Site C Clean Energy Project

Peace River Fish Community Monitoring Program (Mon-2)

Task 2a – Peace River Large Fish Indexing Survey

Construction Year 2 (2016)

Dustin Ford, RPBio
Golder Associates Ltd.

David Roscoe, MSc
Golder Associates Ltd.

Gary Ash
Golder Associates Ltd.

Bill Gazey
W.J. Gazey Research

31 December 2017

REPORT

Peace River Large Fish Indexing Survey

2016 Investigations (Mon-2, Task 2a)

Submitted to:

Brent Mossop
BC Hydro
333 Dunsmuir Street
Vancouver, BC V6B 5R4
Canada

Submitted by:

Golder Associates Ltd.
201 Columbia Avenue, Castlegar, British Columbia, V1N 1A8, Canada

1400753-005-R-Rev0

31 December 2017

Distribution List

2 copies - BC Hydro

1 copy - Golder Associates Ltd.

Suggested Citation: Golder Associates Ltd. and W.J. Gazey Research. 2017. Peace River Large Fish Indexing Survey - 2016 investigations. Report prepared for BC Hydro, Vancouver, British Columbia. Golder Report No. 1400753: 104 pages + 8 appendices.

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. The objective of the Peace River Large Fish Indexing Survey (hereafter, Indexing Survey) is to validate these 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 Indexing Survey was initiated in 2015 (Golder and Gazey 2016) and is a 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 2016, 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 (BC Government 2011), including: Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), Burbot (*Lota lota*), Goldeye (*Hiodon alosoides*), Mountain Whitefish (*Prosopium williamsoni*), Rainbow Trout (*Oncorhynchus mykiss*), and Walleye (*Sander vitreus*). 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 2015 and to select environmental parameters. In 2016, 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 recent (i.e., 2015 and 2016) data in addition to historical data from 2002 to 2014. 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 in order to improve the fit

to the data, which enhances knowledge of population dynamics. Additionally, the synthesis model can assist impact assessments through identification of quantities that can be reliably predicted or identify additional data required to obtain reliable predictions.

Key results from the 2016 survey, which was conducted between 23 August and 1 October, as well as key trends observed over the 15 year monitoring period are summarized as follows:

- In 2016, water levels in the Peace River were near average for most of the year, but were variable during the approximately six-week long study period. PCD discharges were higher than during any previous study year (2002 to 2015) during Sessions 1, 5, and 6, and lower than any previous study year during Session 2. Variable water levels may have implications for population abundance estimates because it is hypothesized that some side channel habitats in the study area become unavailable at low water levels, causing Mountain Whitefish and other fishes to cluster in mainstem habitat areas, where they are more susceptible to capture.
- Catch rates for Arctic Grayling, which generally declined from 2007 to 2014, increased with each successive year between 2014 and 2016. The increase is likely spurred by strong recruitment from the 2014 brood year.
- In 2016, Arctic Grayling, Largescale Sucker (*Catostomus macrocheilus*), and Longnose Sucker (*Catostomus catostomus*) body condition declined with increased distance from PCD.
- Population abundance estimates for Bull Trout were approximately 2.4 times higher in Section 1 (Bayes mean estimate = 717 individuals) when compared to all other sections (average Bayes mean estimate = 296 individuals). Confidence intervals surrounding the abundance estimate for Section 1 were wide (95% Highest Probability Density = 144 to 1648 individuals). Overall, neither population abundance estimates nor catch-per-unit-effort suggested significant or sustained changes in the abundance of Bull Trout between 2002 and 2016.
- In 2016, Bull Trout body condition was similar to values recorded between 2002 and 2015 (all sections combined).
- On average, mean length-at-age was greater in 2014, 2015, and 2016 for most age-classes of Arctic Grayling (approximately 5 mm) and Mountain Whitefish (approximately 15 mm) when compared to 2002 to 2013 values. However, in 2016, age-0 Arctic Grayling and Mountain Whitefish length-at-ages were similar to 2002 to 2013 values, suggesting that the favourable growing conditions present in the Peace River study area in 2014 and 2015 were not present in 2016.
- More Burbot were captured in 2016 (n = 37) than during all other study years combined (n = 33); however, catch was still too low to garner reliable estimates of abundance or life history metrics.
- Longnose Sucker population abundance estimates were similar in 2015 and 2016.
- Eight Goldeye were captured during the 2016 survey. All eight were recorded downstream of the Pine River confluence.
- Overall (all sections combined), 2016 Mountain Whitefish population abundance was estimated at 77,600 individuals using the Bayes sequential model.
- For Mountain Whitefish, population abundance estimates generated using the Bayes sequential model in 2016 were similar to 2015 estimates for all sections except Section 1, which was substantially higher in 2016.

- Results from the Mountain Whitefish synthesis model indicate that changes to electroshocker settings first implemented in 2014 has resulted in differences in selectivity for this species, with more small fish (i.e., fish less than 250 mm FL) being encountered and less large fish being encountered from 2014 to 2016.
- Population abundance estimates for Mountain Whitefish from the Bayes sequential model and the synthesis model were similar during most study years and sections, with the synthesis model providing slightly higher estimates with more confidence during most study years and sections.
- Recruitment estimates generated by the Mountain Whitefish synthesis model were not precise and exhibited large variation among study years. Estimates from the model may improve as additional years of data are added to the model.
- More Rainbow Trout were recorded in 2016 (n = 352) than during any previous study year (average = 140 between 2002 and 2015). Reasons for the increase are not known; however, the authors hypothesizes that recent landslides in the Lynx Creek watershed may have forced Lynx Creek Rainbow Trout into the Peace River mainstem.
- 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 to the following indicator species: Burbot, Goldeye, Northern Pike (*Esox lucius*), Rainbow Trout, Walleye, and White Sucker (*Catostomus commersonii*).

Data collected from 2002 to 2016 represent the baseline, pre-Project state of the Peace River fish community. Management hypotheses cannot be statistically tested until after the commencement of Project construction activities.

ACKNOWLEDGEMENTS

The Peace River Large Fish Indexing Survey is funded by BC Hydro's Site C Clean Energy Project. Bill Gazey of W.J. Gazey Research populated the Bayes sequential model and the Mountain Whitefish synthesis model and wrote the corresponding sections of this report. Golder Associates Ltd. and W.J. Gazey Research would like to thank the following individuals for their contributions to the program:

BC Hydro

Nich Burnett	Vancouver, BC
Dave Hunter	Vancouver, BC
Guy Martel	Vancouver, BC
Michael McArthur	Vancouver, BC
Brent Mossop	Vancouver, BC

BC Ministry of Environment

Kevin Wagner	Fort St. John, BC

Alberta Environment and Sustainable Resource Development-Operations

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/Coauthor
David Roscoe	Biologist/Coauthor
Shawn Redden	Project Director
Gary Ash	Senior Fisheries Biologist
Dana Schmidt, RPBio	Senior Fisheries Biologist
Demitria Burgoon	Biologist
James Chircoski	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
James Goodier	GIS Technician
Carrie McAllister	Project Coordinator
Ron Giles	Warehouse Manager (Castlegar)
Devin Dickson	Warehouse Manager (Fort St. John)

Table of Contents

TABLES

FIGURES

APPENDICES

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, 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.

---

[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.

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 2016, the monitoring program focused on collecting data that quantified the relative and absolute abundance and spatial distribution of seven indicator species. The seven indicator species included Arctic Grayling (*Thymallus arcticus*), 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 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 relatively 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). Changes in methodologies, objectives, and study areas over 16 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).

H3: 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.

H4: 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.

H5: The fish community can support angling effort that is similar to baseline conditions.

H6: 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.

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 (2015a, 2015b) and are monitored under the Site C Offset Effectiveness Monitoring (Mon-2, Task 2d) within the FAHMFP. At the time of the 2016 field program, the River Road Rock Spurs and Upper Site 109L habitat areas had been completed. Lower Site 109L and Side Channel Site 108R have not been constructed yet. Site C Offset Effectiveness Monitoring (BC Hydro 2015a, 2015b) details both site-scale and reach-scale monitoring; however, data collected under this monitoring program will be used to compare fish abundance and habitat use before and after construction at the reach-scale only. Site-scale monitoring will be conducted within Site C Offset Effectiveness Monitoring (Mon-2, Task 2d).

Table 2: Expected fish use of proposed offsetting locations in the Peace River between the Project and the Many Islands area in Alberta.

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	
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 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, were 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 using information provided by Mainstream (2012; Figure 1, Table 3). The upstream extent of Section 5 was moved approximately 6 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. A summary of historical datasets by section, year, study period, and effort (number of days of sampling) are detailed in Appendix B, Table B1.

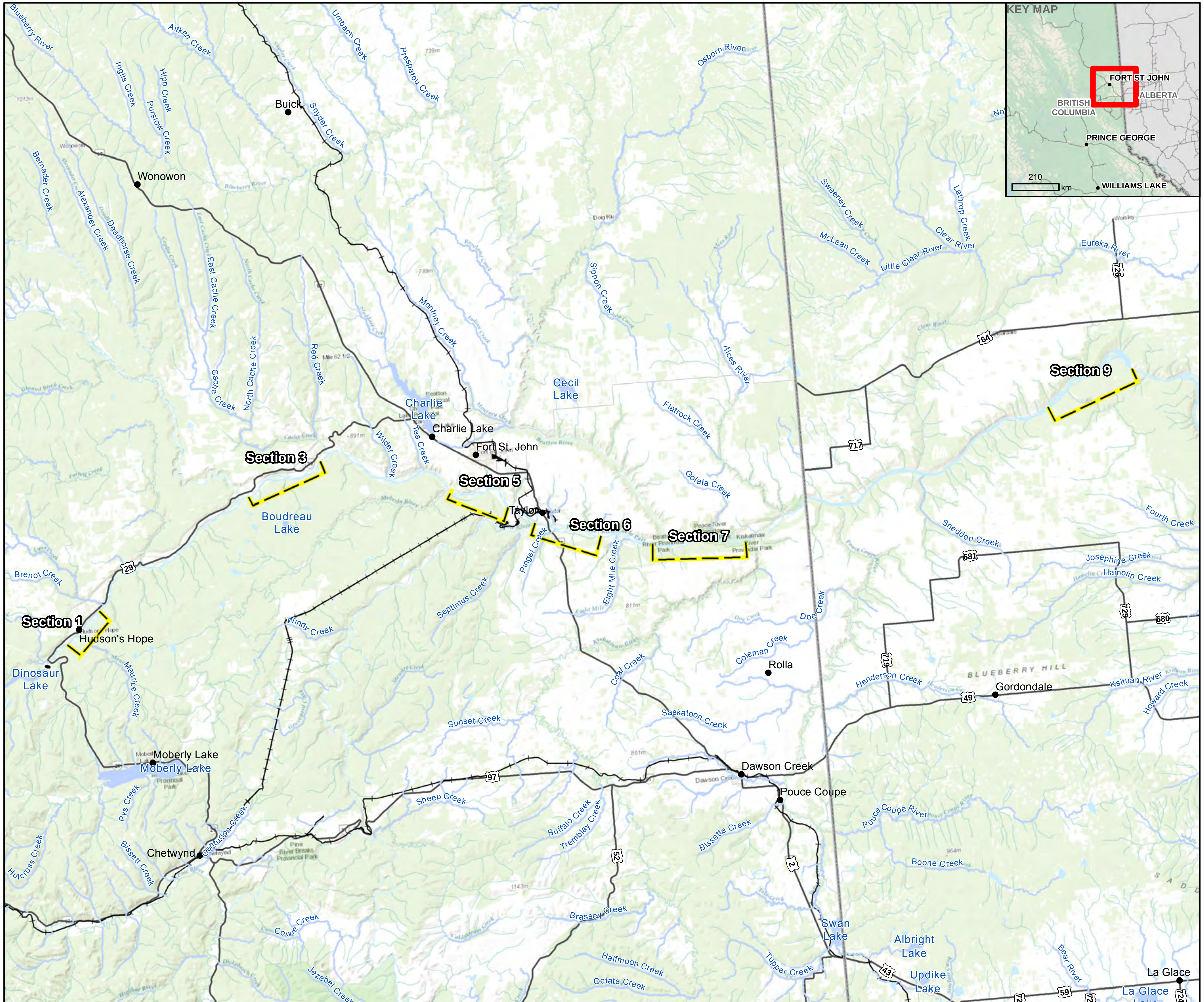
Table 3: Location and distance from WAC Bennett Dam of Peace River sample sections as delineated by Mainstream (2012) with the exception of Section 5.

Section Number	Location	River Kilometre[a]		Number of Sites Sampled in 2016
		Upstream	Downstream	
1a	Peace River Canyon area	20.4	25	0
1	Downstream end of the Peace River Canyon area downstream to the Lynx Creek confluence area	25	34	15
2	The Lynx Creek confluence area downstream to the Halfway River confluence area	34	65.8	0
3	The Halfway River confluence area downstream to the Cache Creek confluence area	65.8	82.1	15
4	The Cache Creek Confluence area downstream to the Moberly River confluence area	82.1	105	0
5[a]	The Moberly River confluence area downstream to near the Canadian National Railway bridge	105	117.7	15
6	The Pine River confluence area downstream to the Six Mile Creek confluence area	121.5	134	18
7	The Beatton River confluence area downstream to the Kiskatinaw River confluence area	140	158	16
8	The Pouce Coupe River confluence area downstream to the Clear River confluence area	174	187.7	0
9	Dunvegan West Wildland Provincial Park boundary downstream to Many Islands Park	217.5	231	16

[a] The upstream delineation of Section 5 was moved approximately 5 km downstream to more closely align with the location of the Project.

Sections 1a, 2, 4, and 8 were excluded from the 2016 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 2010a, 2011a, 2013a), and the similarity of their habitats relative to adjacent sections. As detailed in the FAHMFP, only Sections 1, 3, 5, 6, 7, and 9 were selected for long-term monitoring under Mon-2, Task 2a.

In 2016, Sections 1, 3, 5, 6, 7, and 9 were sampled (Appendix A, Figures A1 to A6, Table A1). 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	2016-09-12
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753	2015 / 5001	0	1

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

25mm

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\BC_Hydro\Peace_River_GMS\99_PROJECTS\1400753_PeaceRiver_GMS\02_PRODUCTION\2016\MXD\Report\2017\FIG 1_1400753_PeaceRiver_2017_overview_rev1.mxd

During most historical study years, the same sites were sampled within each section. Sites sampled in 2016 were identical to sites sampled in 2015 (Golder and Gazey 2016).

Three provincial parks are situated within Section 7: Beatton River Provincial Park, Peace River Corridor Provincial Park, and Kiskatinaw River Provincial Park. Of the 19 different sites established during baseline studies (Mainstream 2010a, 2011a, 2013a), 11 were located within park boundaries. Under the *Park Act*, a Park Use permit is required from BC Parks for research activities that take place within parks and protected areas. A Park Use permit application was submitted for these areas; however, a permit was not received for the 2015 or 2016 field programs. In lieu of sampling within park boundaries, in 2015 and 2016, 11 synoptic sites outside park boundaries but within Section 7 were sampled. The synoptic sites were sampled in conjunction with the original eight sites that were situated outside of provincial parks boundaries. Fish habitats within synoptic sites were similar to fish habitats within most index sites. Two exceptions were sites in the Peace River at the confluences of the Beatton and Kiskatinaw rivers, which are known feeding areas for Walleye and Goldeye (Mainstream 2010a, 2011a, 2013a). These confluence areas are situated within provincial park boundaries and have not been sampled since 2011 (Mainstream 2013a). An inability to monitor these confluence areas during future study years may make it difficult to interpret changes to Walleye and Goldeye populations.

Overall, 95 sites were sampled within the six sections (Appendix A, Figures A1 to A6). The length of sites varied from 220 m to 1900 m, and the sites consisted of the nearshore area along a bank of the Peace River. The two sites in the Pine River were 1000 m and 1500 m in length. Site descriptions and UTM locations for all 95 sites are included in Appendix A, Table A1.

Field crews attempted to sample each site six times (i.e., six sessions) over the study period (Table 4). Five sites (0103, 0104, 0105, 0516, 07SC012) were only sampled five times in 2016 because low water levels in the Peace River prevented crews from being able to access and sample them by boat. 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 was sampled over 1 to 4 days within each sample session. During some sessions, two crews worked in single sections simultaneously, and at different sites within the section.

Table 4: Summary of boat electroshocking sample sessions conducted in the Peace River, 2016.

Session	Start Date	End Date	Section					
			1	3	5	6	7	9
1	23 Aug	2 Sep	23-24 Aug	25-26, 28 Aug	1-2 Sep	30-31 Aug	31 Aug, 1 Sep	29-30 Aug
2	2 Sep	8 Sep	2-3 Sep	3-5 Sep	8-9 Sep	5-6 Sep	7 Sep	6 Sep
3	8 Sep	16 Sep	8-9 Sep	10-12 Sep	14-16 Sep	10-11 Sep	13-14 Sep	13-14 Sep
4	15 Sep	22 Sep	15, 17 Sep	18-20 Sep	20-22 Sep	17-18 Sep	18-20 Sep	21-22 Sep
5	23 Sep	27 Sep	23 Sep	24-25 Sep	26-27 Sep	24-26 Sep	25 Sep	26 Sep
6	27 Sep	1 Oct	27 Sep	28-29 Sep	1 Oct	27-29 Sep	29 Sep	30 Sep

2.0 METHODS

2.1 Data Collection

2.1.1 Discharge

Hourly discharge data for the mainstem Peace River were obtained from BC Hydro (discharge released through PCD). Unless indicated otherwise, discharges throughout this report are daily averages presented as cubic metres per second (m^3/s).

2.1.2 Water Temperature

Hourly water temperatures for 2016 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 2016 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 at all sample sites at the time of sampling and recorded in the Peace River Large Fish Indexing database using a handheld Oakton ECTestr 11 meter (resolution 0.1°C; accuracy ± 0.5°C).

2.1.3 Habitat Conditions

Habitat variables recorded at each site (Table 5) included variables recorded during previous study years (Golder and Gazey 2015, 2016) and variables recorded as part of other, similar BC Hydro programs (i.e., CLBMON-16 [Golder et al. 2016a] and CLBMON-45 [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.

Table 5: Habitat variables and boat electroshocker settings recorded at each site during each sample session in 2016

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 m 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, 2016) 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 distance from the site’s established length and the revised site length was used 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 2016.

Section	Number of Sites	Site Length (m)		
		Minimum	Average	Maximum
1	15	270	850	1200
3	15	950	1338	1900
5	15	450	858	1280
6	18	400	974	1500
7	16	220	968	1600
9	16	200	976	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 2016 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 2016 (i.e., the 2014-2016 epoch) were proven 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, Bull Trout, Goldeye, Kokanee (*Oncorhynchus nerka*), Mountain Whitefish (with the exceptions detailed in Section 2.1.6), 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 Fish Index 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). Fin rays were coated in epoxy and allowed to dry. Once the epoxy dried, a jeweler's saw was used to create multiple cross-sections of each fin ray sample. The cross-sections were permanently mounted on a microscope slide using a clear coat nail polish and examined using a digital 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 had ages assigned using both scale and fin ray samples. Fin ray ages were used for Goldeye because scale-based ages were typically younger than those from fin rays.

Ages were assigned to all Arctic Grayling, Bull Trout, Goldeye, Kokanee, Lake Trout, Northern Pike, Rainbow Trout, and Walleye that were captured, except in cases where ageing structures were too poor quality to assign an age. In total, 936 Mountain Whitefish were assigned ages, which was 9.5% of the total number of Mountain Whitefish captured in 2016. Scales samples of Mountain Whitefish aged in 2016 were from randomly selected, initially captured individuals, from Session 1 (23 August to 2 September).

2.1.6 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). Data collected from each fish were consistent with previous study years (Golder and Gazey 2015, 2016).

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 Fish Index 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.

Table 7: Variables recorded for each fish captured in 2016.

Variable	Description
Species	The species of fish
Size-Class	A general size-class for the fish (e.g., Bull Trout were categorized as YOY for age-0 fish, Immature for fish <250 mm FL, and Adult for fish >250 mm FL)
Length	The fork length of the fish to the nearest 1 mm
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 (e.g., alive, dead, unhealthy, etc.)
Preserve	Details regarding sample collection (if applicable)
Comments	Any additional comments regarding the fish

All Arctic Grayling, Bull Trout, and Rainbow Trout that were greater than 149 mm in length and all Burbot, Goldeye, Lake Trout, Largescale Sucker (*Catostomus macrocheilus*), Longnose Sucker (*Catostomus catostomus*), Mountain Whitefish, Northern Pike, Walleye, and White Sucker (*Catostomus commersonii*) 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 2017).

- 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 HDX PIT tags (23.0 mm x 3.65 mm HDX+).
- Fish greater than 300 mm FL received 32 mm long HDX PIT tags (32.0 mm x 3.65 mm HDX+).

The HDX tags used in 2016 were different than the PIT tags used in all previous study years, which were full duplex (FDX) PIT tags. HDX tags were used in 2016 for compatibility with other monitoring programs currently underway in the Peace River that require PIT tags to be detected by fixed antenna arrays, which is possible with HDX but not the FDX tags used in previous years. In 2016, all fish of the targeted species and size were implanted with a HDX tag, including recaptured fish that had previously been implanted with an FDX PIT tag, as well as fish captured for the first time. 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 fixed antenna arrays and by handheld tag detectors.

PIT tags were read using a Datamars DataTracer FDX/HDX reader. 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 its previous capture history in the Peace River Fish Index 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 Fish Index 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). 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), 2016
- summary of captured and recaptured fish by species and session, 2016 (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 2016 (Appendix F, Figures F1 to F41)

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 2010a, 2011a, 2013a). 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 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, in 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 in 2015 and 2016, and during future study years, increases 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 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 2016 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 (i.e., when more than two years of data are available).

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 three sampling days, see Table 3), 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.

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).
- Tags were applied to fish greater than 250 mm (greater 200 mm for Arctic Grayling); 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 (40 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., samples were taken during the day in water depths up to 2 m).

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 2016 study period, as well as the movements of fish that were at-large for over a year (i.e., fish tagged between 2002 and 2015 and recaptured in 2016), 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 were determined using the upstream River Km value for each of the 95 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) $$\left[R_t \log_e(p_t) + (C_t - R_t)\log_e(1 - p_t)\right]$$

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.

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

- m_{ti} the number of tags applied in 2016, or tagged during a previous study year and encountered in 2016 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". 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^*t_j) 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 23 August 2016, 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 (four recaptures in Section 3, zero recaptures in all other sections). 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., 2015 and 2016) data in addition to historical data from 2002 to 2014 that were collected as part of the Peace River Large Fish Index Survey. 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 in order 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 2014-2016.
- 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 (28-43 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:

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

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:

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

where the reciprocal of estimated abundance is distributed normally and can be estimated using the following expression (Ricker 1975, p 97):

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

2.2.4 Effort Required to Detect Change

To explore the precision that may be obtained under alternative sampling intensities, a simple 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:

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

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

(14) $$R_t' = R_t \cdot \frac{M_t'}{M_t} \cdot \frac{C_t'}{C_t}$$

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 2016. 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 2016.

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

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

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 *t0* 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. Differences in length-at-age were calculated this way to show the magnitude of the difference (i.e. the effect size) between each year, and the average of all other years combined.

Length-weight regressions (Murphy and Willis 1996) were calculated for all species of interest as follows:

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

where *W* is weight (g) and *L* is fork length (mm).

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 consistent sampled between 2002 and 2016. Sections 6, 7, and 9 were combined into another curve for each species because these sections were only sampled in 2015 and 2016. In addition, 2016 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:

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

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 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 spawning 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 2005, 2006). Within-year recaptures were also excluded from age, length, weight, and growth analyses but included in catch rates.

3.0 RESULTS

3.1 Physical Parameters

3.1.1 Discharge

Mean daily discharge in the Peace River (i.e., discharge released through PCD) in 2016 fell within historical bounds for the 2002-2015 period with the exception of low flow periods in April and September and short high flow periods in January, May, late September, and October (Figure 2; Appendix C, Figure C1). Flows were highly variable in 2016, with discharge near the maximum of other study years at the start and end of sampling (Sessions 1, 5 and 6), and near the minimum of other study years during Session 2. Higher than average rainfalls were recorded for the region in August[4], which may have influenced water levels in the Peace River and its tributaries during the study period. During a typical year, discharge through PCD 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.

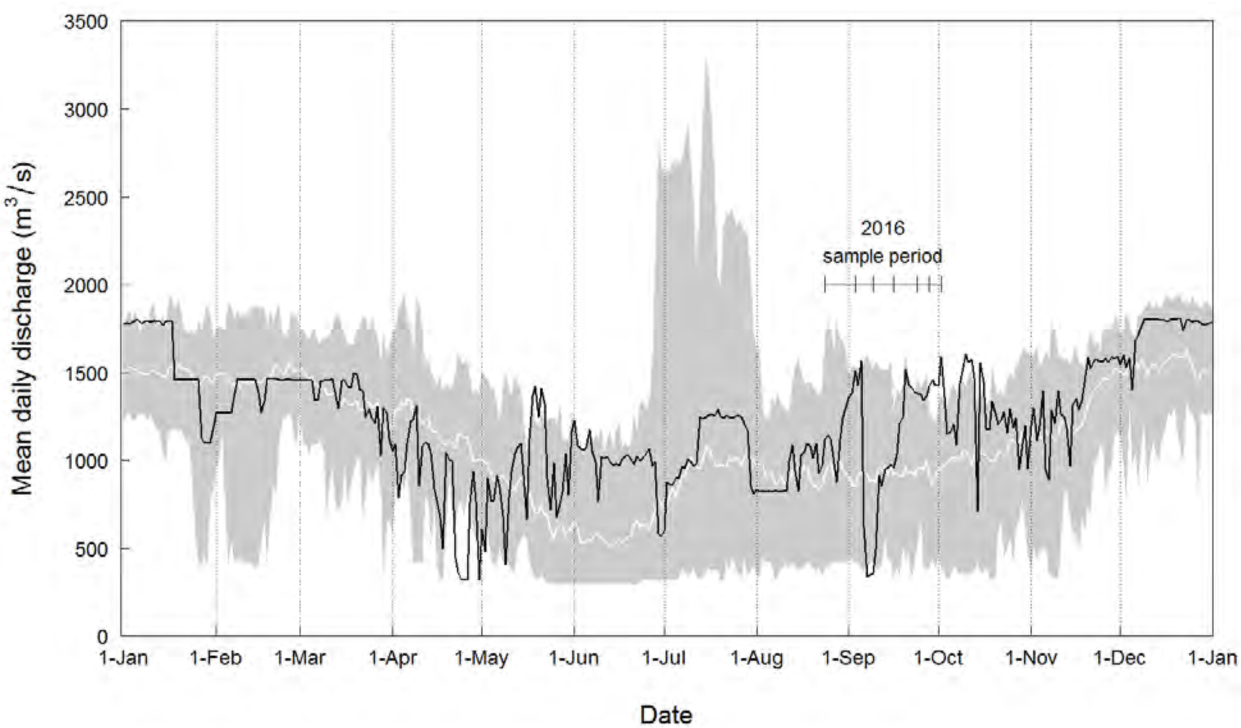


Figure 2: Mean daily discharge (m^3/s) for the Peace River at Peace Canyon Dam, 2016 (black line). The shaded area represents minimum and maximum mean daily discharge values recorded at the dam from 2002 to 2015. The white line represents average mean daily discharge values over the same time period.

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

3.1.2 Water Temperature

During a typical study year, water temperatures are lower in Section 1 during the spring and summer and higher in Section 1 during the fall and winter when compared to Sections 3 and 5 (Appendix C, Figure C2; DES 2017). During a typical year, Peace River water temperatures remain low (typically 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 2016, mean water temperatures in the Peace River measured near PCD were higher than average during the spring and variable but near average for the rest of the year (Figure 3). During the 2016 study period, water temperatures downstream of PCD declined below the historical bounds for the 2002-2015 period during Session 2 (Figure 3), corresponding with an increase in PCD discharge over this same time period (Figure 2).

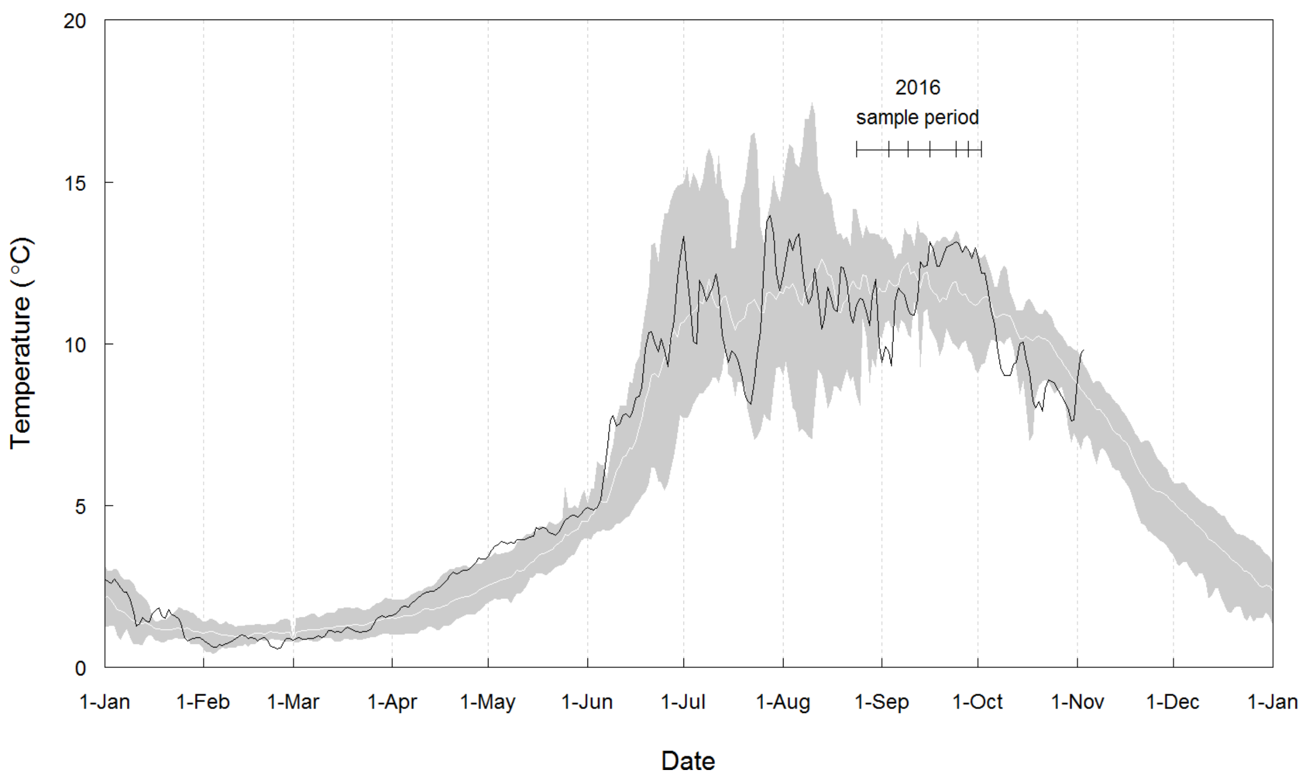


Figure 3: Mean daily water temperature (°C) for the Peace River recorded near the Peace Canyon Dam, 2016 (black line). The shaded area represents the minimum and maximum mean daily water temperature values recorded at that location between 2008 and 2015. The white line represents the average mean daily water temperature during the same time period. Data were collected under GMSWORKS-2 (DES 2017).

Mean daily water temperatures in the Peace River measured at the Halfway River were greater than average from mid-April to mid-May but lower than average from early October to mid-December (Figure 4). During the 2016 study period, water temperatures in Section 3 declined substantially during Sessions 2 and 3 before increasing during Session 4. This decline in water temperature was more evident in Section 3 than in Section 1, suggesting colder Halfway River discharges.

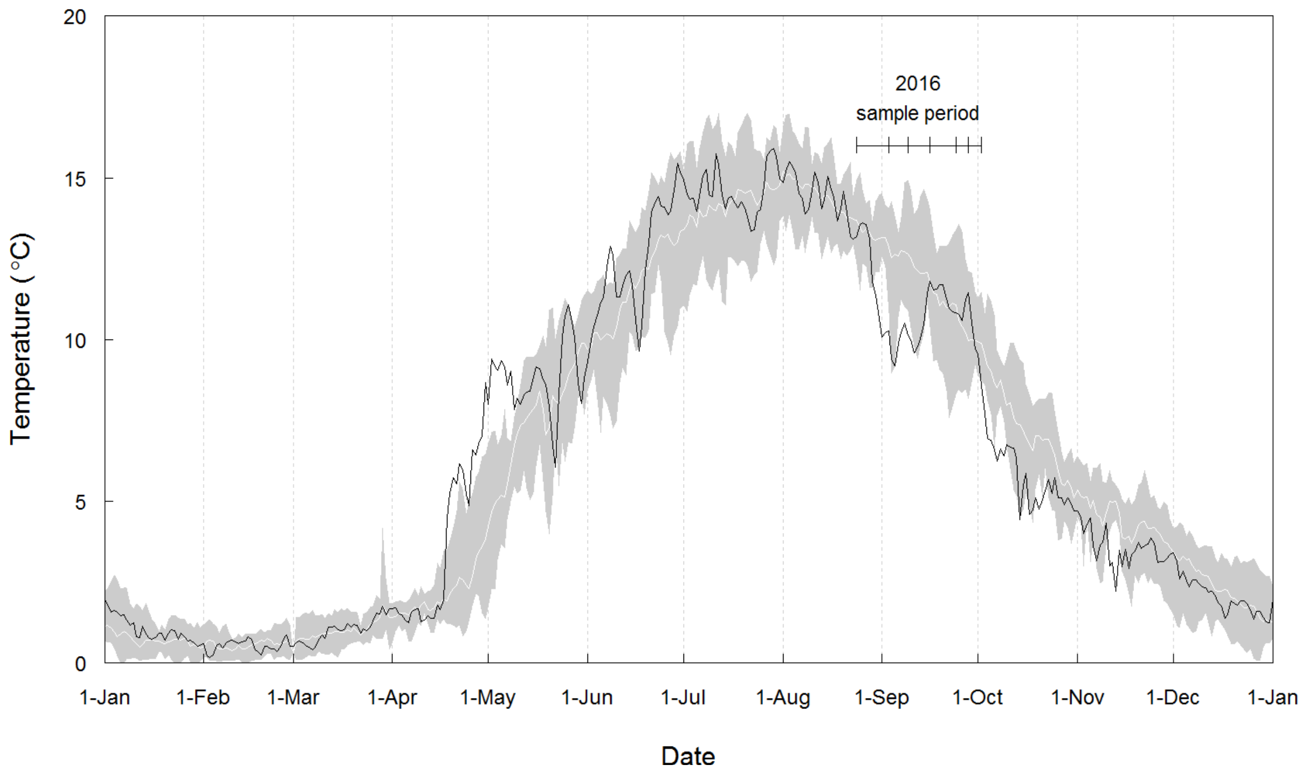


Figure 4: Mean daily water temperature (°C) for the Peace River recorded near the Halfway River confluence, 2016 (black line). The shaded area represents the minimum and maximum mean daily water temperature values recorded at that location between 2008 and 2015. The white line represents the average mean daily water temperature during the same time period. Data were collected under GMSWORKS-2 (DES 2017).

In Section 5, water temperatures were warmer than normal from mid-March to mid-May (Figure 5). Similar to Section 3 (Figure 4), water temperatures in Section 5 declined during Sessions 2 and 3 of the 2016 study period before increasing during Session 4.

For Section 6, continuous water temperature monitoring began in 2016 (DES 2017); historical water temperature data for this section are not available. Over the course of the 2016 study period, water temperatures in Section 6 declined from a high of approximately 15°C to a low of approximately 8°C.

For Section 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 2016, spot temperature readings in Section 7 ranged from a low of 8.8°C recorded on both 31 August and 7 September to a high of 12.9°C recorded on 18 September. For Section 9, spot temperature readings ranged from a low of 8.8°C on 6 September to a high of 11.6°C on 21 September. For both sections, water temperatures increased over Sessions 1 through 3 and declined over Sessions 4 through 6.

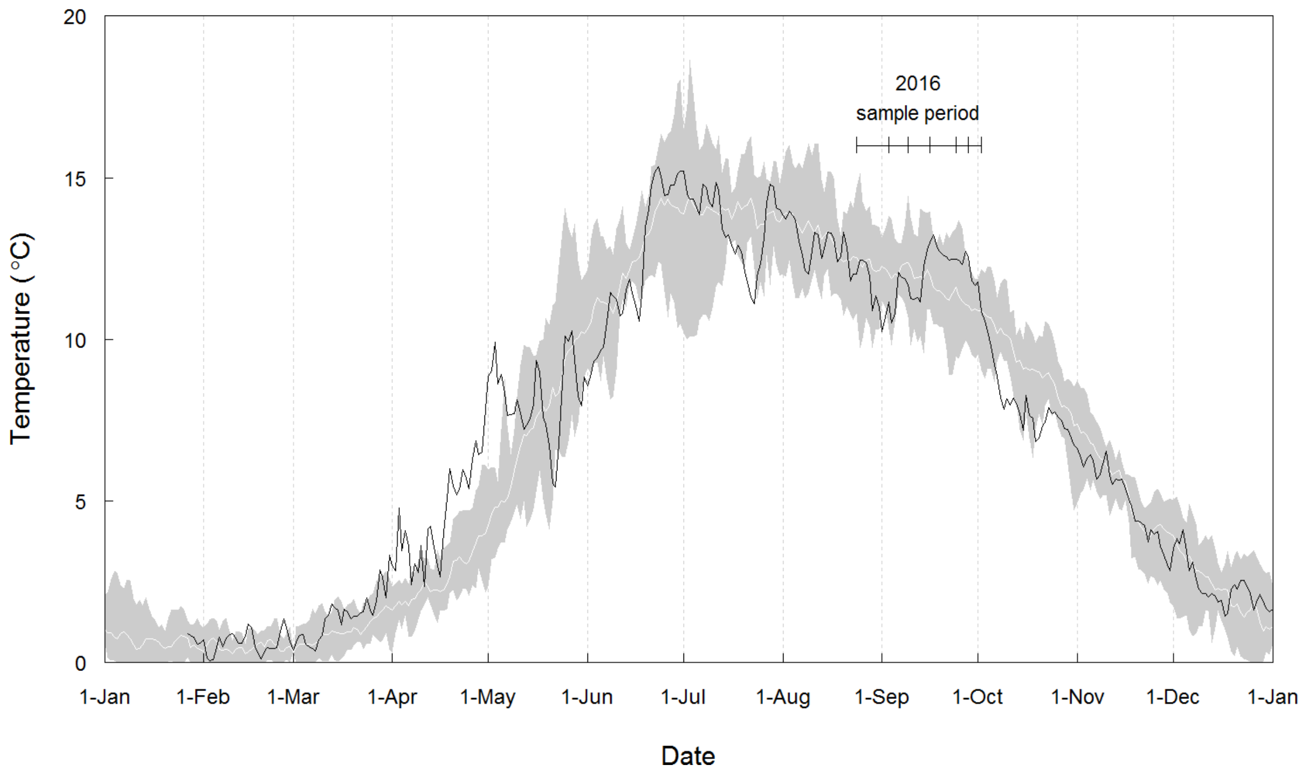


Figure 5: Mean daily water temperature (°C) for the Peace River recorded near the Moberly River confluence, 2016 (black line). The shaded area represents the minimum and maximum mean daily water temperature values recorded at that location between 2008 and 2015. The white line represents the average mean daily water temperature during the same time period. Data were collected under GMSWORKS-2 (DES 2017).

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 Fish Index 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 2016 survey did not suggest any substantial changes to fish habitat in any sections when compared to 2015 data.

3.2 General Characteristics of the Fish Community

In 2016, 16,894 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, 12 were classified as sportfish and 12 were classified as non-sportfish. Catch was greatest in Section 3 (30% of the total catch) and lowest in Section 9 (8% of the total catch; Table 8).

Table 8: Number of fish caught by boat electroshocking and their frequency of occurrence in sampled sections of the Peace River, 23 August to 1 October 2016.

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	3	<1	54	1	28	2	21	1	3	<1	2	<1	111	1	1
Bull Trout	52	2	89	2	64	5	54	3	22	3	17	4	298	3	2
Burbot					3	<1	7	<1	10	1	17	4	37	<1	<1
Kokanee	16	1	3	<1	2	<1	1	<1	1	<1			23	<1	<1
Northern Pike					4	<1	7	<1	3	<1	2	<1	16	<1	<1
Lake Trout	1	<1											1	<1	<1
Goldeye							1	<1	3	<1	4	1	8	<1	<1
Rainbow Trout	51	2	110	3	15	1	7	<1	3	<1			186	2	1
Yellow Perch					2	<1							2	<1	<1
Lake Whitefish			1	<1	2	<1							3	<1	<1
Walleye			11	<1	23	2	38	2	70	9	89	22	231	2	1
Mountain Whitefish	2550	95	3390	93	1173	89	1848	93	646	85	275	68	9,882	92	58
Sportfish subtotal	**2673**	**100**	**3658**	**100**	**1316**	**100**	**1984**	**100**	**761**	**100**	**406**	**100**	**10,798**	**100**	**64**
Non-sportfish															
Lake Chub					2	<1	1	<1	8	1	17	2	28	<1	<1
Flathead Chub									4	<1	14	1	18	<1	<1
Longnose Dace			3	<1	4	<1	3	<1	5	1	1	<1	16	<1	<1
Longnose Sucker	171	52	849	62	617	59	993	70	647	69	770	77	4047	66	24
Prickly Sculpin					3	<1	2	<1					5	<1	<1
Largescale Sucker	104	31	392	29	230	22	253	18	166	18	83	8	1228	20	7
Redside Shiner			8	1	63	6	48	3	24	3	23	2	166	3	1
Northern Pikeminnow	14	4	65	5	43	4	35	2	34	4	19	2	210	3	1
Spottail Shiner					4	<1	2	<1	2	<1	5	1	13	<1	<1
Trout-perch									3	<1	6	1	9	<1	<1
Slimy Sculpin	10	3	9	1	31	3	23	2	16	2	12	1	101	2	1
White Sucker	32	10	37	3	55	5	57	4	27	3	47	5	255	4	2
Non-sportfish subtotal	**331**	**100**	**1363**	**100**	**1052**	**100**	**1417**	**100**	**936**	**100**	**997**	**100**	**6096**	**100**	**36**
All species[c]	**3004**	**18**	**5021**	**30**	**2368**	**14**	**3401**	**20**	**1697**	**10**	**1403**	**8**	**16,894**	**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.

