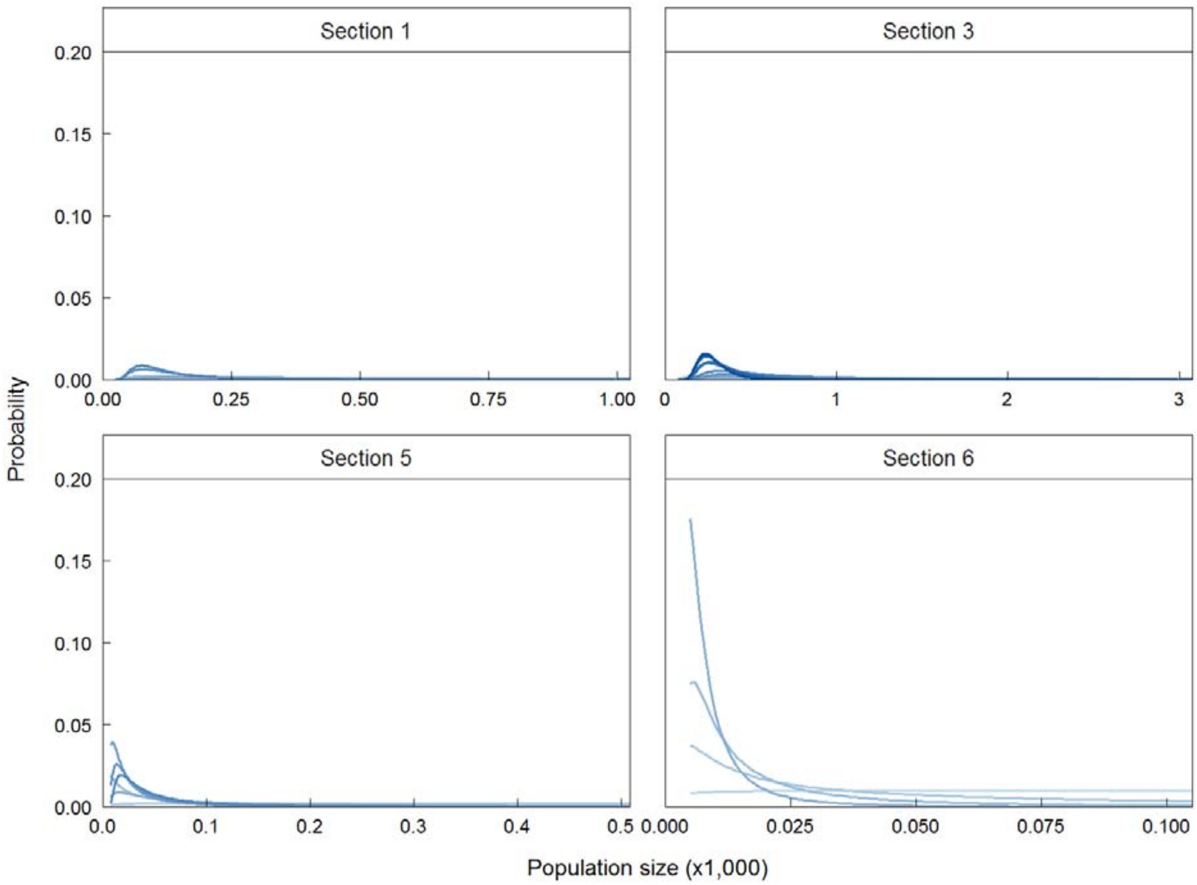


Figure G17 Sequential posterior probability plots of population size by section for Rainbow Trout in 2016. Each line is the posterior probability updated by a sample day.

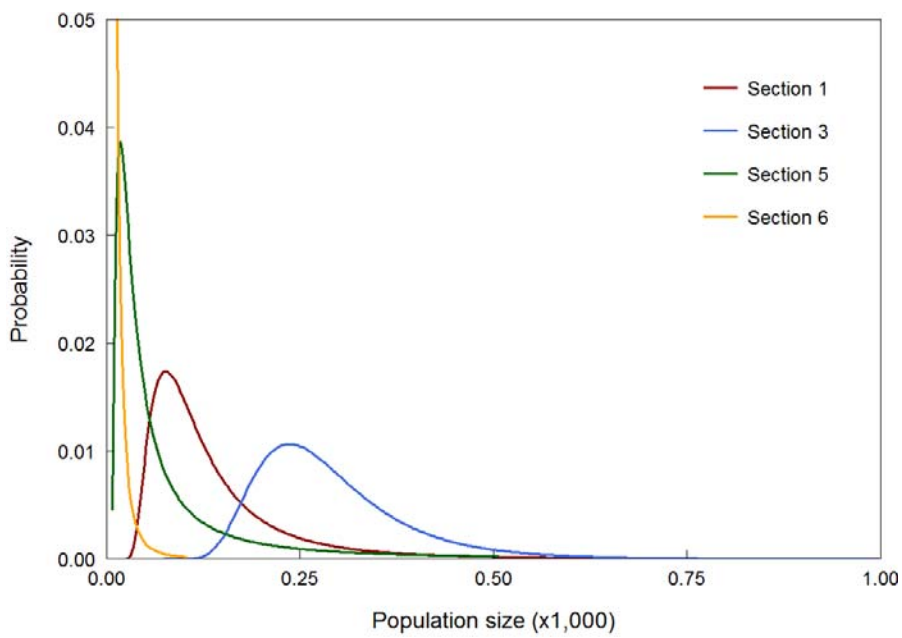


Figure G18 Final posterior distributions by section for Rainbow Trout.

APPENDIX H

Mountain Whitefish Synthesis Model

Introduction

In 2017, the Mountain Whitefish age structured stochastic model that was developed by Gazey and Korman (2016) was updated to include recent (i.e., 2017) data in addition to historical data from 2002 to 2016. The model synthesised length-at-age, incremental growth from release-recapture occurrences, length frequency, and mark-recapture data. The model was modified by Bill Gazey of W.J. Gazey Research. Appendix H was written by W.J. Gazey Research and provides additional information on the model and its corresponding output.

SYNTHESIS MODEL

Available Data

Mountain Whitefish data were extracted and compiled by Sima Usvyatsov of Golder Associates Ltd. The data currently used in the Synthesis Model were organized into the following four text files.

Length-at-age. The ageing of Mountain Whitefish by reading scales is suspect, particularly for larger and older fish. In the hope that younger and smaller fish were aged more accurately, age data from reading scales were restricted to fish age-3 or younger. Some of these aged fish were recaptured at a later date. Any of these younger aged fish that were later recaptured were also used (i.e., the time period from scale reading to recapture was known without error so the age of the fish at recapture was known). Fourteen fish were censored as outliers (extreme length for estimated age). In total, 3221 fish were aged as age-3 and younger, and 220 of these fish were subsequently recaptured for a total of 3441 observations (Table H1).

Growth increments from mark-recapture. When a recaptured fish was released, it served as the release for a future encounter. For example, if a fish was encountered at times A, B, and C, then two incremental growth records were recorded for times A-B and B-C. The release-recapture pair had to be in the same section for inclusion. Within-year release-recapture events were not recorded. Table H2 provides the number of sampled pairs (sum of Floy and PIT tags) by section, release year, and recapture year. In total, 112 fish with abnormal growth (i.e., less than 15 mm/year and greater than 50 mm/year) were subsequently censored by the synthesis model as outliers. While fish should not shrink, measurement error during independent length measurements generated negative growth increments.

Length frequency. A fish was only counted once in a year. If multiple captures occurred during a year, then only the first encounter was recorded. Newly marked fish were counted as unmarked for the year marked. Fish counted as marked were recaptures that were marked in a previous year. Table H3 provides a length-frequency summary of marked (Floy and PIT) and Table H4 provides the summary of unmarked fish. The data file also lists unmeasured unmarked fish sorted into two bins of less than or greater than or equal to 250 mm (Table H5) for 2002 through 2015. These samples were primarily obtained from Sessions 5 and 6. In 2016, several length bins were employed: “less than 150 mm”, “150 - 199 mm”, “200- 299 mm”, and “greater than 299 mm”. To compute the number of fish in the bins less than or greater than 250 mm, consistent with 2002-2015, the “200 - 299 mm” bin was prorated based on the proportion of observed fish between 250 and 299 mm captured in Sessions 1 to 4 in the associated section.

Mark-recapture. The file contains three sets of information. First, the time interval between the cessation of sampling and the commencement of sampling in the following year is provided. The second set contains the within-year sample size excluding recaptures. Table H6 presents a summary (tag type and session combined) by year and section. The third information set catalogues recaptures. Similar to the growth increment data, when a recaptured fish was released, it served as the release for a future encounter. For example, if a fish was encountered at times A, B, and C, then two recapture records were entered for times A-B and B-C. Table H7 displays a summary (tag type and session combined) of recaptures by section, release year, and recapture year.

Results

The parameter estimates and associated standard errors (SEs), with the exception of the capture probabilities, for the three sections included in the synthesis model (Sections 1, 3, and 5) are listed in Table H8. The across-year capture probabilities were transformed from the 270 logit parameters estimated by the synthesis model. The coefficient of variation (CVs) for these estimates were all less than 0.05 (not shown). The capture probabilities are plotted in Figure H1.

The synthesis model goodness of fit to the data was examined graphically (Figures H2 through H8). Figure H2 plots the observed length-at-age data (points) versus the model predicted values (lines) for each section. The predicted length-at-age did not vary by year. Only the mean length at age-0 was shared by the rest of the model. The remaining length-at-age growth parameters were unique to that data and served to enhance the estimate of the age-0 mean length parameter (termed nuisance parameters). These nuisance parameters were not consistent with that estimated by the synthesis model (see Table H8).

Observed (points) and predicted (lines) incremental growth of marked fish as a function of size at release by year of recapture for Sections 1, 3, and 5 are displayed in Figure H3. Predictions were based on observations from all years. Also, the predicted increment was restricted to positive values (i.e., fish cannot shrink). Since the growth coefficient and the mean length at age-0 were assumed to be the same for all years within a section, then the predicted slope of the increment over size at release is the same for all years within a section. Only mean length at age-10 was allowed to vary with year which was expressed in Figure H3 by the alternative X-intercepts (where the prediction is horizontal on the X-axis). By inspection, the assumption appears to be generally consistent with observed incremental growth.

The length-frequency of observed (histograms) and predicted (lines) unmarked fish by year for Sections 1, 3, and 5 are drawn in Figure H4. The predicted lines in 2002 (Sections 1 and 3) and 2004 in Section 5 were based on the mean growth for the section (i.e., year specific predicted growth was not available in the first year of sampling). In general, the best fit to the data was obtained in Section 1. In Section 3, a predicted recruitment bump in 2003 (see Figure H4 and Table H8) allowed for better fits in subsequent years. A similar predicted recruitment bump occurred in Section 5 during 2005. Observed and predicted number of unmarked fish grouped into less than and greater than 250 mm bins are plotted by section in Figure H5.