Mountain Whitefish was the most common species encountered, representing 58% of the total catch and 92% of the sportfish catch, followed by Longnose Sucker (24% of the total catch), Largescale Sucker (7%), Bull Trout (2%), White Sucker (2%), Walleye (1%), Northern Pikeminnow (*Ptychocheilus oregonensis*; 1%), Rainbow Trout (1%), Redside Shiner *(Richardsonius balteatus*; 1%), Arctic Grayling (1%), and Slimy Sculpin (*Cottus cognatus*; 1%). The remaining species each accounted for less than 1% of the total catch and included the following species in declining order of abundance: Burbot, Lake Chub (*Couesius plumbeus*), Kokanee, Flathead Chub (*Platygobio gracilis*), Northern Pike, Longnose Dace (*Rhinichthys cataractae*); Spottail Shiner (*Notropis hudsonius*), Trout-perch (*Percopsis omiscomaycus*), Goldeye, Prickly Sculpin (*Cottus asper*), Lake Whitefish (*Coregonus* clupeaformis), 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).

Arctic Grayling, Bull Trout, and Mountain Whitefish were consistently captured between 2002 and 2016; therefore, changes in catch-rates over time were compared for these species (Figure 6). Changes in catch-rates of other species over time were not compared. Arctic Grayling catch rates declined between 2011 and 2014 and increased slightly in 2015 and 2016; however, confidence intervals overlapped for most estimates. Catch rates of Arctic Grayling were greatest in 2004 (18 fish/km/hr) and were also high in 2007 (16 fish/km/hr). Bull Trout catch rates in 2016 were similar to most other study years (Figure 6) but lower than the peak catch rate observed in 2012. Mountain Whitefish catch rates were stable between 2002 and 2010, increased substantially in 2011, and decreased between 2011 and 2014 (Figure 6). Catch rates of Mountain Whitefish were lower from 2014 to 2016 than during all previous study years. Catch rates of Mountain Whitefish declined an average of approximately 20% each year between 2011 and 2014.

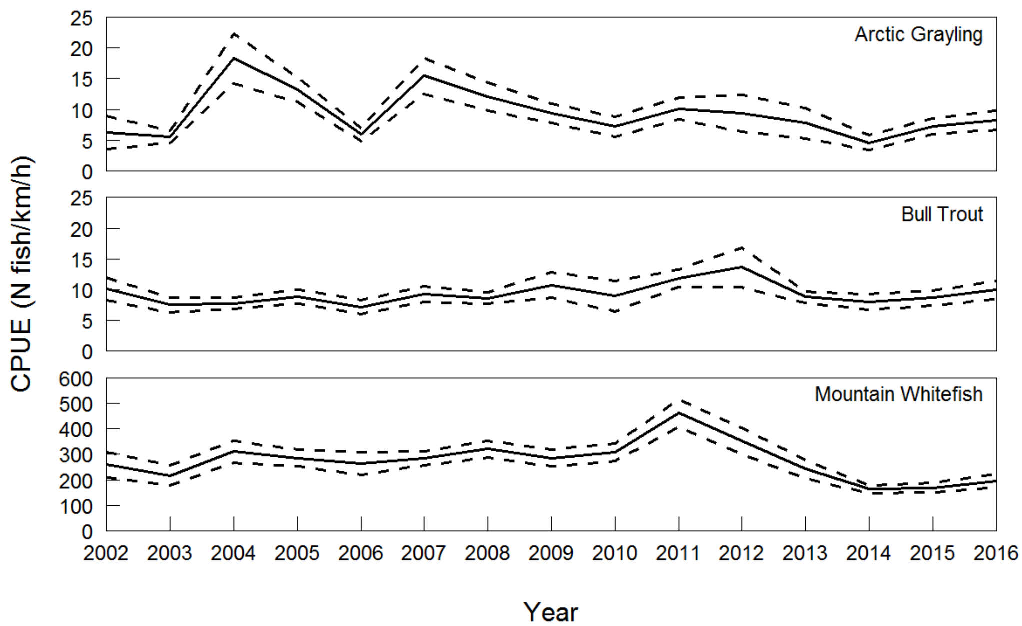


Figure 6: Mean annual catch rates (CPUE) for Arctic Grayling, Bull Trout, and Mountain Whitefish captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River combined, 2002 to 2016. The dashed lines denote 95% confidence intervals. Analysis included captured fish only and all size-cohorts 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 2016 survey, 111 Arctic Grayling were captured (i.e., excluding within-year recaptures) and were encountered in all sections (3 in Section 1, 54 in Section 3, 28 in Section 5, 21 in Section 6, 3 in Section 7, and 2 in Section 9). Fork lengths ranged between 82 and 343 mm; weights ranged between 9 and 516 g (Table 9). Scale samples were analyzed from all captured Arctic Grayling and the ages ranged from age-0 to age-3.

The numbers of Arctic Grayling by age-class (Table 9) and length-frequencies (Figure 7 indicate that both juvenile (age-0 and age-1) and age-2 and older age-classes are present in the study area. Length-frequency data from previous study years also showed a variety of length groupings in most years (Appendix F, Figure F1).

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, 23 August to 1 October 2016.

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	115 ± 11	98 - 133	23	17 ± 6	9 - 34	23	1.1 ± 0.2	0.9 - 1.6	22
1	216 ± 23	158 - 248	24	124 ± 36	41 - 185	24	1.2 ± 0.1	1.0 - 1.4	24
2	296 ± 21	221 - 329	48	332 ± 72	139 - 452	48	1.3 ± 0.1	1.0 - 1.5	48
3	318 ± 33	281 - 343	3	415 ± 134	263 - 516	3	1.2 ± 0.1	1.2 - 1.3	3

[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 8). Most of the Arctic Grayling were age-0, age-1, or age-2. There were three Arctic Grayling that were age-3 and none older than age-3. In 2015, a large percentage of age-1 Arctic Grayling suggested strong recruitment in 2014 when compared to the immediately preceding study years (Appendix F, Figure F3 and F4). Data from 2016 further supports this finding with a higher than anticipated number of age-2 fish (i.e., originating from the 2014 brood year) in the catch.

Growth rates estimated using the von Bertalanffy growth curve suggest higher than average growth in 2016 for this species; however, rates were within the range of estimates generated during previous study years (Figure 9). This result is supported by higher than average length-at-age of age-0 to age-2 Arctic Grayling in 2016 (Figure 10). The body condition (*K*) of Arctic Grayling captured in 2016 ranged between 0.7 and 1.6 (Table 9). Length-weight regressions were similar for Arctic Grayling among sections (Figure 11) and years (Appendix F, Figure F5), although sample sizes were small in some sections or years. In 2016, body condition declined with distance downstream of PCD (Figure 12); however, confidence intervals overlapped for some estimates and were wide for Sections 7 and 9 due to the low number of individuals encountered in these two sections (three and two individuals, respectively). For the upstream three sections (i.e., Sections 1, 3, and 5), average body conditions in 2016 were similar to previous study years. Comparing body conditions in the downstream three sections (i.e., Sections 6, 7, and 9) was not possible due to the low catch rates for this species in these sections and the lack of sampling in these sections prior to 2015.

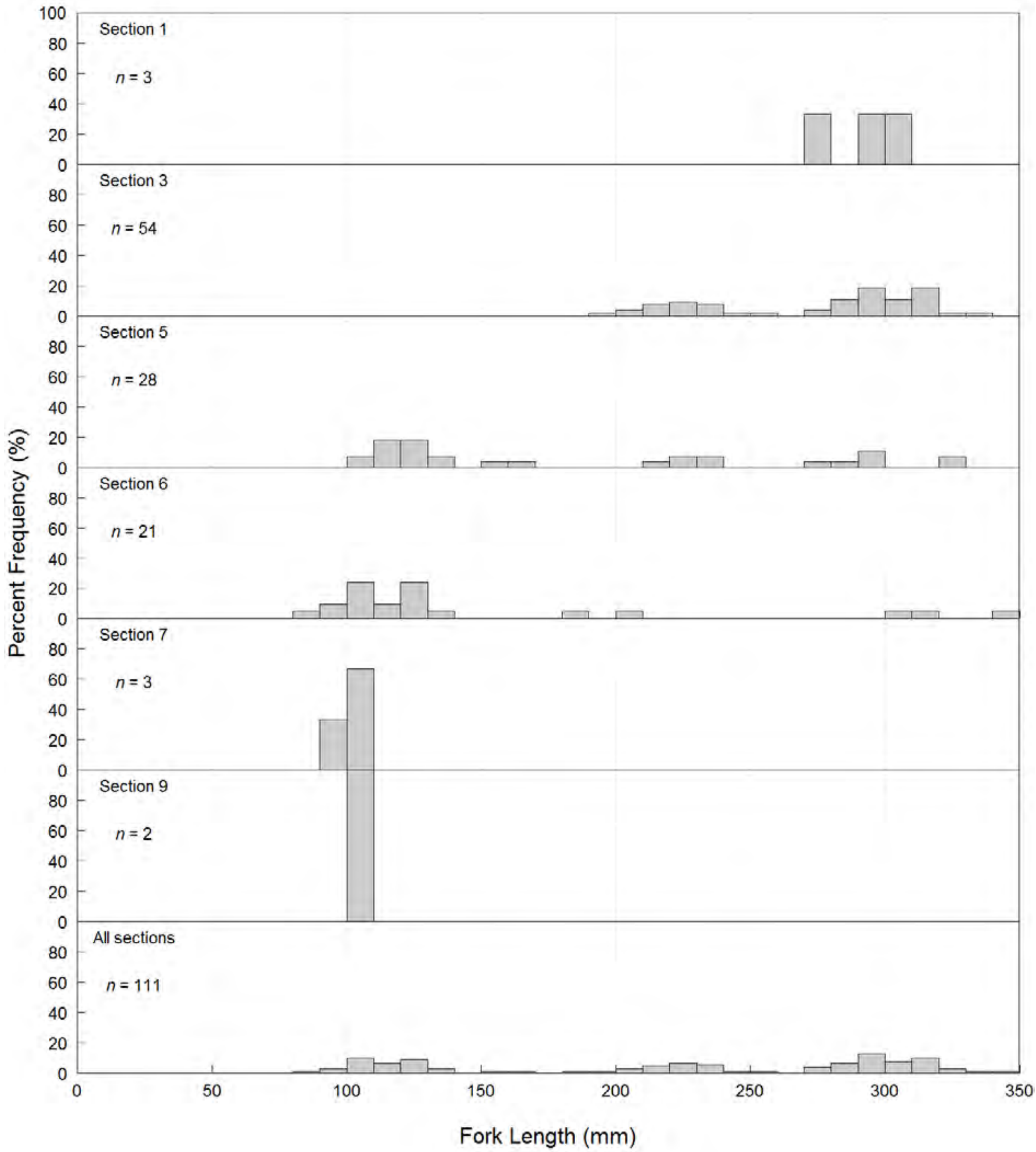


Figure 7: Age-frequency distributions for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

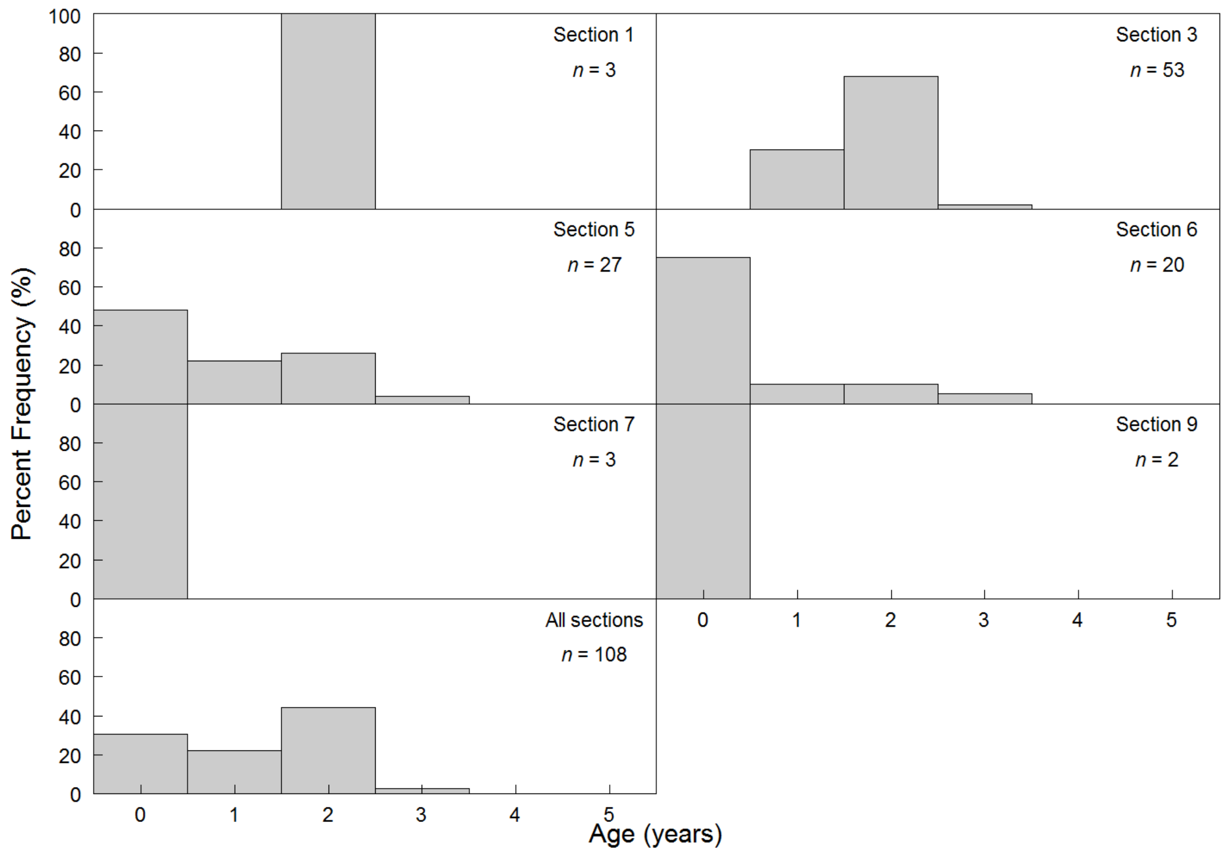


Figure 8: Age-frequency distributions for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

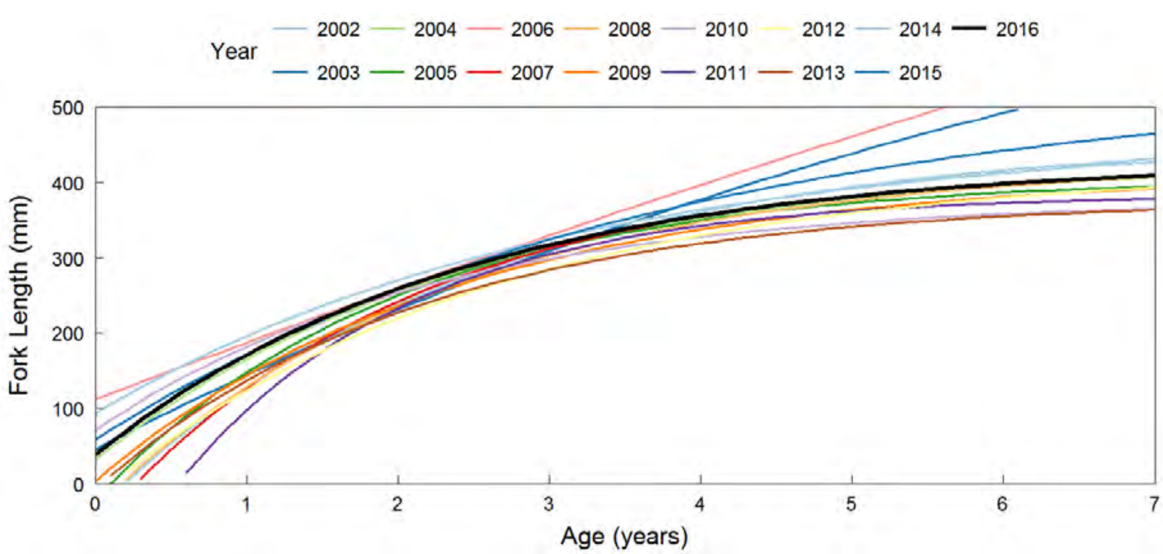


Figure 9: von Bertalanffy growth curves for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

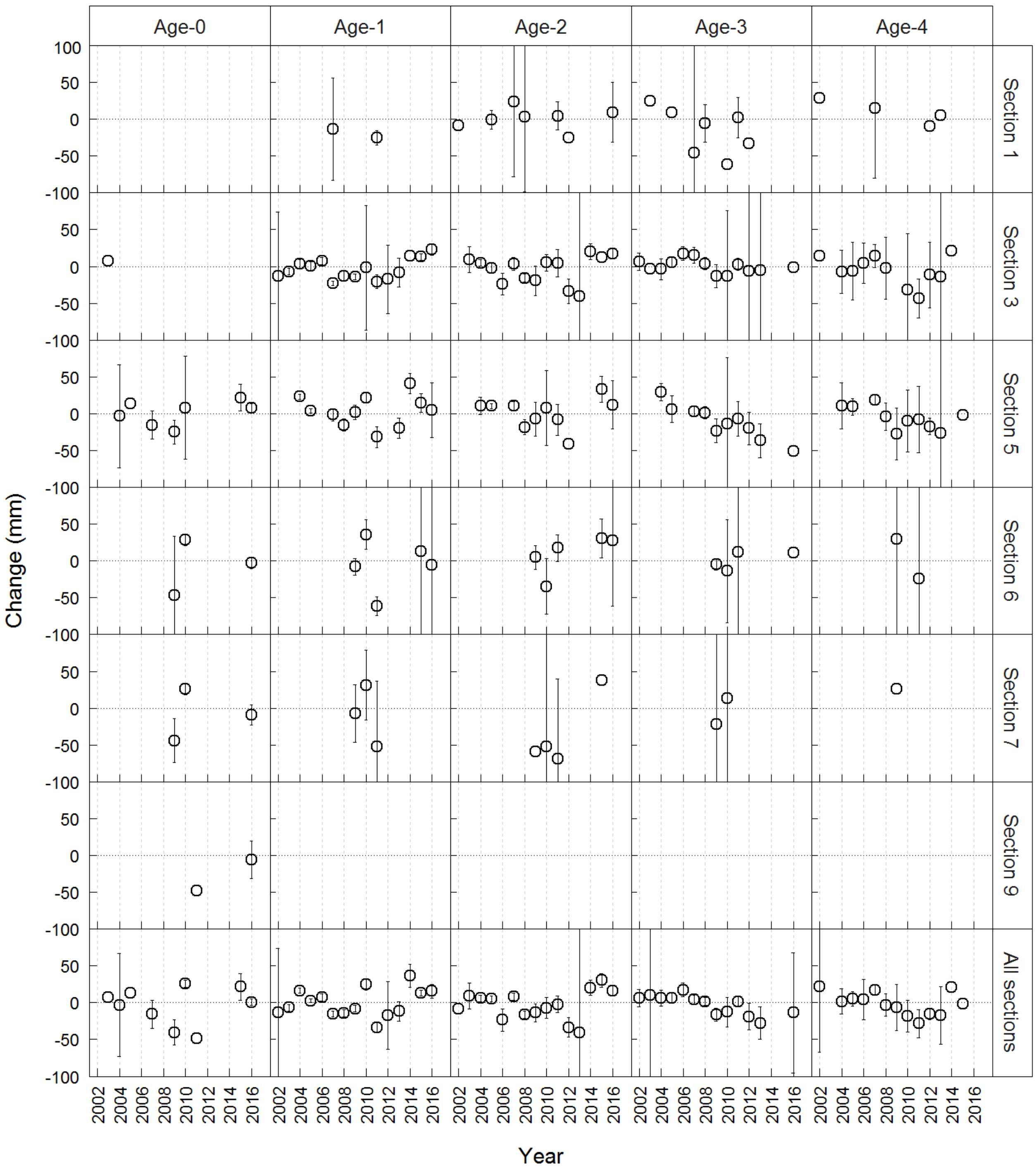


Figure 10: Change in mean length-at-age for Arctic Grayling captured by boat electroshocking in the Peace River, 2002 to 2016. Change is defined as the difference between the annual estimate and the estimate of all years combined. Error bars represent 95% confidence intervals. For Sections 6, 7, and 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 (2010a, 2011a, 2013a).

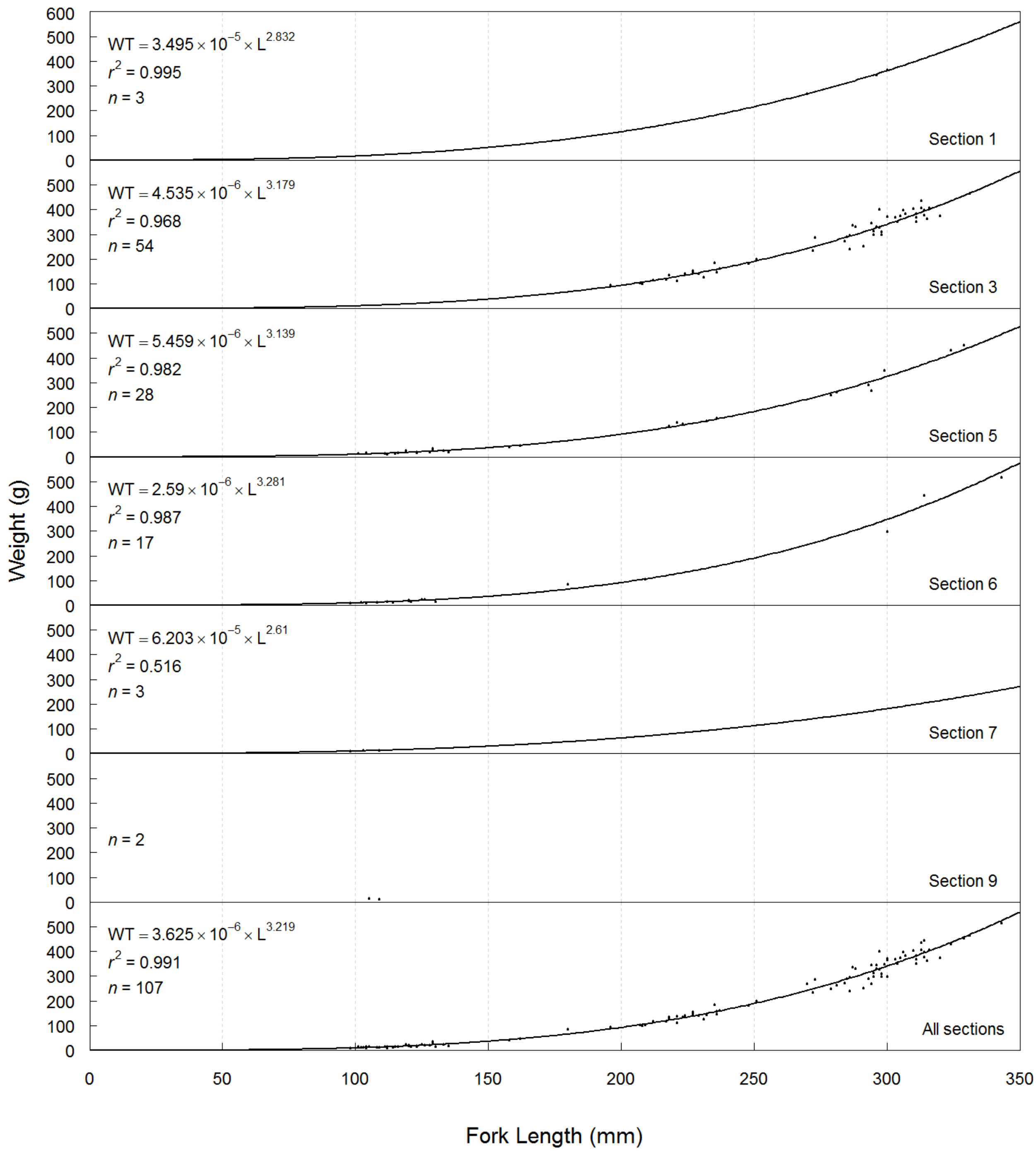


Figure 11: Length-weight regressions for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

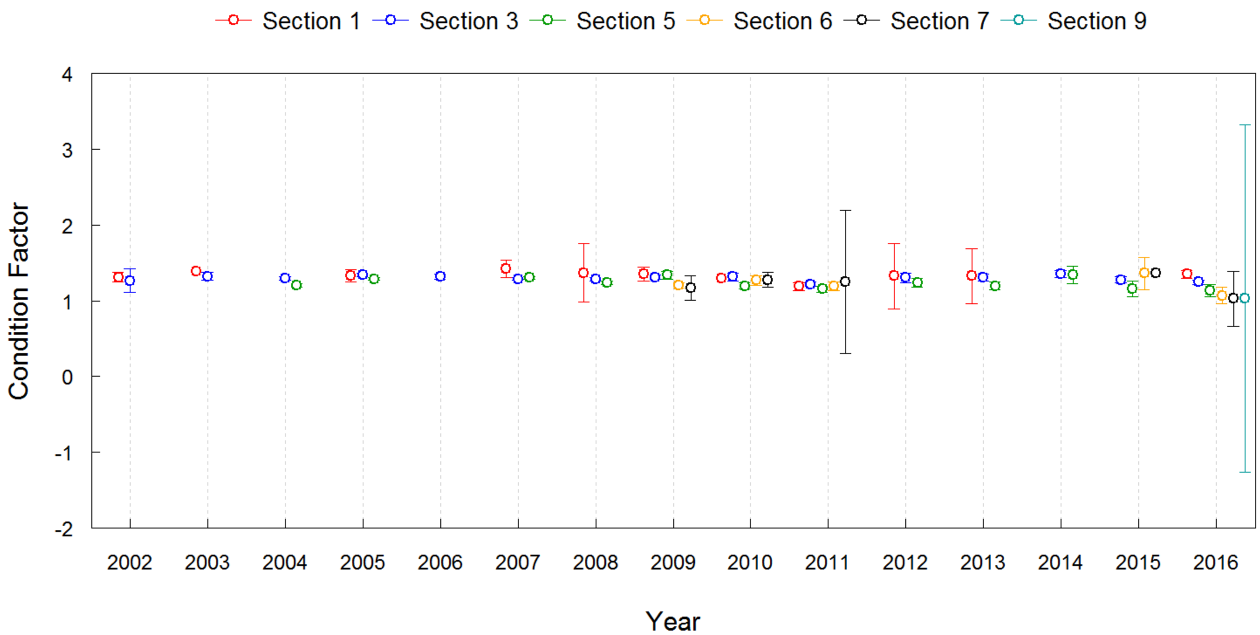


Figure 12: Mean body condition with 95% confidence intervals for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. For Sections 6 and 7, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010a, 2011a, 2013a).

3.3.2 Abundance and Spatial Distribution

Arctic Grayling catch increased each year between 2014 and 2016, with the 111 Arctic Grayling captured in 2016 representing the highest capture in a single year since 2011 (when 114 Arctic Grayling were captured).

Of the 111 Arctic Grayling captured in 2016, 54% were captured at sites with physical cover, 21% were captured at sites without physical cover, and 25% were captured at sites where the presence of cover had not been assessed by P&E and Gazey (2003). Overall, capture data from 2016 and earlier study years indicate that Arctic Grayling are common in Sections 3, 5 and 6 and present in small numbers in Sections 1, 7, and 9.

Small catches of Arctic Grayling prevented the generation of population abundance estimates for most sections in 2016. All Arctic Grayling recaptured during the 2016 survey (*n* = 5) were recorded in Section 3; therefore, minimum population abundance estimates could only be calculated for this section. There was a 0.95 probability of at least 200 fish in Section 3 in 2016 (Appendix G, Figure G16).

3.4 Bull Trout

3.4.1 Biological Characteristics

During the 2016 survey, 298 Bull Trout were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Fork lengths ranged between 164 and 922 mm, and weights ranged between 45 and 4638 g (Table 10). Fin ray samples were analyzed from all individuals; however, ages could not be assigned to all samples. Assigned ages for Bull Trout ranged from age-2 to age-9.

Table 10: Average fork length, weight, and body condition by age for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

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	214 ± 32	164 - 265	18	100 ± 45	45 - 181	18	1.0 ± 0.1	0.8 - 1.1	18
3	307 ± 49	220 - 381	53	305 ± 137	105 - 588	51	1.0 ± 0.1	0.9 - 1.1	51
4	352 ± 44	260 - 460	78	456 ± 169	165 - 937	77	1.0 ± 0.1	0.9 - 1.3	77
5	420 ± 54	318 - 518	47	769 ± 301	338 - 1418	45	1.0 ± 0.1	0.8 - 1.2	45
6	462 ± 71	361 - 571	16	1081 ± 541	464 - 2028	16	1.0 ± 0.1	0.9 - 1.2	16
7	579 ± 76	460 - 659	6	2031 ± 873	952 - 3309	6	1.0 ± 0.1	0.9 - 1.2	6
8	704 ± 19	690 - 726	3	3391 ± 456	2886 - 3774	3	1.0 ± 0.1	0.9 - 1.1	3
9	804	-	1	4638	-	1	0.9	-	1

[a] Number of individuals sampled.

Length-frequency histograms suggest similar size distributions between sections in the study area (Figure 13). The majority of Bull Trout sampled (63%) 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 eight Bull Trout less than 200 mm FL were captured in 2016. Smaller Bull Trout (i.e., less than approximately 200 mm FL) rear in select Peace River tributaries (Mainstream 2012) and thus are 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; DES and Mainstream 2011).

Age-frequency histograms indicated that age-3 through age-5 were the more common age-classes of Bull Trout captured (Figure 14). 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 2016 survey were large enough (164 to 265 mm FL) 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 by section, with most of the available age-classes being present in most sections and habitats during the 2016 survey.

The absence of distinct modes in length-frequency histograms (Figure 13; 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 10) and von Bertalanffy growth analyses (Figure 15 and Figure 16). In 2016, there was little difference in growth between sections for Bull Trout (Figure 15). The von Bertalanffy growth analysis indicates similar sizes for Bull Trout in the Peace River in 2016 when compared to most previous study years (Figure 16).

The average change in length-at-age analysis for Bull Trout (Figure 17) was limited to individuals less than age-4 due to the slow growth, wide range of lengths recorded, and unknown precision of ages assigned to older individuals. The results of this analysis should be treated as suspect as there was little correlation in growth between years for individual cohorts. Average length-at-age in 2016 was similar to most previous study years for most age classes.

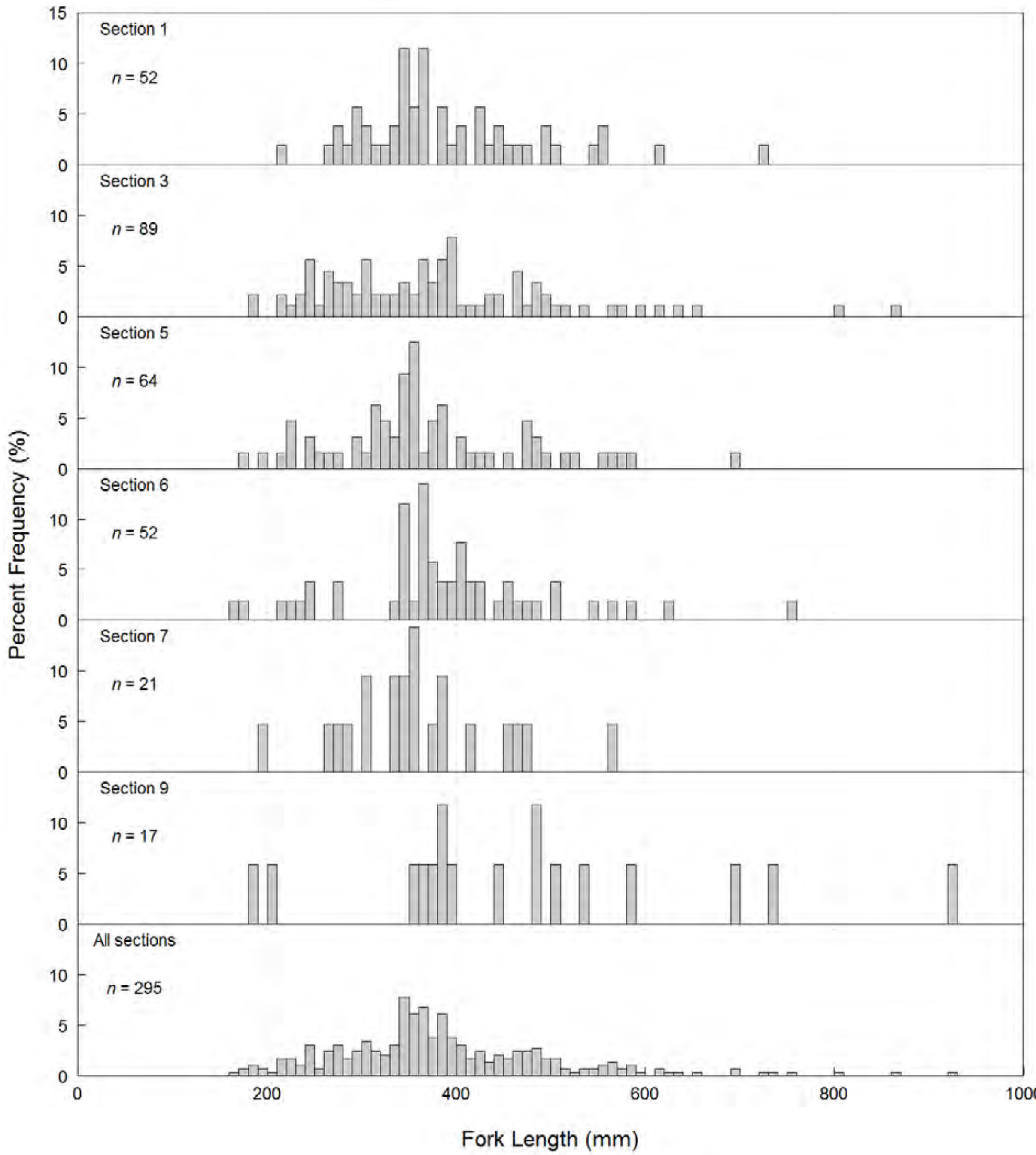


Figure 13: Length-frequency distributions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

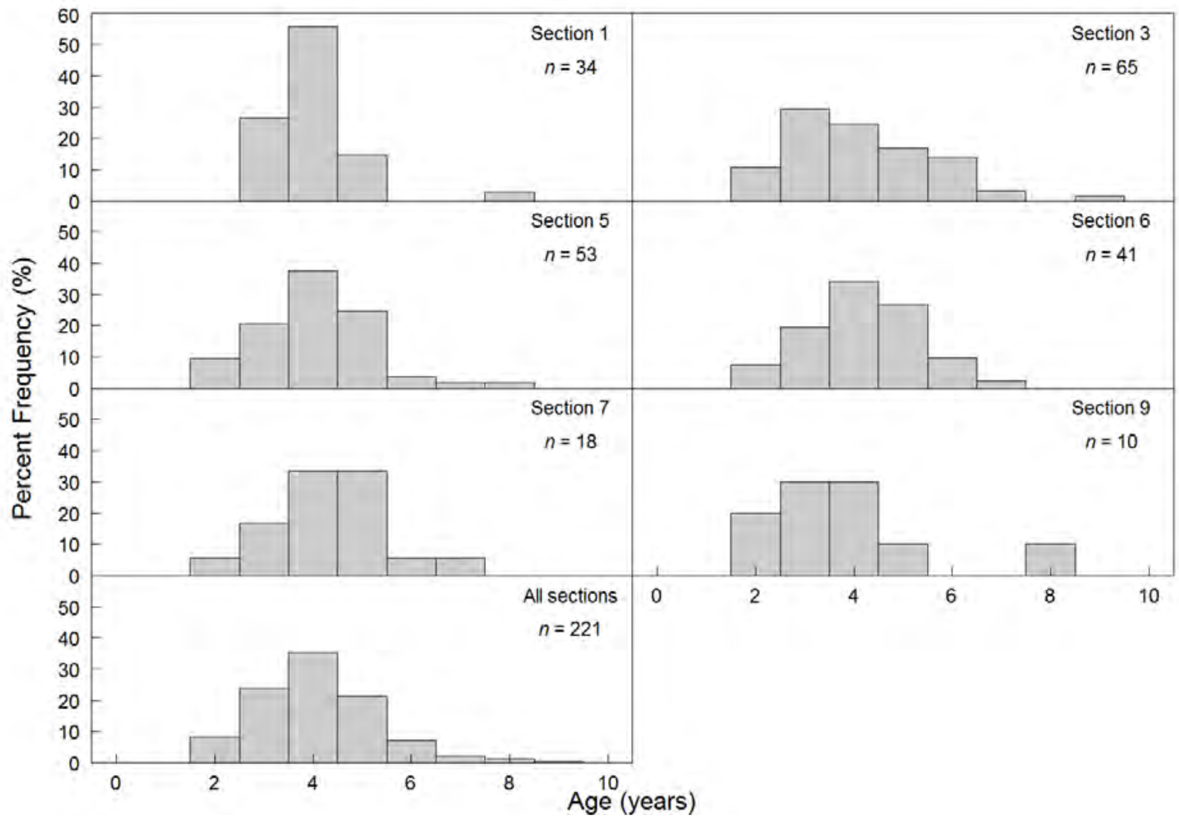


Figure 14: Age-frequency distributions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2015.

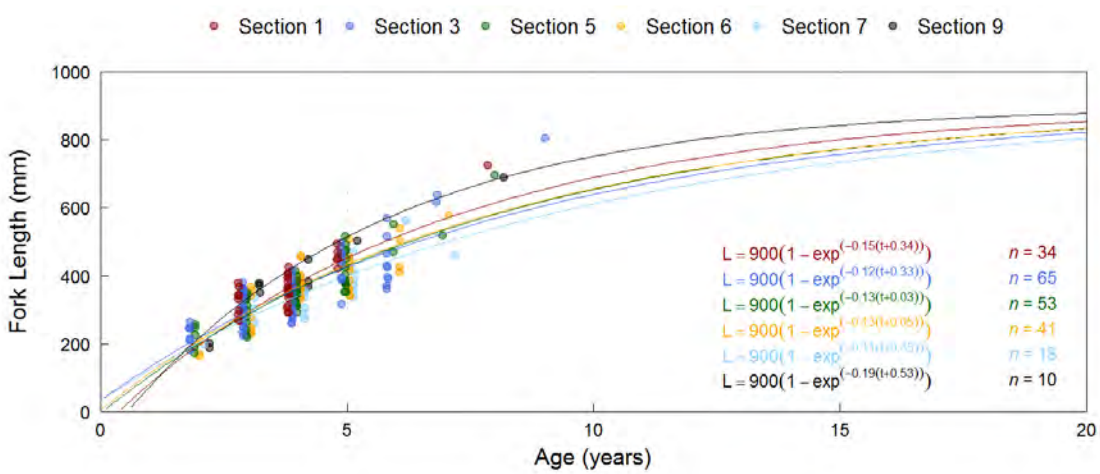


Figure 15: von Bertalanffy growth curve for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

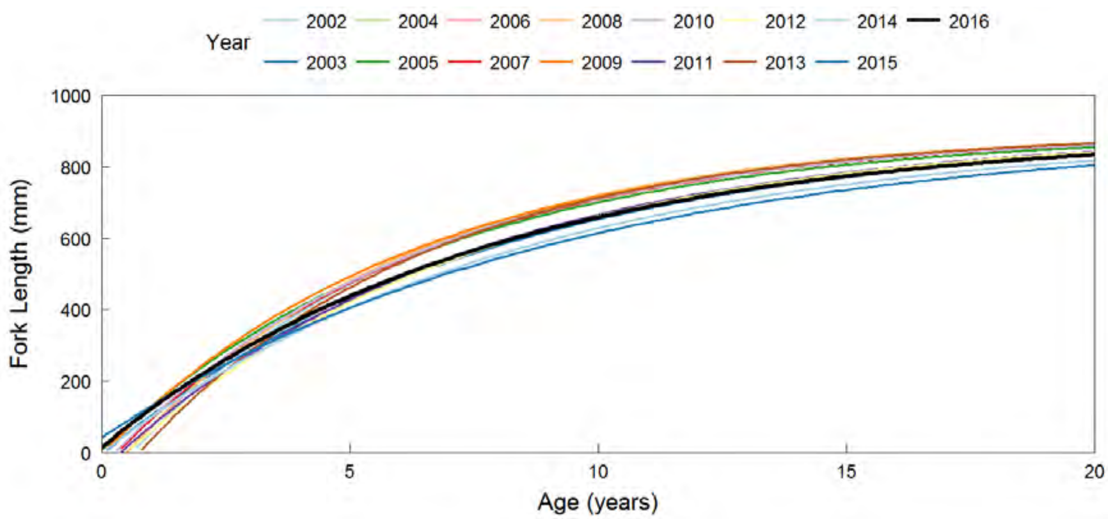


Figure 16: von Bertalanffy growth curve for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

Overall, estimates of mean body condition (*K*) increased from 2002 to 2009, particularly in Section 1. In Sections 3 and 5, mean body condition declined from 2014 to 2016. In 2016, Bull Trout body condition was substantially lower in downstream sections (i.e., Sections 7 and 9) and substantially higher in Section 1. Body condition was similar in Sections 3, 5, and 6. Overall however, confidence intervals overlapped for most sections within 2016, suggesting that intra-year differences observed are not statistically different (Figure 18). During most study years, body condition estimates were greater in Section 1 when compared to other sections.