The length-frequency of observed (histogram) and predicted (lines) marked fish by year for Sections 1, 3, and 5 are plotted in Figure H6. A prediction for the number of marked fish was not feasible in the first year of structured data collection (2002 in Sections 1 and 3, and 2004 in Section 5). These years were not used for the likelihood calculations.

Observed versus predicted recaptures by section are drawn in Figure H7. The scatter (variation) of points increased by section consistent with estimates of the negative binomial dispersion coefficient (1.86, 2.55, and 2.85, for Sections 1, 3, and 5, respectively; Table H8). Sections 1 and 3 did not display any trends with the number of recaptures; however, Section 5 across-year recaptures were consistently under-estimated (predicted) for number of observations less than 25, approximately. More detailed examination revealed better agreement in the estimates as within-year sampling progressed (Sessions 1 through 6). The observed versus predicted captures of unmarked fish did not display any apparent trends with the number observed for any of the sections (see Figure H8). Because the sample size was large for the capture of unmarked fish in comparison to recaptured marked fish, the model placed priority on obtaining the fit to unmarked captures.

Functions of the fundamental parameter estimates in conjunction with other data were employed to display information on growth, selectivity, mortality, recruitment, and population size. The predicted mean length of age-10 fish by section and year of recapture are plotted in Figure H9. The overall trends in size over time were generally similar, particularly for 2010 through 2016. Also note the extremely tight error bars. However, the individual variation in length is large (asymptotic length SD of 27.9 mm, 51.6 mm, and 44.8 mm for Sections 1, 3, and 5, respectively; Table H8). Using all growth parameters, the predicted length-at-age by year is shown in Figure H10. For reference, the predicted growth curve obtained from the length-at-age data is overlaid on the plot. The mean length-at-age was used for 2002 in Sections 1 and 3, and 2004 in Section 5 (first years of tag application).

The predicted size selectivity by section is plotted in Figure H11. Selectivity as a function of length was flatter for the 2014-2017 period consistent with the change in electroshocker settings. The predicted instantaneous mortality by age and section is plotted in Figure H12. The mortalities for a year were largely defined by the asymptotic mortality (fundamental parameters that were estimated). The predicted mean survival by year of marked fish (weighted by the number at age) is depicted in Figure H13. These survival rates were used to predict the number of available marks across years for mark-recapture computations. Predicted recruitment by section and year is presented in Figure H14. Population estimates and the associated standard errors by section and year are listed in Table H9.

Table H1: Number of length-at-age samples by estimated age and section. Fourteen outliers not included.

River	Estimated age														
Section	0	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	6	103	258	456	18	17	12	8	3	5	1	1	1	1	890
3	42	435	607	576	48	25	14	13	5	6	4	4	1		1,780
5	42	236	249	211	12	6	6	1	3	2	1	2			771
Total	90	774	1,114	1,243	78	48	32	22	11	13	6	7	2	1	3,441

Table H2: Number (sum of Floy and PIT tags) of incremental length samples by section, release year, and recapture year. The model subsequently excluded 112 of these samples based on the outlier criteria (-15 mm/yr and > 50 mm/yr).

Release	River	Recapture year															
Year	Section	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2002	1	213	147	78	26	30	10	4	1	2							511
	3	279	119	109	25	23	18	8	4	4			1				590
2003	1		284	192	96	63	26	11	5	3	6	2	2				690
	3		248	217	50	46	28	14	11	3	4						621
2004	1			326	177	93	70	33	15	13	11	1	1	1			741
	3			358	84	112	63	16	15	23	8	3	1	1	1		685
	5			173		67	31	16	8	8	6	1					310
2005	1				178	153	77	28	19	29	10	7	1				502
	3				194	316	137	49	35	46	14	11	3	4			809
	5					192	71	43	16	21	9	5					357
2006	1					261	156	85	47	48	27	16	4	6	2		652
	3					221	110	51	37	36	12	6	1	3		1	478
2007	1						204	90	36	40	28	10	3	2	1		414
	3						331	160	76	98	34	19	8	6	4		736
	5						162	81	33	52	30	11	3	2			374
2008	1							200	85	87	56	23	6	2	4		463
	3							271	138	155	75	38	12	9	7	5	710
	5							184	55	79	43	21	4	4	4	2	396
2009	1								129	129	101	30	9	8	6	4	416
	3								203	189	90	40	8	7	7	2	546
	5								115	134	72	39	13	4	2	1	380
2010	1									153	106	36	22	17	9	7	350
	3									363	153	103	37	30	15	8	709
	5									148	66	32	21	16	5	7	295

Release	River	Recapture year															
Year	Section	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2011	1										237	73	30	52	39	16	447
	3										392	219	62	66	45	25	809
	5										197	102	32	18	8	7	364
2012	1											203	98	58	45	21	425
	3											453	87	78	55	39	712
	5											229	49	27	9	17	331
2013	1												114	76	68	46	304
	3												197	189	113	76	575
	5												111	55	35	31	232
2014	1													128	72	33	233
	3													165	102	66	333
	5													74	32	29	135
2015	1														112	59	171
	3														238	140	378
	5														50	33	83
2016	1															41	41
	3															134	134
	5															55	55
Total		492	798	1453	830	1577	1494	1344	1083	1863	1787	1733	940	1108	1090	905	18497

Table H3: Length frequency of marked (Floy and PIT) Mountain Whitefish.

Size	Capture year														
Bin (mm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
200-209								1		2						3
210-219																
220-229								1					2	1		4
230-239		2											1		2	5
240-249			1		1					1				5	3	11
250-259		1	3		6	3	3	2	20	12	11	1		9	10	81
260-269	2	5	11	13	18	13	19	16	52	64	76	5	1	6	20	321
270-279	11	23	40	23	39	58	66	38	104	161	174	34	16	20	16	823
280-289	29	42	94	58	86	100	88	61	159	233	257	61	41	32	28	1,369
290-299	26	54	129	108	117	139	137	100	198	234	276	122	114	73	57	1,884
300-309	46	81	144	91	171	158	152	133	229	223	242	178	146	137	122	2,253
310-319	65	102	189	112	173	179	168	128	209	177	191	161	186	169	161	2,370
320-329	72	136	183	111	209	179	153	124	188	167	140	117	190	208	171	2,348
330-339	82	120	176	103	187	170	133	108	155	131	115	72	137	144	103	1,936
340-349	53	90	131	73	154	140	98	95	141	115	103	67	89	81	82	1,512
350-359	41	51	92	50	109	107	75	83	100	80	69	51	74	50	54	1,086
360-369	22	33	69	42	73	71	69	49	80	51	30	36	47	52	29	753
370-379	15	27	54	17	56	48	46	42	78	56	31	19	30	38	30	587
380-389	15	26	48	19	62	51	48	40	50	39	23	21	23	28	17	510
390-399	11	10	36	10	43	33	26	31	38	33	12	11	16	24	13	347
400-409	7	21	30	9	34	25	30	19	28	23	8	7	8	12	8	269
410-419	9	9	24	10	23	16	19	18	29	12	11	7	6	15	5	213
420-429	4	6	25	6	31	20	17	9	17	14	12	5	9	6	3	184

Size	Capture year														
Bin (mm)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
430-439	3	6	13	3	16	9	13	17	22	7	8	4	4	5	1	131
440-449	1	4	21	2	15	9	6	9	11	6	4	1	4	6	1	100
≥450		6	17	2	25	17	14	10	16	7	4	8	5	17	11	159
Total	514	855	1,530	862	1,648	1,545	1,380	1,134	1,924	1,848	1,797	988	1,149	1,138	947	19,259

Table H4: Length frequency of unmarked Mountain Whitefish.

Size	Capture year																
Bin (mm)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
30-39															2		2
40-49															1		1
50-59																	
60-69							1						1	4	3		9
70-79			1	1		2	2	2		1		1	19	11	28	8	76
80-89			17		4		19	8	5	1		4	80	80	50	18	286
90-99		2	23	6	11		7	8	17	1		5	164	64	47	18	373
100-109		1	6	3	18		5	3	19	2			97	35	7	16	212
110-119		1			14	3			10	3	2		34	6		2	75
120-129	1	2	3	1	2	22	1	1		15	1	7	4	1	2	3	66
130-139	3	7	5	22	2	101	17	11	1	19	5	35	2		11	13	254
140-149	10	24	17	93	1	267	76	51	4	33	19	73	6	6	68	41	789
150-159	27	77	110	146	29	266	91	180	39	6	31	90	56	55	152	71	1,426
160-169	10	80	256	96	102	113	63	224	163	18	24	44	341	198	140	26	1,898
170-179	5	28	188	28	203	57	38	101	231	28	9	10	570	232	75	14	1,817
180-189	16	3	43	34	143	27	220	31	84	94	44	18	205	159	18	40	1,179
190-199	40	18	21	140	48	55	387	65	36	162	112	43	62	60	24	122	1,395
200-209	36	75	84	238	67	175	484	212	61	179	126	73	56	15	64	144	2,089
210-219	32	82	236	261	243	286	300	217	229	115	156	65	189	67	163	70	2,711
220-229	70	61	345	159	259	239	140	269	304	168	220	80	179	193	188	77	2,951
230-239	175	57	167	130	168	209	137	498	171	283	306	160	77	156	114	136	2,944
240-249	206	99	95	247	151	338	230	568	171	321	327	226	48	77	91	146	3,341
250-259	113	166	146	234	257	285	306	332	356	352	435	337	71	91	156	156	3,793
260-269	112	231	237	170	228	261	385	293	512	564	457	434	122	119	169	214	4,508
270-279	148	242	346	222	252	294	411	339	626	780	604	441	222	140	143	202	5,412

Size	Capture year																
Bin (mm)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
280-289	150	195	454	317	293	349	398	330	535	908	631	482	319	133	175	172	5,841
290-299	188	175	527	368	343	291	393	335	451	745	506	411	379	250	207	205	5,774
300-309	305	229	563	339	340	337	365	310	412	615	392	337	335	301	318	272	5,770
310-319	441	284	602	366	289	306	343	244	316	449	286	239	298	313	403	323	5,502
320-329	517	336	618	383	278	293	296	226	315	365	216	148	193	272	418	281	5,155
330-339	416	295	502	341	205	234	256	203	237	288	170	135	121	182	246	201	4,032
340-349	291	196	373	251	150	184	182	167	180	244	144	85	93	127	149	121	2,937
350-359	158	119	253	191	80	127	162	143	169	201	103	83	81	75	101	101	2,147
360-369	85	82	232	141	69	136	130	99	125	138	74	66	39	60	67	47	1,590
370-379	72	60	130	126	35	85	95	90	100	100	58	36	44	39	56	46	1,172
380-389	67	53	94	74	34	69	70	56	75	67	60	22	34	52	36	23	886
390-399	45	46	92	58	24	64	62	55	58	48	45	21	20	30	21	18	707
400-409	24	31	73	51	19	51	43	32	39	52	27	17	10	14	12	12	507
410-419	27	24	65	53	24	45	43	33	37	39	18	10	13	12	21	10	474
420-429	15	15	61	25	14	30	28	15	16	25	26	11	8	5	10	6	310
430-439	10	5	37	24	12	28	12	14	11	17	8	7	8	5	15	7	220
440-449	9	9	37	30	7	19	8	8	9	13	7	3	4	8	4	5	180
≥450	9	12	81	36	10	37	22	16	14	21	9	10	6	8	10	13	314
Total	3,833	3,422	7,140	5,405	4,428	5,685	6,228	5,789	6,138	7,480	5,658	4,269	4,610	3,655	3,985	3,400	81,125

Table H5: Length frequency of unmarked Mountain Whitefish classified into length bins.

Year	River Section	Length Bin	
		<250 mm	≥250 mm
2002	1	73	769
	3	97	722
2003	1	47	602
	3	358	743
2004	1	49	690
	3	245	831
	5	274	330
2005	1	182	966
	3	635	928
	5	352	660
2006	1	39	451
	3	276	309
2007	1	170	647
	3	412	826
	5	358	686
2008	1	257	791
	3	757	941
	5	344	702
2009	1	281	712
	3	389	634
	5	202	616
2010	1	92	756
	3	462	982
	5	245	784
2011	1	202	1,038
	3	307	1,175
	5	167	806
2012	1	299	1,355
	3	210	783
	5	139	531
2013	1	32	561
	3	104	867
	5	75	724
2014	1	13	434
	3	296	382
	5	169	382

Year	River Section	Length Bin	
		<250 mm	≥250 mm
2015	1	85	480
	3	255	636
	5	182	289
2016	1	116	480
	3	346	668
	5	159	215
2017	1	130	419
	3	155	493
	5	140	321

Table H6: Number of newly marked, marked in a previous year, and unmarked Mountain Whitefish encountered by year and river section.

Year	River Section	Newly Marked	Previously Marked	Unmarked	Dead Unmarked	Dead Marked
2002	1	1,646	0	2,619	5	0
	3	1,279	0	2,074	11	0
2003	1	1,523	214	2,243	15	5
	3	1,099	296	1,907	3	3
2004	1	2,284	435	3,565	94	12
	3	1,361	387	2,374	8	2
	5	1,008	20	1,434	0	0
2005	1	1,027	601	2,211	3	9
	3	1,423	719	2,479	2	9
	5	971	199	1,662	3	2
2006	1	1,780	473	2,335	5	44
	3	1,035	370	1,388	3	3
2007	1	1,020	611	1,755	14	5
	3	1,318	746	2,211	7	4
	5	989	281	1,717	6	0
2008	1	1,281	550	2,149	4	2
	3	1,465	710	2,447	7	0
	5	1,111	283	1,848	2	1
2009	1	1,183	455	1,938	3	1
	3	1,071	576	1,728	2	3
	5	992	345	1,636	2	1
2010	1	1,289	340	2,086	7	2
	3	1,950	541	3,005	0	5
	5	1,207	244	2,024	1	4

Year	River Section	Newly Marked	Previously Marked	Unmarked	Dead Unmarked	Dead Marked
2011	1	2,353	518	3,538	0	2
	3	2,051	943	3,264	0	0
	5	1,414	459	2,248	1	0
2012	1	1,796	606	3,197	7	2
	3	1,522	804	2,320	4	0
	5	874	430	1,428	10	1
2013	1	1,064	421	1,688	15	3
	3	1,216	913	2,098	3	1
	5	931	459	1,701	2	12
2014	1	823	298	1,307	9	3
	3	677	436	1,087	2	2
	5	821	253	1,224	1	1
2015	1	757	359	1,250	1	1
	3	910	578	1,551	0	0
	5	537	211	837	0	0
2016	1	1,301	371	1,789	1	0
	3	1,065	602	1,740	1	1
	5	352	158	572	0	0
2017	1	980	233	1,362	2	0
	3	975	514	1,399	5	1
	5	464	195	789	0	0
Total		54,195	19,157	87,224	271	147

Table H7: Recapture of Mountain Whitefish by section, release year, and year of recapture.

Release Year	River Section	Recapture Year																
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2002	1	207	213	147	78	26	31	10	4	1	2							719
	3	261	280	120	109	25	23	18	8	4	4			1				853
2003	1		200	282	191	95	63	26	11	5	3	6	2	2				886
	3		275	251	218	50	47	28	14	11	3	4						901
2004	1			258	325	175	93	70	33	15	13	11	1	1	1			996
	3			159	357	84	113	62	16	15	23	8	3	1	1	1		843
	5			63	174		67	31	15	8	8	5	1					372
2005	1				256	178	153	76	28	19	29	10	7	1				757
	3				357	196	314	137	49	35	45	14	11	3	4			1,165
	5				227		192	71	45	16	21	10	5					587
2006	1					199	260	156	84	47	48	27	16	4	6	2		849
	3					92	224	110	51	37	36	12	6	1	3		1	573
2007	1						157	204	90	36	40	28	10	3	2	1		571
	3						281	332	160	75	98	34	19	8	6	4		1,017
	5						185	162	81	33	52	30	11	3	2			559
2008	1							161	200	85	87	56	23	6	2	4		624
	3							302	271	137	153	74	39	12	9	7	5	1,009
	5							168	184	54	79	43	21	4	4	4	2	563
2009	1								131	128	129	101	30	9	8	6	4	546
	3								215	203	189	90	40	8	7	7	2	761
	5								151	114	135	72	39	13	4	2	1	531
2010	1									83	153	106	36	22	17	9	7	433
	3									198	363	153	102	37	30	15	8	906
	5									85	147	66	32	21	15	5	7	378

Release Year	River Section	Recapture Year																
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2011	1										244	235	74	30	52	39	16	690
	3										414	392	221	62	66	46	25	1,226
	5										206	197	102	32	18	8	7	570
2012	1											355	202	98	58	45	21	779
	3											534	452	87	77	55	40	1,245
	5											226	229	49	26	9	17	556
2013	1												126	113	76	68	46	429
	3												426	197	190	113	75	1,001
	5												230	111	55	35	31	462
2014	1													75	128	72	32	307
	3													82	167	100	66	415
	5													51	74	32	29	186
2015	1														75	106	58	239
	3														132	226	125	483
	5														46	48	30	124
2016	1															61	40	101
	3															148	131	279
	5															23	54	77
2017	1																49	49
	3																111	111
	5																46	46
Total		468	968	1,280	2,292	1,120	2,203	2,124	1,841	1,444	2,724	2,899	2,516	1,147	1,361	1,301	1,086	26,774

Table H8: Parameter estimates and associated standard errors (SE).

Parameter	Year	River Section 1		River Section 3		River Section 5	
		Estimate	SE	Estimate	SE	Estimate	SE
Nuisance length-at-age							
Length age-10 (mm)		325.2	4.2	328.6	3.1	349.7	6.9
Growth coefficient		0.383	0.018	0.354	0.010	0.282	0.015
Individual length SD (mm)		25.2	0.7	25.6	0.5	31.9	1.2
Growth							
Length age-0 (mm)		98.3	2.6	94.3	1.0	93.6	1.2
Growth coefficient		0.188	0.005	0.124	0.004	0.147	0.006
Individual length SD (mm)		27.9	0.6	51.6	1.6	44.8	1.6
Length age-10 (mm)	2003	292.0	2.4	284.8	3.1		
	2004	310.4	1.8	334.9	3.0		
	2005	280.7	1.8	289.8	2.7	310.7	3.5
	2006	292.5	1.9	328.8	3.0		
	2007	289.7	1.9	299.9	2.7	340.9	3.6
	2008	305.2	2.0	294.4	2.4	321.6	3.4
	2009	290.6	2.0	288.3	2.8	322.5	3.1
	2010	307.6	2.1	296.5	2.3	319.1	3.2
	2011	286.3	1.6	270.5	2.3	289.6	2.8
	2012	277.0	1.6	257.8	2.3	273.9	2.9
	2013	286.5	2.0	259.9	2.4	278.8	2.9
	2014	331.2	2.1	319.0	3.1	326.9	3.3
	2015	327.7	2.5	311.9	2.9	317.1	4.0
	2016	306.4	2.4	289.7	2.6	298.8	5.0
	2017	298.7	2.6	280.7	2.7	293.3	4.0

Parameter	Year	River Section 1		River Section 3		River Section 5	
		Estimate	SE	Estimate	SE	Estimate	SE
Selectivity							
Mid length bin (10 mm increments)	2002-13	28.6	0.30	30.9	0.33	34.2	0.67
	2014-17	30.5	0.81	375.5		349.4	
Slope	2002-13	1.7	0.06	2.8	0.06	3.6	0.15
	2014-17	2.0	0.21	14.4	1.51	15.1	2.42
Asymptotic Survival (logit)	2002-04	-1.199	0.047	-1.294	0.031		
	2005-07	-0.930	0.060	-1.415	0.055	-0.936	0.047
	2008-10	-1.347	0.093	-1.269	0.057	-1.982	0.141
	2011-13	0.040	0.081	-0.589	0.066	-0.488	0.109
	2014-16	-41.738		-2.669	0.467	-1.092	0.225
Recruitment (log_e)	2002	11.61	0.16	11.69	0.12		
	2003	11.85	0.45	14.20	0.15		
	2004	13.47	0.30	10.52	0.68	12.91	0.21
	2005	13.63	0.30	14.27	0.14	14.26	0.28
	2006	12.36	0.55	11.29	1.01	12.98	0.49
	2007	12.30	0.51	10.61	0.66	10.67	0.65
	2008	12.51	0.41	10.49	0.62	10.26	0.51
	2009	11.53	0.53	10.42	0.64	9.97	0.55
	2010	11.64	0.56	12.11	0.96	10.40	0.56
	2011	12.32	0.69	12.58	0.51	10.59	0.65
	2012	14.33	0.39	10.50	0.68	12.05	0.37
	2013	13.17	0.48	9.51	0.49	10.19	0.57
	2014	12.16	0.53	9.07	0.38	9.97	0.48
	2015	12.25	0.66	8.27	0.40	10.01	0.42
	2016	12.41	0.72	8.26	0.42	9.36	0.44

Parameter	Year	River Section 1		River Section 3		River Section 5	
		Estimate	SE	Estimate	SE	Estimate	SE
	2017	12.50	0.75	8.32	0.45	8.57	0.49
Miscellaneous							
Capture probability coefficient		0.0440	0.0102	0.0351	0.0108	0.0700	0.0172
Negative binomial dispersion coefficient		1.86	0.12	2.55	0.15	2.85	0.20

Table H9: Population estimates and the associated standard errors (SE) for Mountain Whitefish based on the synthesis model.