In 2016, length-weight regression analyses for Bull Trout (Figure 19) were similar to historical study years (Appendix F, Figure F10) and showed low variability over the 14-year study period.

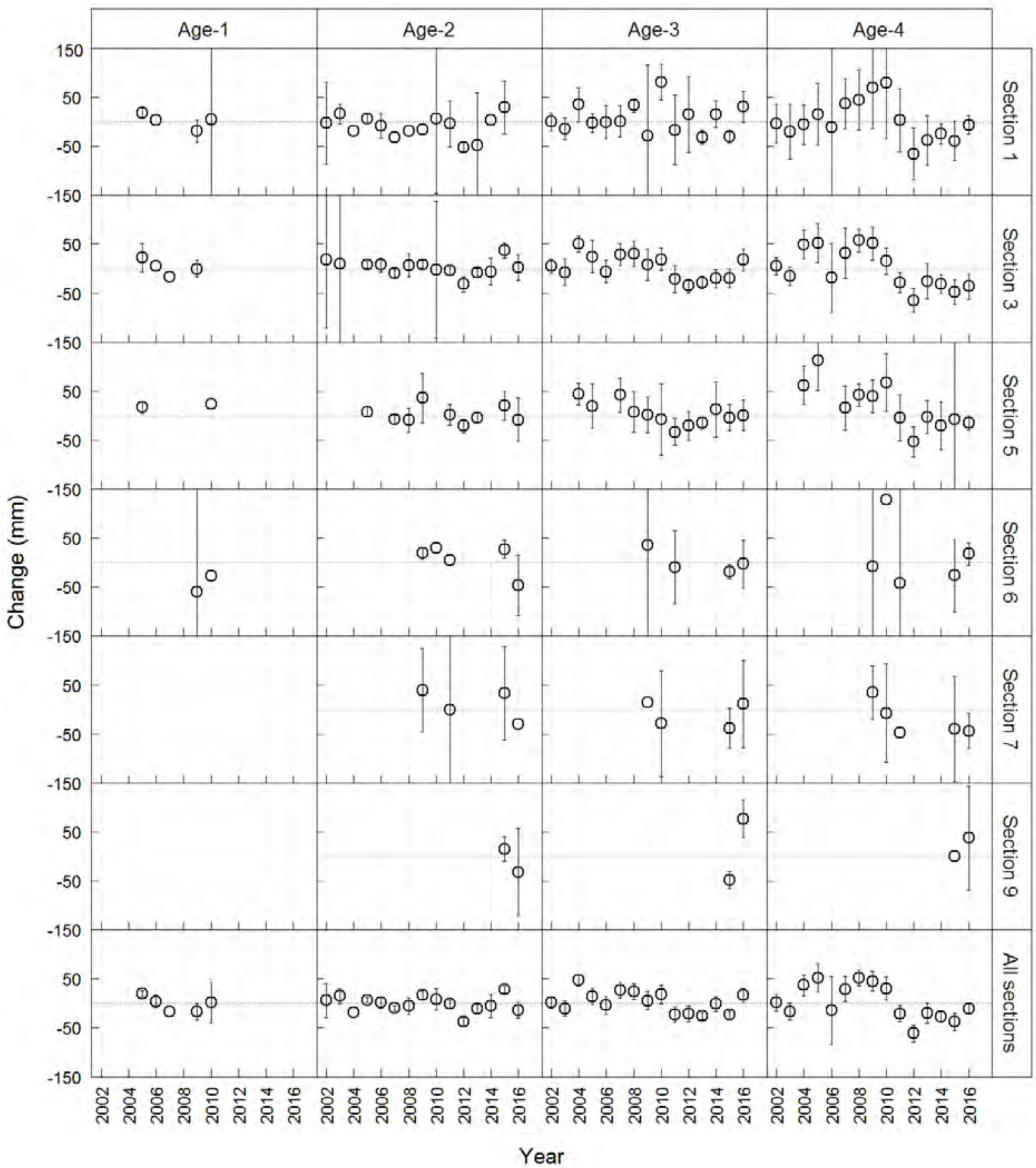


Figure 17: Change in mean length-at-age for Bull Trout captured by boat electroshocking during the Peace River Fish Index, 2002 to 2016. Change is defined as the difference between the annual estimate and the estimate of all years combined. Error bars represent 95% confidence intervals. For Sections 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 (2010a, 2011a, 2013a).

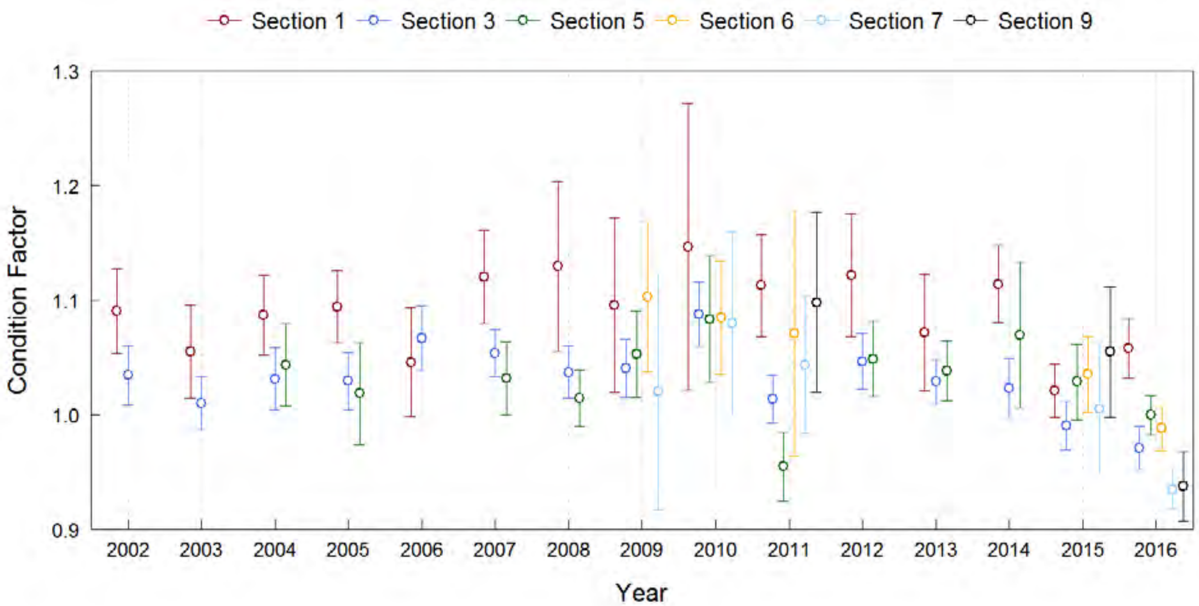


Figure 18: Mean body condition with 95% confidence intervals for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010a, 2011a, 2013a).

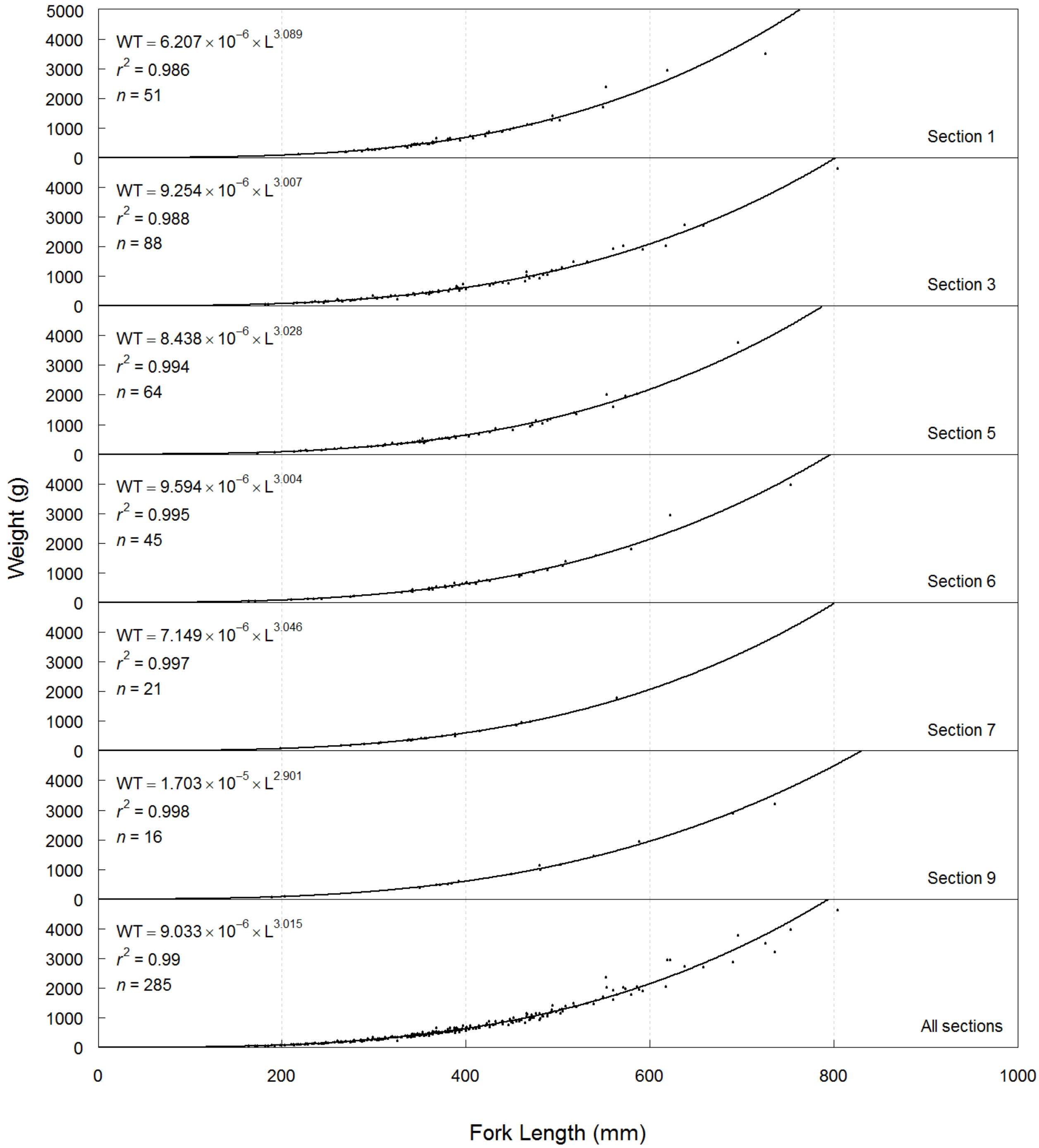


Figure 19: Length-weight regressions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

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.

Bull Trout movement between sections was not observed. A population estimate was not generated for Section 9 in 2016 because recaptures were not recorded in this section. A summary of the 2016 population estimates using the Bayes sequential model is listed in Table 11. Bar plots of the population estimates for the 2002 to 2016 studies for Sections 1, 3, and 5 are provided in Figure 20 (upper panel) and for 2015 and 2016 for Sections 6, 7, and 9 in Figure 21.

Table 11: Population abundance estimates generated using the Bayes sequential model for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2016.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
1	717	372	144	1648	425	59.3
3	224	199	132	334	55	24.4
5	181	151	93	294	56	31.2
6	421	230	92	1014	286	67.9
7	358	86	24	1234	377	105.3
Total	**1901**		**645**	**3157**	**641**	**33.7**

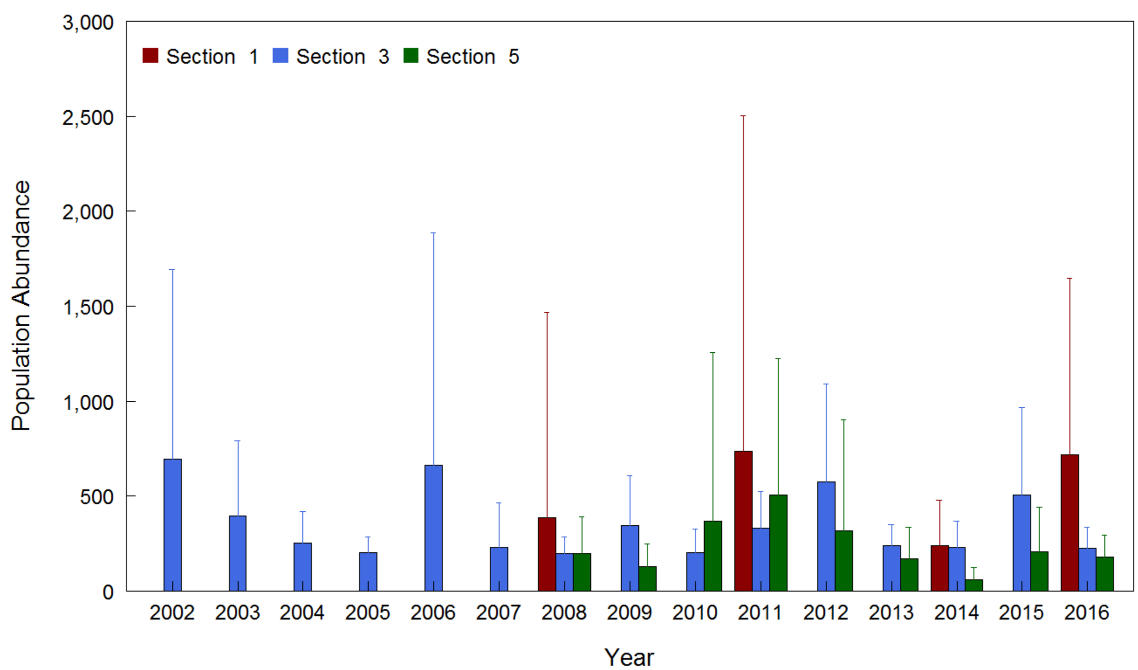


Figure 20: Population abundance estimates (with 95% confidence intervals) generated using the Bayes sequential model for Bull Trout captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002-2016.

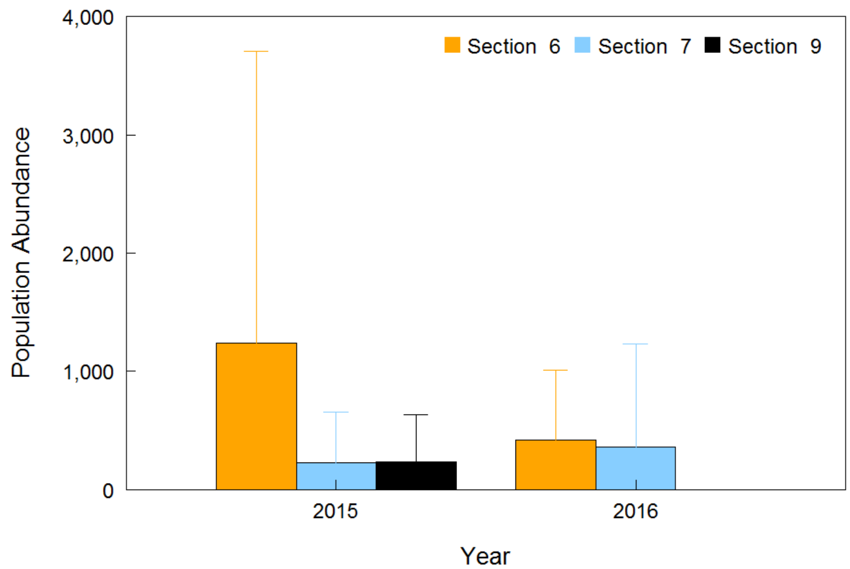


Figure 21: Population abundance estimates (with 95% confidence intervals) generated using the Bayes sequential model for Bull Trout captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2015-2016.

For Sections 1, 3, and 5, population abundance estimates were lower in 2013 and 2014 when compared to previous study years but increased in 2015 and 2016 (Figure 20), although confidence intervals surrounding estimates were wide and overlapped during most years. Within most study years, population abundance estimates were typically greater in Section 1 when compared to Sections 3 and 5.

In 2015, Bull Trout abundance was higher in Section 6 when compared to Sections 7 and 9, but in 2016, abundance in Section 6 was similar to Section 7. An estimate of Bull Trout abundance was not generated for Section 9 in 2016 due to the limited number of recaptured individuals within this section Figure 21).

The annual mortality rate for Bull Trout as calculated by catch-curve analysis using data from all study years combined was 14–41%, 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).

3.5 Burbot

In 2016, 37 Burbot were captured and an additional 23 Burbot were observed but not captured. Overall encounters (i.e., captured plus observed fish) were substantially higher in 2016 (*n* = 60) when compared to 2015 (*n* = 5). Burbot were encountered in all sections except Section 1 and over 90% of the Burbot encountered were recorded in the downstream three sections (i.e., Sections 6, 7, and 9). Total lengths ranged between 228 and 685 mm, and weights ranged between 62 and 2034 g. Ageing structures were not collected from Burbot. The age of the smallest Burbot encountered in 2016 (228 mm TL) is likely age-1 or age-2 based on growth rates in other systems (e.g., Bailey 2011; Bonar 2000).

Length-frequency histograms for Burbot by section are presented in Figure 22. The limited number of immature Burbot encountered, coupled with their sporadic use of the study area (i.e., a 12-fold increase in encounters between 2015 and 2016) 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.

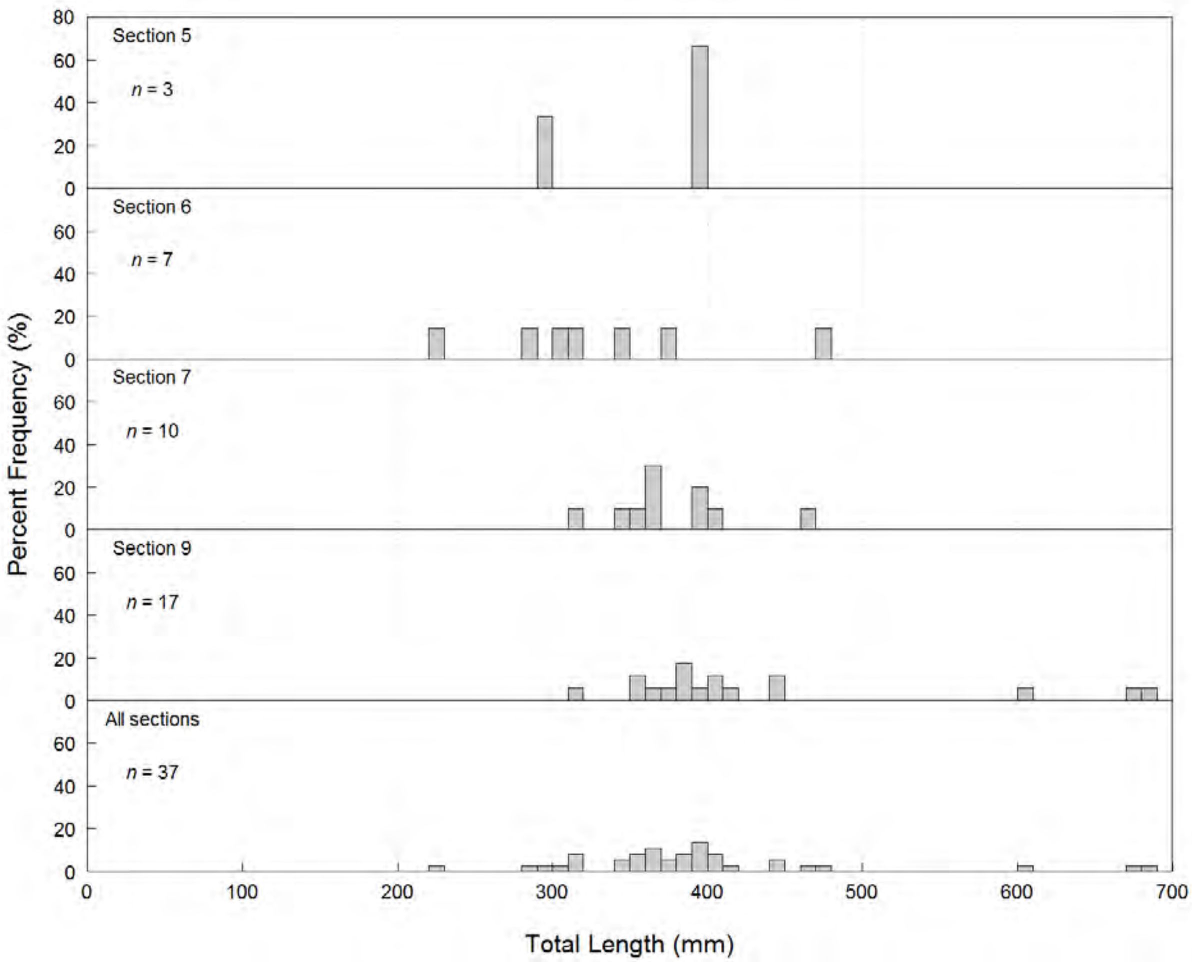


Figure 22: Length-frequency distribution for Burbot captured by boat electroshocking in the Peace River (all sections combined), 23 August to 1 October 2016.

All 37 of the Burbot captured during the 2016 survey were implanted with PIT tags. Of those, two were subsequently recaptured. A 362 mm TL Burbot that was tagged on 29 August in Section 9 (Site 0902) was recaptured on 6 September within the site immediately upstream of its release location (Site 0901). A 602 mm TL Burbot that was tagged on 6 September in Section 9 (Site 0903) was recaptured on 13 September approximately 5 km downstream (Site 0906). Population abundance estimates were not generated for Burbot due to the low number of tagged and recaptured fish.

3.6 Goldeye

In total, eight Goldeye were captured during the 2016 survey and an additional two Goldeye were observed but not captured. One Goldeye was captured in Section 6, four were captured in Section 7, and five were captured in Section 9. Fork lengths ranged between 374 and 422 mm, weights ranged between 526 and 972 g, and body conditions ranged between 0.90 and 1.29 (Table 12). Ages were assigned to 6 of the 8 Goldeye encountered and ranged between age-10 and age-16. The limited data available suggest that Goldeye are present in small numbers in the downstream portion of the study area during the study period. Length-at-age (Figure 23) and body condition (Figure 24) data for Goldeye in 2016 were consistent with historical datasets (Mainstream 2010a, 2011a, 2013a).

Table 12: Fork length, weight, body condition, and age for Goldeye captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

Section	Age	Fork Length (mm)	Weight (g)	Body Condition (K)
6		398	750	1.19
7	11	374	615	1.18
7		379	606	1.11
7	16	401	744	1.15
9	10	388	526	0.90
9	10	400	790	1.23
9	13	402	786	1.21
9	14	422	972	1.29

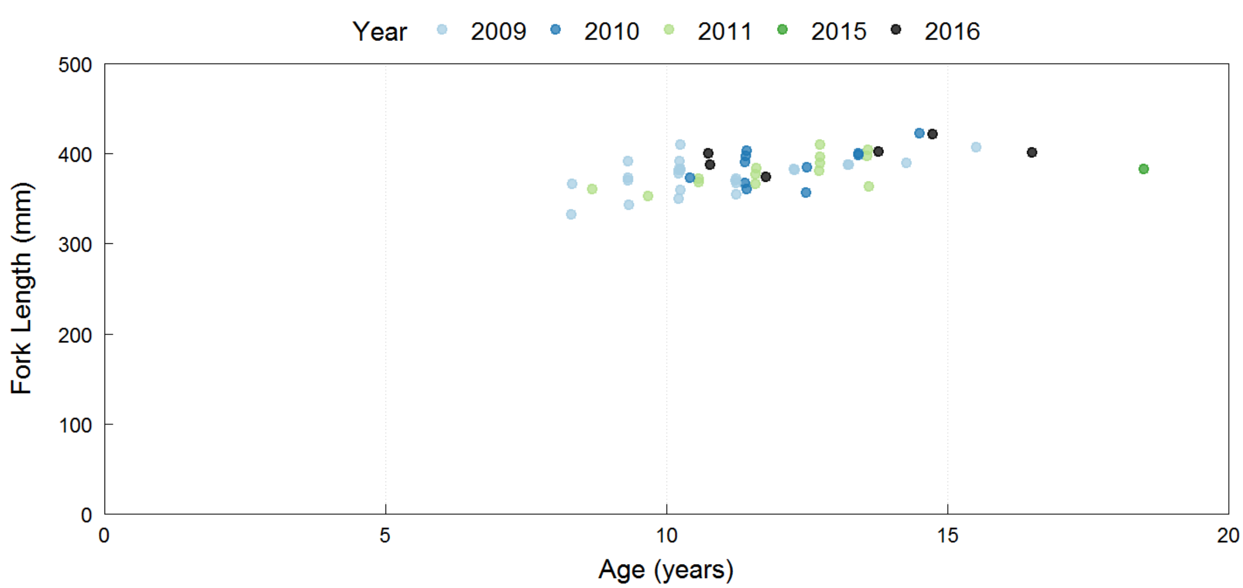


Figure 23: Length at age data for Goldeye captured by boat electroshocking in sampled sections of the Peace River, 2009 to 2011, 2015, and 2016. Data from 2009, 2010, and 2011 were collected during boat electroshocking surveys conducted during the late summer to fall period by Mainstream (2010a, 2011a, 2013a).

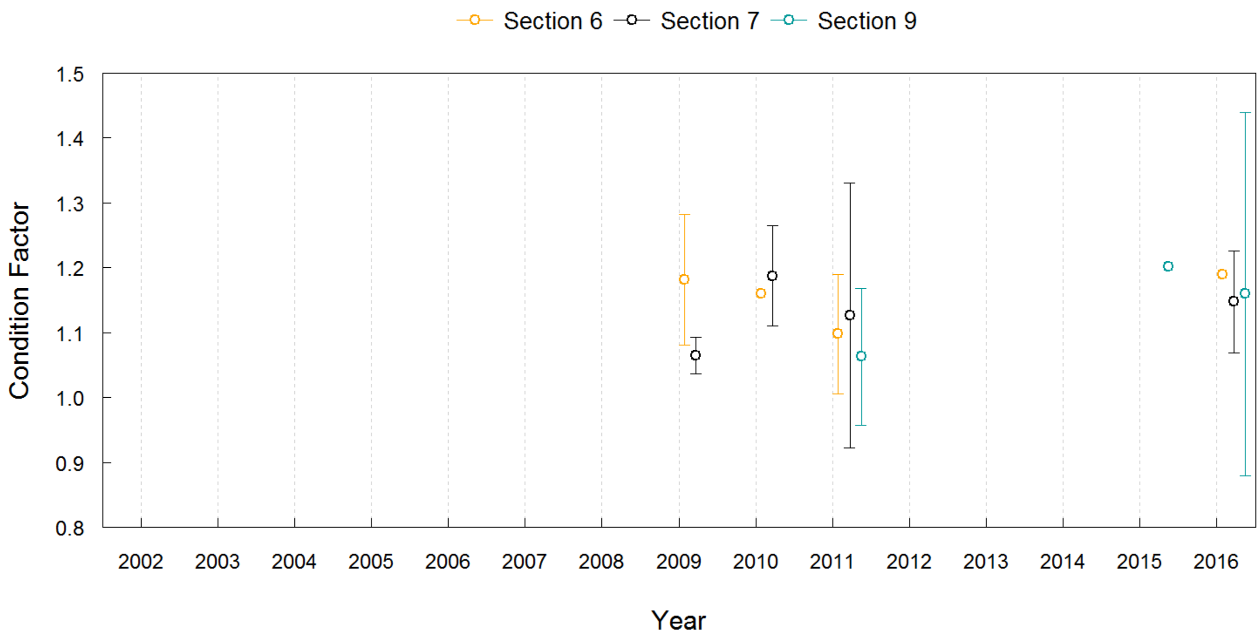


Figure 24: Mean body condition with 95% confidence intervals for Goldeye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from 2009, 2010, and 2011 were collected during boat electroshocking surveys conducted during the late summer to fall period by Mainstream (2010a, 2011a, 2013a).

All eight of the Goldeye captured during the 2016 survey were implanted with PIT tags; however, none of them were subsequently recaptured. Population abundance estimates were not generated for Goldeye.

3.7 Largescale Sucker

3.7.1 Biological Characteristics

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 to 600 mm FL) were most commonly recorded in Section 1. This finding is consistent with the results of the 2015 survey (Golder and Gazey 2016).

In 2016, 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, 2016 data suggest a trend of declining condition with distance downstream of PCD (Figure 27).

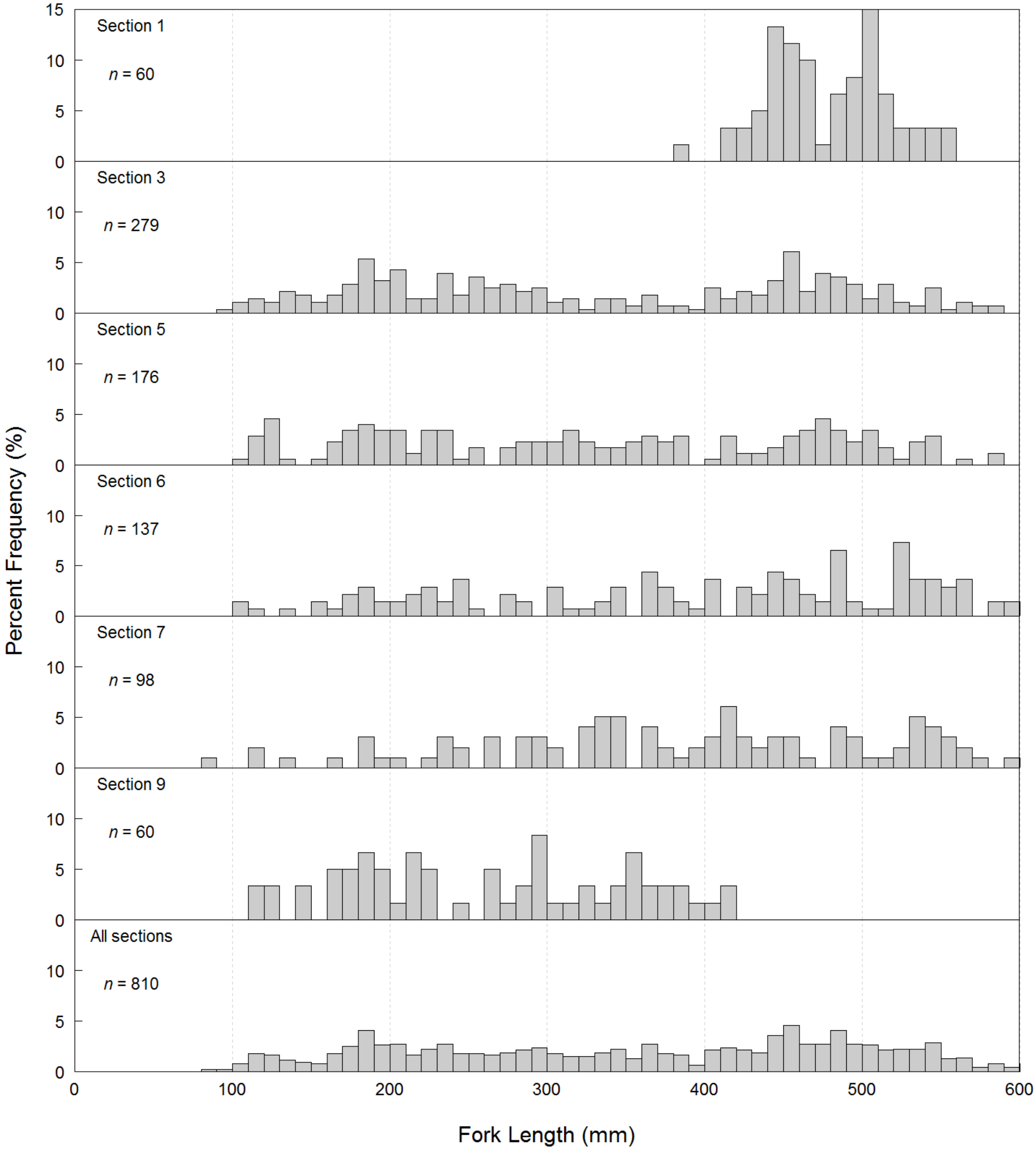


Figure 25: Length-frequency distributions for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

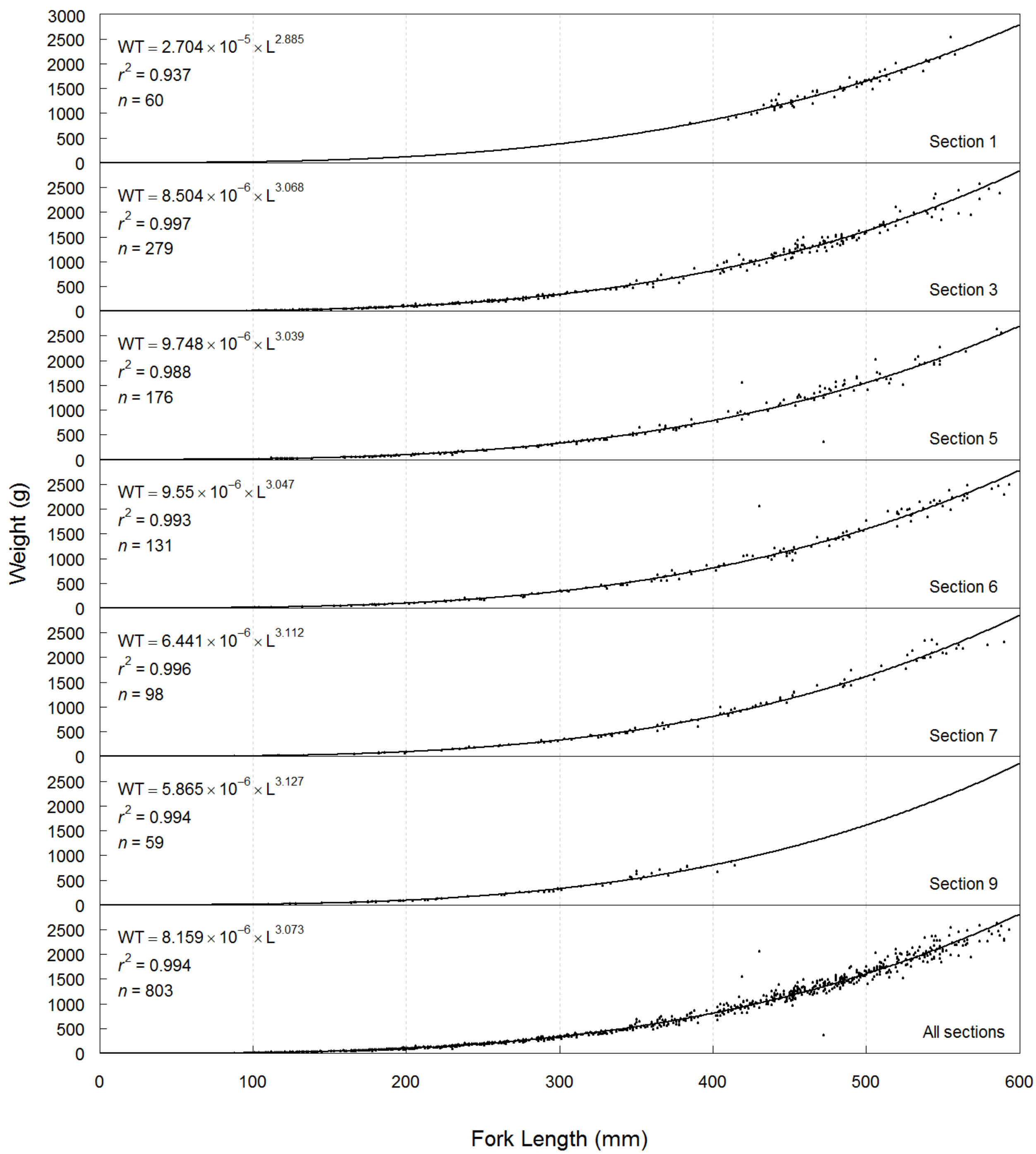


Figure 26: Length-weight regressions for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

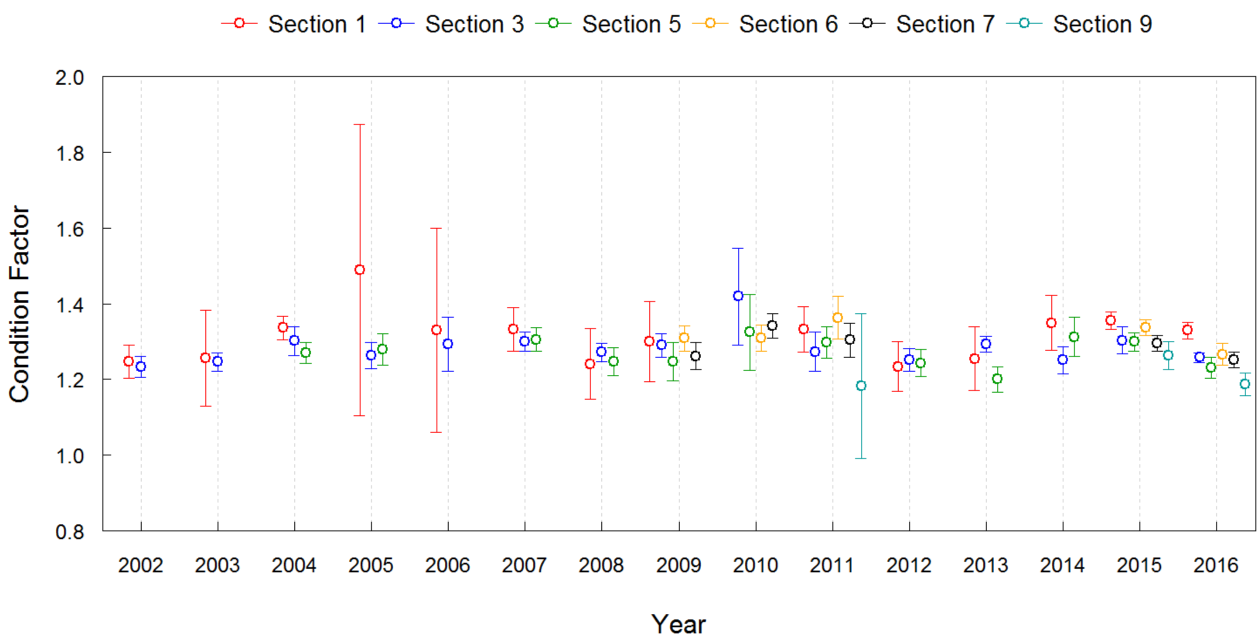


Figure 27: Mean body condition with 95% confidence intervals for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010a, 2011a, 2013a).

3.7.2 Abundance and Spatial Distribution

Low recapture numbers in Sections 1 (*n* = 2) and 9 (*n* = 0) hindered the calculation of population abundance estimates for these sections in 2016. Abundance estimates for the remaining sections (Table 13) were similar to 2015 estimates (Golder and Gazey 2016). Population abundance estimates were not available for years prior to 2015 because this species was not marked prior to 2015.

Table 13: Population abundance estimates generated using the Bayes sequential model for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 2016.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			Low	High		
3	2827	2410	1440	4550	849	30.0
5	1406	1060	540	2590	606	43.1
6	2988	2110	990	5880	1350	45.2
7	2395	1360	530	5530	1431	59.7
Total	**9616**		**5251**	**13,981**	**2227**	**23.2**

3.8 Longnose Sucker

3.8.1 Biological Characteristics

For Longnose Sucker, a lack of distinct modes in length-frequency histograms for most sections suggest that most individuals captured were adults, and the samples represented multiple age-classes with overlapping length distributions (Figure 28). A more defined mode in the length-frequency histogram between 100 and 170 mm FL for Section 9 in 2016 relative to 2015 (Golder and Gazey 2015) suggests increased use of this area by immature cohorts in 2016. Based on fork lengths, these individuals are likely age-1, representing the 2015 brood year.