Year	River Section 1		River Section 3		River Section 5	
	Estimate	SE	Estimate	SE	Estimate	SE
2002	18,970	669	9,078	333		
2003	17,062	848	8,303	374		
2004	23,578	841	16,329	614	8,705	596
2005	14,367	532	9,583	310	9,657	705
2006	16,768	566	16,286	610		
2007	15,212	589	13,259	463	15,354	1,022
2008	20,079	941	15,652	609	11,929	728
2009	18,872	810	17,883	739	16,847	894
2010	39,224	2,106	26,116	1,032	22,507	1,127
2011	28,607	1,282	18,427	634	17,296	941
2012	18,470	698	13,275	426	11,457	601
2013	18,035	1,022	11,952	478	10,510	677
2014	19,310	1,268	16,054	973	17,050	1,359
2015	22,492	1,396	16,405	704	13,224	977
2016	21,791	1,110	14,826	860	9,603	980
2017	28,319	1,686	14,898	1,276	7,700	1,074

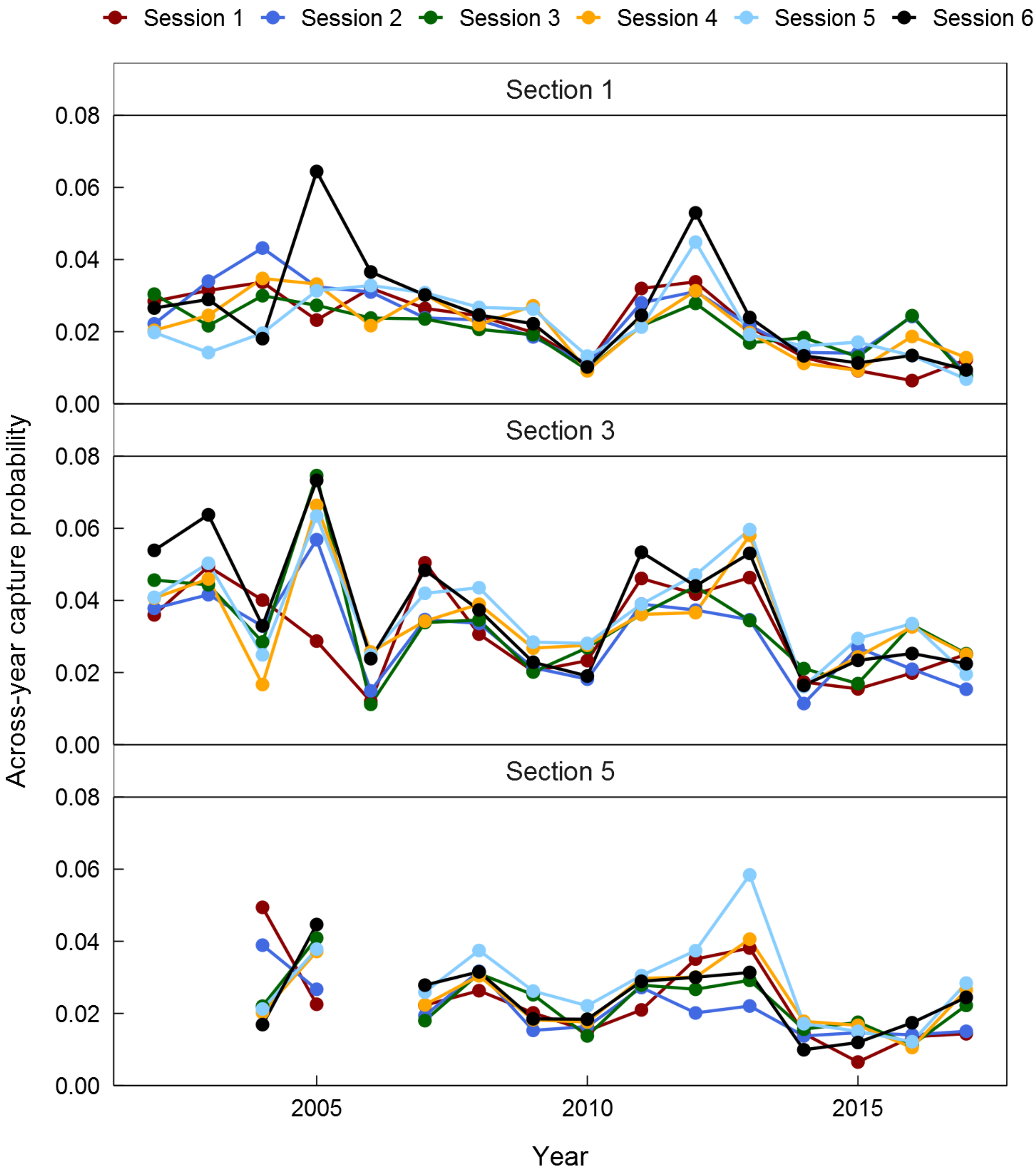


Figure H1: Across year capture probability estimates by section, year and session.

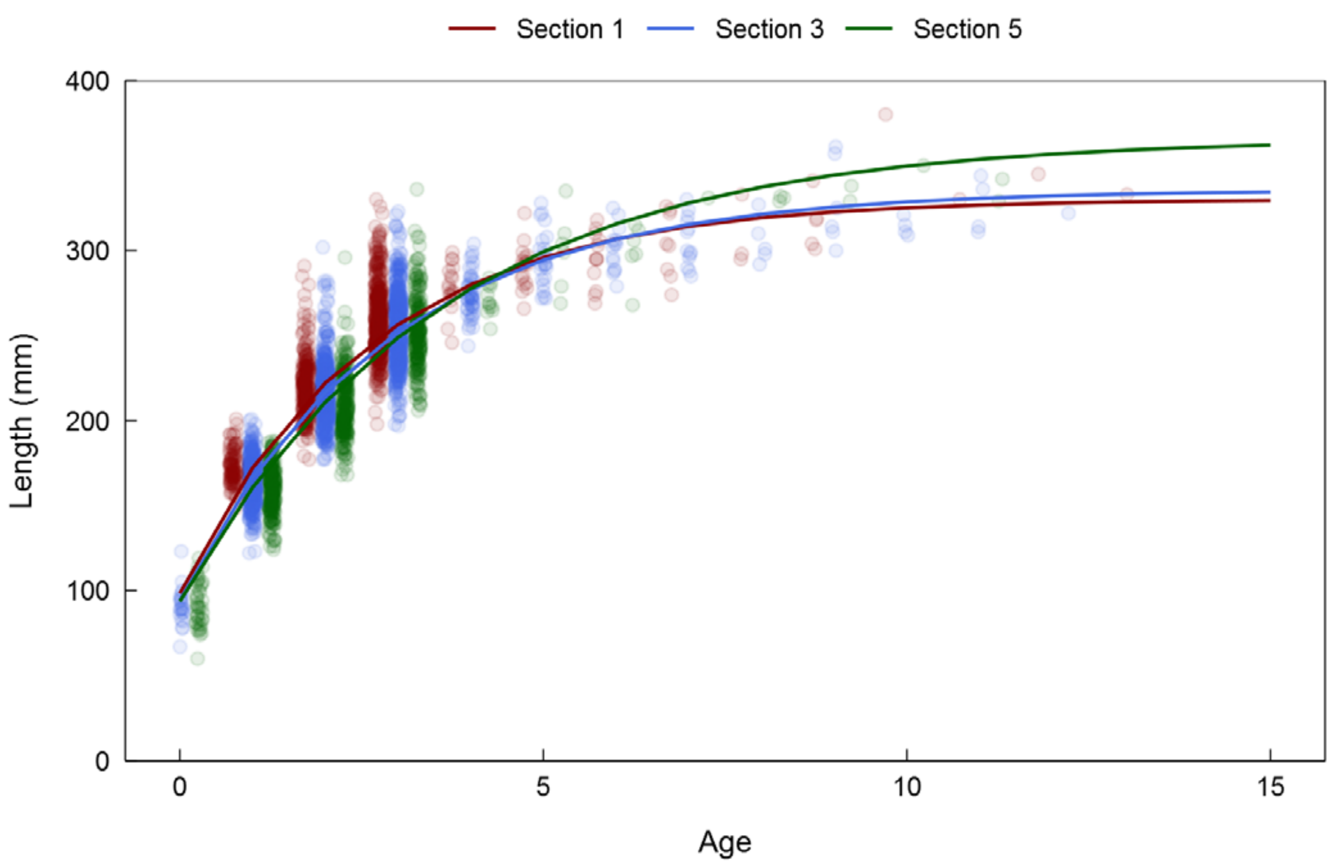


Figure H2: Observed (points) and expected (lines) length-at-age by section.

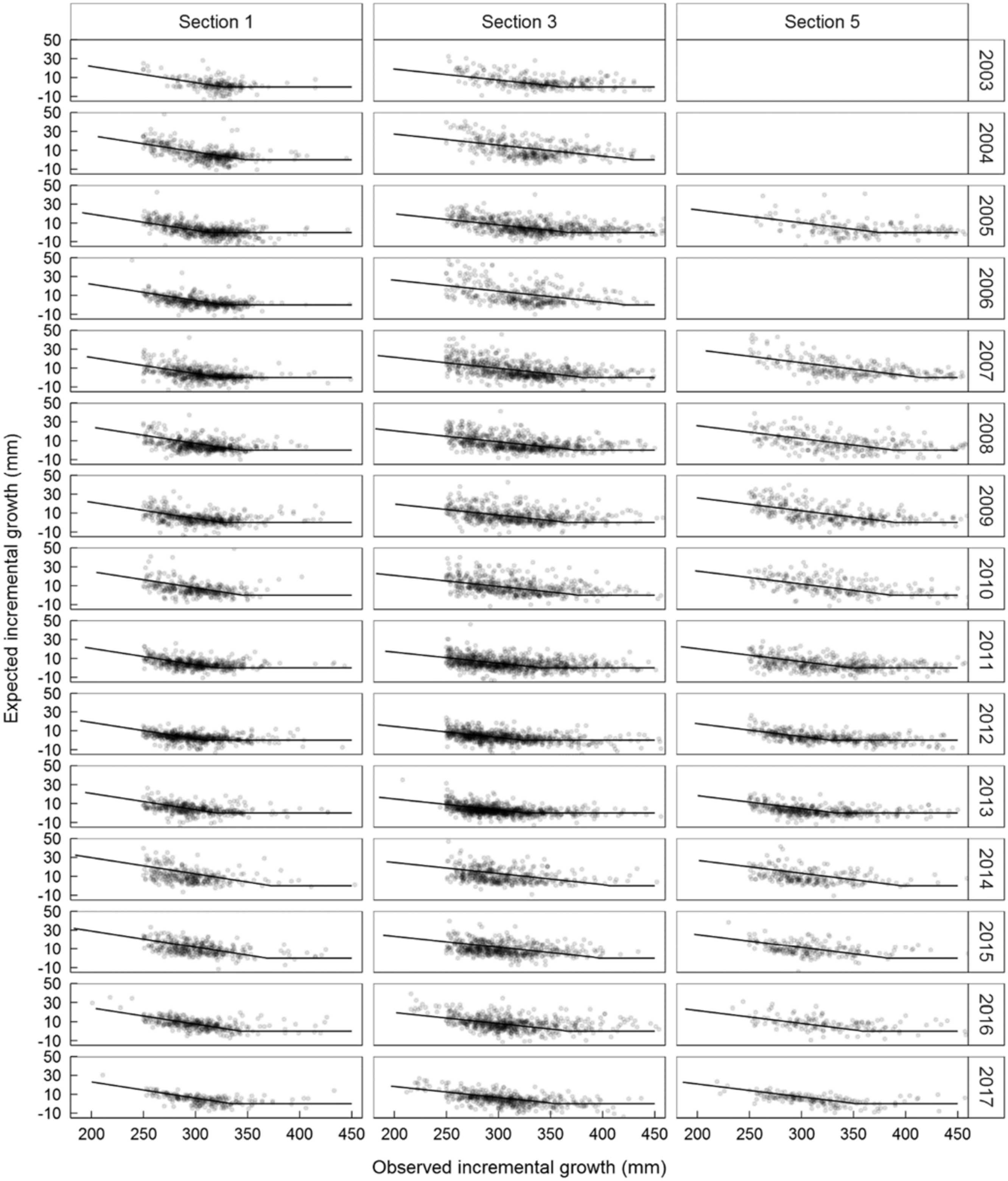


Figure H3: Observed (points) and expected (line) incremental growth of marked Mountain Whitefish as a function of size at release for Section 1 and year of recapture. Note that the expected increment is based on all observations, which include recaptures from adjacent years.

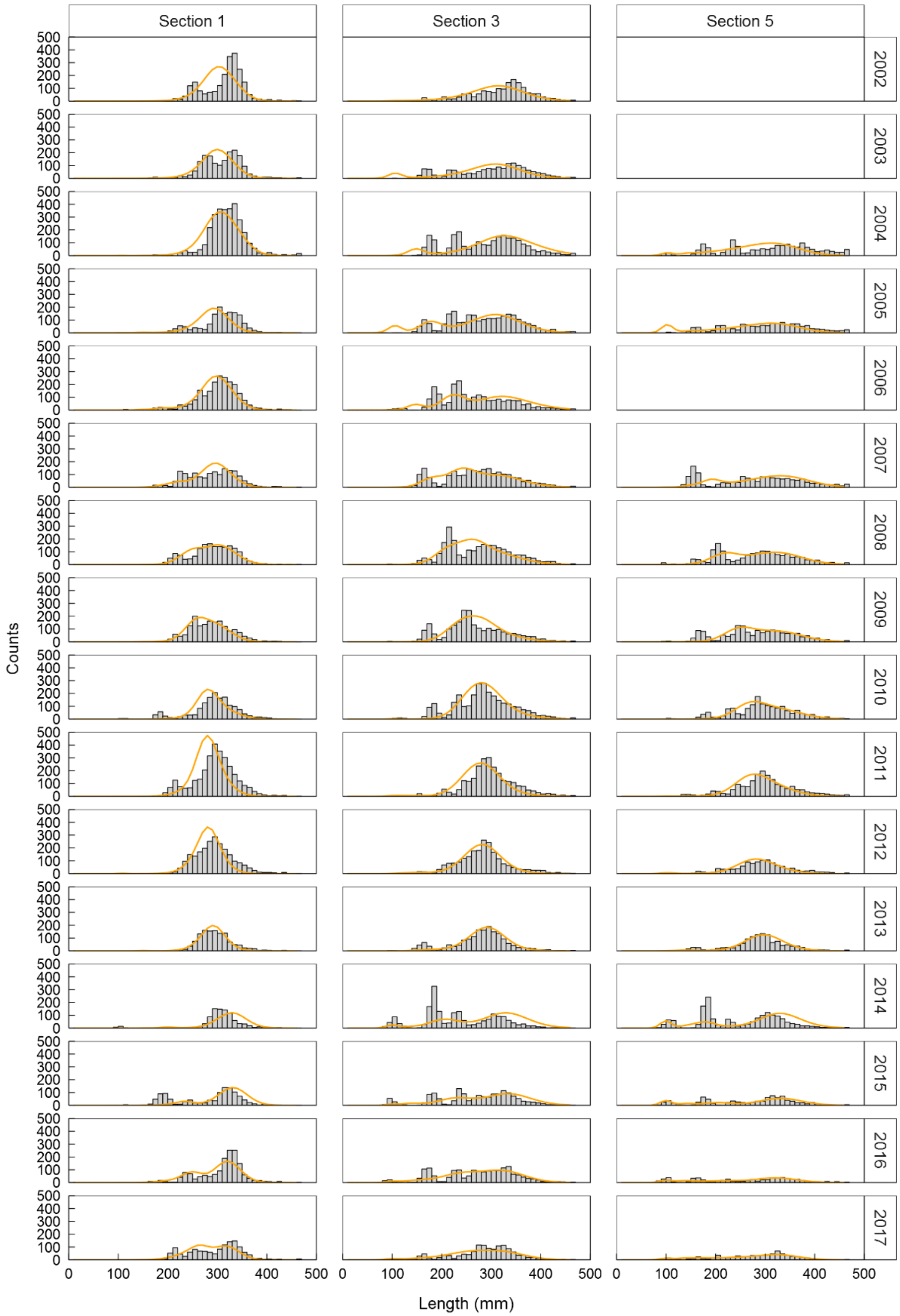


Figure H4: Length frequency of observed (histogram) and predicted (lines) by year for unmarked Mountain Whitefish by section.

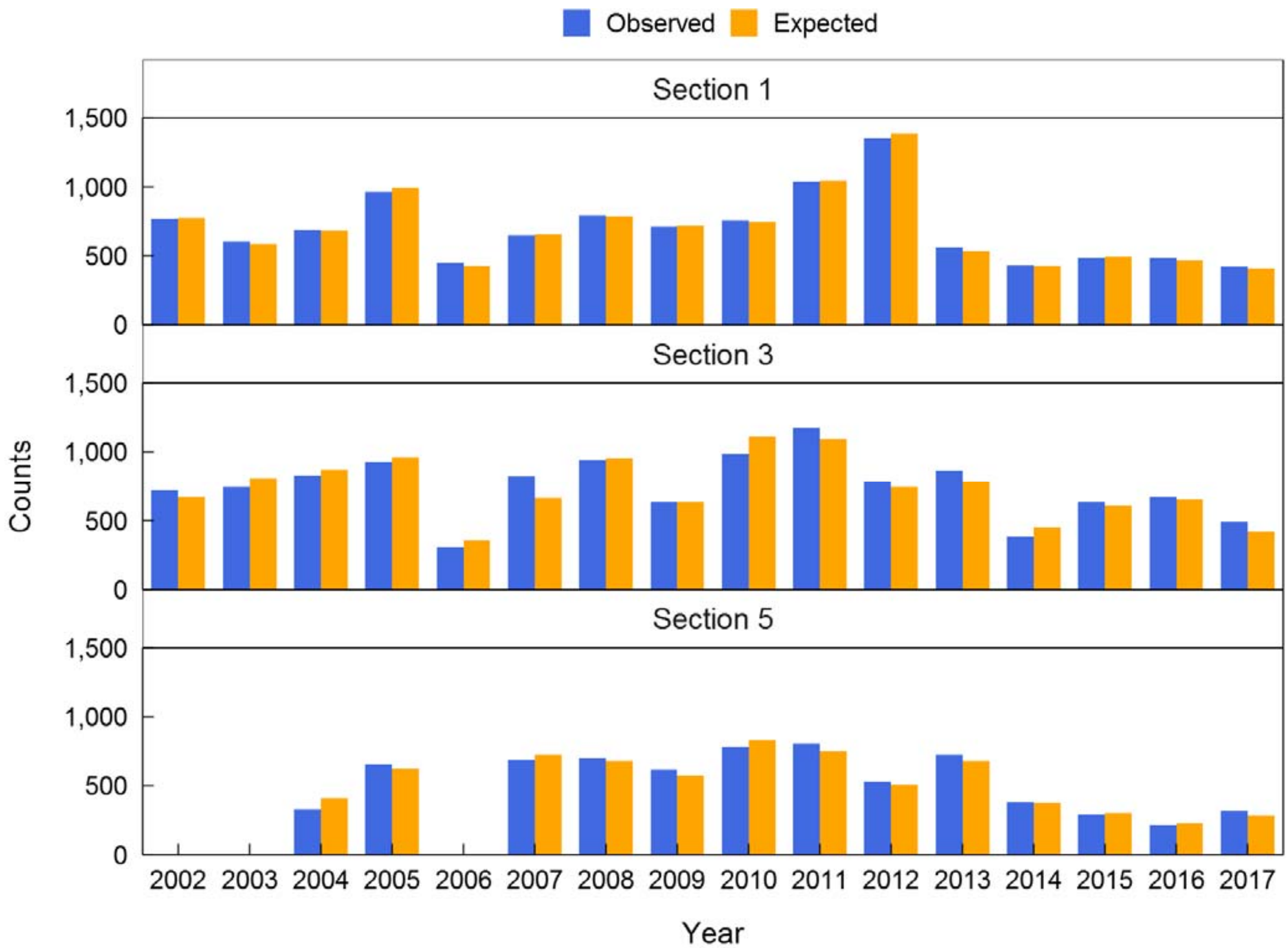


Figure H5: Observed and predicted number of unmarked and unmeasured Mountain Whitefish by section.