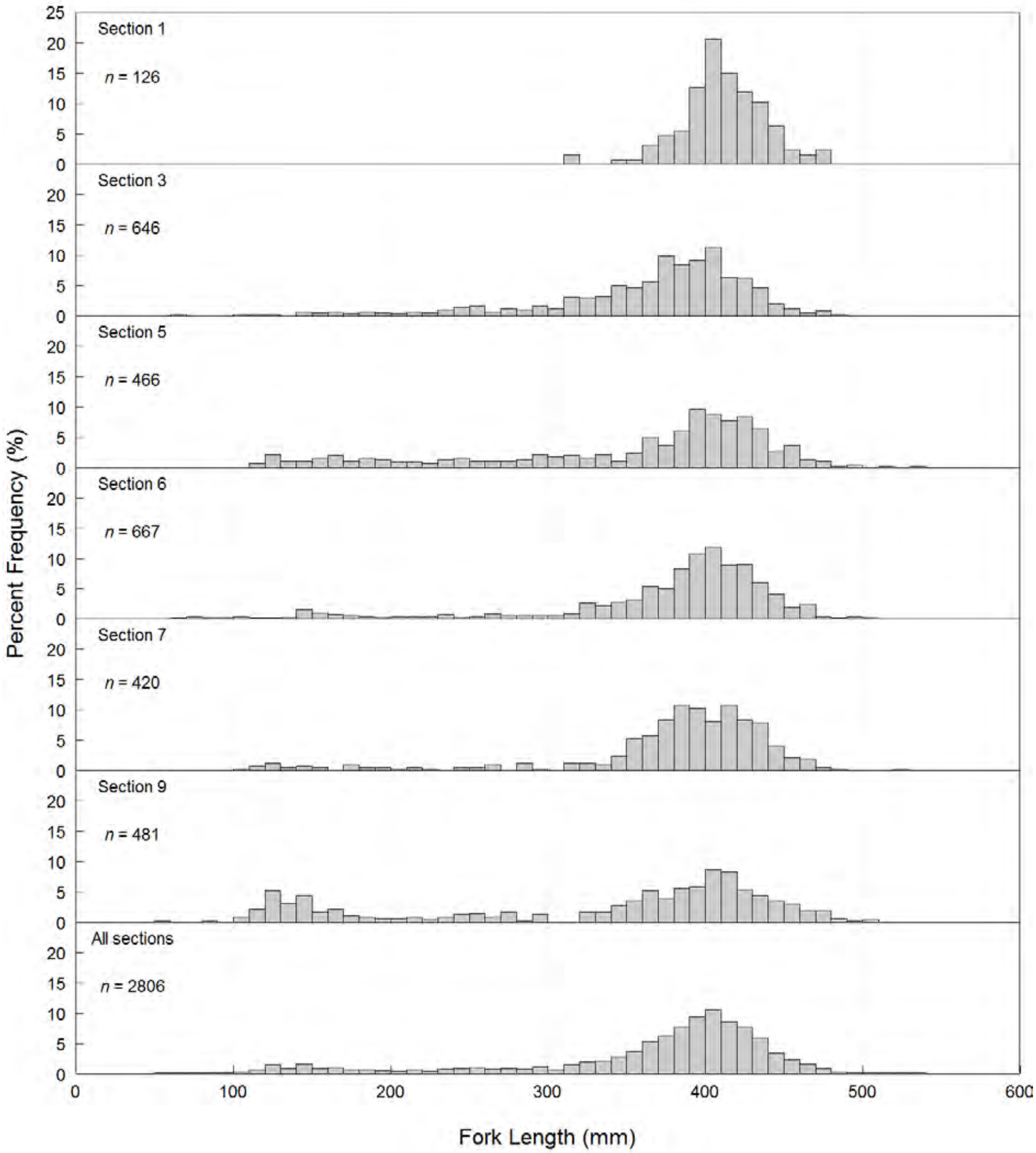


Figure 28: Length-frequency distributions for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

Most captured Longnose Sucker were between 350 and 450 mm FL in all sections in 2016 (Figure 28) and previous study years (Appendix F, Figures F20 and F21). Section 9 had more small (i.e., less than 200 mm FL) Longnose Sucker, whereas Section 1 had fewer small Longnose Sucker when compared to other sections (Figure 28).

There was no consistent trend over time in the body condition of Longnose Sucker (Figure 29). Similar to the trend observed in Largescale Sucker (Figure 27), 2016 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 size related, 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 (Golder and Gazey 2016), but was not observed in historical datasets (Mainstream 2010a, 2011a, 2013a; Figure 29).

Length-weight relationships were similar among sections (Figure 30) and did not suggest substantial changes over time (Appendix F, Figure F22).

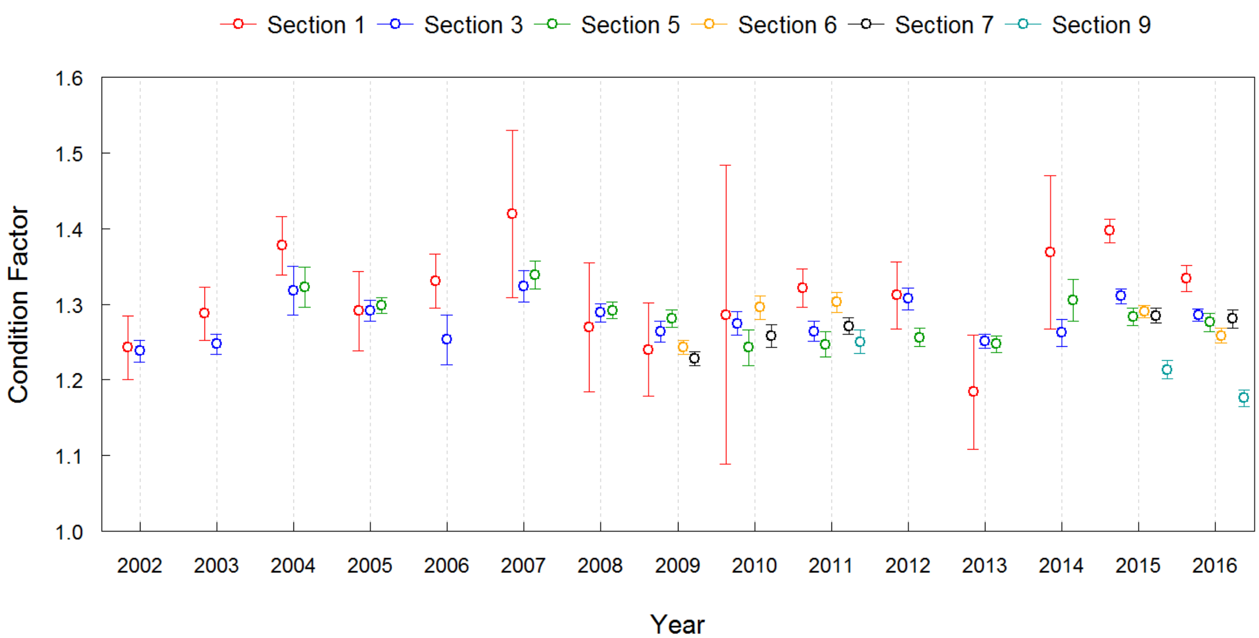


Figure 29: Mean body condition with 95% confidence intervals for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010a, 2011a, 2013a).

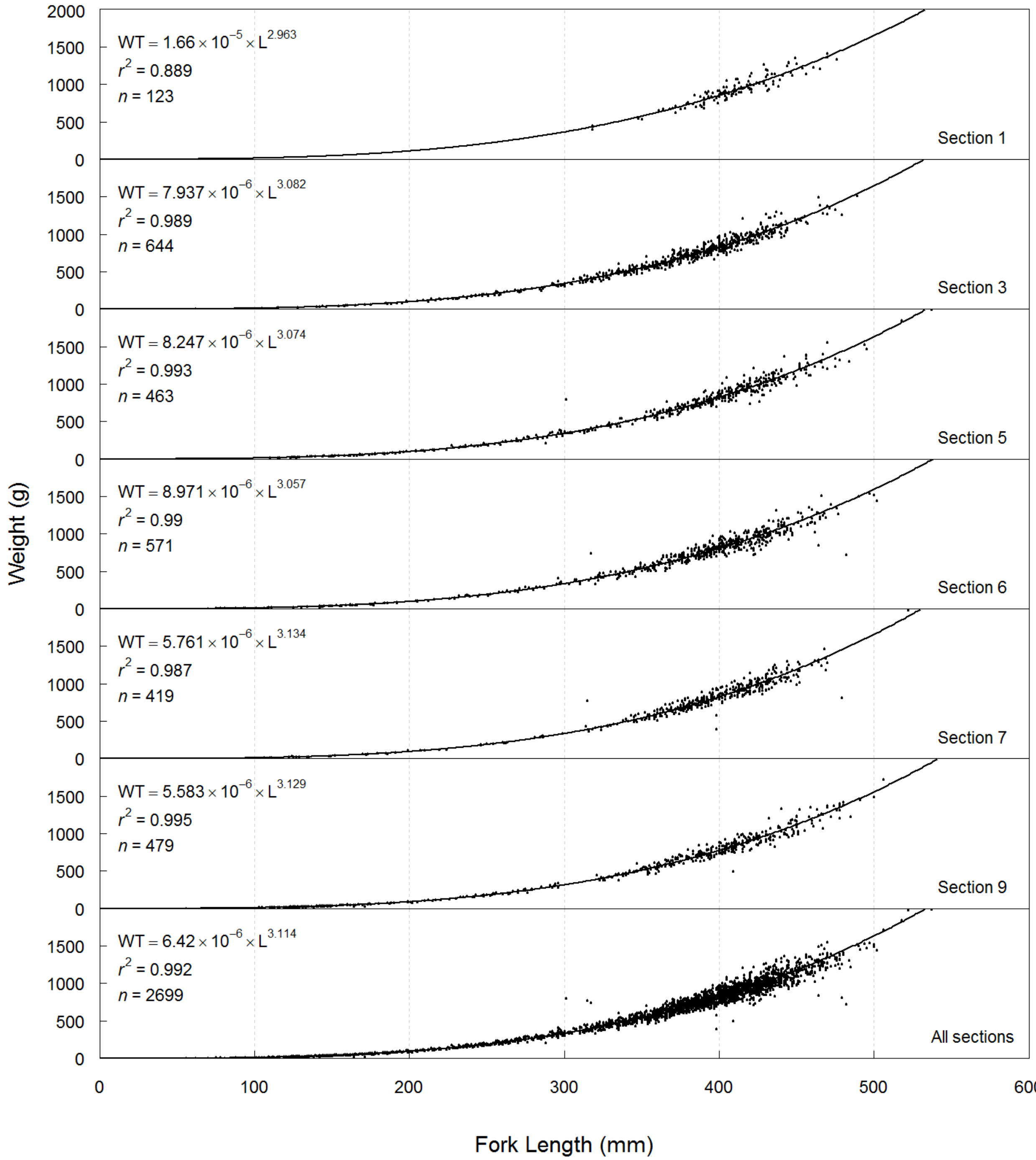


Figure 30: Length-weight regressions for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

3.8.2 Abundance and Spatial Distribution

In 2016, Longnose Sucker were more abundant in Sections 5, 6, and 7 and comparatively less abundant in Sections 1, 3, and 9 (Table 14). This result is similar to 2015 estimates (Golder and Gazey 2016). Abundance estimates for 2015 and 2016 were similar, with confidence intervals overlapping for each section (Figure 31). Population abundance estimates were not available for earlier study years because Longnose Sucker were not tagged prior to 2015.

Table 14: Population abundance estimates generated using the Bayes sequential model for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2016.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			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

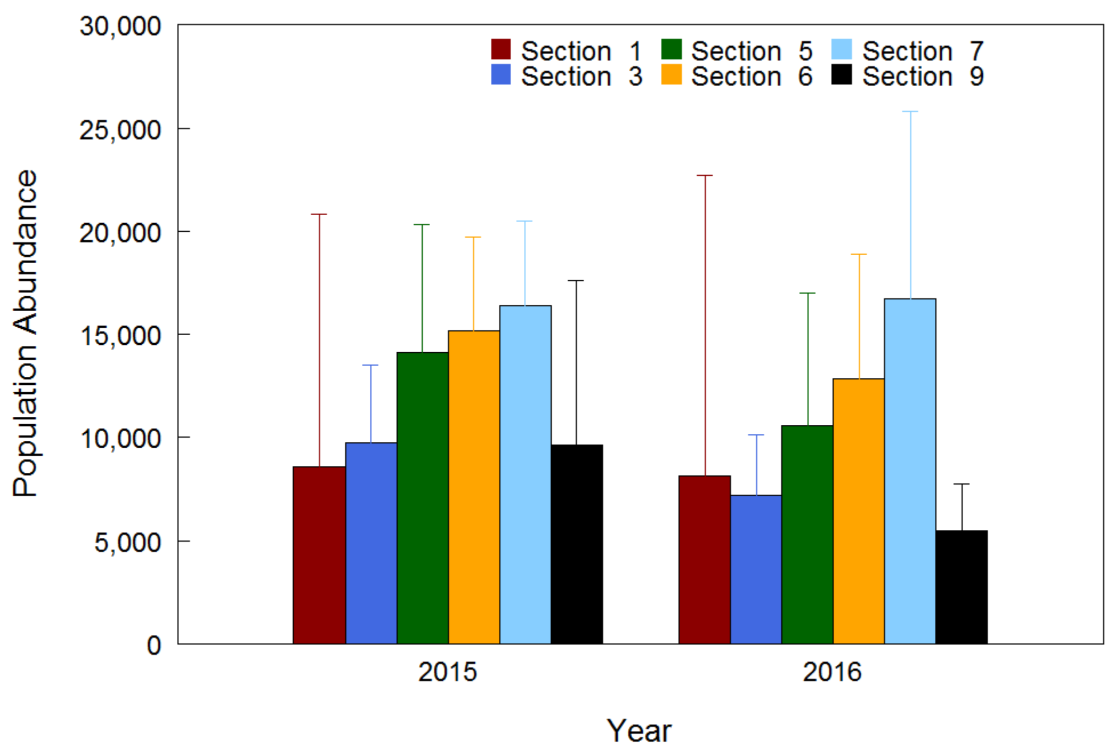


Figure 31: Population abundance estimates (with 95% confidence intervals) generated using the Bayes sequential model for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2015–2016.

3.9 Mountain Whitefish

3.9.1 Biological Characteristics

During the 2016 survey, 9882 Mountain Whitefish were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Fork lengths ranged between 32 and 501 mm FL, and weights ranged between 1 and 1609 g. A total of 928 scale and otolith samples were analyzed; ages ranged between age-0 and age-12 (Table 15).

Table 15: Average fork length, weight, and body condition by age for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

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	82 ± 5	75 - 91	9	6 ± 2	4 - 9	6	1.0 ± 0.2	0.8 - 1.2	6
1	161 ± 14	137 - 201	80	43 ± 10	24 - 75	77	1.0 ± 0.1	0.8 - 1.3	77
2	228 ± 22	177 - 282	139	131 ± 41	58 - 263	129	1.1 ± 0.1	0.8 - 1.3	129
3	267 ± 20	215 - 330	120	217 ± 49	108 - 380	107	1.1 ± 0.1	0.9 - 1.5	107
4	303 ± 26	244 - 364	127	308 ± 72	166 - 482	106	1.1 ± 0.1	0.9 - 1.4	106
5	332 ± 30	260 - 422	186	412 ± 109	209 - 846	158	1.1 ± 0.1	0.9 - 1.5	158
6	339 ± 31	275 - 441	157	439 ± 114	260 - 968	138	1.1 ± 0.1	0.8 - 1.5	138
7	365 ± 38	302 - 465	71	534 ± 180	333 - 1331	59	1.1 ± 0.1	0.9 - 1.3	59
8	368 ± 41	303 - 452	27	519 ± 135	334 - 876	22	1.1 ± 0.1	0.9 - 1.3	22
9	395 ± 38	311 - 455	9	652 ± 150	386 - 865	7	1.1 ± 0.1	0.9 - 1.3	7
10	449 ± 18	436 - 462	2	1175 ± 91	1111 - 1239	2	1.3 ± 0.1	1.3 - 1.3	2
12	485 ± 0	485 - 485	1	0 ± 0	-	0	0 ± 0	-	0

[a] Number of individuals sampled.

For Mountain Whitefish, four modes were evident in the 2016 length-frequency histograms (Figure 32), corresponding to the age-0, age-1, age-2, and age-3 and older cohorts. Based on these data, 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 (Figure 33). Section 5 had the greatest percentage of age-0 Mountain Whitefish, based on the length-frequency in 2016, whereas Section 1 had the lowest percentage (Figure 32). There was a greater percentage of age-1 fish captured in 2014, 2015, and 2016 than in previous study years based on length-frequency histograms (Appendix F, Figures F13 and F14).

There was a small percentage of age-0 Mountain Whitefish in the catch in 2016 (Figure 34), which was consistent with previous study years (Appendix F, Figures F15 and F16). Age-0 Mountain Whitefish are too small to fully recruit to the boat electroshocker (Mainstream and Gazey 2014; Golder and Poisson 2014; ONA et al. 2014). Larger catches of age-1 Mountain Whitefish in in Sections 1, 3, and 5 in 2014, 2015, and 2016 relative to other years (Appendix F, Figures F15 and F16) suggests strong recruitment in 2013, 2014, and 2015 compared to most previous years. Alternatively, greater catch of age-0 and age-1 Mountain Whitefish in 2014, 2015, and 2016 in Sections 1, 3, and 5 may be at least partially explained by the different electroshocker settings that were used in those years (see Section 2.1.4).

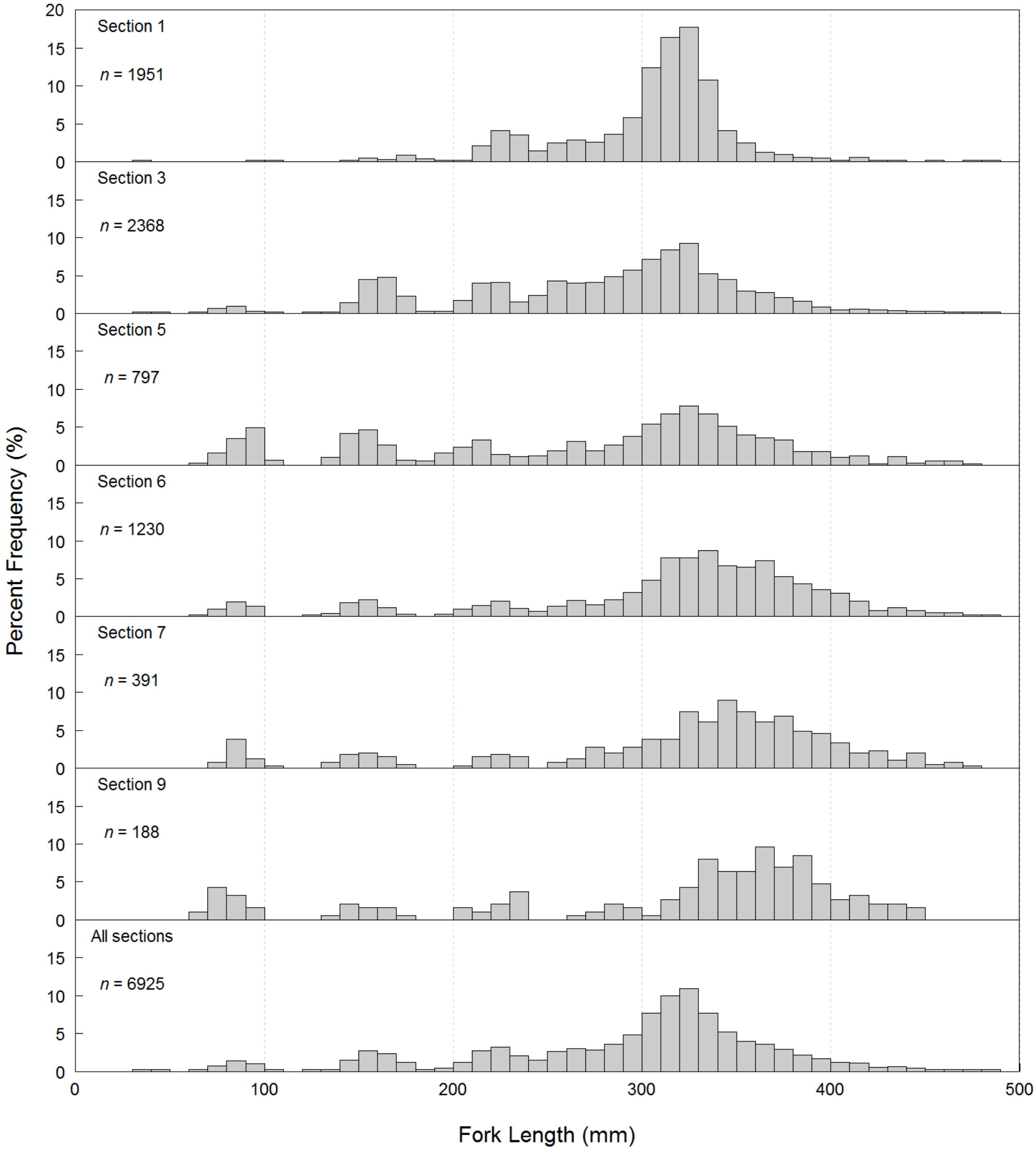


Figure 32: Length-frequency distributions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

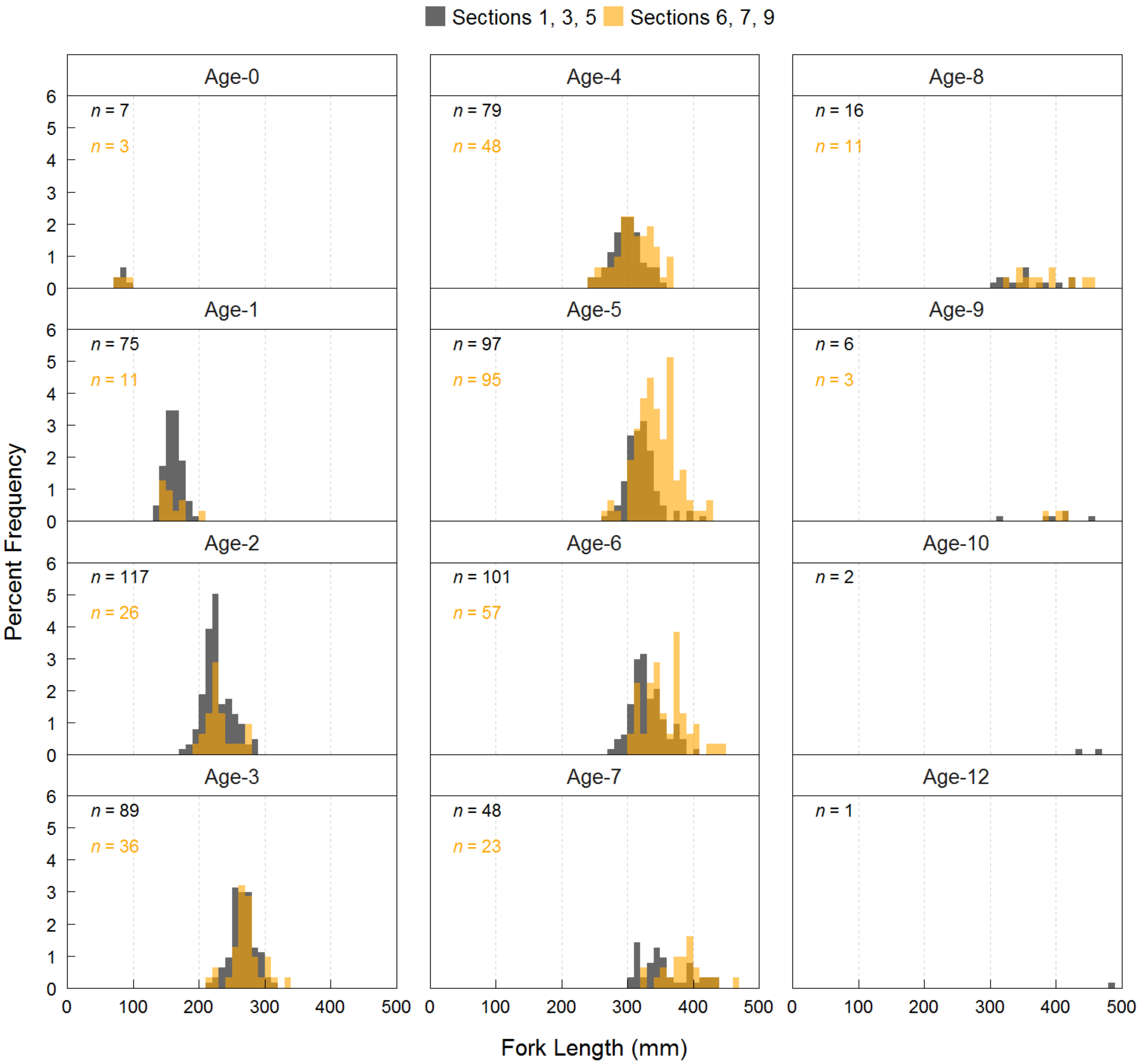


Figure 33: Length-at-age frequency distributions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

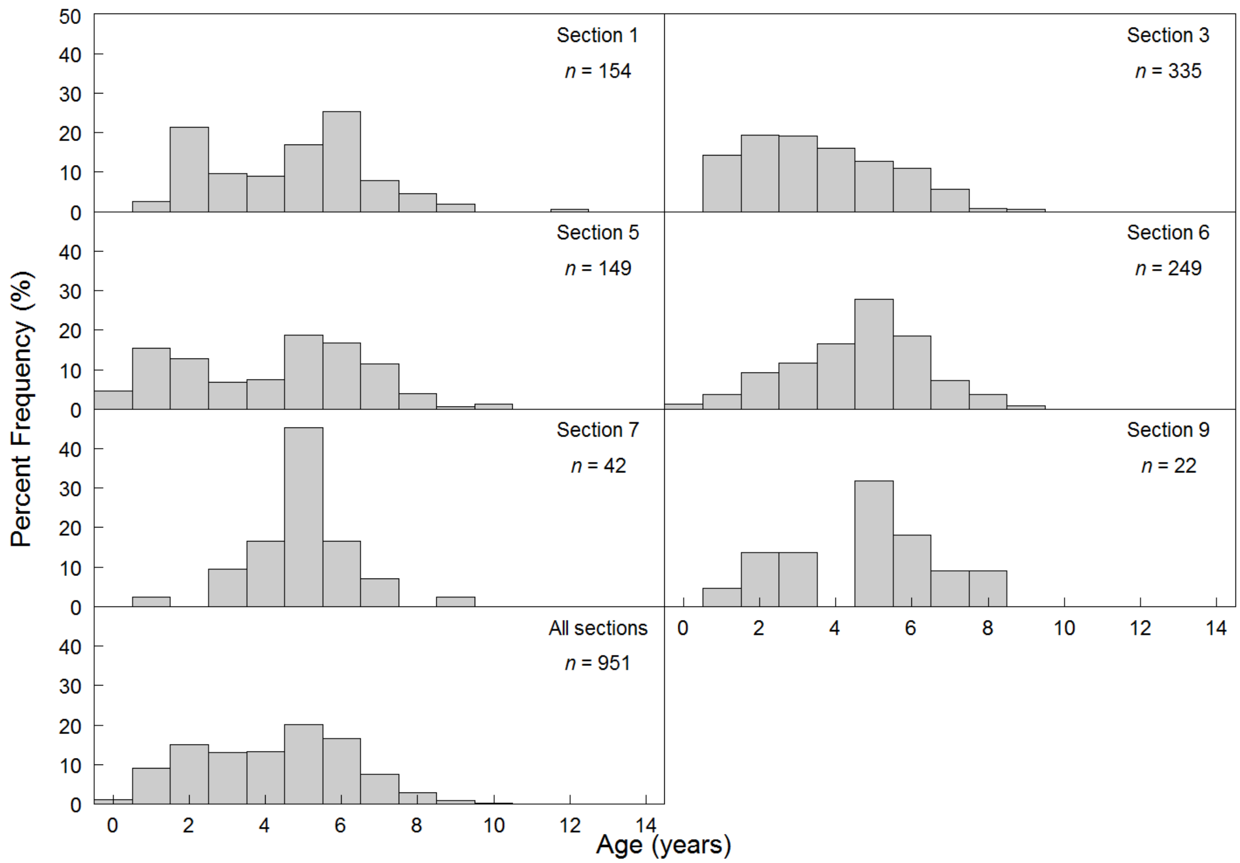


Figure 34: Age-frequency distributions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

The annual growth of Mountain Whitefish in the study area, as assessed using the von Bertalanffy growth curve, was similar among most sections (Figure 35), with Section 1 exhibiting a suppressed growth curve relative to the other sections. The anomalous result in Section 1 is likely due to the low number of young (age-0 and age-1) and old (age-12) fish included in the model. Similar to 2015, the growth curve in 2016 suggests faster growth of juvenile Mountain Whitefish when compared to other study years; however, annual differences in growth rate and asymptotic size were small and did not indicate substantial differences in growth between years (Figure 36). Mountain Whitefish in the study area exhibit rapid growth until approximately age-3; thereafter, growth slows considerably (Figure 35 and Figure 36).

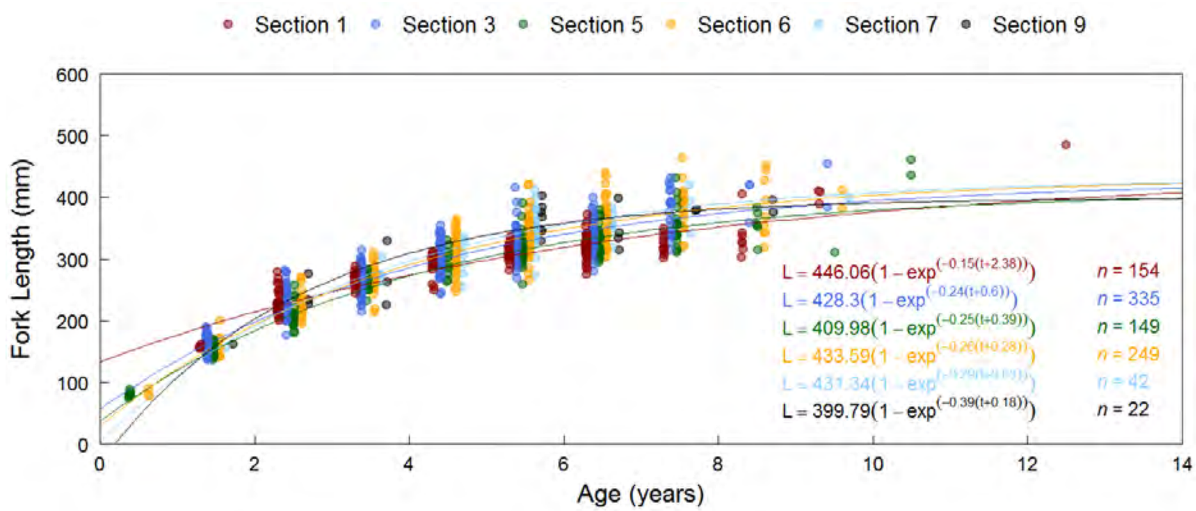


Figure 35: von Bertalanffy growth curve for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

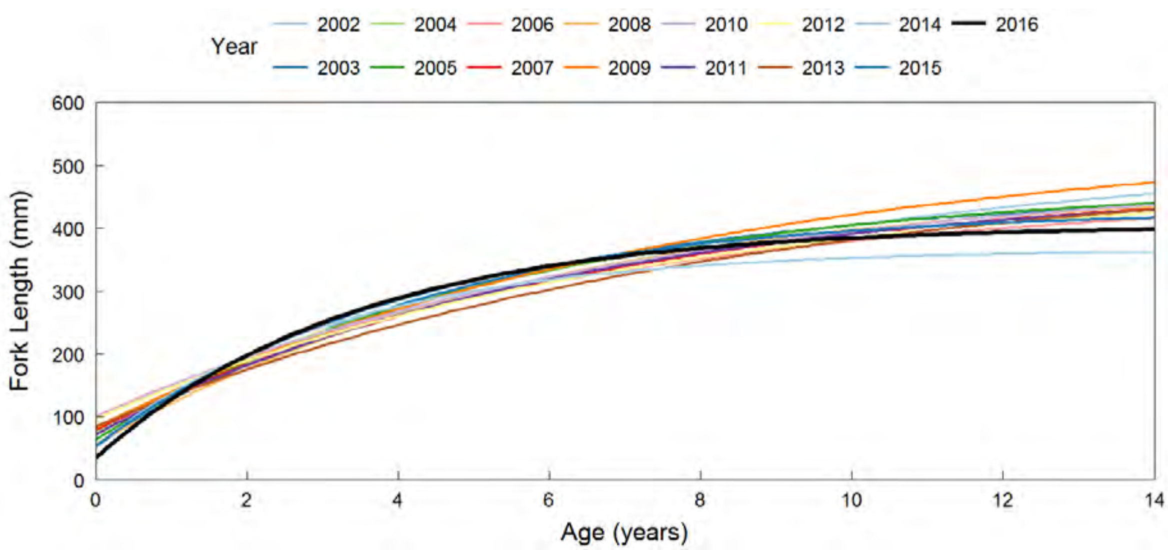


Figure 36: von Bertalanffy growth curve for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

The average change in length-at-age analysis for Mountain Whitefish (Figure 37) 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 between the 2014-2016 and the 2013 estimates, with a difference of approximately 10 to 20 mm in length-at-age, depending on age group, relative to the 14-year average. A similar increase in length-at-age was also noted for Arctic Grayling for several age-classes (Figure 10). Both Mountain Whitefish and Arctic Grayling are largely insectivores that feed on drifting prey and on invertebrates on the stream bottom; therefore, the increase in length-at-age identified for both species could be related to increased food availability from 2014 to 2016.

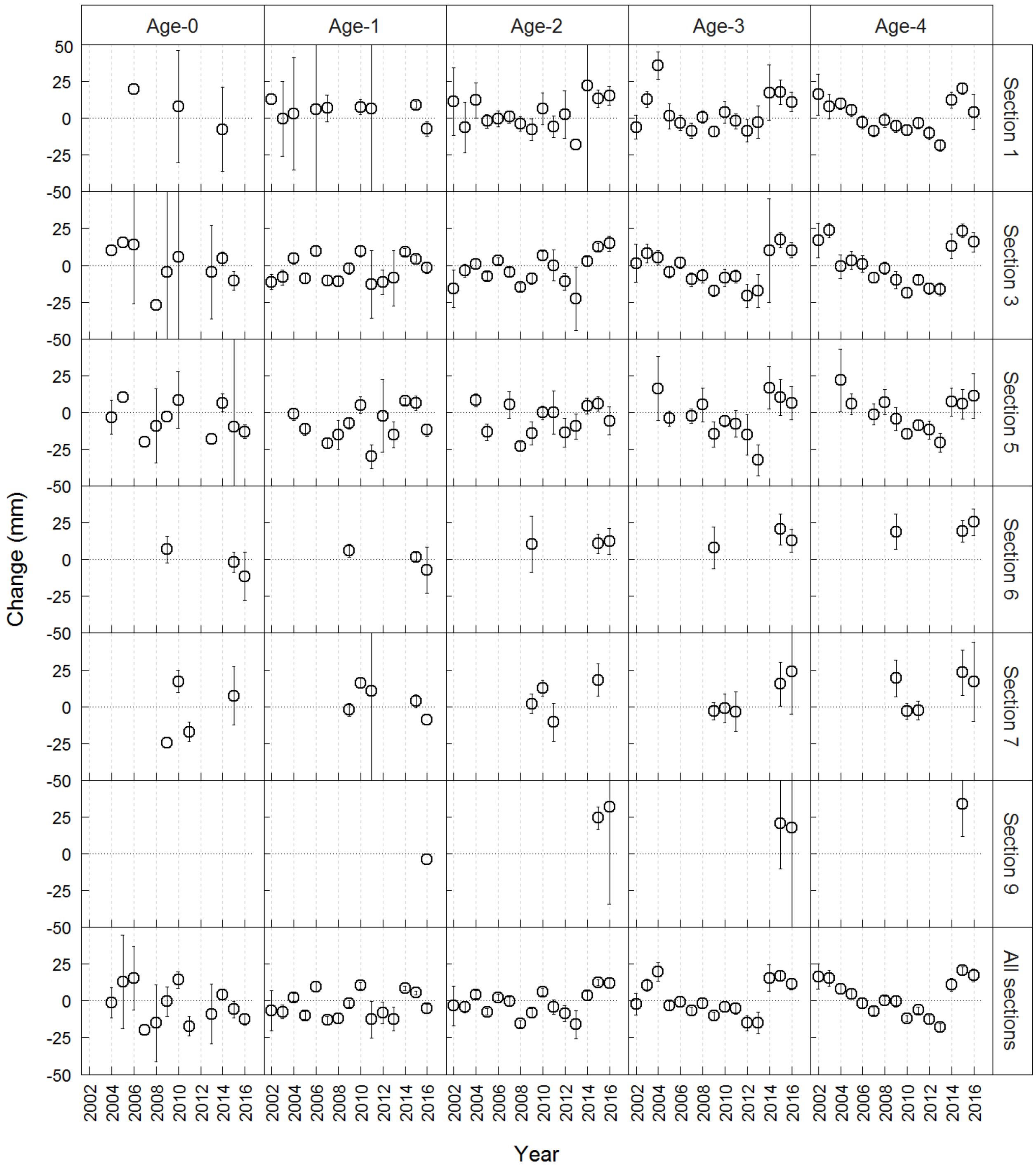


Figure 37: Change in mean length-at-age for Mountain Whitefish captured by boat electroshocking during the Peace River Fish Index, 2002 to 2016. Change is defined as the difference between the annual estimate and the estimate of all years and sections combined. Error bars represent 95% confidence intervals. 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 (2010a, 2011a, 2013a).

Mean body condition (*K*) of Mountain Whitefish was greater in Section 1 than other sections in most study years (Figure 38). Overall, mean body condition was similar from 2002 to 2010, lower from 2011 to 2013, higher in 2014 and 2015, and lower in 2016. Mean body condition in 2016 was similar to body condition values recorded from 2002 to 2010. During most study years, body condition values were highest in Section 1. Mountain Whitefish body condition was more variable among years than the body condition of Arctic Grayling (Figure 12) or Bull Trout (Figure 18).

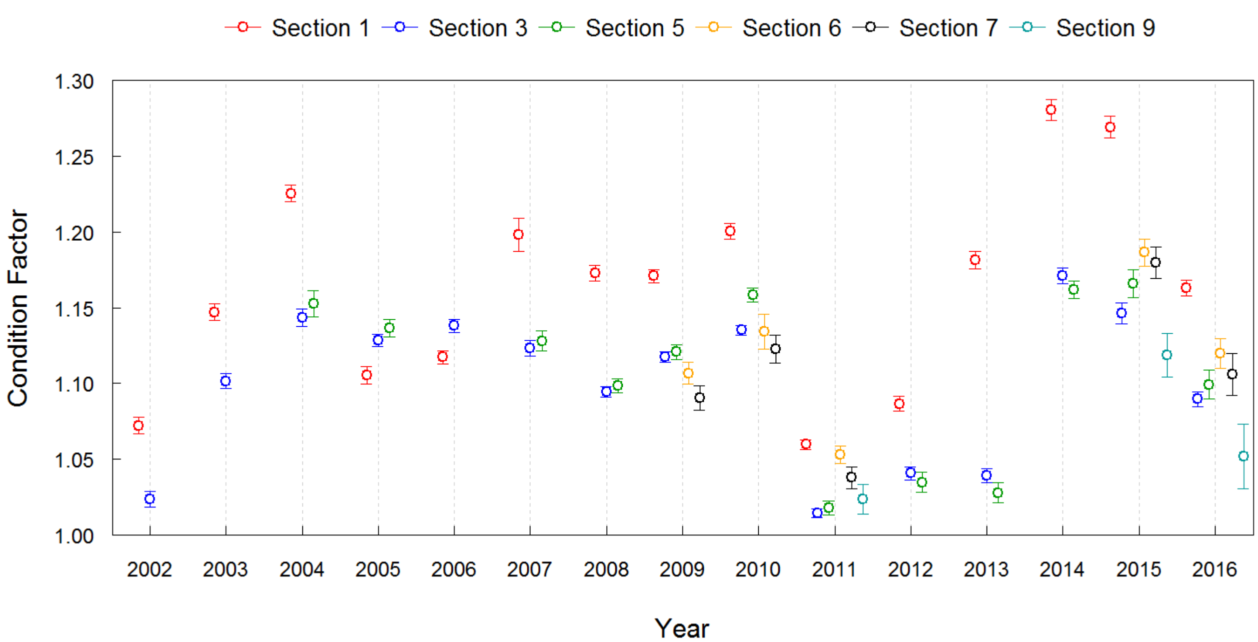


Figure 38: Mean body condition with 95% confidence intervals for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. For Sections 6, 7, and 9, the analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010a, 2011a, 2013a).

Length-weight regression equations for Mountain Whitefish were similar among all sections (Figure 39) in 2016 and among all study years for the sections combined (Appendix F, Figure F17).

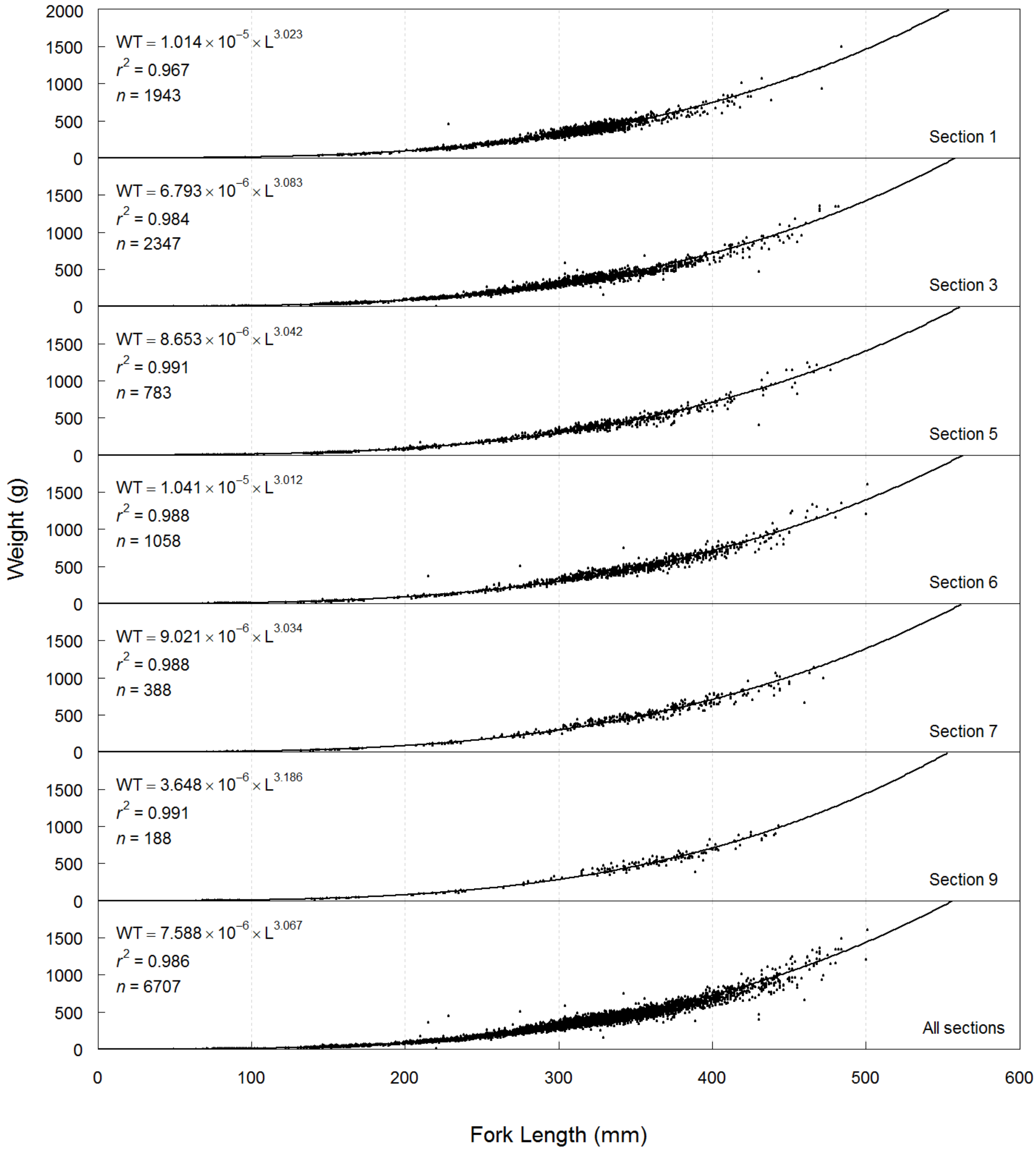


Figure 39: Length-weight regressions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

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; recapture data from T-bar tagged fish were not included.

Comparison of length distributions between initially captured and recaptured Mountain Whitefish disclosed some difference, but not statistically significant differences, for fish greater than 250 mm FL. Consistent with past studies, 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. There was not sufficient power to detect a significant difference in the length of unmarked fish relative to recaptured marked fish.

Growth (i.e., the increment in length of recaptured fish as a function of time-at-large) was not statistically significant; 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 3.6 mm for each measurement).

Mountain Whitefish exhibited some movement between sections in 2016. Overall, 6% of fish moved between sections. In general, fish exhibited high site fidelity within sections between release and recapture. The CJS analysis revealed no apparent mortality (i.e., survival was not significantly different than 1.0) of tagged Mountain Whitefish during the 2016 study.

The test for time-varying catchability using AD Model Builder models resulted in a better fit for time-varying catchability in Sections 1 and 3, while constant catchability fit better in all other sections. The population estimates were similar for Sections 1 and 3 regardless of the model (within 20%). The logarithmic population deviation estimates displayed little trend over time except for Section 6 that 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 with the exception of Section 6.

Table 15 presents a summary of the 2016 Mountain Whitefish population abundance estimates for the Bayes sequential model. Bar plots of the population estimates for the 2002 to 2016 studies for Sections 1, 3 and 5 are provided in Figure 40, and are provided for 2015 and 2016 for Sections 6, 7, and 9 in Figure 41. Population estimates from previous studies (prior to 2016) 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 2016 population estimates is discussed in Section 4.3.2.

Overall, population abundance estimates for Mountain Whitefish in 2016 were similar to 2015 estimates for Sections 3, 5, 6, 7, and 9, but were higher in Section 1 (Figure 40 and Figure 41). Mountain Whitefish abundance in Section 1 was higher than other sections during most study years between 2002 and 2016 (Figure 40).

Table 16: Population abundance estimates generated using the Bayes sequential model for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2016.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			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

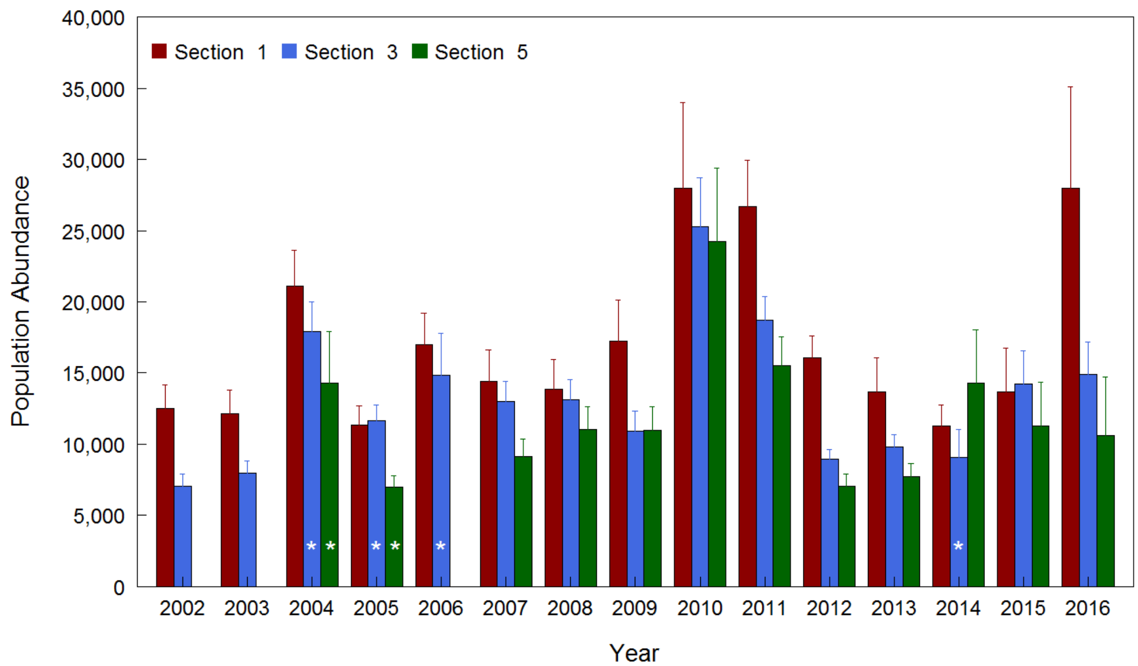


Figure 40: Population abundance estimates (with 95% confidence intervals) generated using the Bayes sequential model for Mountain Whitefish captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002-2016. Stars denote suspect estimates due to assumption violations.

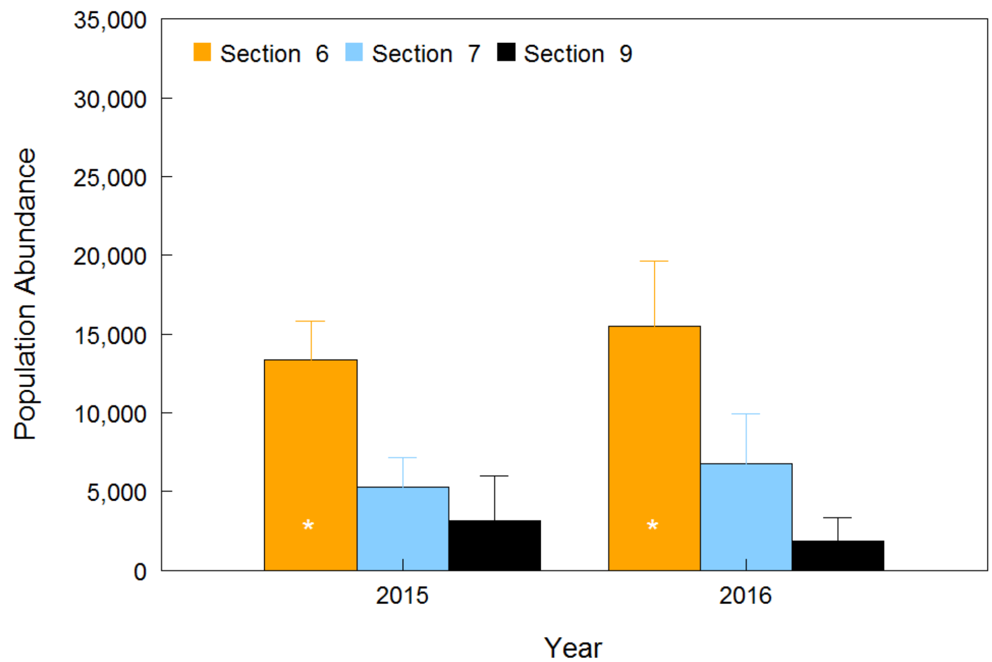


Figure 41: Population abundance estimates (with 95% confidence intervals) generated using the Bayes sequential model for Mountain Whitefish captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2015-2016. Stars denote suspect estimates due to assumption violations.

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. An exception was that across-year recaptures were underestimated for Section 5 for session-year observations greater than 25 recaptures. Table 17 presents the parameter estimates, absent capture probabilities, and Figure 42 compares synthesis model and Bayes sequential model estimates by section and year. Predicted mean length at age-10 and survival of marked fish had consistent trends by section and with each other. The 2014–2016 selectivity epoch was substantially flatter (higher preference for small fish and lower preference for large fish) than the 2002-2013 epoch (Appendix H, Figure H11). Recruitment estimates were not precise and exhibited large variation among study years.

Table 17: Synthesis model parameter estimates and associated standard errors.

Parameter	Year	Section 1		Section 3		Section 5	
		Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Nuisance length-at-age							
Length age-10 (mm)		322.0	4.1	328.5	3.2	364.0	7.2
Growth coefficient		0.4	0.0	0.4	0.0	0.3	0.0
Individual length SD (mm)		24.4	0.7	25.3	0.6	33.4	1.3
Growth							
Length age-0 (mm)		96.5	2.5	94.6	1.1	94.4	1.2
Growth coefficient		0.2	0.0	0.1	0.0	0.1	0.0
Individual length SD (mm)		28.5	0.7	56.2	1.7	47.2	4.0
Length age-10 (mm)	2003	290.5	2.4	279.7	3.1		
	2004	308.6	1.8	329.9	3.1		
	2005	280.2	1.8	284.7	2.7	308.6	6.0
	2006	291.7	1.9	323.8	3.1		
	2007	288.2	1.9	295.0	2.7	338.1	6.7
	2008	303.2	2.0	289.9	2.5	319.1	6.8
	2009	289.8	2.0	283.1	2.8	320.8	4.7
	2010	305.1	2.1	292.6	2.5	317.2	5.0
	2011	285.1	1.7	265.5	2.4	287.1	6.0
	2012	276.0	1.7	252.9	2.4	271.5	5.8
	2013	283.6	2.0	255.0	2.5	276.8	5.6
	2014	331.4	2.1	315.1	3.1	325.3	5.2
	2015	324.2	2.3	308.7	2.9	317.4	5.0
	2016	311.6	2.3	292.2	2.7	308.9	7.5
Selectivity							
Mid length bin (10 mm increments)	2002-13	29.5	0.36	30.7	0.32	33.5	0.79
	2014-16	34.3	1.23	100.0	0.02	100.0	0.14
Slope	2002-13	1.8	0.05	2.7	0.06	3.5	0.23
	2014-16	3.4	0.41	13.4	1.26	14.8	2.29
Asymptotic Survival (logit)							
	2002-04	-1.122	0.045	-1.322	0.031		
	2005-07	-0.923	0.057	-1.443	0.054	-0.947	0.052
	2008-10	-1.370	0.093	-1.305	0.059	-2.075	0.158
	2011-13	0.064	0.085	-0.568	0.068	-0.355	0.117
	2014-15			-2.051	0.368	-1.494	0.509
Recruitment ($\log_e$)							
	2002	12.04	0.17	11.74	0.12		
	2003	12.09	0.51	14.33	0.15		
	2004	13.97	0.31	10.94	0.66	12.88	0.25
	2005	14.01	0.33	14.27	0.14	14.23	0.38
	2006	12.51	0.63	11.47	0.81	12.62	0.89
	2007	12.63	0.63	10.80	0.60	10.69	0.62
	2008	13.31	0.36	10.72	0.58	10.19	0.50
	2009	11.91	0.58	10.74	0.60	9.97	0.53
	2010	11.83	0.57	11.80	0.79	10.37	0.55
	2011	12.36	0.67	12.27	0.67	10.61	0.63
	2012	12.88	0.63	11.41	0.62	11.89	0.38
	2013	13.04	0.46	10.14	0.50	10.26	0.55
	2014	11.48	0.53	9.88	0.39	9.89	0.48
	2015	11.91	0.60	8.70	0.40	10.05	0.44
	2016	12.15	0.68	9.04	0.42	10.01	0.44
Miscellaneous							
Capture probability coefficient		0.0354	0.0100	0.0256	0.0112	0.0663	0.0179
Negative binomial dispersion coefficient		1.73	0.11	2.53	0.15	2.91	0.21

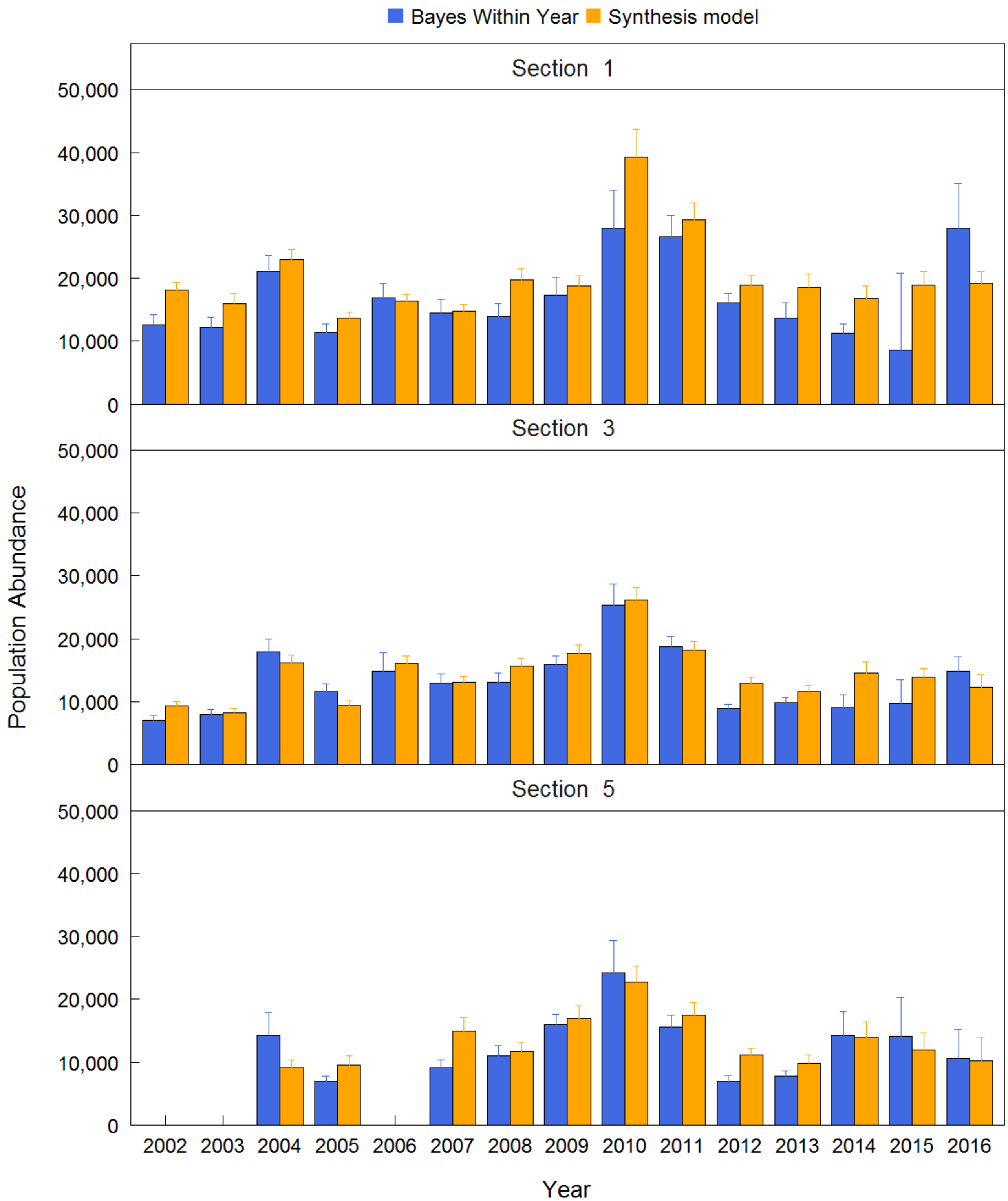


Figure 42: Comparison of Mountain Whitefish population abundance estimates based on the synthesis model and the Bayes sequential model by section and year. Bayesian error bars are the 95% highest probability density interval and the synthesis model error bars are ±2 standard errors.

3.10 Northern Pike

3.10.1 Biological Characteristics

During the 2016 survey, 16 Northern Pike were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Fork lengths ranged between 248 and 800 mm FL, weights ranged between 104 and 2210 g, and condition (K) ranged between 0.6 and 0.7. Ageing structures were collected from all captured Northern Pike and analyzed; however, assigned ages varied widely between analysts and were considered unreliable. Thus, ageing results are not presented.

There were too few Northern Pike to assess year-class strength based on length-frequency (Figure 43). The limited length data indicated that both juvenile and adult Northern Pike were present in Sections 5, 6, 7, and 9. Northern Pike were not captured in Sections 1 or 3 in 2016, but they have been recorded in these sections during previous study years (Attachment A).

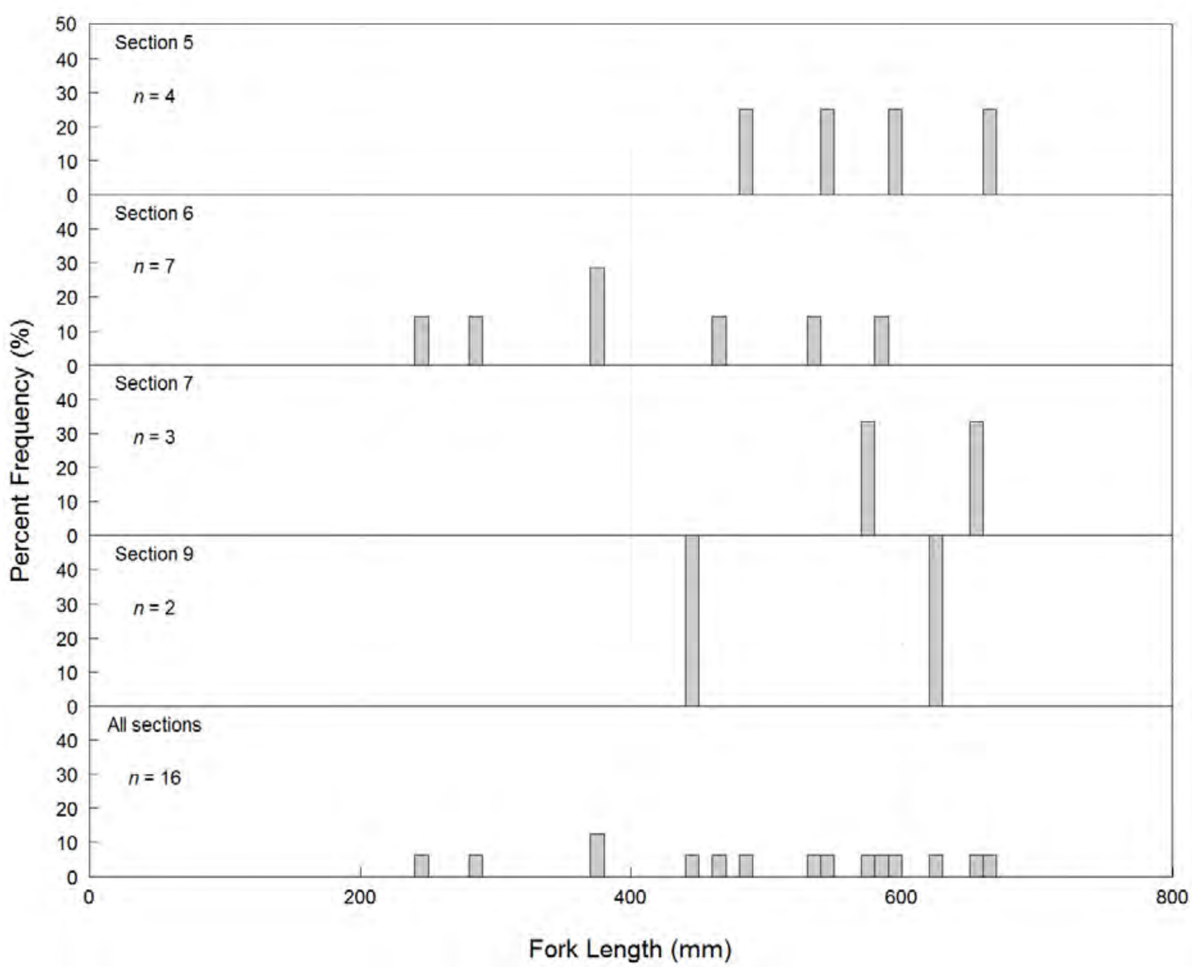


Figure 43: Length-frequency distributions for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

Length-weight relationships for Northern Pike in 2016 are shown in Figure 44. Although based on a small sample size, the mean body condition of Northern Pike in 2016 ranged between 0.6 and 0.7 for all size-classes and sections (Figure 45).

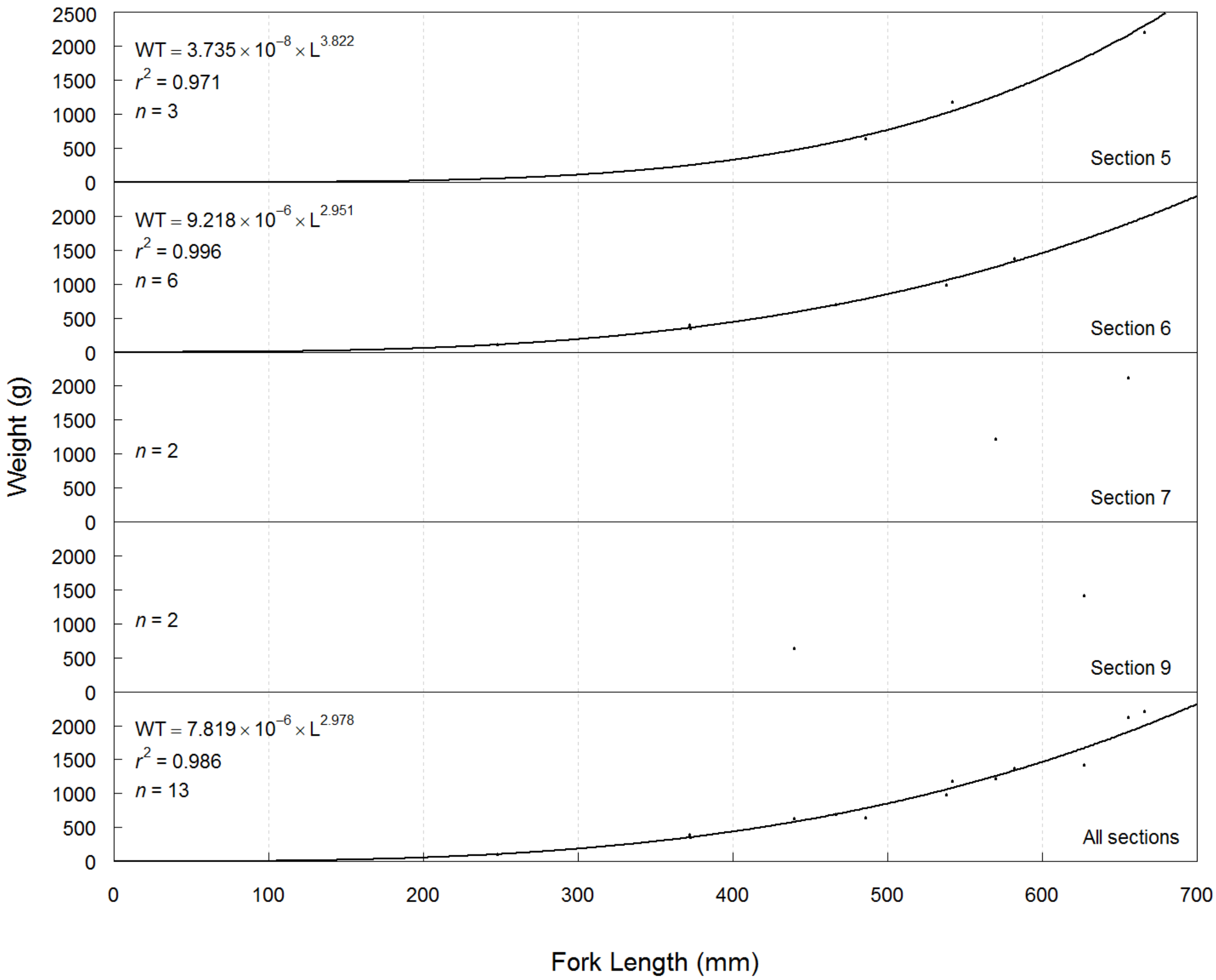


Figure 44: Length-weight regressions for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016

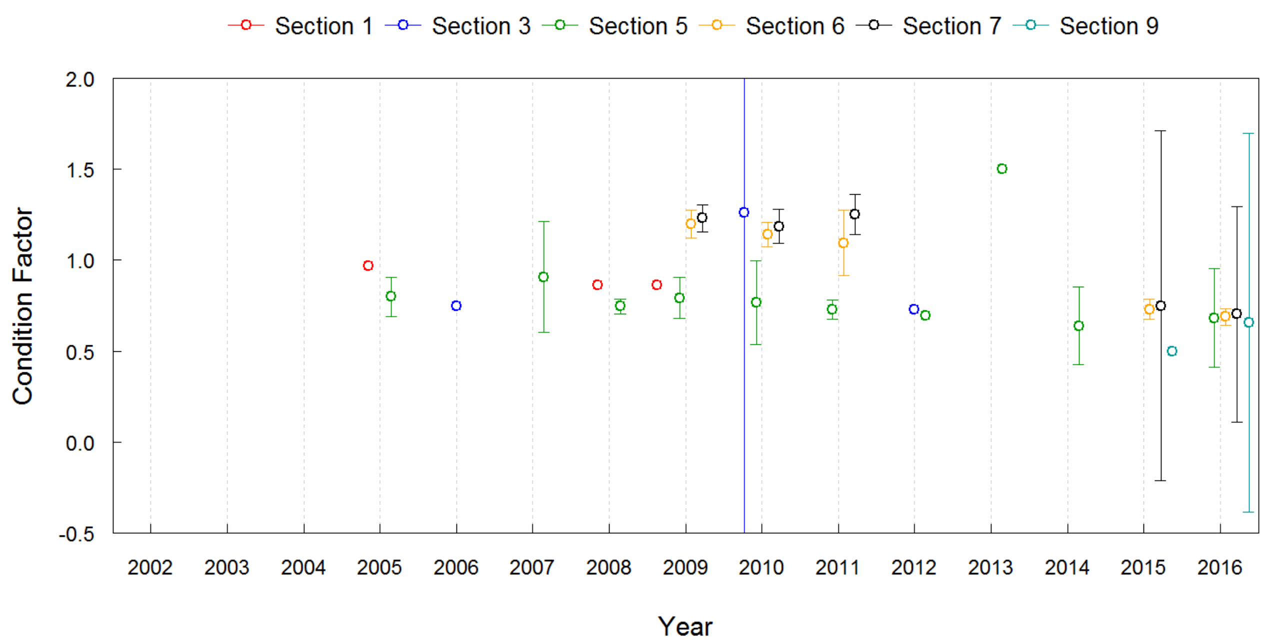


Figure 45: Mean body condition with 95% confidence intervals (CIs) for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. For Sections 6, 7, and 9, analysis was supplemented with data collected during boat electroshocking surveys conducted during the late summer to fall period of 2009, 2010, and 2011 by Mainstream (2010a, 2011a, 2013a). The 95% CI of Section 3 values in 2010 extends from -1.14 to 3.66.

3.10.1 Abundance and Spatial Distribution

In Sections 1, 3, and 5, which are the sections where sampling was conducted during historical years of the survey (2002-2014), the number of Northern Pike captured each year ranged from 0 to 11, with the greatest number recorded in 2011 (*n* = 11). Northern Pike were not recorded in Sections 1 and 3 in 2016 and only four were recorded in Section 5 in 2016 (Table 8). In Sections 6, 7, and 9, which were only sampled as part of this sampling program in 2015 and 2016, 13 Northern Pike were captured in 2015 and 12 were captured in 2016 (Appendix E, Table E2). Higher captures in Sections 6, 7, and 9 relative to Sections 1, 3, and 5 suggests a preference for the downstream portions of the study area for this species. The sparse catch data for Northern Pike between 2002 and 2016 do not suggest any substantial changes or trends over time.

All 16 of the Northern Pike captured during the 2016 survey were implanted with PIT tags; none of them were recaptured.

3.11 Rainbow Trout

3.11.1 Biological Characteristics

During the 2016 survey, 186 Rainbow Trout were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Fork lengths ranged between 129 and 474 mm and weights ranged between 22 and 1193 g (Table 18). Ages were assigned to 159 Rainbow Trout based on scale analyses. Ages ranged from age-2 to age-6.

Table 18: Average fork length, weight, and body condition by age for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

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	209 ± 36	132 - 273	65	111 ± 52	24 - 232	65	1.1 ± 0.1	0.9 - 1.3	65
3	310 ± 48	202 - 399	62	372 ± 145	88 - 660	62	1.2 ± 0.1	1 - 1.4	62
4	364 ± 29	282 - 396	25	557 ± 125	224 - 721	25	1.1 ± 0.1	0.9 - 1.4	25
5	381 ± 27	343 - 407	6	648 ± 105	492 - 766	6	1.2 ± 0.1	1.1 - 1.3	6
6	372	-	1	601	-	1	1.2	-	1

[a] Number of individuals sampled.

Most of the Rainbow Trout captured were between 150 and 400 mm FL (Figure 46). The length-frequency histograms did not suggest any difference in length distributions between section although sample sizes within each section were small (Figure 46). Age-2 and age-3 Rainbow Trout were the most common in all sections combined (Figure 47). Age-0 and age-1 Rainbow Trout were not captured in 2016, which may be because these age-classes remain in spawning tributaries and had not yet migrated into the Peace River mainstem at the time of sampling. Alternatively, if they were present, they were not effectively sampled by the boat electroshocker due to their small size.

Growth curves estimated using the von Bertalanffy method suggested that the oldest age-classes captured had not yet reached their asymptotic length (Figure 48). Growth curves did not suggest any large differences in growth rates or body size among sections (Figure 48) or years (Figure 49). Mean body condition was similar among all years and sections, with overlapping confidence intervals for most estimates (Figure 50). A lower body condition estimate for Section 7 in 2016 is likely the result of the small sample size (n = 3). Length-weight regressions are provided in Figure 51.

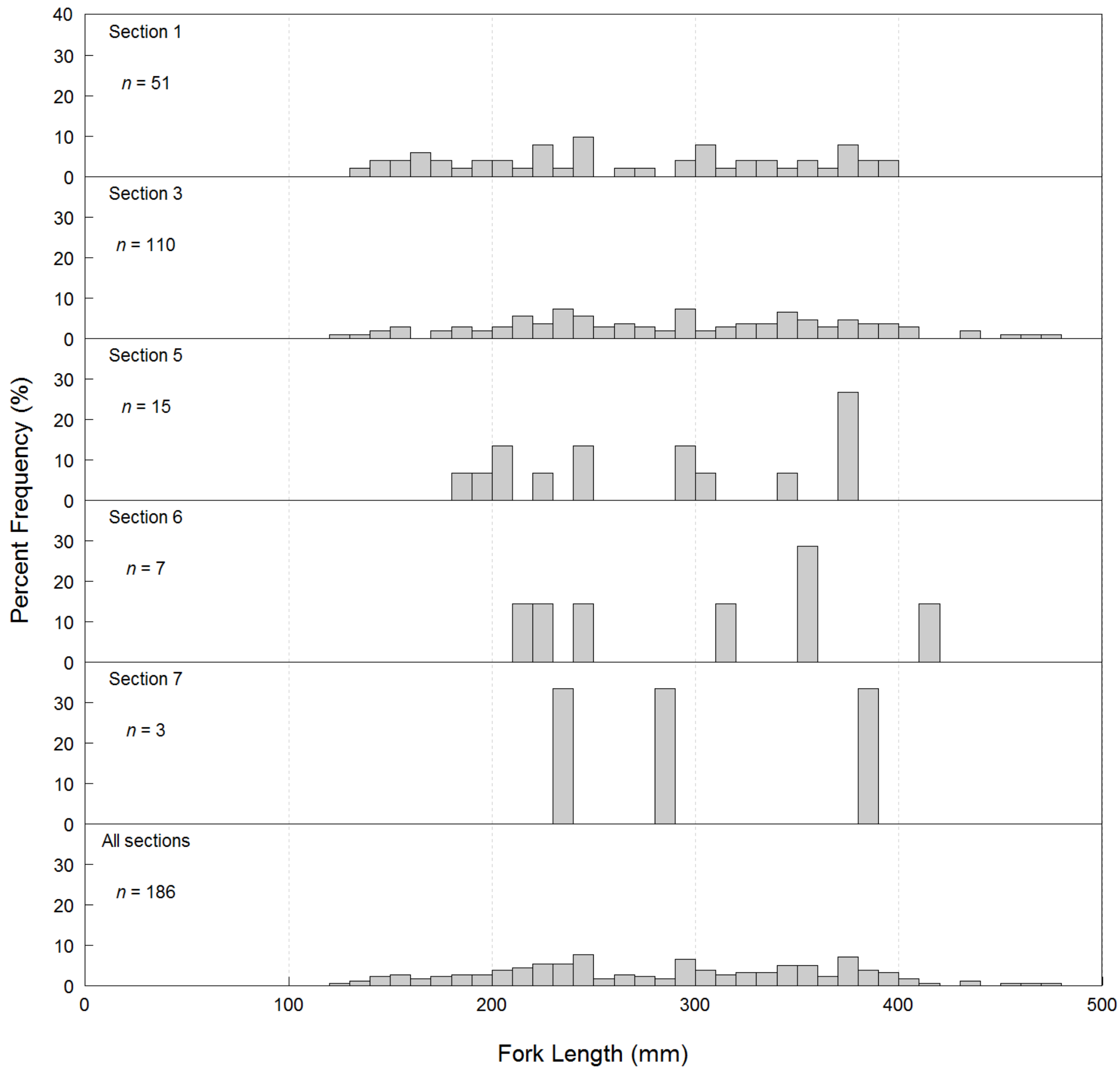


Figure 46: Length-frequency distributions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

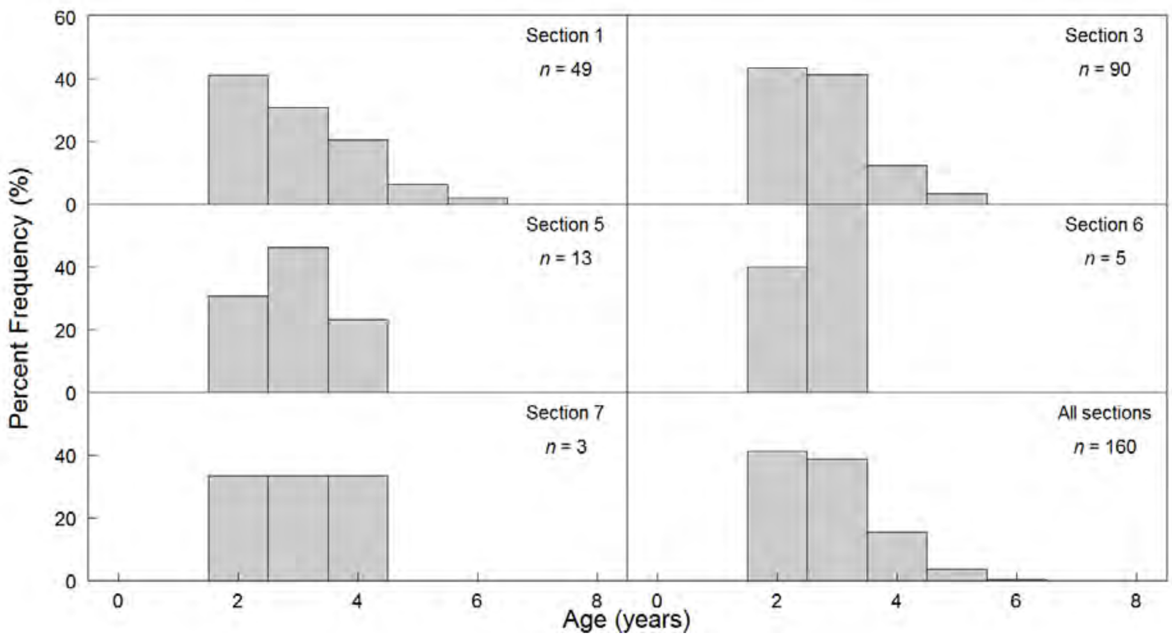


Figure 47: Age-frequency distributions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

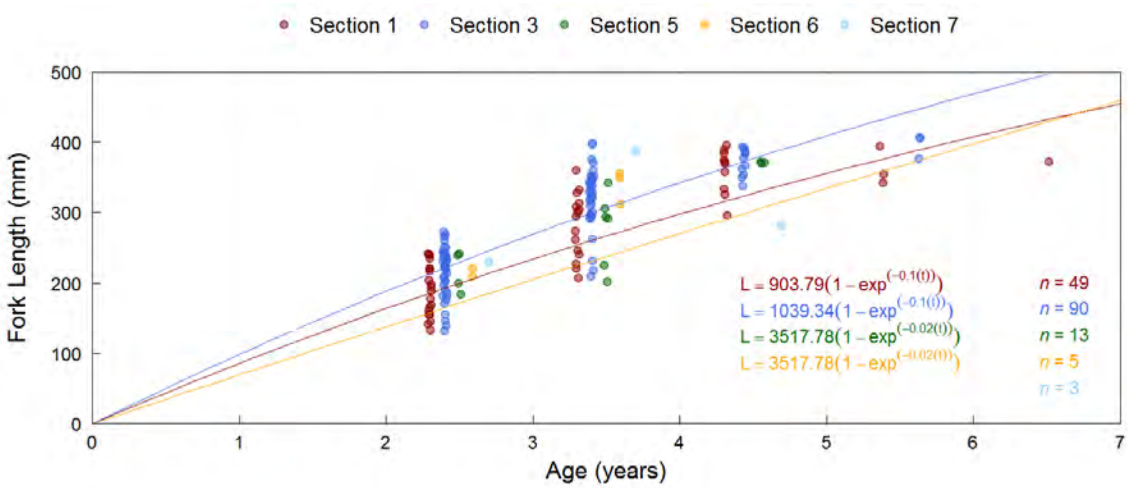


Figure 48: von Bertalanffy growth curve for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

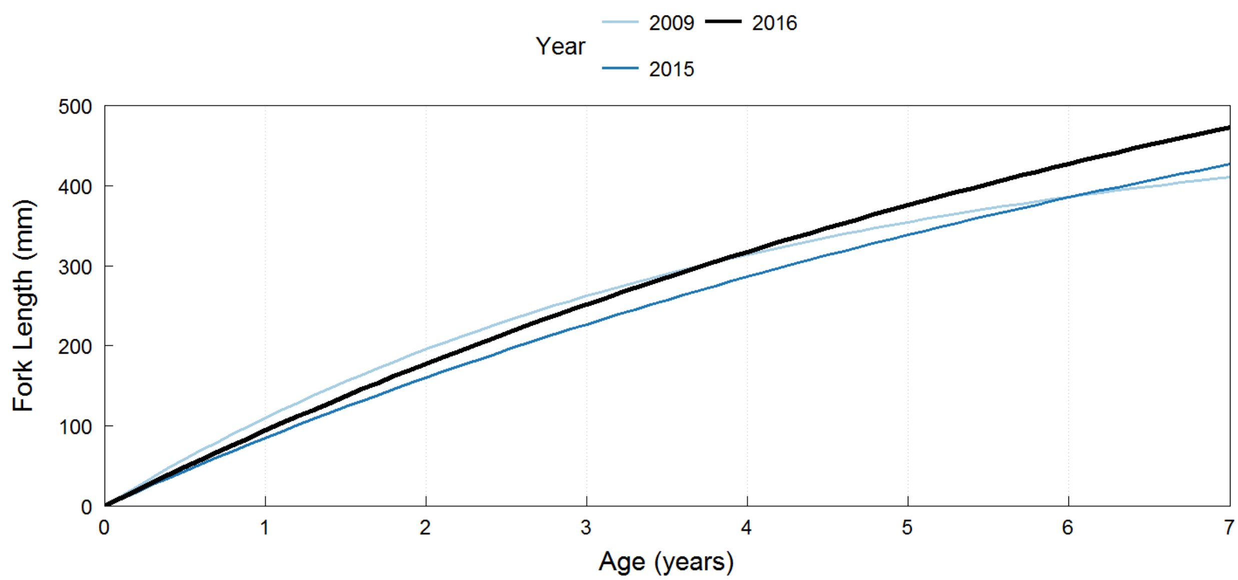


Figure 49: von Bertalanffy growth curve for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

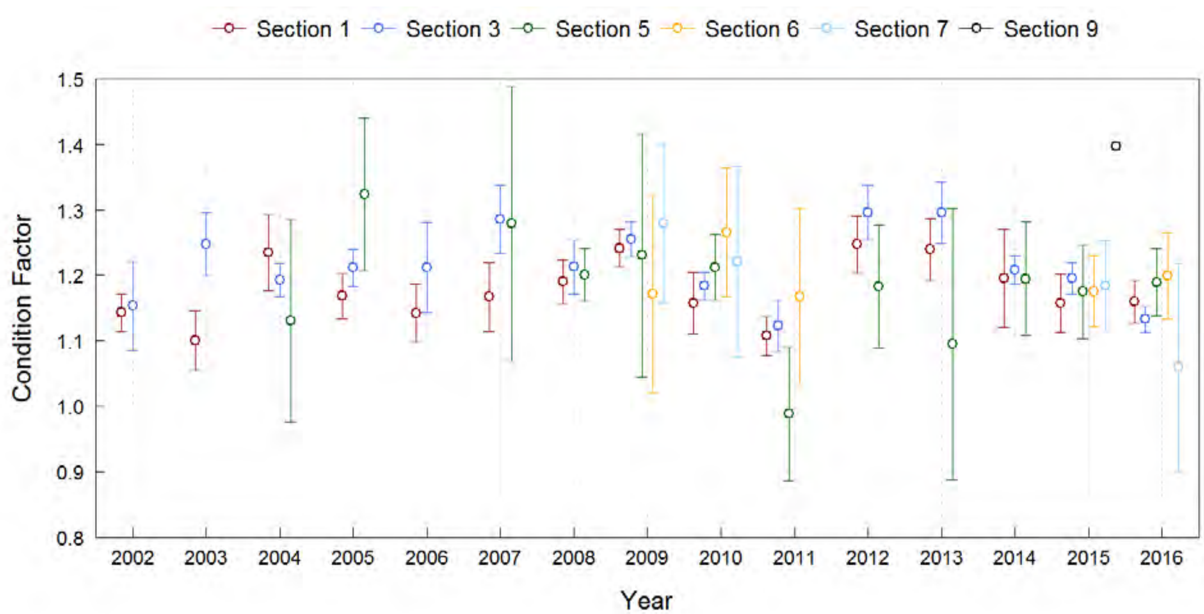


Figure 50: Mean body condition with 95% confidence intervals for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

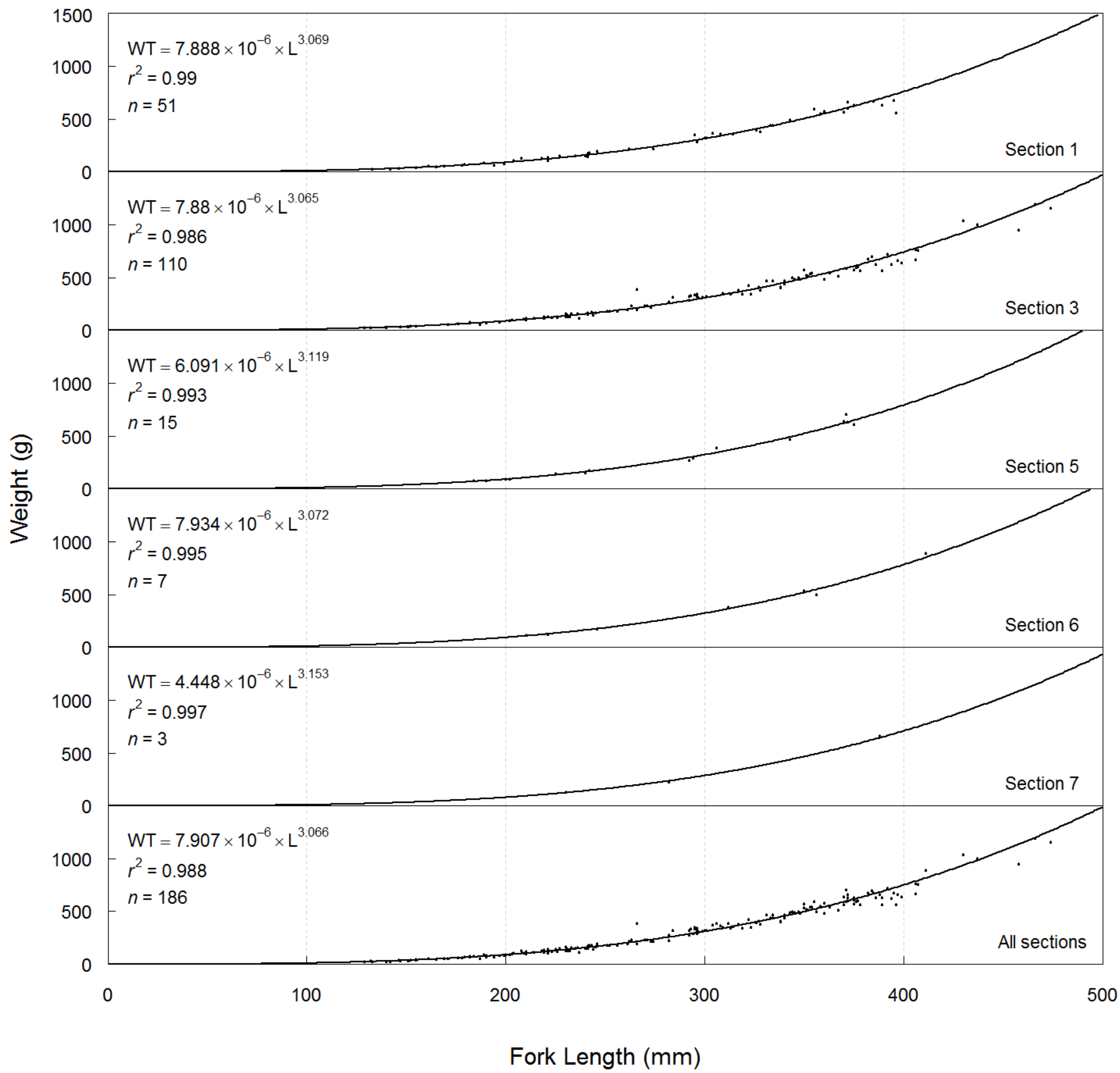


Figure 51: Length-weight regressions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

3.11.2 Abundance and Spatial Distribution

The number of Rainbow Trout captured and observed in Sections 1, 3, and 5 combined ranged between 39 and 171 individuals between 2002 and 2015 and was 176 in 2016 (Appendix E, Table E1). In Sections 6 and 7 combined, 10 Rainbow Trout were captured in 2016 (Appendix E, Table E2). Rainbow Trout were not captured in Section 9 in 2016.