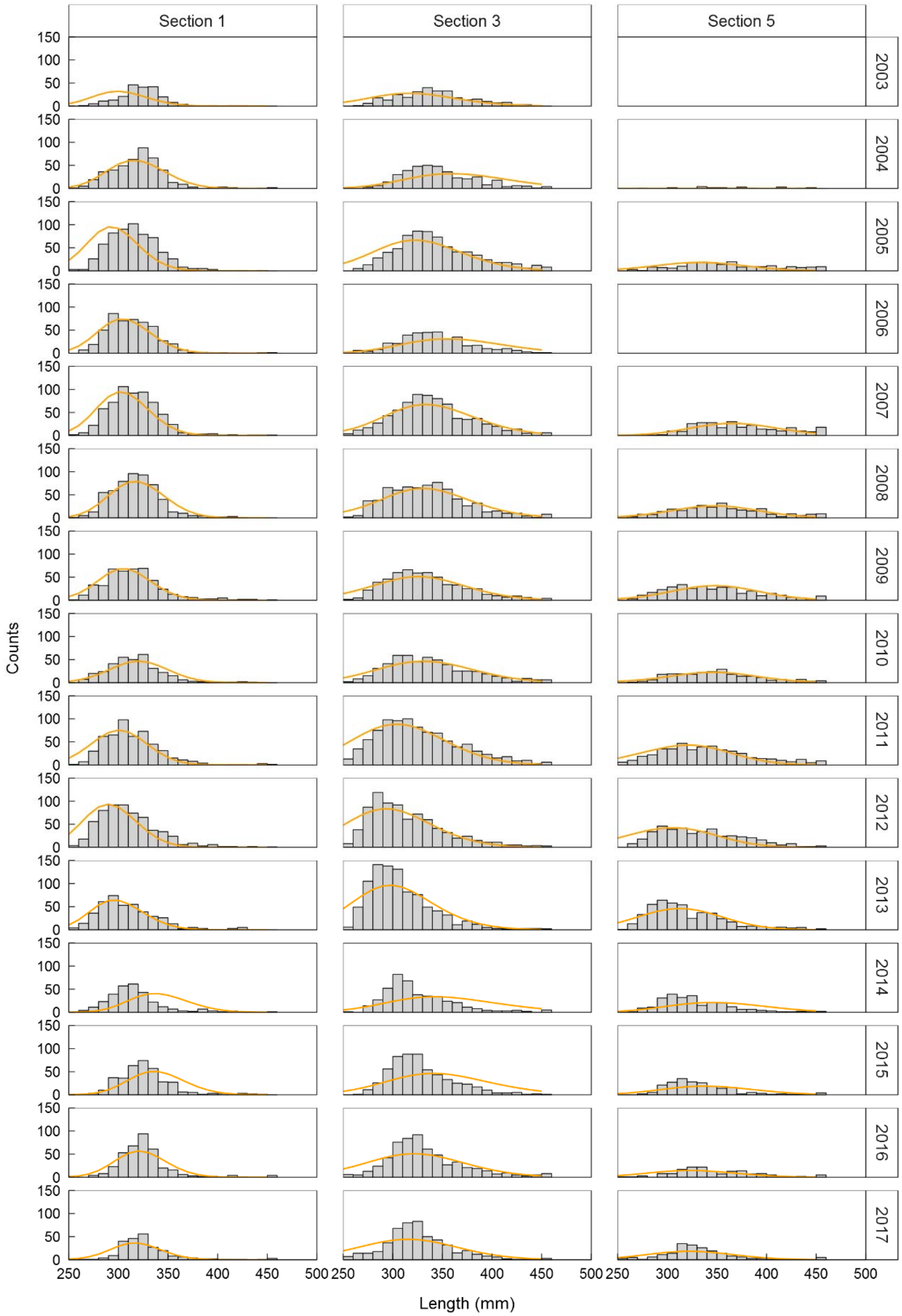


Figure H6: Length frequency of observed (histogram) and predicted (lines) by year for marked Mountain Whitefish in Section 1.

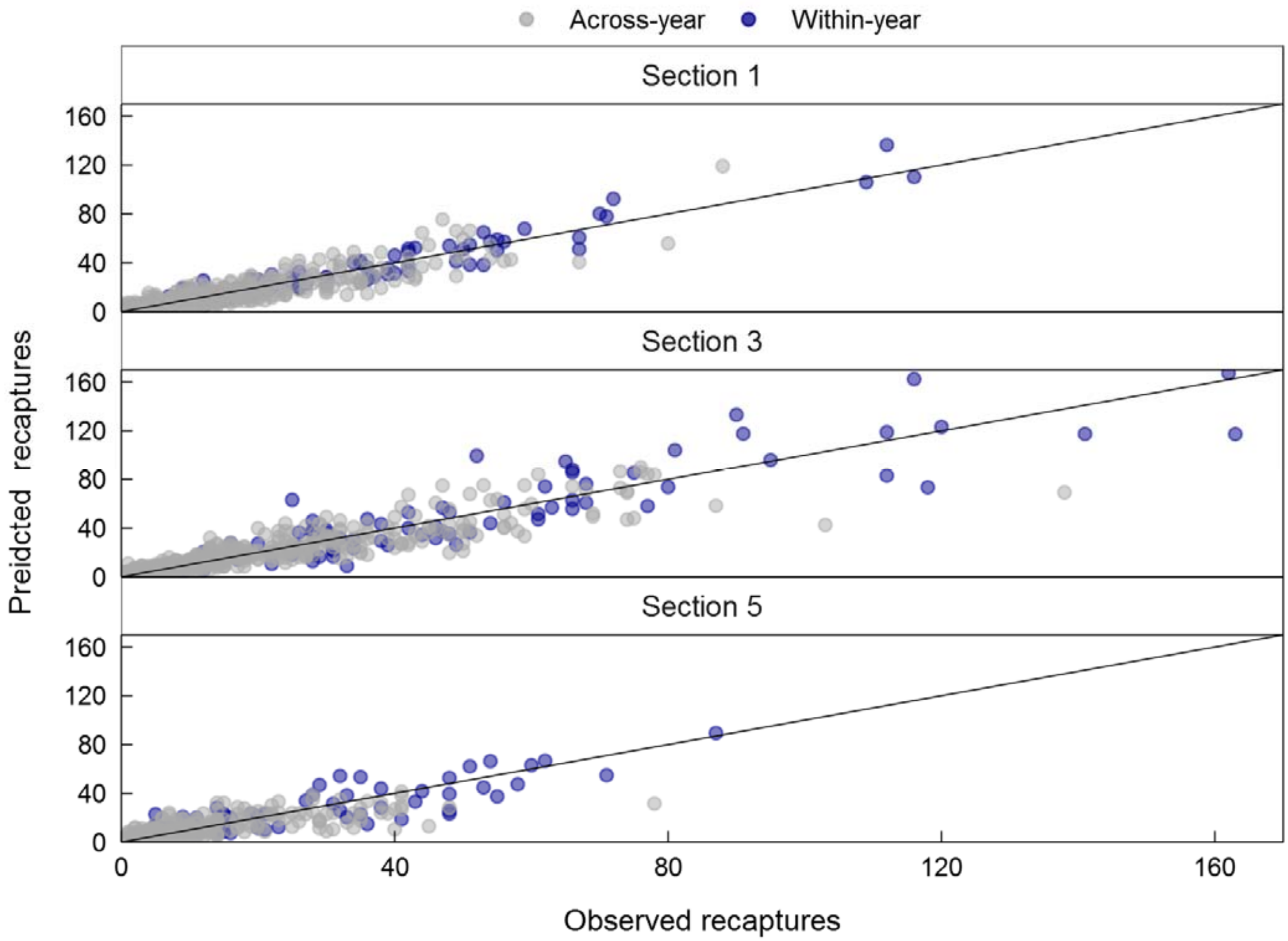


Figure H7: Observed versus predicted recaptures by section. The line is the 1:1 association or line of equality. The solid points are within year and the grey points across year recaptures.

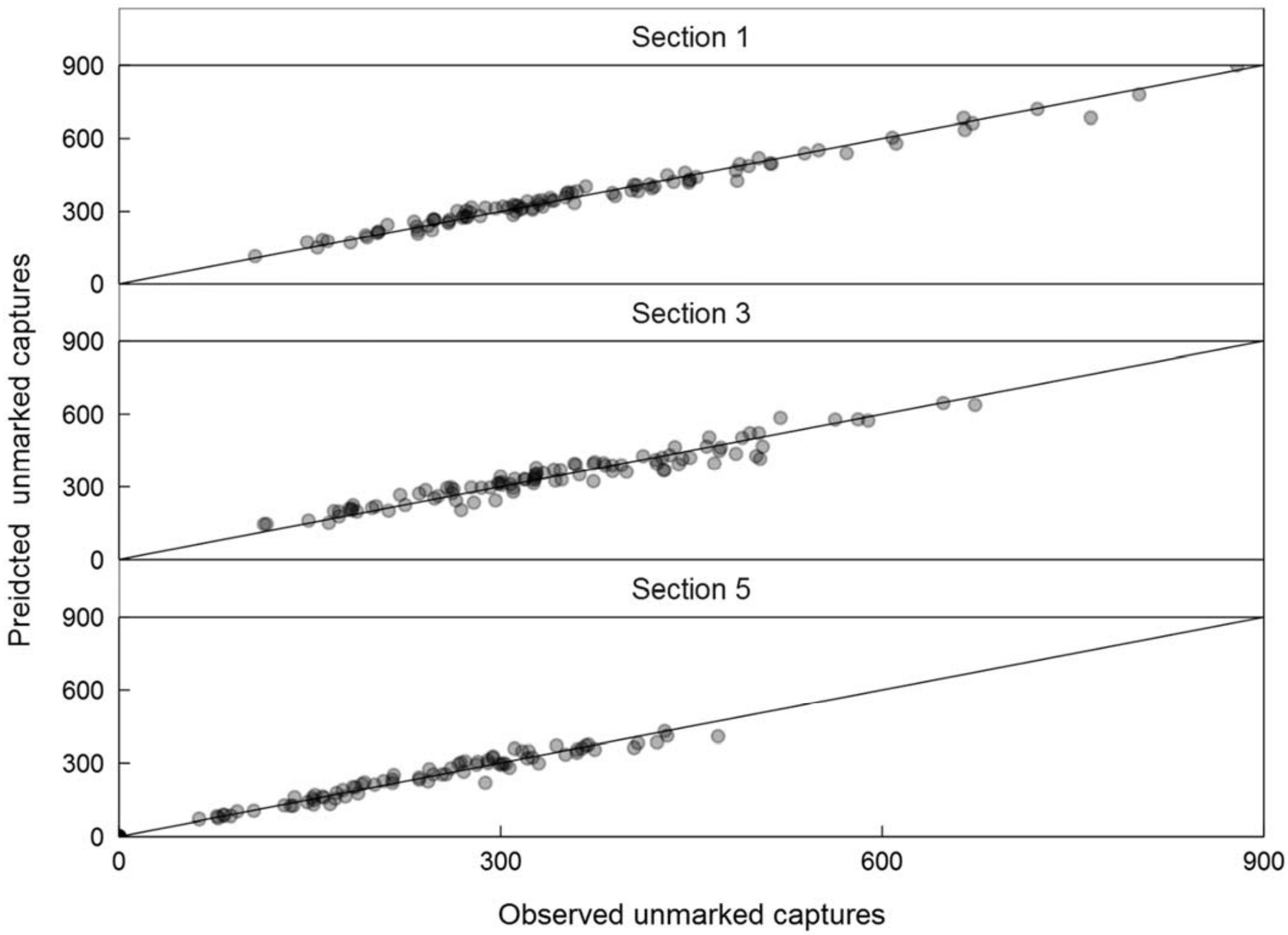


Figure H8: Observed versus predicted unmarked captures by section. The line is the 1:1 association or line of equality.