Of the 186 Rainbow Trout captured during the 2016 survey, 181 were implanted with PIT tags. Of those 181 fish, 22 were subsequently recaptured. Movement between sections was not observed. There were insufficient data in

Sections 7 and 9 to produce population abundance estimates for these sections. A summary of the 2016 population abundance estimates using the Bayes sequential model is presented in Table 19. Comparisons to historical population abundance estimates was not possible because 2016 was the first year with sufficient capture and recapture data for Rainbow Trout. Although the annual catch for this species is highly variable, overall, the catch data do not suggest any large trends in abundance or catchability between 2002 and 2016.

Table 19: Population abundance estimates generated using the Bayes sequential model for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2016.

Section	Bayes Mean	Maximum Likelihood	95% Highest Probability Density		Standard Deviation	Coefficient of Variation (%)
			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**

3.12 Walleye

3.12.1 Biological Characteristics

During the 2016 survey, 231 Walleye were initially captured (i.e., excluding within-year recaptures) and measured for length and weight. Fork lengths ranged between 145 and 557 mm and weights ranged between 30 and 2596 g (Table 20). Ages were assigned to 169 Walleye based on analyses of fin rays. Ages of Walleye ranged from age-1 to age-12. After age-1, length ranges overlapped adjacent age-classes.

Table 20: Average fork length, weight, and body condition by age for Walleye captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

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	188 ± 23	152 - 218	10	71 ± 29	35 - 109	10	1.0 ± 0.1	0.9 - 1.2	10
2	291 ± 30	248 - 351	28	282 ± 102	151 - 540	27	1.1 ± 0.1	1.0 - 1.2	27
3	308 ± 31	258 - 369	43	336 ± 106	187 - 570	43	1.1 ± 0.1	1.0 - 1.3	43
4	335 ± 52	247 - 422	41	463 ± 221	163 - 950	40	1.2 ± 0.1	1.0 - 1.4	40
5	410 ± 39	345 - 462	12	853 ± 284	446 - 1195	12	1.2 ± 0.1	1.0 - 1.4	12
6	427 ± 34	369 - 506	18	973 ± 294	511 - 1754	18	1.2 ± 0.1	1.0 - 1.5	18
7	444 ± 44	362 - 518	12	1038 ± 348	524 - 1719	11	1.2 ± 0.1	1.0 - 1.3	11
8	525	-	1	1848	-	1	1.3	-	1
9	439	-	1	877	-	1	1.0	-	1
10	542	-	1	1906	-	1	1.2	-	1
11	542	-	1	1943	-	1	1.2	-	1
12	565	-	1	2392	-	1	1.3	-	1

[a] Number of individuals sampled.

The majority of Walleye captured were longer than 250 mm FL (Figure 52). The age-6 and age-7 year classes that dominated the 2015 Walleye catch (Appendix F, Figure F35) were less evident in the 2016 catch (Figure 53). This is largely due to high abundances of the age-3 and age-4 cohorts, corresponding to the 2013 and 2012 brood years, respectively. These two brood years were underrepresented in the 2015 catch (Appendix F, Figure F35). All small Walleye (i.e., fish less than approximately 230 mm FL corresponding to the age-1 cohort) were encountered in Section 7 or 9; small Walleye were not encountered in Sections 1, 3, 5, and 6 (Appendix F, Figures F32, and F33).

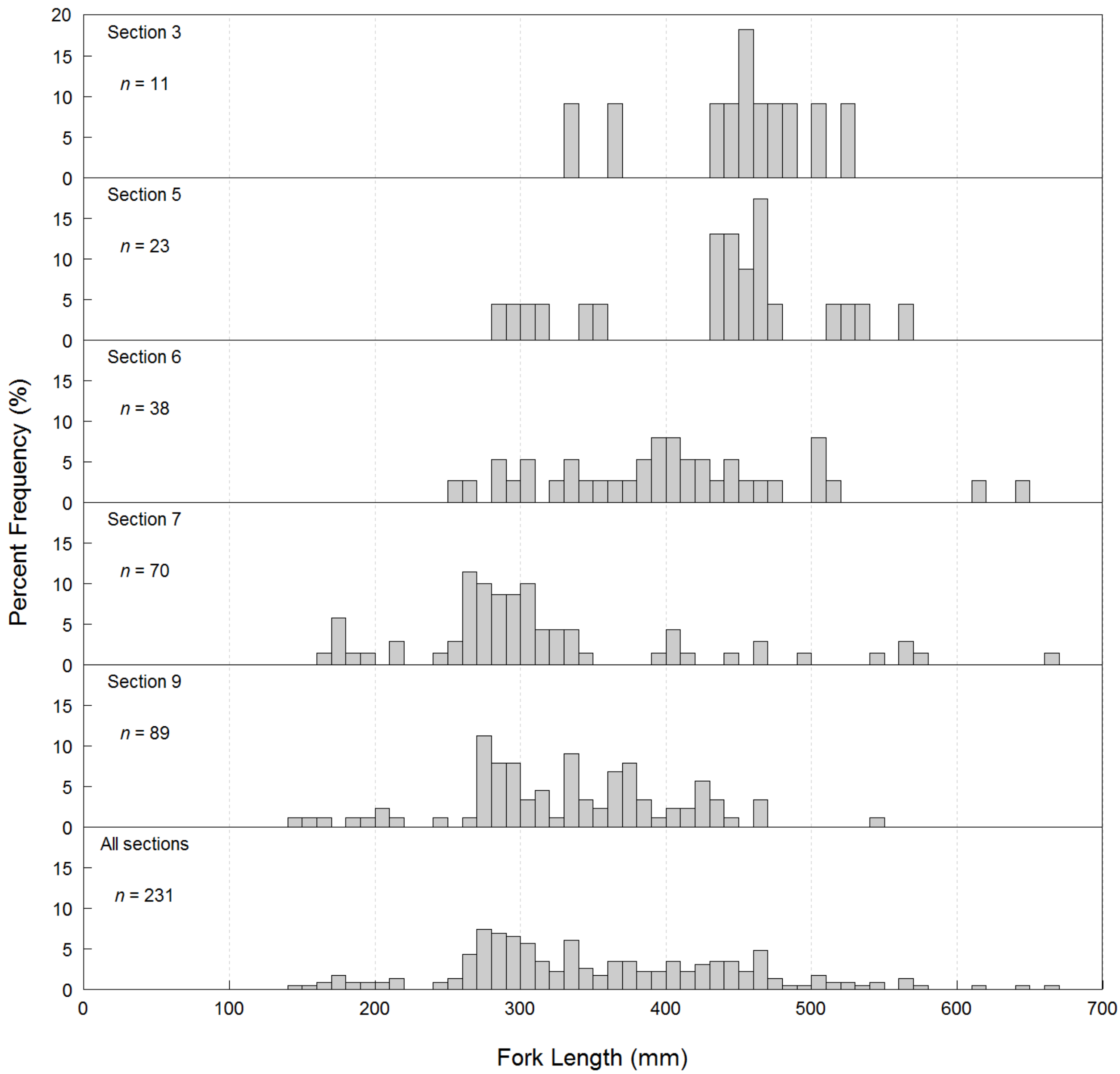


Figure 52: Length-frequency distributions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

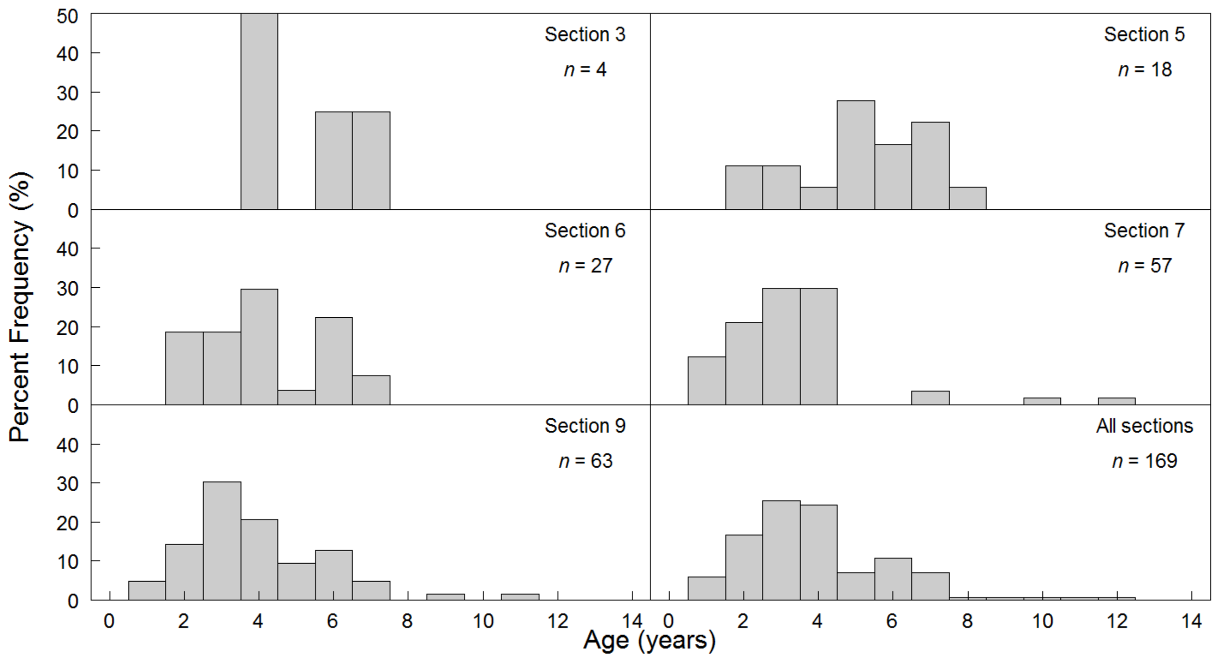


Figure 53: Age-frequency distributions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

Growth curves estimated using the von Bertalanffy method suggested that the oldest age-classes of the Walleye captured in 2016 had not yet reached their asymptotic length, as lengths continued to increase with increasing age (Figure 54). This result is largely driven by the low number of older individuals aged in 2016 as only four fish encountered in 2016 were assigned ages of age-8 or older. Growth curves from previous years when length-at-age data were available (2009 to 2011 [Mainstream 2010a, 2011a, 2013a] and 2015) suggested similar growth rates with growth slowing after approximately age-5 and an asymptote at approximately age-10 (Figure 55).

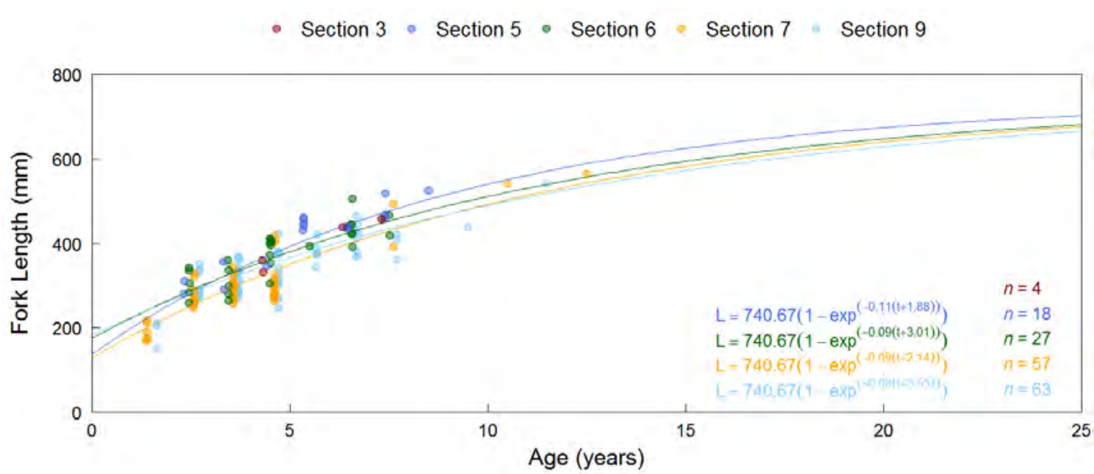


Figure 54: von Bertalanffy growth curve for Walleye captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

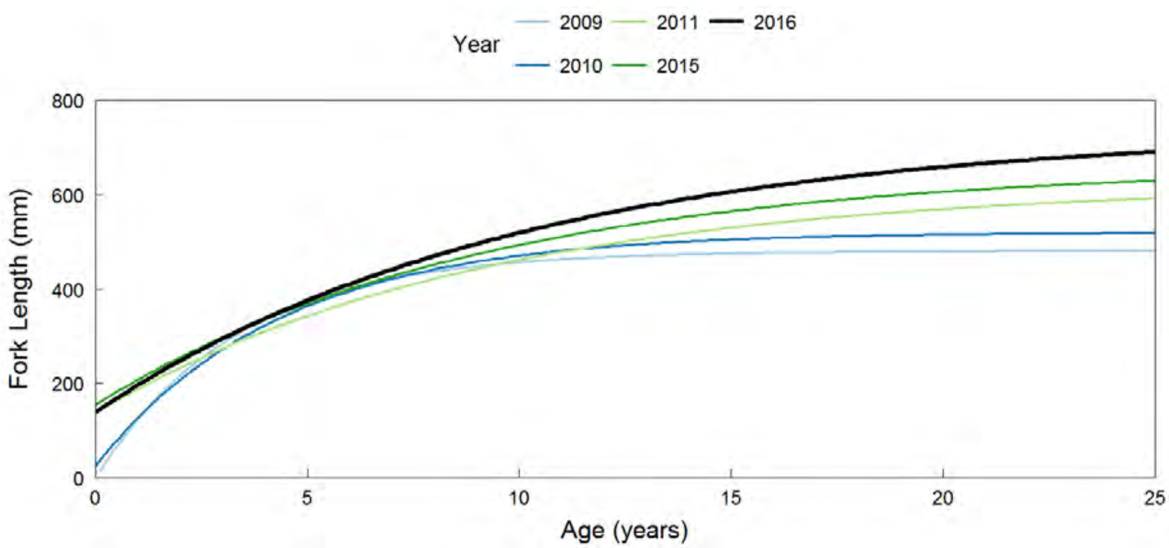


Figure 55: von Bertalanffy growth curve for Walleye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

Mean body condition varied little among years, and in 2016, body condition generally declined with increased distance from PCD (Figure 56). Length-weight regressions are provided in Figure 57 and did not appear to vary by section or study year (Appendix F, Figure F36).

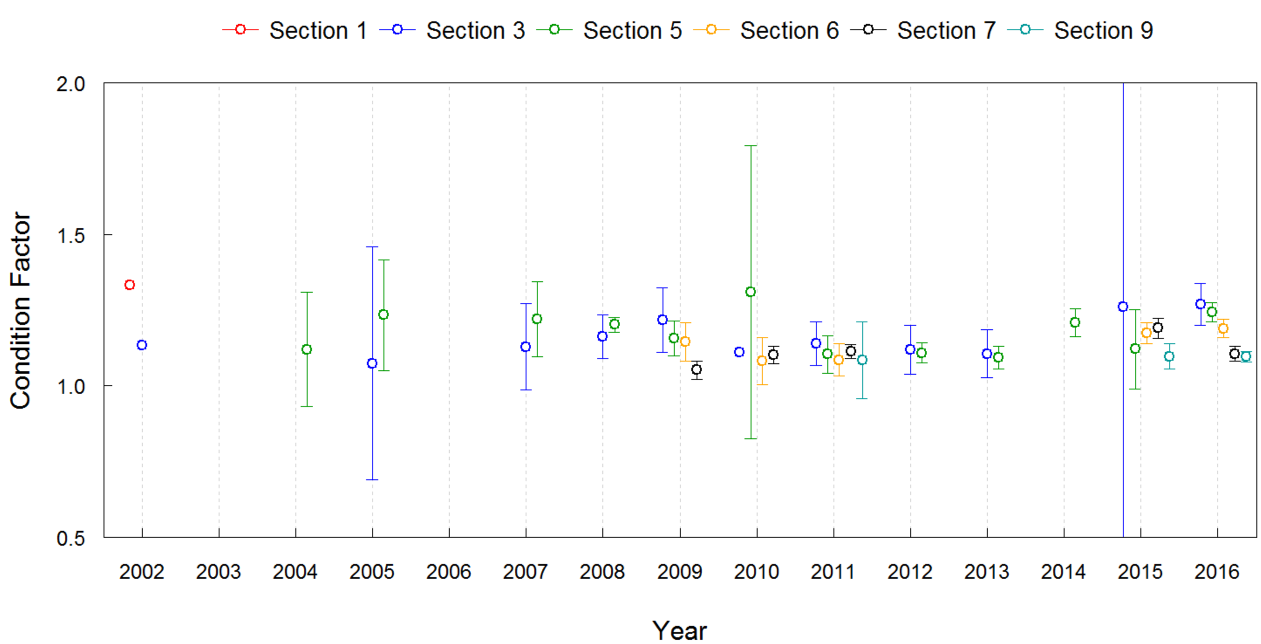


Figure 56: Mean body condition with 95% confidence intervals (CIs) for Walleye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. The 95% CI of Section 3 values in 2015 extends from 0.39 to 2.91.

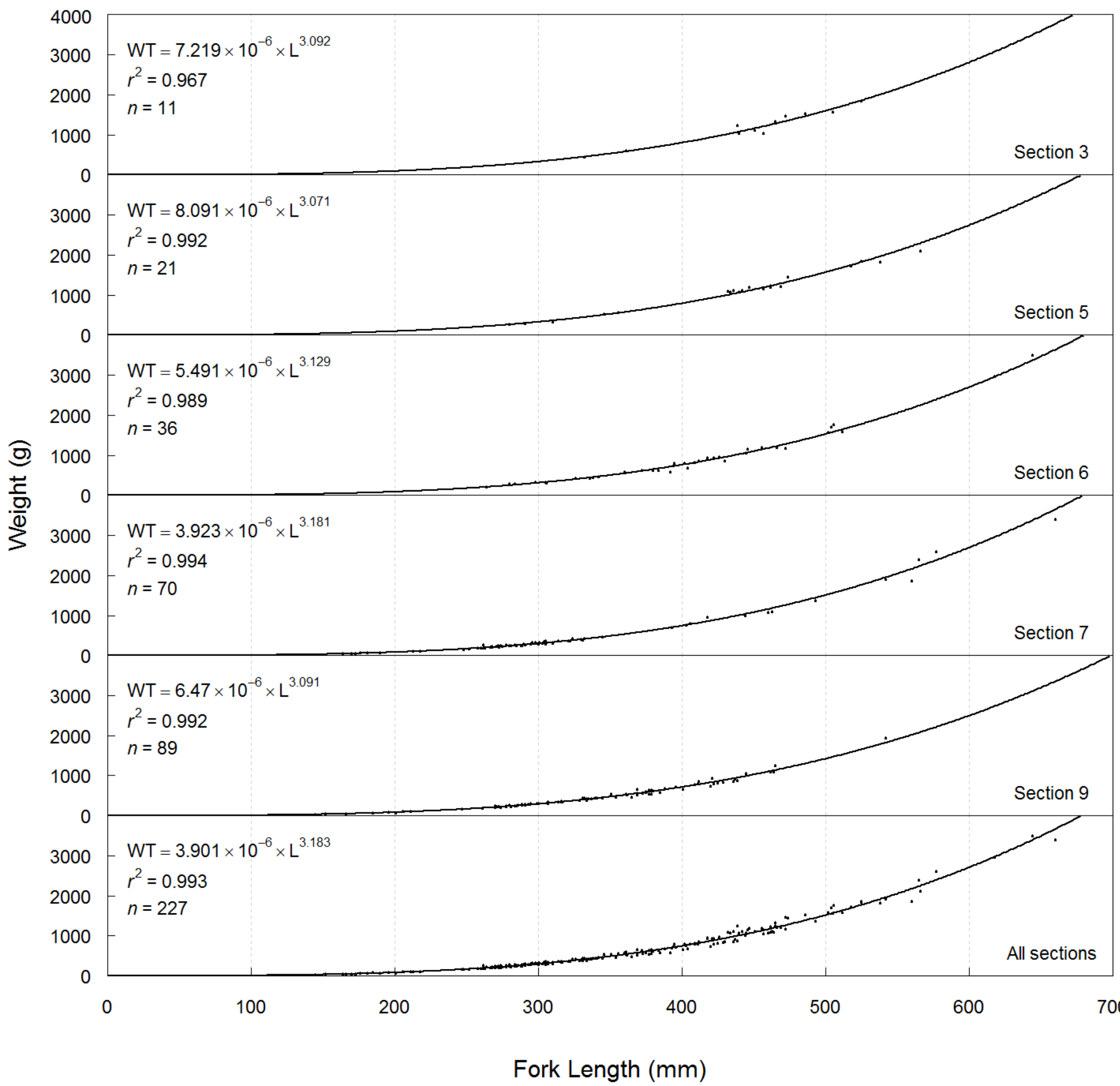


Figure 57: Length-weight regressions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

3.12.2 Abundance and Spatial Distribution

In Sections 1, 3, and 5, which are the sections where sampling was conducted during historical years of the survey (2002-2015), the number of Walleye captured ranged from 0 to 58 individuals, with the greatest number recorded in 2008 (*n* = 58); 34 Walleye were captured in those sections in 2016 (Appendix E, Table E1).

In Sections 6, 7, and 9, which were only sampled as part of this sampling program in 2015 and 2016, 103 and 197 Walleye, respectively, were captured (Appendix E, Table E2). These results suggest a preference for the downstream portions of the study area for this species and suggest a substantial increase in use of the area for this species in 2016 relative to 2015.

All but one of the 231 Walleye captured in 2016 (all sections combined) were implanted with PIT tags. Of those 230 tagged fish, four were recaptured in subsequent sessions. All four fish were recaptured in the same section they were initially captured in. Movement between sections was not observed. There were insufficient data to produce population abundance estimates for this species.

3.13 White Sucker

3.13.1 Biological Characteristics

Fork lengths of captured White Sucker ranged from 88 mm to 575 mm (*n* = 188), with the majority of individuals being between 300 and 450 mm. Length-frequency histograms suggest similar length distributions among sections (Figure 58), except that White Sucker less than 120 mm FL (likely age-0) were only captured in Section 6. In 2016, the length-weight relationship for White Sucker (Figure 59) was similar to historical study years (Appendix F, Figure F41). The mean body condition of White Sucker varied little among sections or years (Figure 60).

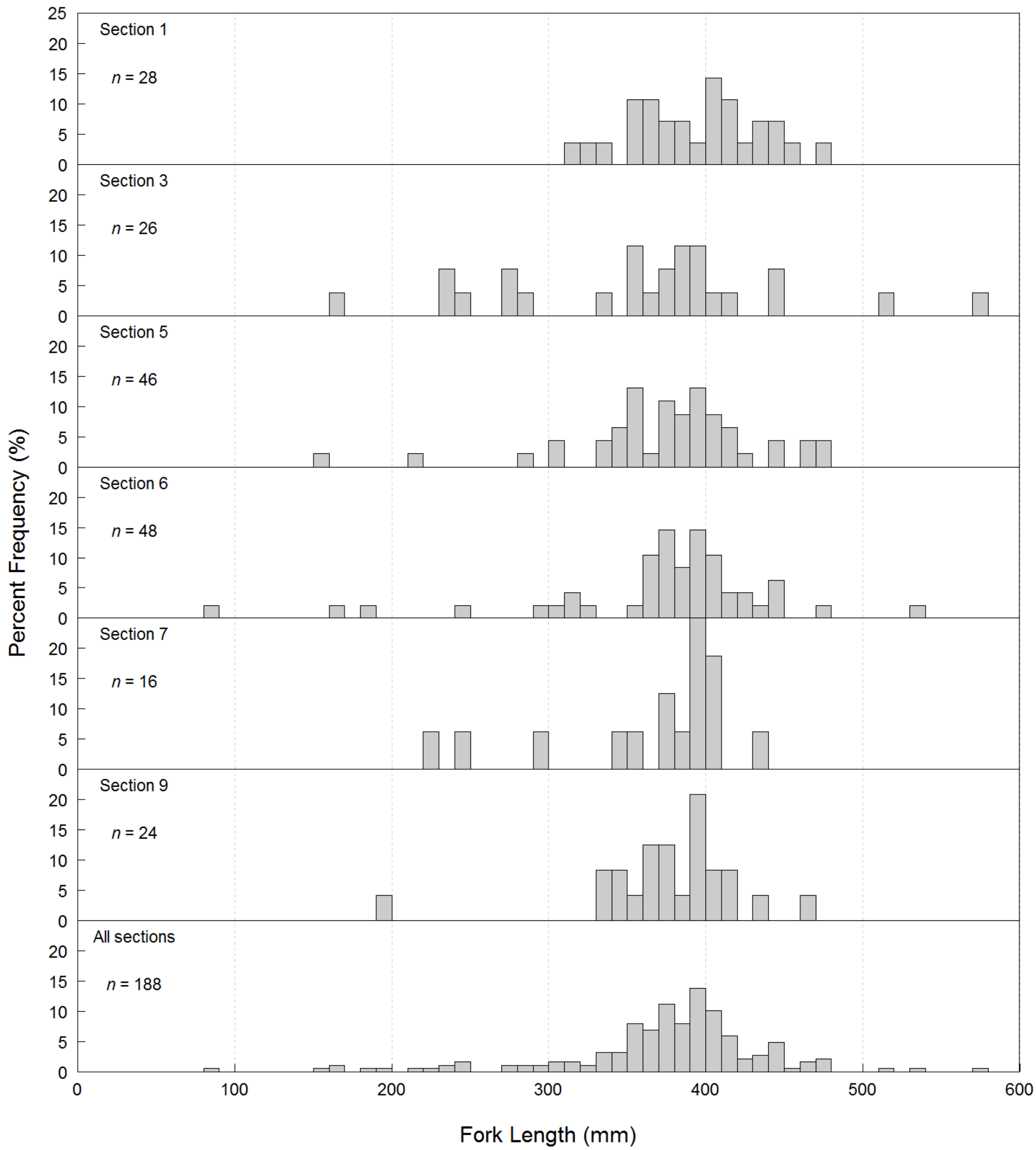


Figure 58: Length-frequency distributions for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

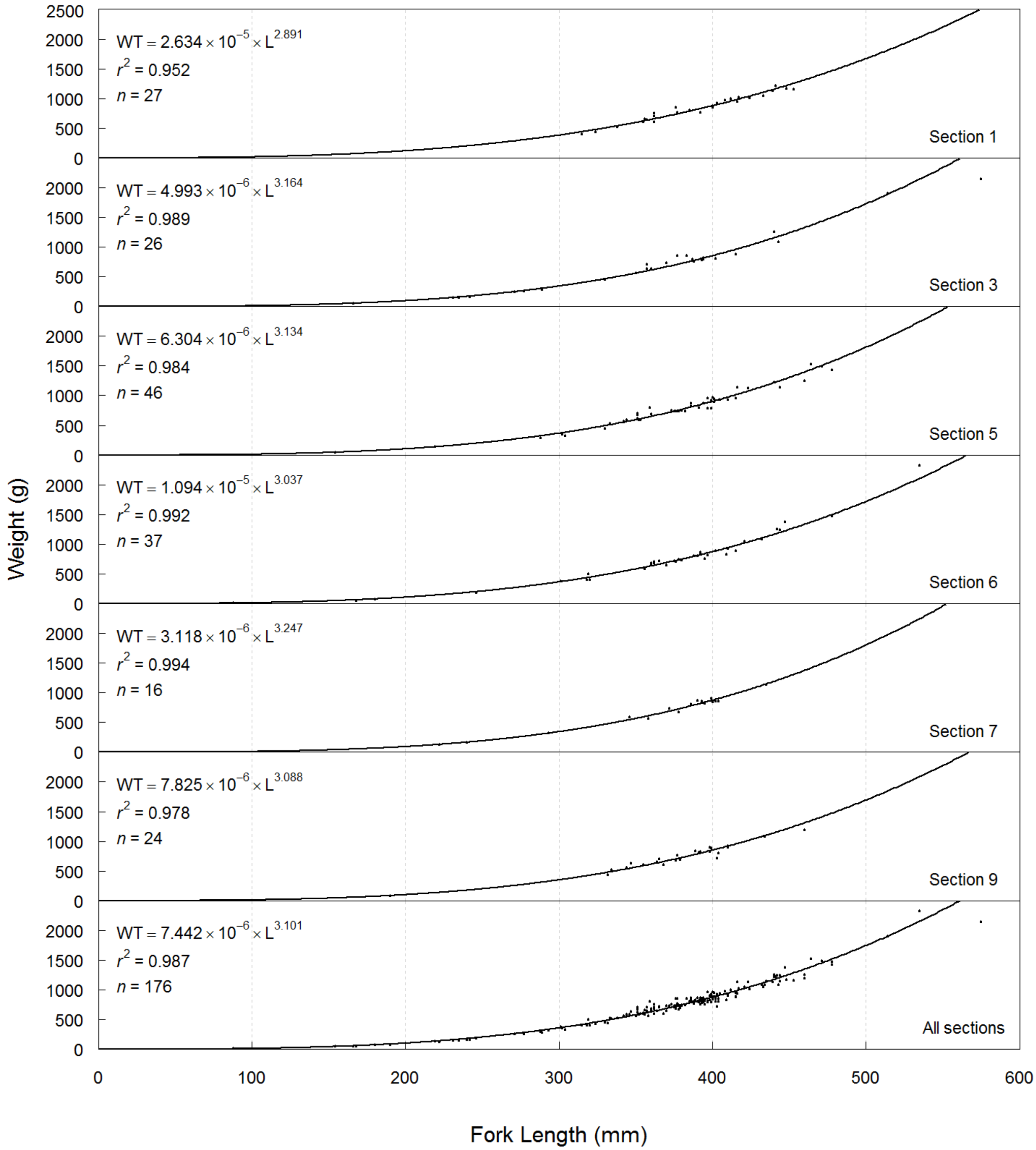


Figure 59: Length-weight regressions for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 23 August to 1 October 2016.

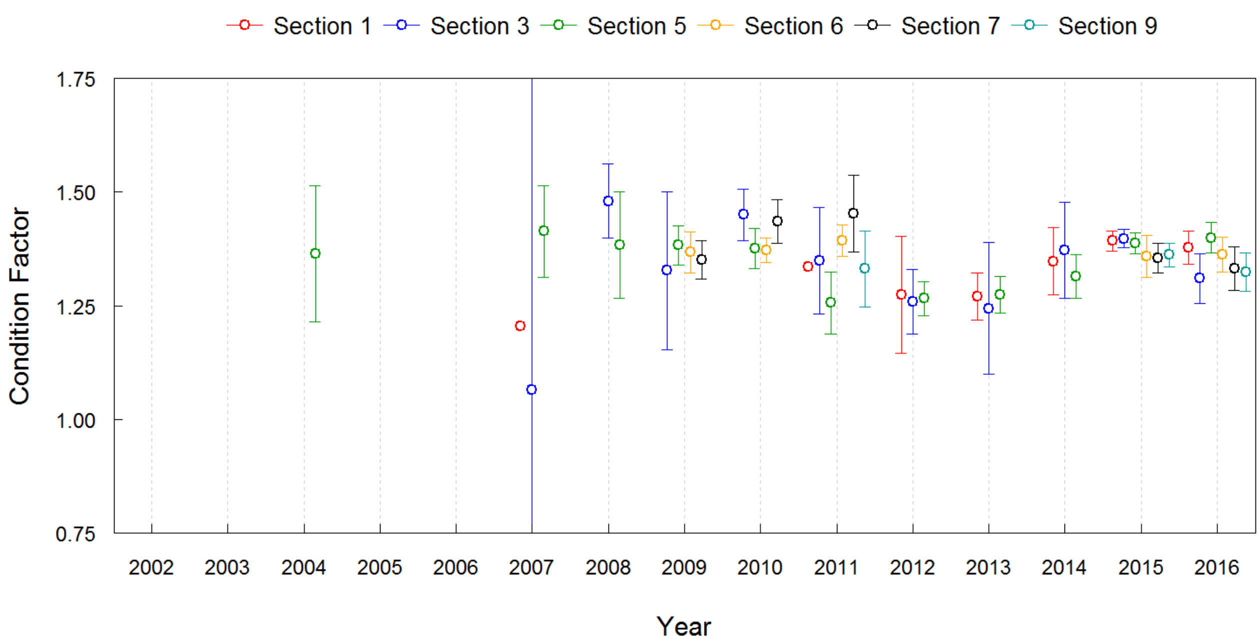


Figure 60: Mean body condition with 95% confidence intervals (CIs) for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. The 95% CI of Section 3 values in 2007 extends from 1.60 to 3.73.

3.13.1 Abundance and Spatial Distribution

In 2016, White Sucker were recorded in all sections, but were most commonly recorded in Sections 5 and 6 and least commonly recorded in Section 7. Of the 255 White Sucker encountered during the 2016 survey (all sections and sessions combined), 198 were implanted with PIT tags; six 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 in 2015 and 2016 (Figure 61). Confidence limits overlapped for all sections and years.

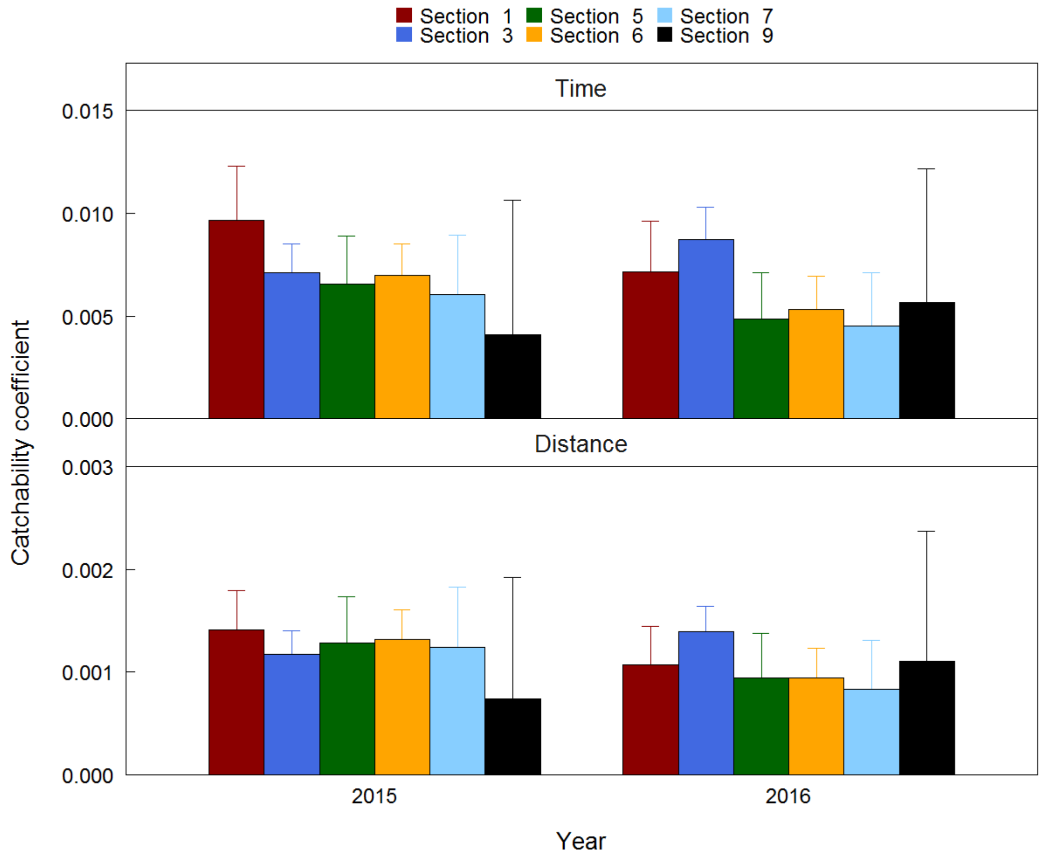


Figure 61: Catchability estimates by section for Mountain Whitefish captured by boat electroshocking based on sampling effort measured in time (top panel) and distance (bottom panel) in the Peace River, 2015-2016.

Catchability coefficient estimates for Sections 1, 3, and 5 from 2002 to 2016 are presented in Figure 62. The 2016 coefficients were of similar scale to those estimated in 2010, 2014 and 2015. The coefficients were consistent among sections within 2016, as were many other years (e.g., 2008 through 2012). Coefficients were not consistent across all years but were similar between 2014 and 2016.

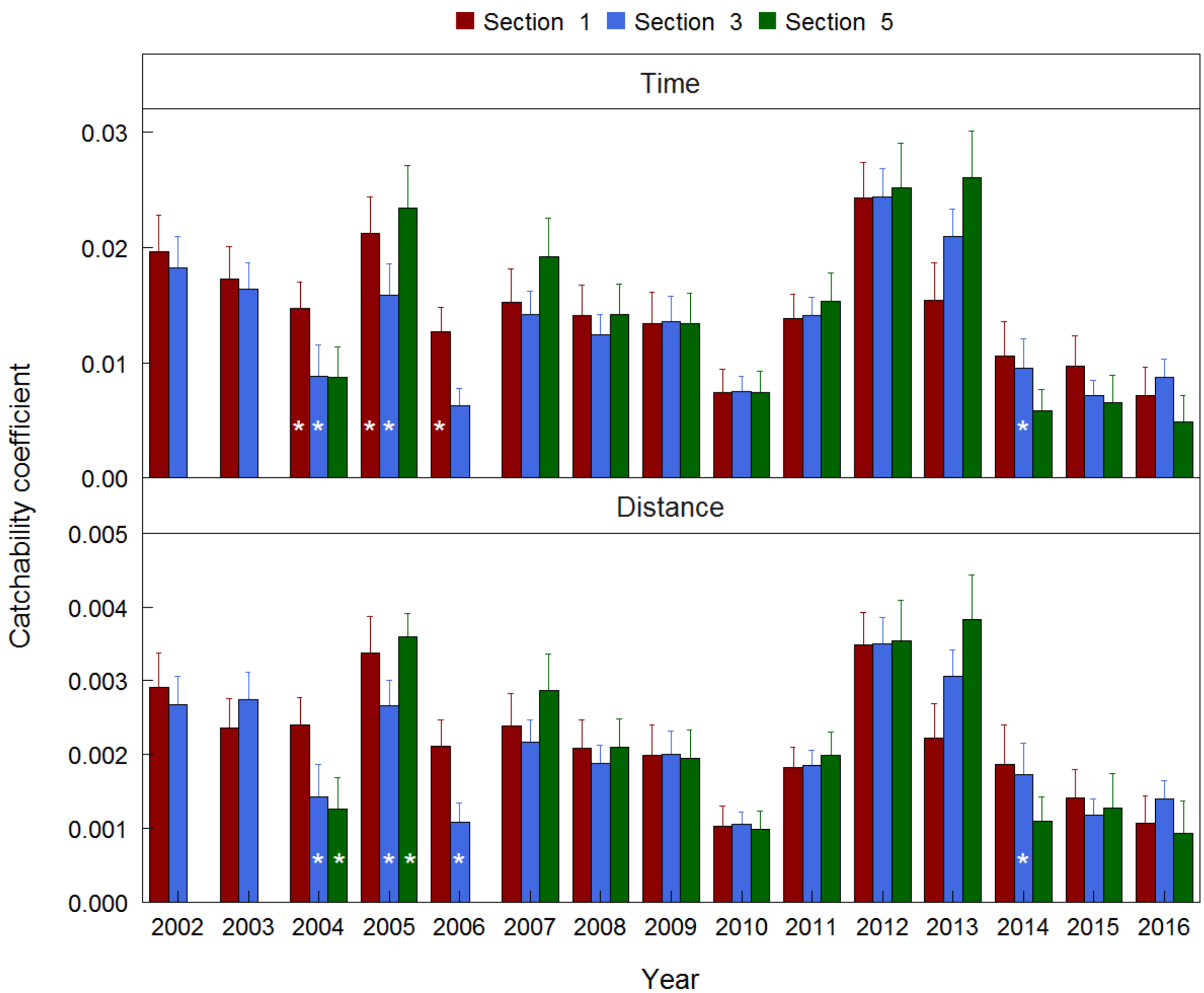


Figure 62: Catchability estimates by year and section (Sections 1, 3, and 5) for Mountain Whitefish captured by boat electroshocking based on sampling effort measured in time (top panel) or distance (bottom panel) in the Peace River, 2002-2016. Vertical bars represent 95 % confidence intervals; stars indicate suspect population abundance estimates.

3.15 Effort Required To Detect Change

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 63 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 each year between 2002 and 2016. 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 63).

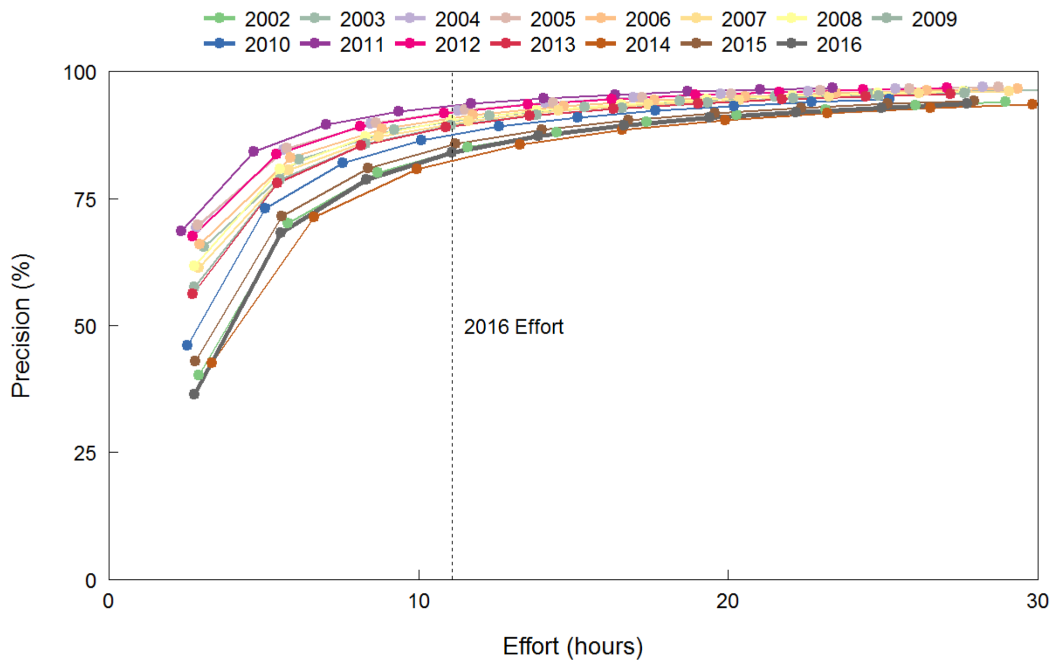


Figure 63: Precision of the Bayesian mean estimates of Mountain Whitefish abundance in Section 1 of the Peace River at various levels of effort, 2002 to 2015. The vertical dashed line represents the amount of effort (in hours) expended during the 2016 survey.

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 2016 represent the baseline, pre-Project state of the fish community. Currently, management hypotheses are not scheduled to be statistically tested until after the river diversion phase of construction (i.e., after 2019).

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 this 15-year study period (2002 to 2016), 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 [2002, 2003, 2004], PIT tags [2004-Present]). For a long-term monitoring program, changes to methods have the potential to confound results and hinder the identification of patterns and trends in the data. Changes made between 2002 and 2013 are discussed in previous reports. The field crew from 2014 to 2016 used the same methods as Mainstream and Gazey (2014) whenever possible; however, two substantial changes were made to electroshocker settings to reduce electroshocker related fish injury that had the potential to impact results: these were pulse frequency and amperage. These changes are discussed below.

Mainstream and Gazey (2014) employed a Smith-Root Type VIA electroshocker during the 2013 field survey, which has a minimum frequency setting of 60 Hz (Smith-Root pers. comm.). From 2014 to 2016, all electroshocker systems employed Smith-Root GPP5.0 electroshockers with their frequencies manually set at 30 Hz. 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 30 Hz when compared to 60 Hz (Snyder 2003; Golder 2004, 2005).

The average electroshocker amperage output used in 2013 was 4.5 A (range: 3.2 - 5.2 A; Attachment A) compared to 2.8 A from 2014 to 2016 (range: 2.0 – 4.2 A; Attachment A). Based on the recommendations of Snyder (2003), the lowest possible amperage required to effectively catch fish was used from 2014 to 2016. Golder (2004, 2005) noted that Mountain Whitefish, Rainbow Trout, and Walleye that enter narcosis (i.e., are stunned) are more susceptible to internal injury than fish that remain in taxis (i.e., forced swimming). The probability of a fish experiencing narcosis increases with increased amperage.

It is not known whether the difference in electroshocker settings used in 2014-2016 *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 2016, selectivity was greater for Mountain Whitefish less than approximately 250 mm FL and less for fish larger than 250 mm FL (Appendix H, Figure H11). 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

Factors that affect population estimates can be evaluated through an assessment of assumptions required for the Bayes sequential and stratified population models:

1. The population size in the study area does not change and is not subject to apparent mortality over the period of the experiment.

Few Mountain Whitefish were recaptured in sections other than their section of release (approximately 6%). 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 sequential model indicated that all species and sections (except Mountain Whitefish in Section 6) were convergent with no substantial trend to larger or smaller population sizes. For Mountain Whitefish in Section 6, 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 tagged fish through time. The available data do not support a closed population for Mountain Whitefish in Section 6; however, the substantial overlap of posterior distributions suggests that the change in catchability or population size was small. For all other sections and species, available data support a closed population.

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

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 Sections 1 and 3, the time-varying catchability model had a better fit to the data than the constant catchability model. Moreover, the population estimates were similar. The constant catchability model fit the data better in all other sections. Overall, data generally support the above assumption and the impact to estimates for any violations was assumed to be small.

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

Each captured fish was examined for the presence of a tag implantation wound (current study) or scar (previous study). Two Mountain Whitefish had evidence of a tag implantation wound from the 2016 study without a tag being present. Tag implantation wounds or scars were not observed on any other fish. The impact on 2016 population estimates from lost tags was assumed to be negligible.

4. All marked fish are reported on recovery.

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 Bayesian algorithm updates the posterior distribution from the previous session using the information from the current session. Gazey and Staley (1986) showed that sequential mark-recapture experiments can be characterized as a sequential Bayes algorithm updated by the binomial kernel. Thus, the Bayes sequential model weights each session by the information contained in the sample regardless of variation in catchability or population size. The sequential Bayesian 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, population estimates should be good approximations.

The Bayes sequential 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 6.

4.4 Effort Required to Detect Change

Because there is little movement of fish between the sections, sampling intensity can be isolated to a section. The power obtained from the effort employed in 2016 was similar to 2015 and slightly better than in 2014. The power analysis indicated that a reduction in effort in Section 1 would risk a substantive loss of power. If modifications to the study design are required during future study years, adding or removing sections would be preferred over changing the intensity within a section.

Insufficient data prevented the generation of reliable power curves for Arctic Grayling and Bull Trout.

4.5 Catchability

Catchability coefficients were calculated under the assumptions of a closed population with apparent mortality (none for 2016), and that abundance indices are proportional to the population size (Figure 61 and Figure 62). 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 2016 survey generally complied with the above caveats and estimated catchability coefficients were consistent across sections within 2016. Historically, the coefficients have not been consistent across years, but were consistent, albeit lower, during the 2014-2016 epoch. Additional years of data are required to determine if the altered electroshocker settings employed from 2014 to 2016 allow for more consistent Mountain Whitefish catchability or to determine if Mountain Whitefish catchability was consistent from 2014 to 2016 for other, unknown reasons.

4.6 Arctic Grayling

Over the 15-year monitoring period, the catch rate of Arctic Grayling declined (Figure 6), with the lowest catch rate for Arctic Grayling being recorded in 2014. Since 2014, Arctic Grayling catch rates have increased during each successive year, with catch rates in 2016 being approximately 60% higher than in 2014. Insufficient mark-recapture data prevented the generation of population abundance estimates that could corroborate the declining trend in abundance observed between approximately 2004 and 2014 or the increasing trend observed over the last three years. In 2016, almost 20% of the Arctic Grayling catch was recorded in Section 6, which was not consistently sampled prior to 2015. Not sampling Section 6 prior to 2015 confounds results for this species, as it is possible that a portion of the Peace River Arctic Grayling population occupied habitats downstream of Section 5 during some of the earlier study years. None of the Arctic Grayling initially tagged in the upstream three sections (Sections 1, 3, and 5) have ever been recaptured in the downstream three sections (Sections 6, 7, or 9). Similarly, none of the Arctic Grayling tagged in the downstream three sections have been recaptured in the upstream three sections; however, this is a small dataset (only 11 Arctic Grayling have been tagged in Section 6 as part of the Indexing Survey). AMEC and LGL (2009) noted Arctic Grayling movements between these two areas during telemetry surveys conducted in 2008.

Age data 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. Length-at-age analyses suggested larger body size over the last 3 years when compared to earlier study years, particularly for the age-0 to age-2 year classes, although the difference was not statistically significant. This result is supported by length-frequency histograms that show larger modes corresponding to the age-0, age-1, and age-2 year classes in 2015 and 2016 when compared to earlier study years (Appendix F, Figure F1). Reasons for the increase in length-at-age are unknown, but given their lower numbers, could be related to reduced intra-species competition for available resources.

During future study years, the continued inclusion of downstream sections would increase catch and recapture numbers for Arctic Grayling; however, it is anticipated that encounters will still be insufficient to generate reasonable estimates of absolute abundance for this species during the construction and operation of the Project. Based on this assumption, changes in abundance over time will likely need to be assessed using indicators of relative abundance (e.g., catch-per-unit effort metrics) for this species. The reliance on these 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 approximately five 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 two life history stages (i.e., spawning and age-0 dispersal) is paramount to sustaining the Peace River Arctic Grayling population. These two life history stages are also highly susceptible to environmental perturbation. Low abundance of a particular cohort, such as the 2011 and 2015 brood years (Appendix F, Figure F3), is likely related to environmental conditions during the spring and summer of that cohort's spawning year. In both 2011 and 2015, discharges from the Moberly River were substantially greater than average during the spring (WaterOffice 2017), which may have negatively impacted pre-spawning migrations, spawning/incubation, or the downstream dispersal of age-0 Arctic Grayling.

4.7 Bull Trout

Population abundance estimates for Bull Trout were higher in Section 1 in 2016 when compared to any previous study year. Bull Trout catch in Section 1 was also higher in 2016 than in any previous study year; however, the abundance estimate in this section is likely inflated by the low number of Section 1 recaptures in 2016 (n = 3). With the exception of the higher numbers in Section 1 in 2016, neither population abundance estimates nor catch-per-unit-effort data suggest substantial or sustained changes in Bull Trout abundance during the monitoring period. Similar to previous study years, age-0 and age-1 Bull Trout were not recorded in 2016 and age-2 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 these tributaries to spawn. The Bull Trout population sampled during the Indexing Survey is largely composed of fish that are old enough to have migrated out of their natal streams but have not yet reached sexual maturity (i.e., subadults), but could partially consist of Bull Trout that have forgone spawning (i.e., skip spawners) or Bull Trout that have not yet migrated into tributaries to spawn.

There is 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. The body condition of Bull Trout was higher in 2016 in Section 1 when compared to all other sections, a result that may be influenced by Bull Trout feeding on dead and injured fish entrained through PCD.

There are uncertainties in Bull Trout age assignments (Golder and Gazey 2016), particularly for older individuals. Confirming assigned ages by comparing them to modes in annual length-frequency histograms is difficult due to small sample sizes and the slow growth rates of Bull Trout. The chemical ageing of Bull Trout using microchemistry analysis of fin ray samples should be considered to better answer the management questions. A small dataset (n = 10) of fin rays analyzed by Golder (2010) suggested that seasonal trends in element concentrations, particularly zinc, could be used to age Bull Trout in the Duncan River watershed in the interior of BC, and that these ages agreed with ages assigned using otoliths from the same fish. The feasibility of fin ray microchemistry analysis is watershed-specific and this approach would require a substantial level of investigation before it could be implemented under this program.

4.8 Mountain Whitefish

Population abundance estimates for Mountain Whitefish greater than 250 mm FL in Sections 3 and 5 suggested similar abundance in most years between 2002 and 2016, except for greater abundance in these sections in 2011 and 2012. Abundance estimates for Section 1 were substantially higher in 2016 when compared to most previous study years and was nearly double estimates generated for 2013 to 2015. While Mountain Whitefish catch in Section 1 was higher in 2016 (n = 2550), it was not double the values recorded between 2013 and 2015 (average n = 2010; range = 1662 to 2271). The abundance estimate for Section 1 in 2016 is influenced by a proportionally lower number of recaptured individuals. Abundance estimates for Sections 6, 7, and 9 in 2015 and 2016 were similar, with estimates for Section 6 being suspect in both years due to assumption violations.

Discharges in the Peace River in 2016 were variable, particularly during the 2016 study period, which may have influenced Mountain Whitefish population abundance estimates. The abundance of Mountain Whitefish in the study area during the study period appears to be related to water levels, with higher densities typically observed when water levels are lower. 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 based on the two years with the highest Mountain Whitefish abundance estimates (2010 and 2011), which coincided with low PCD summer/early fall discharge (Appendix C, Figure C1). In recent years, population abundance estimates were lower in 2012 and 2013 when discharge was above average, and greater in 2014 and 2015 when discharge was near or below average during the study period. Discounting 2016 results due to variable discharge during the study period, data largely support the hypothesized relationship between abundance estimates and water levels for most years; however, to test this hypothesis, additional sampling would be required in side channel habitats in conjunction with existing sites. 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.

Population models suggested time-varying catchability for Mountain Whitefish in Sections 1 and 3 in 2016. During Session 3 of the 2016 survey, low discharges from PCD prevented field crews from accessing some habitats in Section 1. This would have influenced catchability over time in this section. Section 3 is located immediately downstream of the Halfway River confluence. 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.

Length-at-age data suggested larger Mountain Whitefish in 2014 and 2015 when compared to previous study years. In 2016, older (age-2 and older) age-classes of Mountain Whitefish were larger, while younger age-classes (age-0 and age-1) were similar in size to previous study years. These data suggest favourable growing conditions for Mountain Whitefish in the Peace River from approximately 2010 to 2014, but less favourable growing conditions in 2015 and 2016.

For younger individuals, annuli were more pronounced on scale samples collected from Mountain Whitefish from the Peace River when compared to samples collected from Mountain Whitefish from other large systems, such as the Columbia River downstream of Hugh L. Keenleyside Dam (Golder et al. 2016b) and downstream of Revelstoke Dam (e.g., Golder et al. 2016a).

4.8.1 Mountain Whitefish Synthesis Model

There was a partial lack of fit for Mountain Whitefish recaptures across years in Section 5. This result is not fully 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 sequential model (no across-year recaptures) indicates that the impact was not large (see Figure 42).

The changed electroshocker settings that commenced in 2014 altered the selectivity of the gear. Additional sampling years 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.

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

4.9 Rainbow Trout

More Rainbow Trout were captured in 2016 than during any other study year. Reasons for the increase are not known. Most (95%) of the Rainbow Trout encountered in 2016 were recorded in the upstream three sections. 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[5] 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 young Rainbow Trout in 2016 relative to 2015.

Population abundance estimates were generated for Rainbow Trout for four of the six sections. Confidence intervals were wide around all four estimates; however, continued, successive increases to the Rainbow Trout catch during future study years would improve the certainty around estimates.

4.10 Sucker species

Although none of the sucker species are considered indicator species under this program's objectives, all adult large-bodied fishes were monitored as part of the program in 2015 and 2016 in order to eventually test Management Hypothesis #4 regarding fish community structure. Suckers 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. Their large sample sizes, coupled with large 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.

Results suggested that the distribution of suckers varied by species, life-stage, and section. Based on length-frequencies of Largescale Sucker and Longnose Sucker, nearly all of the individuals captured in Section 1 were adults; 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. Sucker species were not marked with PIT tags prior to 2015, therefore population abundance estimates are not available prior to 2015.

Over the two years in which sampling has been conducted in the downstream sections (2015 and 2016), mean values of body condition indicate declining condition in Largescale Sucker and Longnose Sucker with increasing distance from PCD. Reasons for this trend are unknown and additional years of data are required to confirm this result. This trend is more substantial for Longnose Sucker than for Largescale Sucker. This trend is not apparent

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

in White Sucker data; however, fewer White Sucker have been measured over the last two years (*n* = 753) when compared to Largescale Sucker (*n* = 2198) and Longnose Sucker (*n* = 9503).

4.11 Other species

For three of the seven indicator species, there were not enough mark-recapture data to calculate precise population abundance estimates. These species were Burbot, Goldeye, and Walleye.

The 37 Burbot captured during the 2016 study were more than all other study years combined (*n* = 33). Reasons for the substantial increase are not known. Burbot are photonegative and prefer low-light environments (Wydoski and Whitney 2003). It is possible that higher than normal turbidity levels in the study area during the 2016 study period (Attachment A) caused them to be more active during the day, swimming into shallower water where they were more susceptible to capture. Another possible reason might be higher than average discharge values for the Moberly River. At times, Moberly River discharge during the 2016 study period was approximately 40% above average for that time of the year (WaterOffice 2017). These higher flows may have reduced the quality of habitat available for Burbot in the Moberly River or forced fish downstream into the Peace River. During BC Hydro’s Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c; Golder 2017), seven Burbot were encountered during the 2016 survey of the Moberly River. By comparison, during similarly designed studies conducted by Mainstream in 2009 (Mainstream 2010b), 2010 (Mainstream 2011b), and 2011 (Mainstream 2013d), 119, 45, and 207 Burbot, respectively, were encountered. These data suggest that Burbot numbers in the Moberly River were lower than normal in 2016, supporting the hypothesis that the 2016 Burbot catch in the Peace River may have, in part, consisted of fish from the Moberly River Burbot population. Given Burbot’s propensity for deeper water during daytime, boat electroshocking is not an ideal capture method for this species. 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 both 2015 (*n* = 1) and 2016 (*n* = 8). Goldeye are seasonal residents to 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. 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 years of the study. 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.

Substantially more Walleye were recorded in 2015 (*n* = 115) and 2016 (*n* = 231) when compared to previous study years (average *n* = 21; range 0-58). The increase is largely the result of sampling the downstream three sections of the study area. Similar to Goldeye, the study design in its current form is unlikely to encounter enough Walleye to allow meaningful inter-annual comparisons of life history metrics or abundance levels in future study years. Additional sampling at the confluences of select tributaries, such as the Beatton and Kiskatinaw rivers, during both the spring and summer/fall period may provide more meaningful data for this species.

The precision of ages assigned to Walleye remains uncertain, particularly for older fish where ages cannot be validated using the fish’s length due to the overlapping length ranges of each individual age-class and sexual size dimorphism (e.g., Henderson et al. 2003). Watkins and Spencer (2009) postulate that the methods outlined by Mackay et al. (1990) for collecting and analyzing Walleye fin rays can lead to the misidentification of the fish’s first annulus. Watkins and Spencer also provide alternative ageing techniques for Walleye that improve accuracy and age agreement when compared to the techniques presented in Mackay et al. (1990). These alternative ageing techniques and age validation techniques should be explored during future study years.

Northern Pike is not an indicator species under the current program but is a sport-fish that was captured in low numbers during most previous study years. In 2016, both juvenile and adult Northern Pike were present in the downstream portion of the study area (Sections 6, 7, and 9). Northern Pike were not captured in Sections 1 or 3 in 2016, but have been captured in small numbers in these sections in previous study years.

In 2016, several Spottail Shiner were encountered in all sections except Sections 1 and 3. Spottail Shiner are a species of conservation concern and are on the Provincial red list[6]. 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).

[6] 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 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 the construction and operation of the Project.

In 2016, fish population metrics were similar to previous study years and indicated stable abundance, distribution, size structure, and body condition for most species. Some trends first identified in 2015 (Golder and Gazey 2016) were further supported by 2016 data, including a small recovery of the Arctic Grayling population spurred by a strong 2014 brood year, and greater mean length-at-age of select brood years for Arctic Grayling and Mountain Whitefish. Higher than expected catches of Burbot, Rainbow Trout, and Walleye in 2016 were encouraging; however, increases in these numbers are likely attributed to poor habitat conditions in adjacent tributaries (i.e., increased migration into the study area rather than increased recruitment within the study area) or higher Peace River turbidity levels in 2016 relative to previous study years. Catches of these species are anticipated to be lower in 2017 if adjacent tributary habitats are more preferable to mainstem habitats. For some indicator fish species, most notably Burbot, Goldeye, and Walleye, 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 2016 will provide suitable information on the presence and distribution of these species.

6.0 CLOSURE

We trust that this report meets your current requirements. If you have any further questions, please do not hesitate to contact the undersigned.

Golder Associates Ltd.

Dustin Ford, RPBio
Fisheries Biologist, Project Manager

Shawn Redden, RPBio
Associate, Project Director

Senior Technical Review

Gary Ash, MSc

DF/GA/SR/nnv

\\golder.gds\gal\castlegar\active_2014\1492\1400753 - gmsmon-2 - peace river fish indexing\07 deliverables\2016 annual report\final\wp\1400753-005-r-rev0-peaceindexing2016-31dec_17.docx

7.0 LITERATURE CITED

AMEC and LGL (AMEC Earth & Environmental and LGL Limited). 2008. Peace River Fisheries Investigation - Peace River and Pine River Radio Telemetry Study 2007. Prepared for BC Hydro. 148 pages.

AMEC and LGL (AMEC Earth & Environmental and LGL Limited). 2009. Peace River Fisheries Investigation - Peace River and Pine River Radio Telemetry Study 2008. Prepared for BC Hydro. 148 pages.

Bailey, M.M. 2011. Age, Growth, Reproduction, and Food of the Burbot, *Lota lota* (Linnaeus), in Southwestern Lake Superior. Transactions of the American Fisheries Society Vol. 101, Iss. 4. Pages 667-674.

BC Government. 2011. DRAFT Fish, Wildlife and Ecosystem resources and Objectives for the Lower Peace River Watershed – Site C Project Area. 25 pages + appendices.

BC Hydro. 2008. Peace River Water Use Plan. Monitoring Program Terms of Reference. GMSMON-2 Fish Index. 8 pages. Downloaded from: http://www.bchydro.com/content/dam/hydro/medialib/internet/documents/environment/pdf/wup_-_peace_-_gmsmon-2.pdf

BC Hydro. 2013. Site C Clean Energy Project Environmental Impact Statement – Volume 2: Assessment Methodology and Environmental Effects. Amended EIS presented to the Secretariat for the Joint Review Panel - Site C Clean Energy Project – Canadian Environmental Assessment Agency. 7 August 2013.

BC Hydro. 2015a. Site C Clean Energy Project Fisheries Act Application for Authorization – Site Preparation. Submitted to Fisheries and Oceans Canada. February 23, 2015. 80 pages + 15 appendices.

BC Hydro. 2015b. Site C Clean Energy Project Fisheries Act Application for Authorization – Dam Construction, Reservoir Preparation, and Filling. Submitted to Fisheries and Oceans Canada. December 15, 2015. 178 pages + 24 appendices.

BC Ministry of Environment. 2009. DRAFT Ministry of Environment Fish and Wildlife Interim Objectives for Site C Project Area.

Bonar, S.A., L.G. Brown, P.E. Mongillo, and K. Williams. 2000. Biology, Distribution and Management of Burbot (*Lota lota*) in Washington State. Northwest Science, Volume 74, Number 2. 87-96.

Burnham, K.P., and D.R. Anderson. 2002. Model selection and multimodel inference: a practical information-theoretic approach. Springer, New York.

Cooke, S.J., C.M. Bunt, S.J. Hamilton, C.A. Jennings, M.P. Pearson, M.S. Cooperman, and D.F. Markle. 2005. Threats, conservation strategies, and prognosis for suckers (Catostomidae) in North America: insights from regional case studies of a diverse family of non-game fishes. Biological Conservation 121: 317-331.

DES (Diversified Environmental Services Ltd.). 2017. Peace River Water Use Plan. Peace River Baseline TDGP/Temperature. GMSWORKS-2. Year 8 Monitoring Program – Final Report.

DES and Mainstream (Diversified Environmental Services and Mainstream Aquatics Ltd.). 2011. Upper Halfway River Watershed Bull Trout Spawning Survey 2010. Prepared for BC Hydro. Report No.10016: 21 pages + appendices.

Fournier, D.A., H.J. Skaug, J. Ancheta, J. Ianelli, A. Magnusson, M.N. Maunder, A. Nielsen, and J. Sibert. 2012. AD Model Builder: using automatic differentiation for statistical inference of highly parameterized complex nonlinear models. Optimization Methods and Software 27: 233-249.

Gazey, W.J. 1994. Population size estimation for sparse data. Biometrics 50: 301-303.

Gazey, W. J. and J. Korman. 2016. Stock synthesis model for Peace River Mountain Whitefish. Report prepared for B.C. Hydro, Burnaby, B.C.

Gazey, W.J. and M.J. Staley. 1986. Population estimation from mark-recapture experiments using a sequential Bayes algorithm. Ecology 67: 941-951.

Golder Associates Ltd. 2004. Large River Fish Indexing Program – Lower Columbia River 2003 Phase 3 Investigations. Report prepared for B.C. Hydro, Burnaby, B.C. Golder Report No. 03-1480-021F: 54 pages + 6 appendices.

Golder Associates Ltd. 2005. Large River Fish Indexing Program – Lower Columbia River 2004 Phase 4 Investigations. Report prepared for B.C. Hydro, Burnaby, B.C. Golder Report No. 04-1480-047F: 57 pages + 6 appendices.

Golder Associates Ltd. 2010. Upper Duncan Bull Trout Migration Monitoring – Final Report March 2010. Report prepared for BC Hydro, Castlegar, BC Golder Report No. 09-1480-0051: 49 pages + 8 appendices.

Golder Associates Ltd. 2017. Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c) – 2016 Investigations. Report prepared for BC Hydro, Vancouver, British Columbia. Golder Report No. 1650533: 28 pages + 3 appendices.

Golder and Gazey (Golder Associates Ltd. and W.J. Gazey Research). 2015. GMSMON-2 Peace Project Water Use Plan – Peace River Fish Index - 2014 Investigations. Report prepared for BC Hydro, Burnaby, British Columbia. Golder Report No. 1400753: 68 pages + 6 appendices.

Golder and Gazey (Golder Associates Ltd. and W.J. Gazey Research). 2016. Peace River Large Fish Indexing Survey - 2015 Investigations. Report prepared for BC Hydro, Vancouver, British Columbia. Golder Report No. 1400753: 97 pages + 7 appendices.

Golder Associates Ltd., Poisson Consulting Ltd., and Okanagan Nation Alliance. 2016a. CLBMON-16 Middle Columbia River Fish Population Indexing Survey 2015 Report. Report prepared for BC Hydro Generation, Water License Requirements, Revelstoke, BC.

Golder Associates Ltd., Okanagan Nation Alliance, and Poisson Consulting Ltd. 2016b. CLBMON-45 Lower Columbia River Fish Population Indexing Survey 2015 Report. Report prepared for BC Hydro Generation, Water License Requirements, Castlegar, BC. 75 pages + 8 apendices.

Henderson, H.A., N. Collins, G.E. Morgan, and A. Vaillancourt. 2003. Sexual size dimorphism of walleye (*Stizostedion vitreum vitreum*). Canadian Journal of Aquatic Sciences. Volume 60. 1345-1352.

Hilborn, R., and C.J. Walters. 1992. Quantitative fisheries stock assessment: choice, dynamics, and uncertainty. Chapman and Hall, London.

Mackay, W.C., G.R. Ash and H.J. Norris. 1990. Fish ageing methods for Alberta. R.L. & L. Environmental Services Ltd. in association with Alberta and Wildlife Division and University of Alberta, Edmonton. 133 pages.

Mainstream Aquatics Ltd. 2010a. Site C fisheries studies – Peace River Fish Inventory. Prepared for BC Hydro Site C Project, Corporate Affairs Report No. 09008AF: 90 pages + plates (Volume 1) and appendices (Volume 2).

Mainstream Aquatics Ltd. 2010b. Halfway River and Moberly River summer fish survey – 2009. Prepared for BC Hydro Engineering Services. Report No. 09008BF: 61 pages + plates and appendices.

Mainstream Aquatics Ltd. 2011a. Site C fisheries studies – 2010 Peace River Fish Inventory. Prepared for B.C. Hydro Site C Project, Corporate Affairs Report No. 10005F: 102 pages + plates and appendices.

Mainstream Aquatics Ltd. 2011b. Site C Fisheries Studies – 2010 Moberly River and Halfway River Summer Fish Inventory. Report No. 10006F: 59 pages + plates and appendices.

Mainstream Aquatics Ltd. 2012. Site C Clean Energy Project – Fish and Fish Habitat Technical Data Report. Prepared for BC Hydro Site C Project, Corporate Affairs Report No. 12002F: 239 pages.

Mainstream Aquatics Ltd. 2013a. Site C fisheries studies - 2011 Peace River Fish Inventory. Prepared for B.C. Hydro Site C Project, Corporate Affairs Report No. 11005F: 98 pages + plates and appendices.

Mainstream Aquatics Ltd. 2013d. Site C Fisheries Studies – 2011 Moberly River and Halfway River Summer Fish Inventory. Report No. 11006F: 51 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2004. Peace River Fish Community Indexing Program Phase 3 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 3008F: 104 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2005. Peace River Fish Community Indexing Program Phase 4 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 04008F: 135 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2006. Peace River Fish Community Indexing Program Phase 5 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 05016F: 118 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2007. Peace River Fish Community Indexing Program Phase 6 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 06011F: 116 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2008. Peace River Fish Community Indexing Program Phase 7 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 07011F: 116 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2009. Peace River Fish Community Indexing Program - 2008 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 08011F: 93 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2010. Peace River Fish Index Project - 2009 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 09011F: 79 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2011. Peace River Fish Index Project - 2010 Studies. Report Prepared for BC Hydro by Mainstream Aquatics Ltd. Mainstream Report No. 1011F: 96 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2012. Peace River Fish Index Project - 2011 Studies. Prepared for B.C. Hydro. Report No. 11011F: 86 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2013. Peace River Fish Index Project - 2012 Studies. Prepared for B.C. Hydro. Report No. 12011F: 84 pages + appendices.

Mainstream and Gazey (Mainstream Aquatics Ltd. and W.J. Gazey Research). 2014. Peace River Fish Index Project - 2013 Studies. Prepared for B.C. Hydro. Report No. 13011F: 82 pages + appendices.

Martinez, P.J. and A.L. Kolz. 2009. Evaluating the power output of the Smith-Root GPP 5.0 electrofisher to promote electrofishing fleet standardization. North American Journal of Fisheries Management 29: 570-575.

McPhail, J.D. 2007. The Freshwater Fishes of British Columbia. University of Alberta Press, Edmonton, AB. 620 pages.

Murphy, B.R. and D.W. Willis, editors. 1996. Fisheries Techniques Second Edition. American Fisheries Society. Bethesda, Maryland, USA.

Northcote, T. G. and G. L. Ennis. 1994. Mountain Whitefish biology and habitat use in relation to compensation and improvement possibilities. Reviews in Fisheries Science 2: 347-371.

ONA et al. (Okanagan Nation Alliance, Golder Associates Ltd., and Poisson Consulting Ltd.). 2014. CLBMON-16 Middle Columbia River Fish Population Indexing Survey. Report prepared for BC Hydro Generation, Water License Requirements, Revelstoke, BC.

Otis, D.L., K.P. Burnham, G.C. White and D.R. Anderson. 1978. Statistical inference from capture data on closed animal populations. Wildlife Monograph 62: 3:135.

P&E (P&E Environmental Consultants Ltd.). 2002. Peace River Fish Community Indexing Program Phase 1 Studies. Report Prepared for BC Hydro by P&E Environmental Consultants Ltd. P&E Report No. 01005F: 76 pages + appendices.

P&E and Gazey (P&E Environmental Consultants Ltd. and W.J. Gazey Research). 2003. Peace River Fish Community Indexing Program Phase 2 Studies. Report Prepared for BC Hydro by P&E Environmental Consultants Ltd. P&E Report No. 02011F: 86 pages + appendices.

Quinn, T.J., II. and R.B. Deriso. 1999. Quantitative Fish Dynamics. Oxford University Press. Oxford. 542 pages.

R.L.&L. Environmental Services Ltd. 2001. Peace River fish habitat utilization study. Prepared for BC Hydro - Environmental Services, Burnaby, BC. RL&L Report No. 725F: 72 pages + appendices.

R Core Team. 2014. R: A language and environment for statistical computing. Vienna, Austria. http://www.R-project.org.

RRCS (Renewable Resources Consulting Services Ltd.). 1978. Peace River Site C Hydro-electric development fish and aquatic environment. Report submitted to Thurber Consultants, Victoria BC by Renewable Resources Consulting Services, Ltd., Edmonton AB.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada. Bulletin 191. 382 pages.

Seber, G. A. F. 1982. The estimation of animal abundance and related parameters. Second edition. Edward Arnold, London.

Snyder, D.E. 2003. Electrofishing and its harmful effects on fish, Information and Technology Report USGS/BRD/ITR--2003-0002: U.S. Government Printing Office, Denver, CO. 149 pages.

WaterOffice. 2017. Government of Canada. Real-Time Hydrometric Data for Moberly River near Fort St. John (Station Number 07FB008). Downloaded from: http://wateroffice.ec.gc.ca/report/report_e.html?type=realTime&stn=07FB008 on 9 January 2017.

Watkins, O.B. and S.C. Spencer. 2009. Collection, preparation and ageing of Walleye pelvic fin rays. Fish and Wildlife Division, Alberta Sustainable Resource Development. 14 pages.

White, G. C. 2006. Program MARK (Version 4.3): Mark Recapture Survival Rate Estimation. Department of Fishery and Wildlife, Colorado State University, Fort Collins, Colorado.

Williams, B. K., J. D. Nichols, and M. J. Conroy. 2001. Analysis and management of animal populations. Academic Press. 817 pages.

Wydoski, R.S. and Whitney, R.R. 2003. Inland Fishes of Washington (Second Edition). American Fisheries Society, Bethesda, Maryland in association with University of Washington Press. ISBN 0-295-98338-8. 217 pages + 14 appendices.

APPENDIX A

Maps and UTM Locations

Table A1. Location and distance from WAC Bennett Dam of Peace River boat electroshocking sites sampled in 2016.