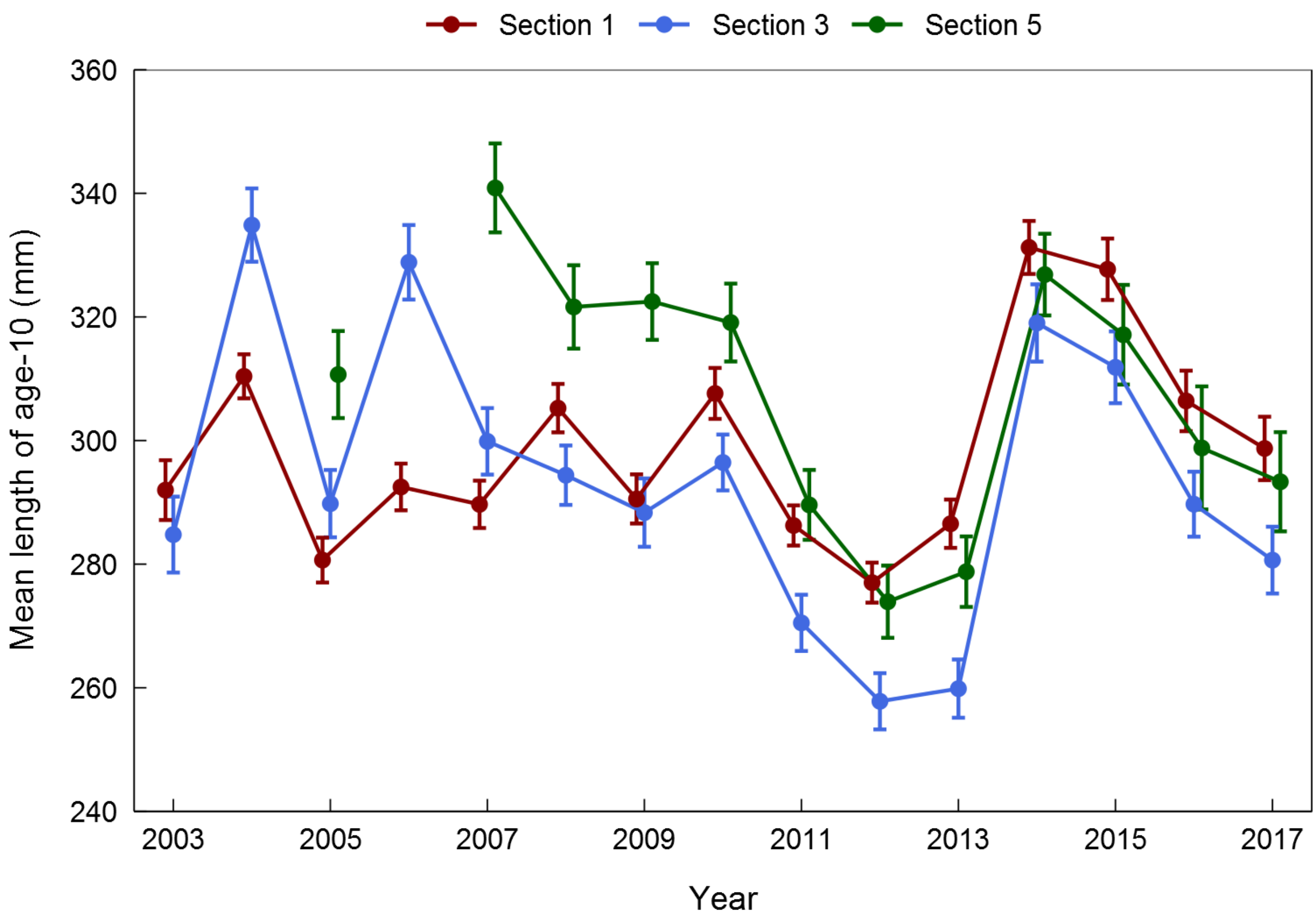


Figure H9: Predicted mean length of age-10 Mountain Whitefish by section and year. The error bars represent ± 2 standard errors.

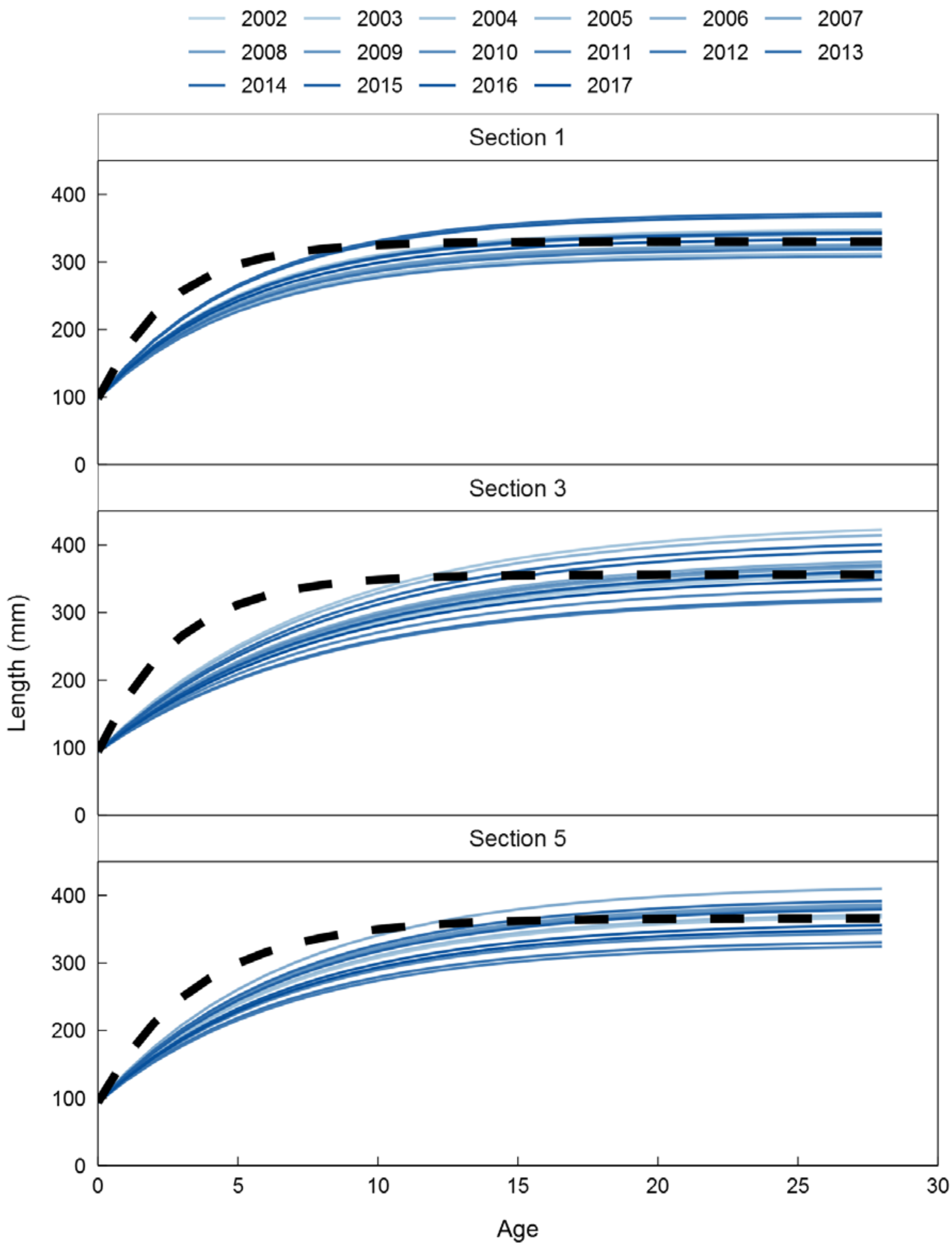


Figure H10: Predicted length-at-age by year and section. The predicted lengths based on age data (Age) are also overlaid.

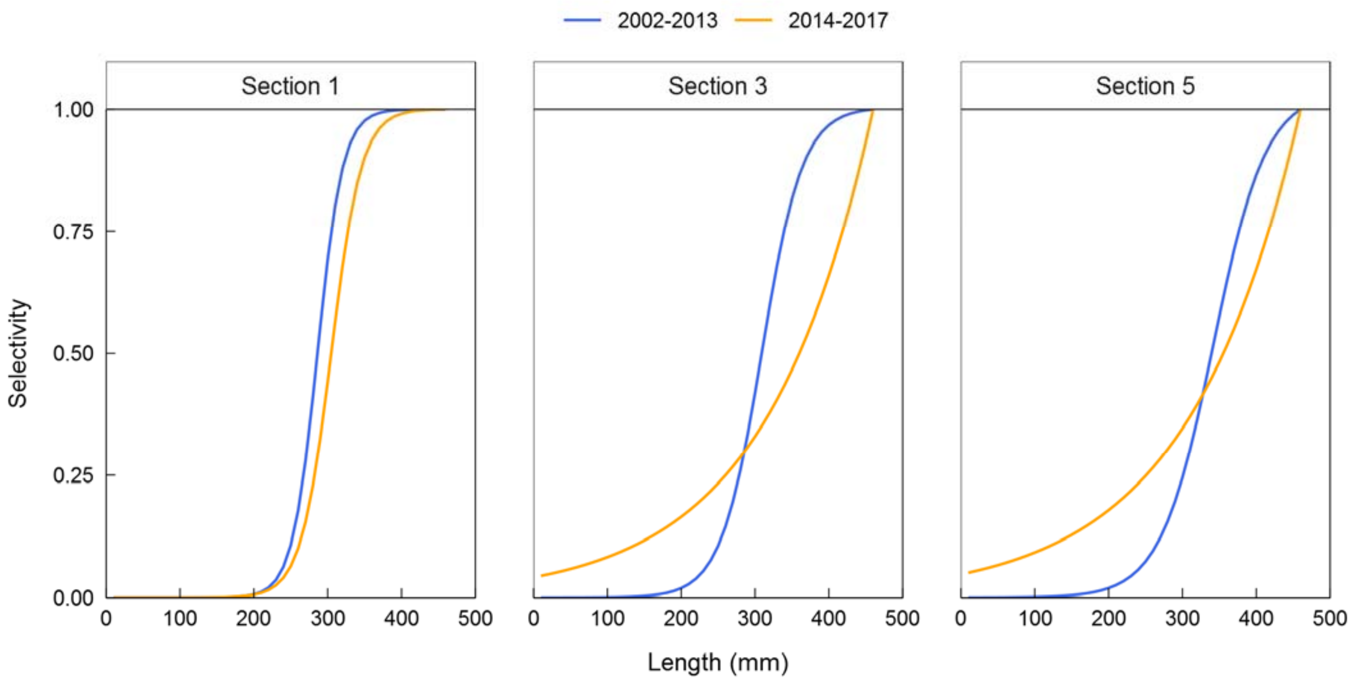


Figure H11: Predicted size selectivity by epoch and section.

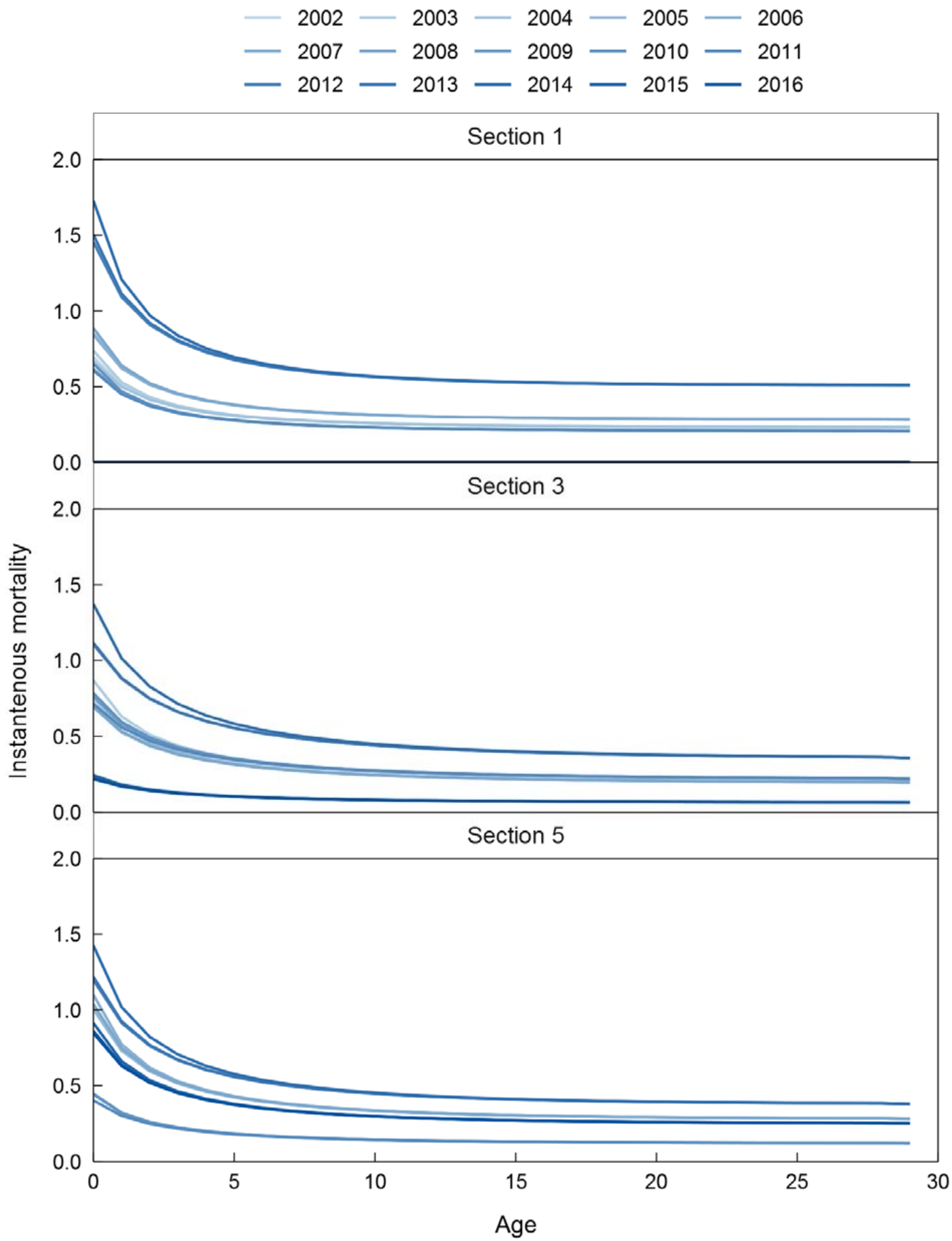


Figure H12: Predicted instantaneous mortality by age and section.

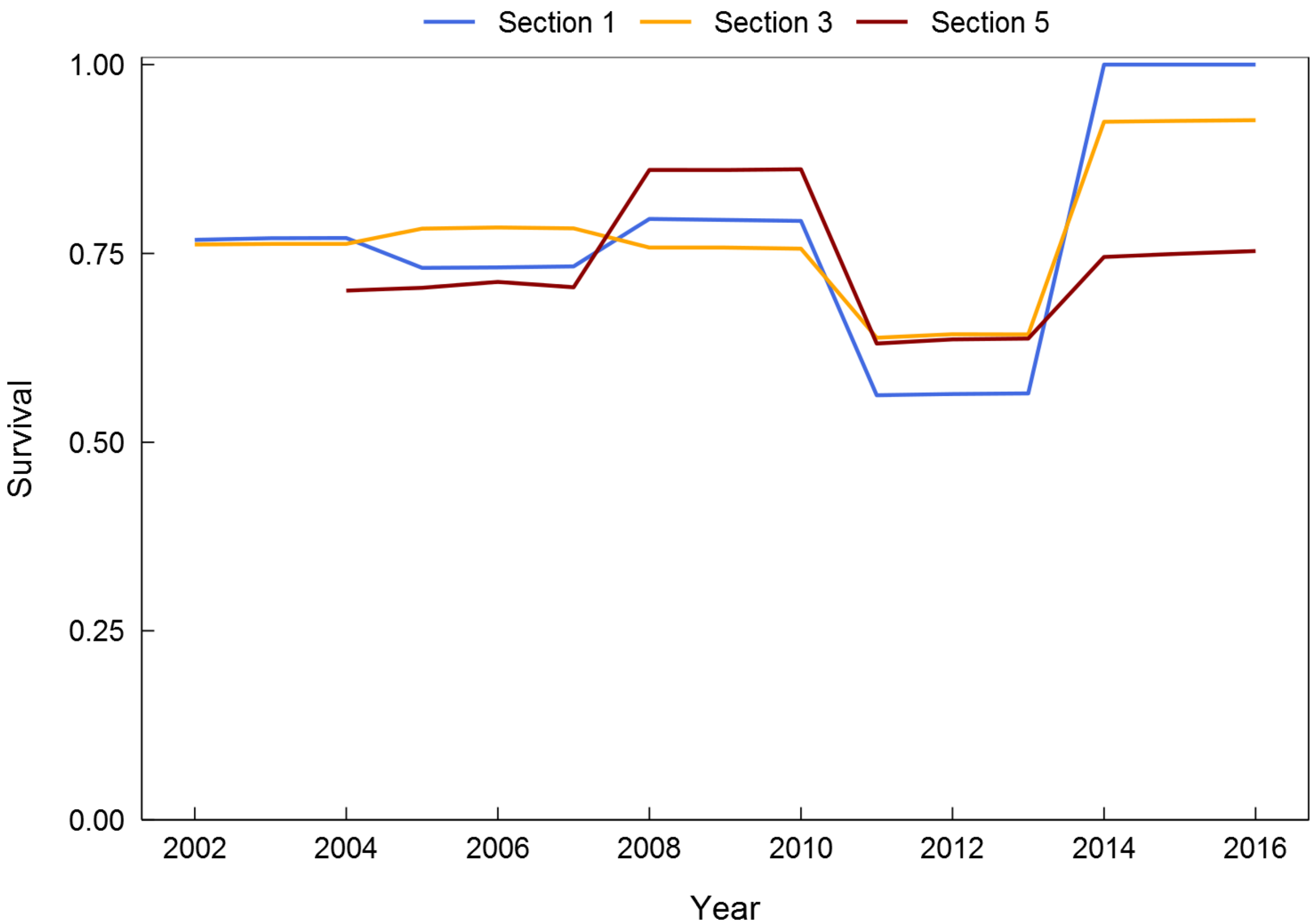


Figure H13: Predicted mean survival of marked Mountain Whitefish by year, weighted by the number at age, and section.

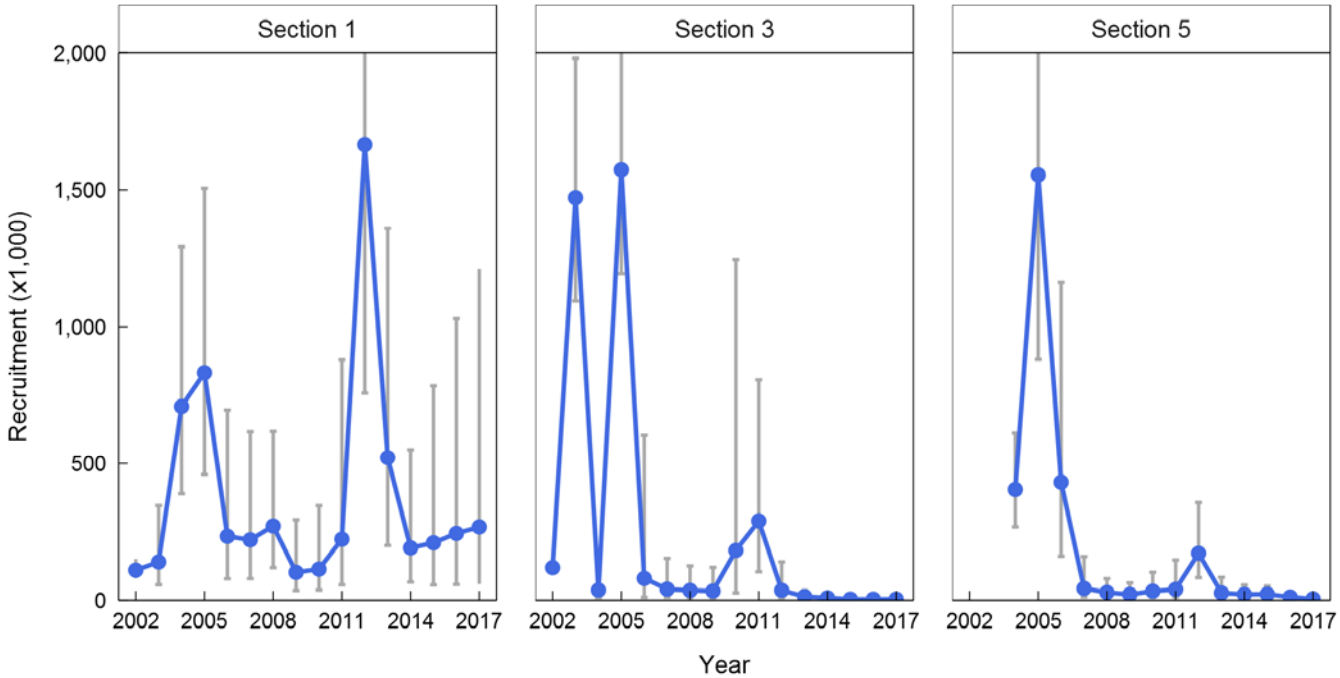


Figure H14: Predicted recruitment by section and year. Error bars represent ± 2 standard errors. The error bars were truncated to 2.0 million.

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