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	47.3	10	644400	6224099	46.1	1200
	0602	RDB	n/a	n/a	10	644567	6223590	46.0	10	645385	6223368	45.1	900
	0603	IRDB	n/a	n/a	10	646156	6223144	44.3	10	647208	6222813	43.1	1300
	0604	RDB	n/a	n/a	10	646546	6222599	43.7	10	647508	6222650	42.8	1000
	0605	IRDB	n/a	n/a	10	647888	6222979	42.4	10	648668	6223109	41.6	800
	0606	LDB	n/a	n/a	10	649302	6223371	41.1	10	650601	6222912	39.6	1400
	0607	IRDB	n/a	n/a	10	651250	6222649	39.1	10	652139	6222123	38.1	1000
	0608	RDB	n/a	n/a	10	647711	6222699	42.6	10	648681	6222855	41.6	1000
	0609	ILDB	n/a	n/a	10	649423	6223115	40.9	10	650300	6222732	39.9	1000
	0610	ILDB	n/a	n/a	10	650309	6222738	39.9	10	651089	6222427	39.1	850
	0611	ILDB	n/a	n/a	10	651070	6222442	39.2	10	651842	6221990	38.3	900
	0612	IRDB	n/a	n/a	10	652136	6222141	38.1	10	652937	6221822	37.2	850
	0613	RDB	n/a	n/a	10	653270	6221438	36.8	10	654182	6221491	35.9	900
	0614	IRDB	n/a	n/a	10	645301	6223722	45.3	10	646108	6223365	44.3	975
	06PIN01	RDB	n/a	n/a	10	641497	6223588	47.7	10	642638	6224067	47.7	1500
	06PIN02	RDB	n/a	n/a	10	642639	6224071	47.9	10	643433	6224055	47.1	1000
	06SC036	IRDB	n/a	n/a	10	654048	6222162	35.4	10	654522	6222203	35.4	500
	06SC047	RDB	n/a	n/a	10	644017	6223518	46.0	10	644510	6223546	46.0	550
7	0702	IRDB	n/a	n/a	10	664322	6219824	25.2	10	665185	6220188	24.3	950
	0703	LDB	n/a	n/a	10	665724	6220631	23.7	10	666643	6220828	22.8	950
	0704	IRDB	n/a	n/a	10	667149	6220752	22.3	10	668100	6220738	21.3	1000
	0705	RDB	n/a	n/a	10	667571	6220294	21.8	10	668547	6220497	20.9	1000
	0706	RDB	n/a	n/a	10	668544	6220498	20.9	10	669537	6220614	19.9	1000
	0709	IRDB	n/a	n/a	10	665176	6220191	24.3	10	666096	6220512	23.3	1000
	0715	LDB	n/a	n/a	10	664862	6220453	23.5	10	665722	6220631	22.7	900
	0716	LDB	n/a	n/a	10	666641	6220828	21.8	10	668284	6221090	20.3	1600
	0717	LDB	n/a	n/a	10	668284	6221090	20.3	10	668899	6221122	19.6	650
	0718	ILDB	n/a	n/a	10	666094	6220512	22.3	10	667189	6220254	21.2	1200
	0719	LDB	n/a	n/a	10	676792	6220831	11.5	10	677560	6220945	10.7	750
	0720	RDB	n/a	n/a	10	661649	6219951	26.7	10	663004	6219878	25.3	1400
	0721	RDB	n/a	n/a	10	663004	6219878	25.3	10	664320	6219824	24.1	1300
	0722	RDB	n/a	n/a	10	660554	6220625	27.8	10	661617	6220323	26.8	1100
	07SC012	LDB	n/a	n/a	10	676579	6220730	11.6	10	676792	6220831	11.4	220
	07SC022	RDB	n/a	n/a	10	666832	6219962	22.6	10	667130	6220145	22.3	360
9	0901	LDB	n/a	n/a	11	357843	6239030	-49.7	11	358391	6239968	-50.7	1100
	0902	LDB	n/a	n/a	11	358391	6239968	-50.7	11	359350	6240287	-51.7	1000
	0903	ILDB	n/a	n/a	11	358363	6239289	-50.3	11	359084	6240016	-51.3	1100
	0904	ILDB	n/a	n/a	11	359520	6240016	-51.2	11	360625	6240169	-52.3	1100
	0905	LDB	n/a	n/a	11	361692	6240512	-53.3	11	362771	6240709	-54.4	1100
	0906	RDB	n/a	n/a	11	363235	6241089	-55.5	11	363870	6241929	-56.6	1000
	0907	ILDB	n/a	n/a	11	364583	6242344	-57.5	11	365319	6243257	-58.7	1200
	0908	ILDB	n/a	n/a	11	365837	6243458	-59.5	11	366849	6243231	-60.5	1100
	0909	ILDB	n/a	n/a	11	366849	6243231	-55.7	11	367534	6242583	-56.7	950
	0910	LDB	n/a	n/a	11	363258	6240685	-59.8	11	364070	6241393	-60.7	1100
	0911	IRDB	n/a	n/a	11	366799	6243728	-59.7	11	367379	6243081	-60.7	1000
	0912	LDB	n/a	n/a	11	368560	6241724	-62.0	11	368549	6240689	-63.0	1100
	0913	RDB	n/a	n/a	11	367347	6241966	-61.0	11	367721	6241096	-62.0	1000
	0914	IRDB	n/a	n/a	11	367734	6241649	-61.1	11	368179	6240875	-62.0	950
	09SC53	RDB	n/a	n/a	11	360795	6239970	-53.0	11	361029	6240059	-53.0	260
	09SC61	RDB	n/a	n/a	11	366861	6242408	-60.5	11	367347	6241966	-61.0	675

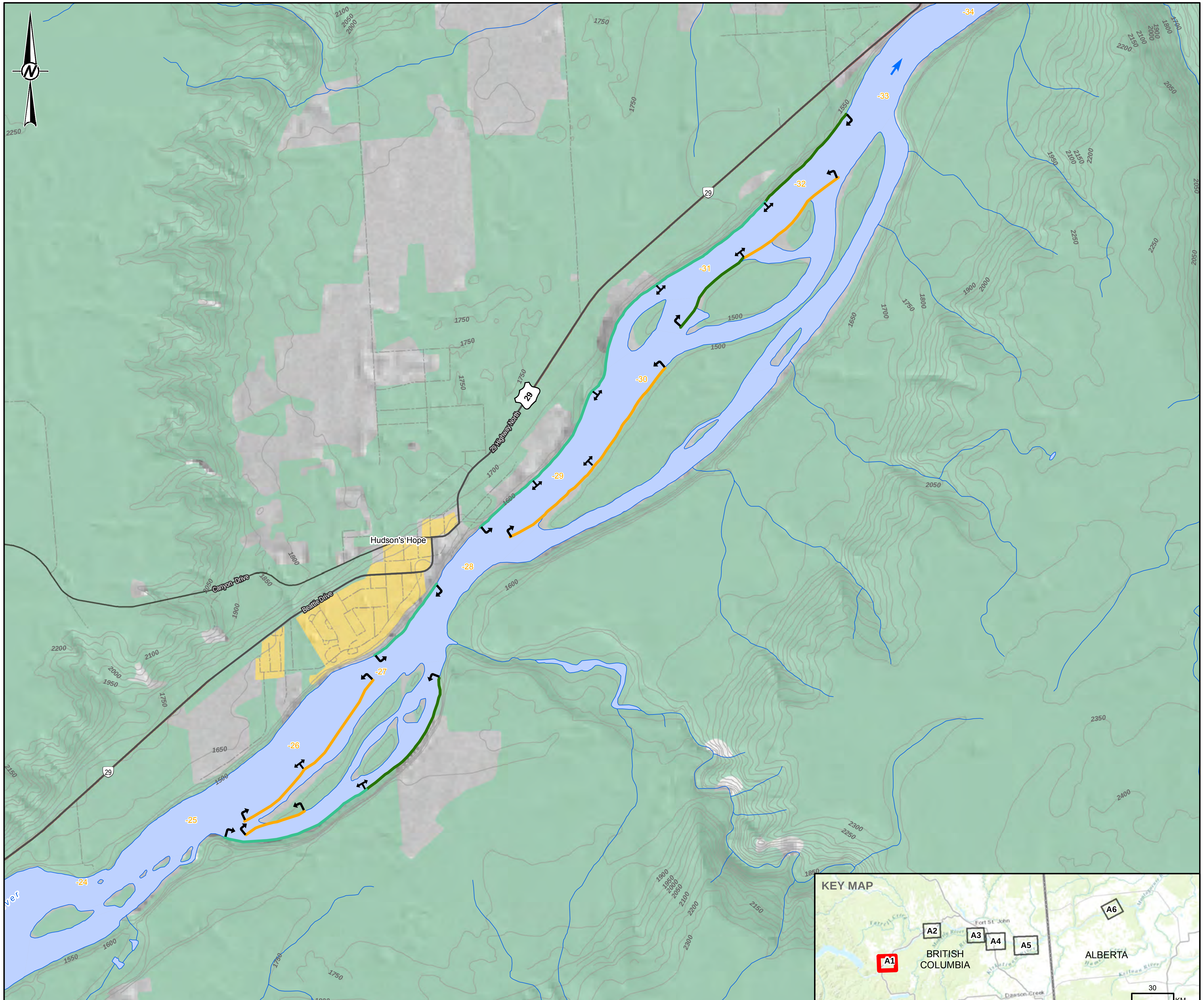
[a] RDB=Right bank as viewed facing downstream; LDB=Left bank as viewed facing downstream; IRDB=Right bank of island as viewed facing downstream; ILDB=Left bank of island as viewed facing downstream.

[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).



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

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

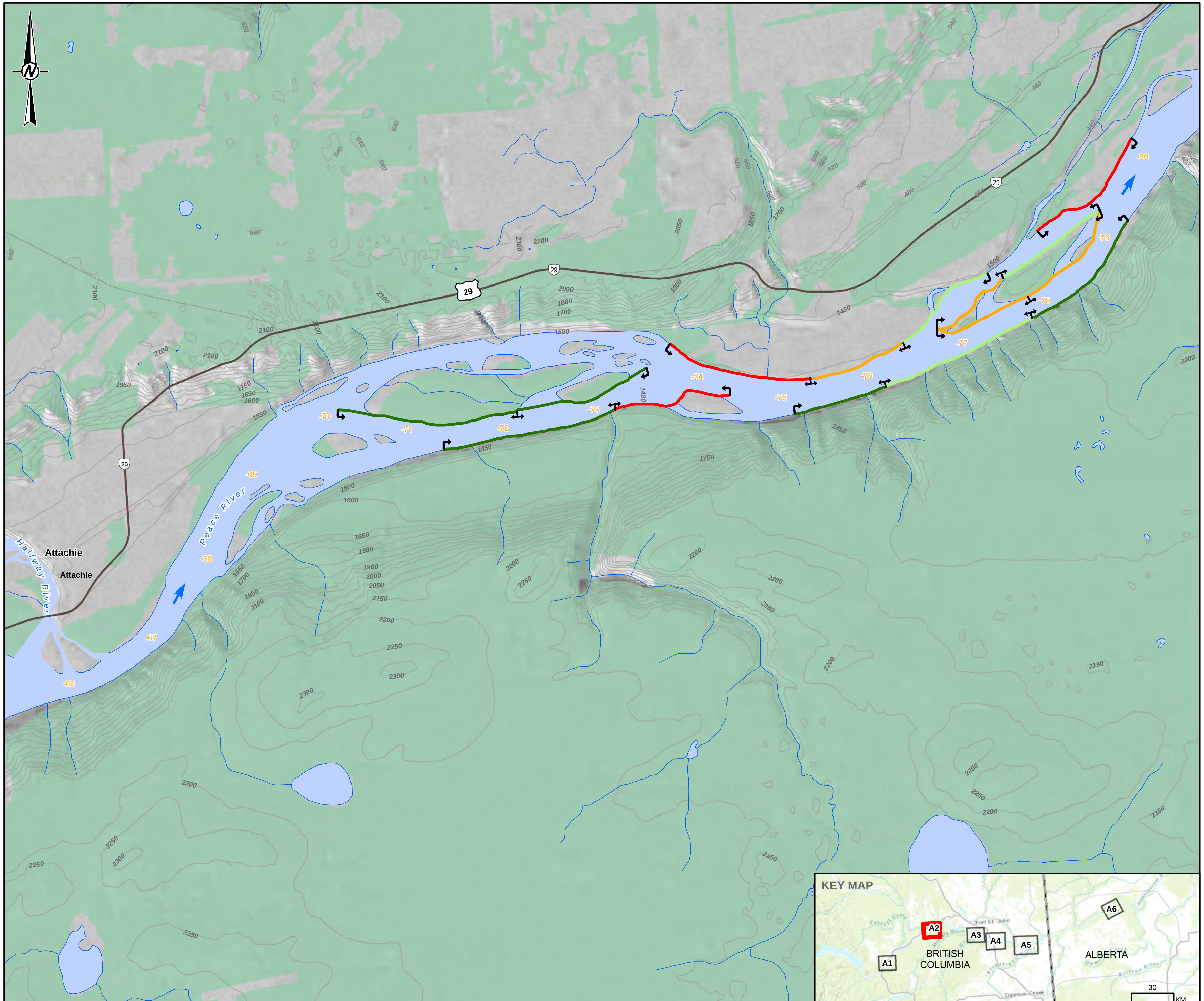
SECTION 1 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT

GOLDER

YYYY-MM-DD	2017-01-17
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753		1	A1



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

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	2017-01-17
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753		1	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

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

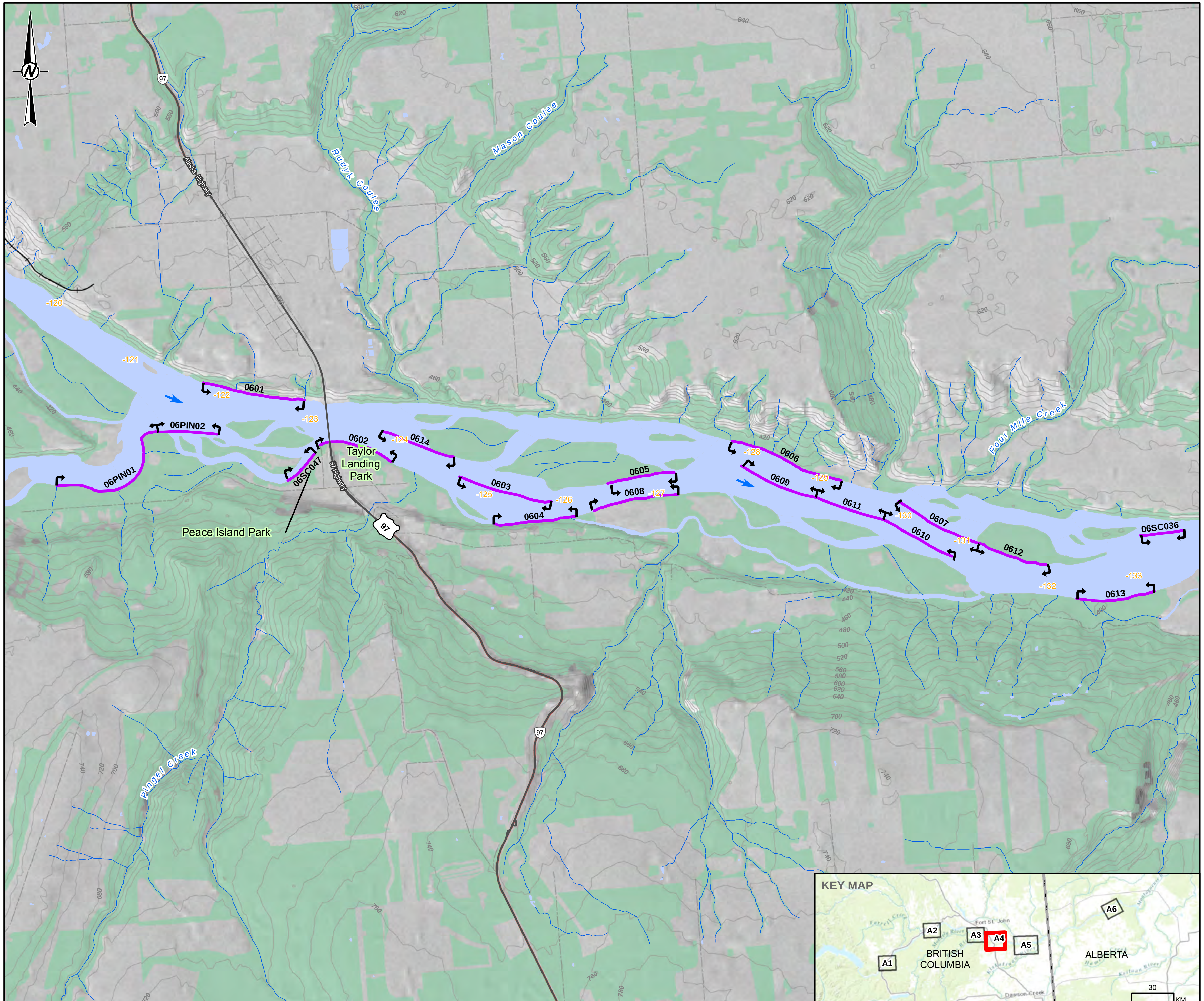
YYYY-MM-DD	2017-01-17
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753		1	A3

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

25mm

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\BC_Hydro\Peace_River_GMS\99_PROJECTS\1400753_PeaceRiver_GMS\02_PRODUCTION\2015\MXD\Report\2017\FIG A1-6_1400753_PeaceRiver_2017_REV1.mxd



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

0 900 1,800

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)

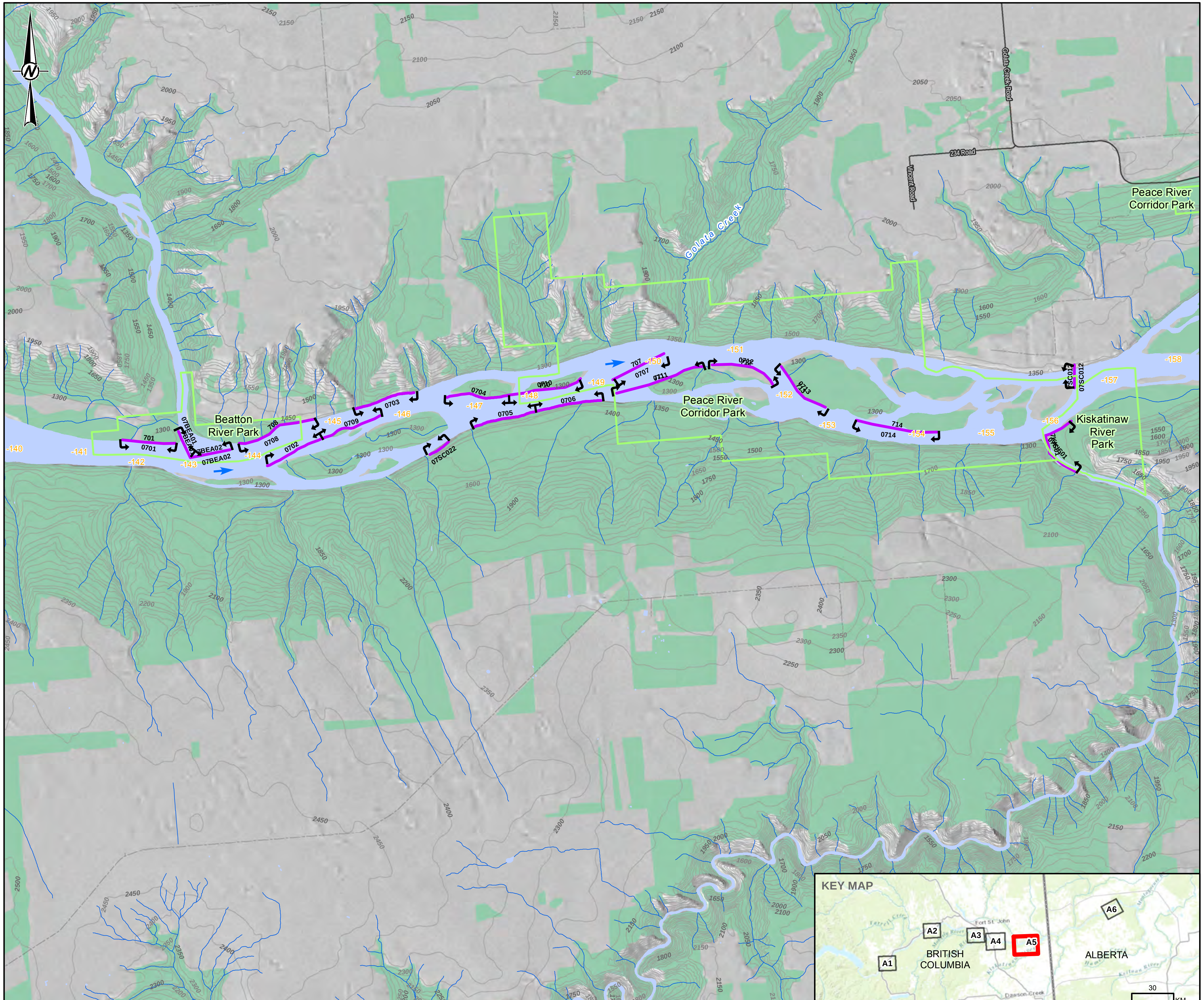
CONSULTANT
GOLDER

YYYY-MM-DD	2017-01-17
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753		1	A4

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

TRANSPORTATION

- ARTERIAL ROAD
- LOCAL ROAD

HYDROLOGY

- WATERCOURSE
- WATER

TOPOGRAPHY

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

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)

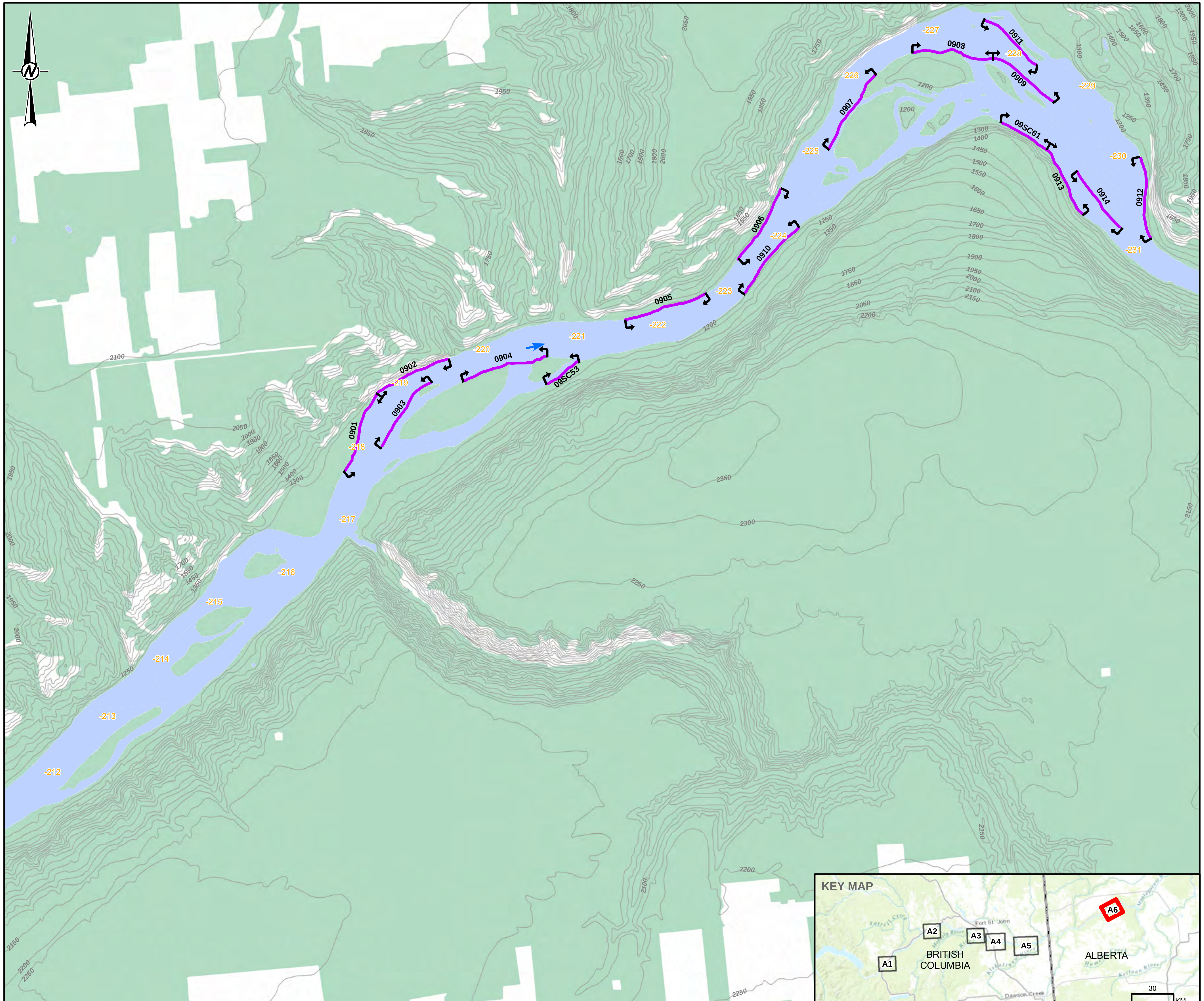
TITLE
SECTION 7 - PEACE RIVER LARGE FISH INDEXING SURVEY (TASK 2A)

CONSULTANT
GOLDER

YYYY-MM-DD	2017-01-17
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753		1	A5

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



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

0 1,000 2,000
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	2017-01-17
DESIGNED	DF
PREPARED	AD
REVIEWED	DF
APPROVED	GA

PROJECT NO.	CONTROL	REV.	FIGURE
1400753		1	A6

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

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\BC_Hydro\Peace_River_GMS\99_PROJECTS\1400753_PeaceRiver_GMS\02_PRODUCTION\2015\MXD\Report\2017\FIG A1-6_1400753_PeaceRiver_2017_REV1.mxd

APPENDIX B

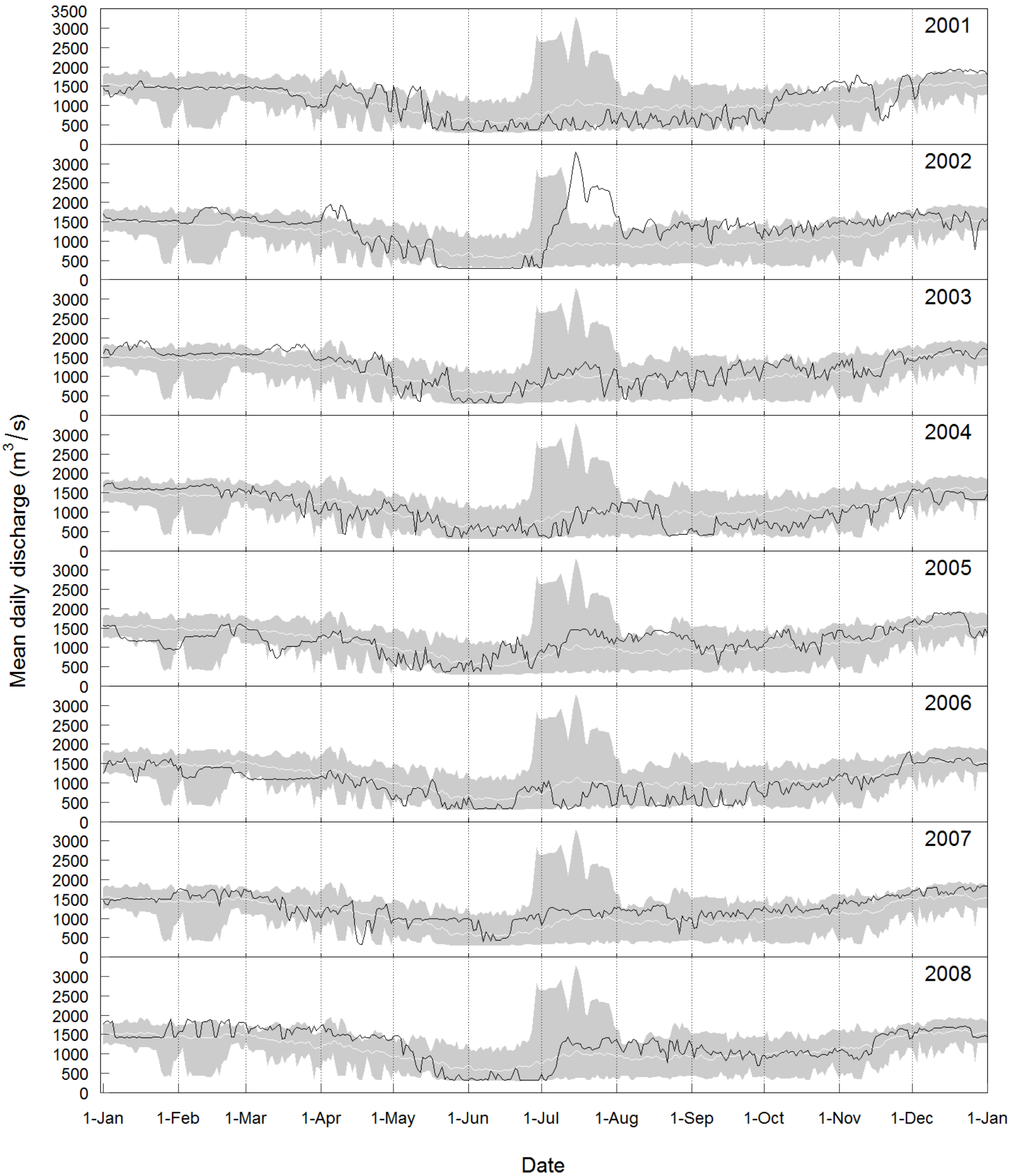
Historical Datasets

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		Current Study Year		Current Study Year		Current Study Year	Current Study Year	Current Study Year		Current Study Year

APPENDIX C

Discharge and Temperature



Continued...

Figure C1: Mean daily discharge (m³/s) for the Peace River at Peace Canyon Dam (PCD; black line), 2001 to 2016. 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.

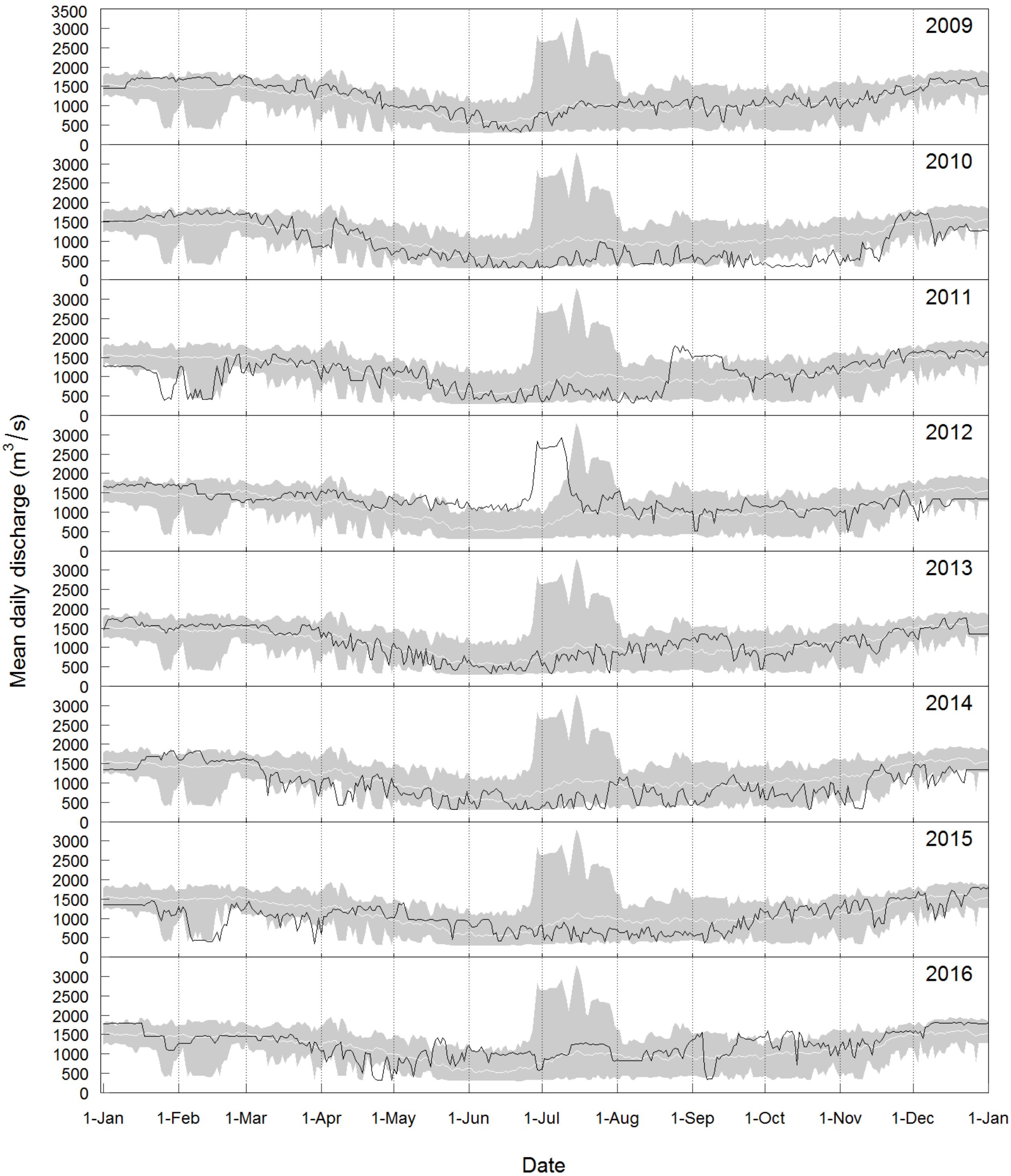


Figure C1: Concluded.

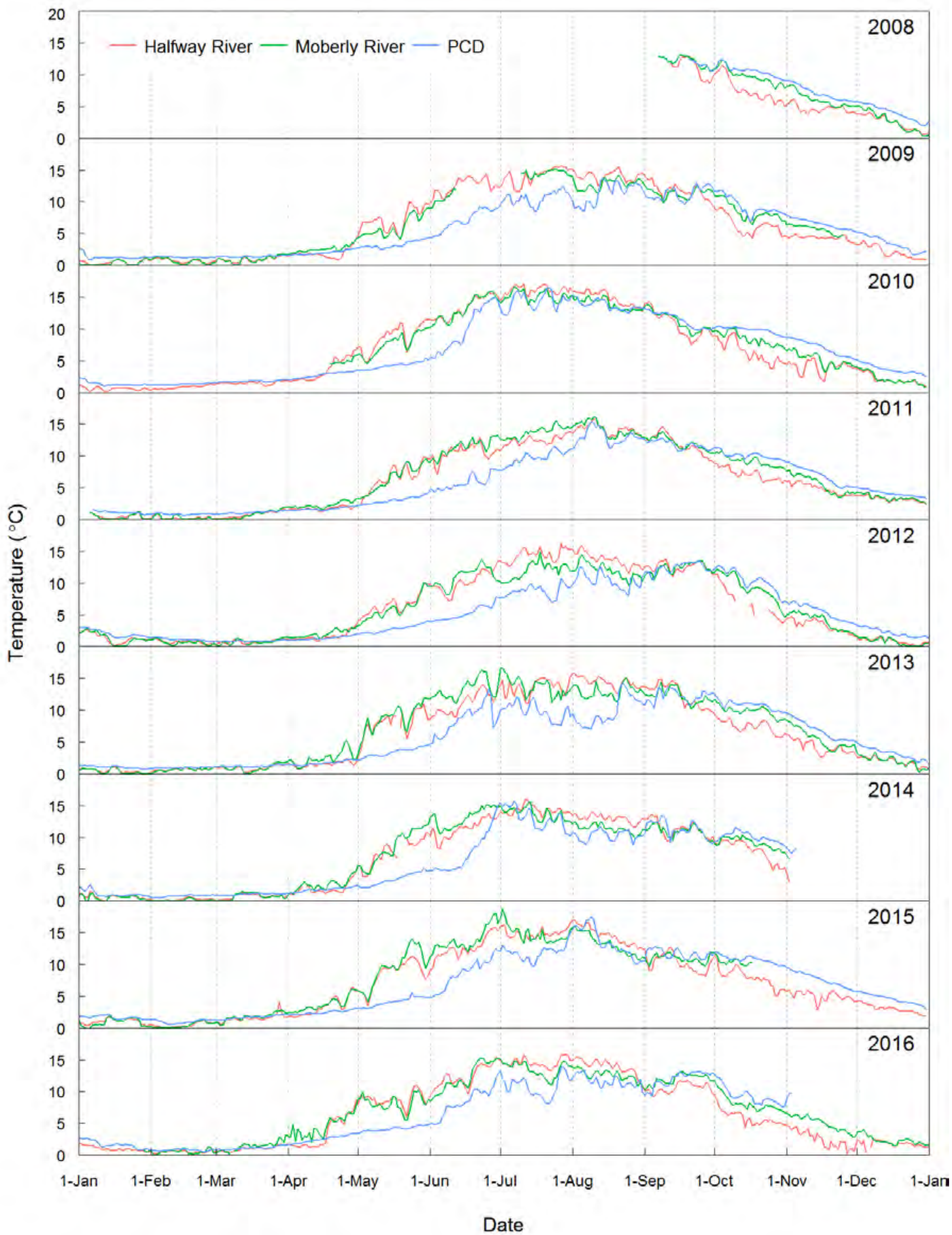


Figure C2: Mean daily water temperatures (°C) for the Peace River downstream of Peace Canyon Dam (PCD; blue line), downstream of the Halfway River confluence (red line) and downstream of the Moberly River confluence (green line), 2008 to 2016. Data were collected under GMSWORKS-2 (DES 2014).

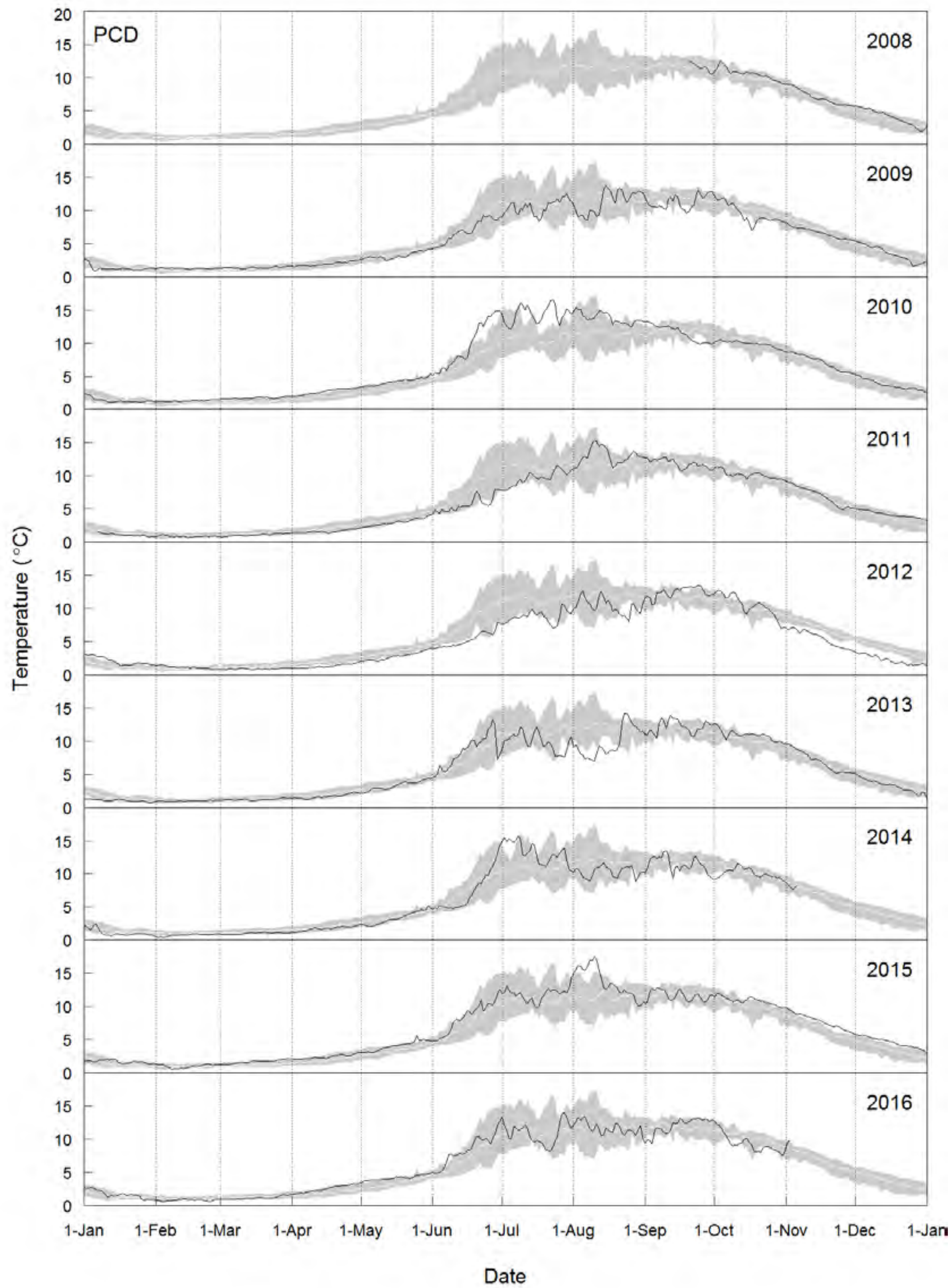


Figure C3: Mean daily water temperature (°C) for the Peace River at Peace Canyon Dam (PCD; black line), 2008 to 2016. The shaded area represents minimum and maximum water temperatures recorded at PCD during other study years between 2008 and 2016. The white line represents average mean daily water temperatures over the same time period. Data were collected under GMSWORKS-2 (DES 2014).

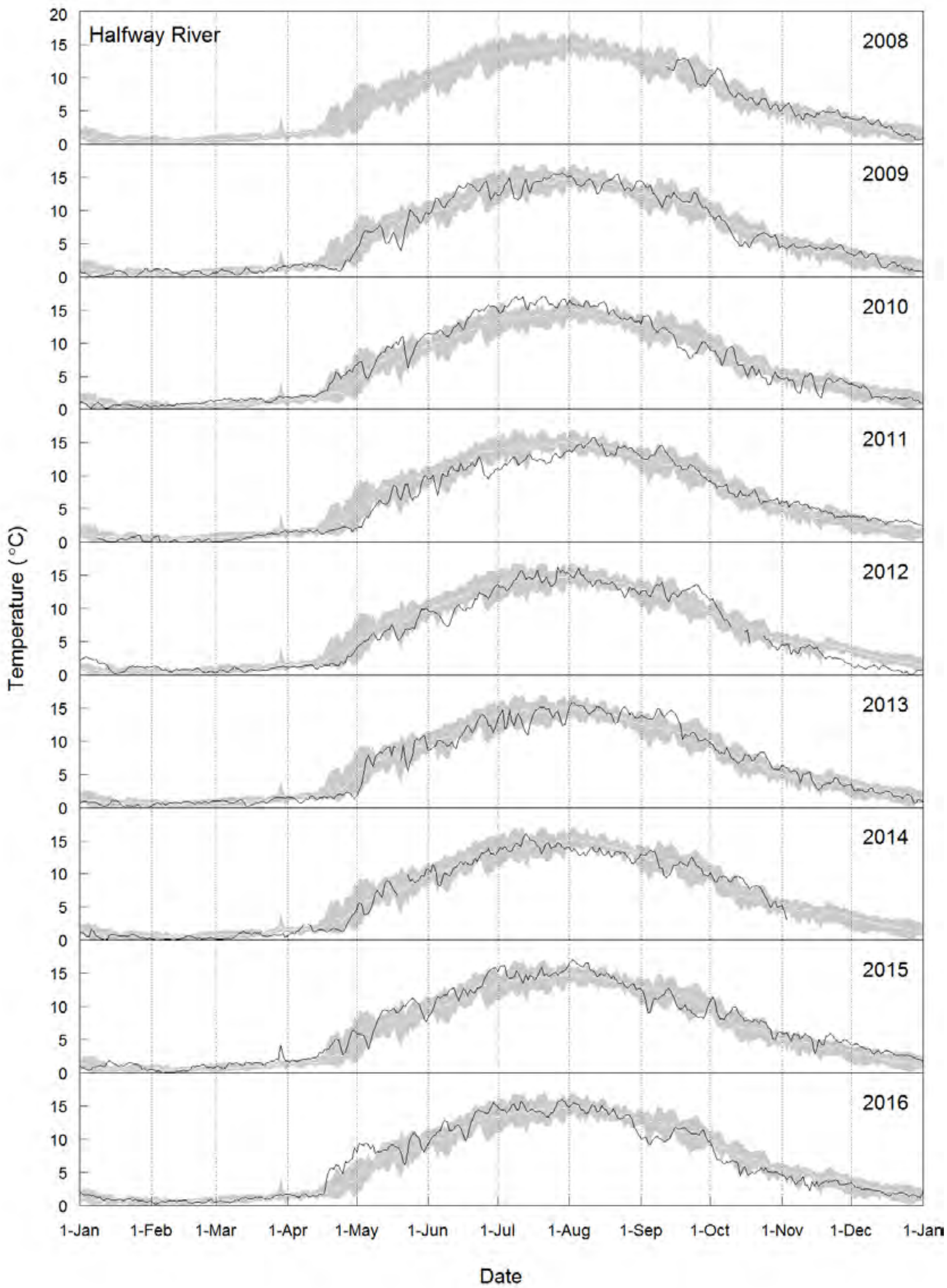


Figure C4: Mean daily water temperature (°C) for the Peace River downstream of the Halfway River confluence (black line), 2008 to 2016. The shaded area represents minimum and maximum water temperatures recorded at the site during other study years between 2008 and 2016. The white line represents average mean daily water temperatures over the same time period. Data were collected under GMSWORKS-2 (DES 2014).

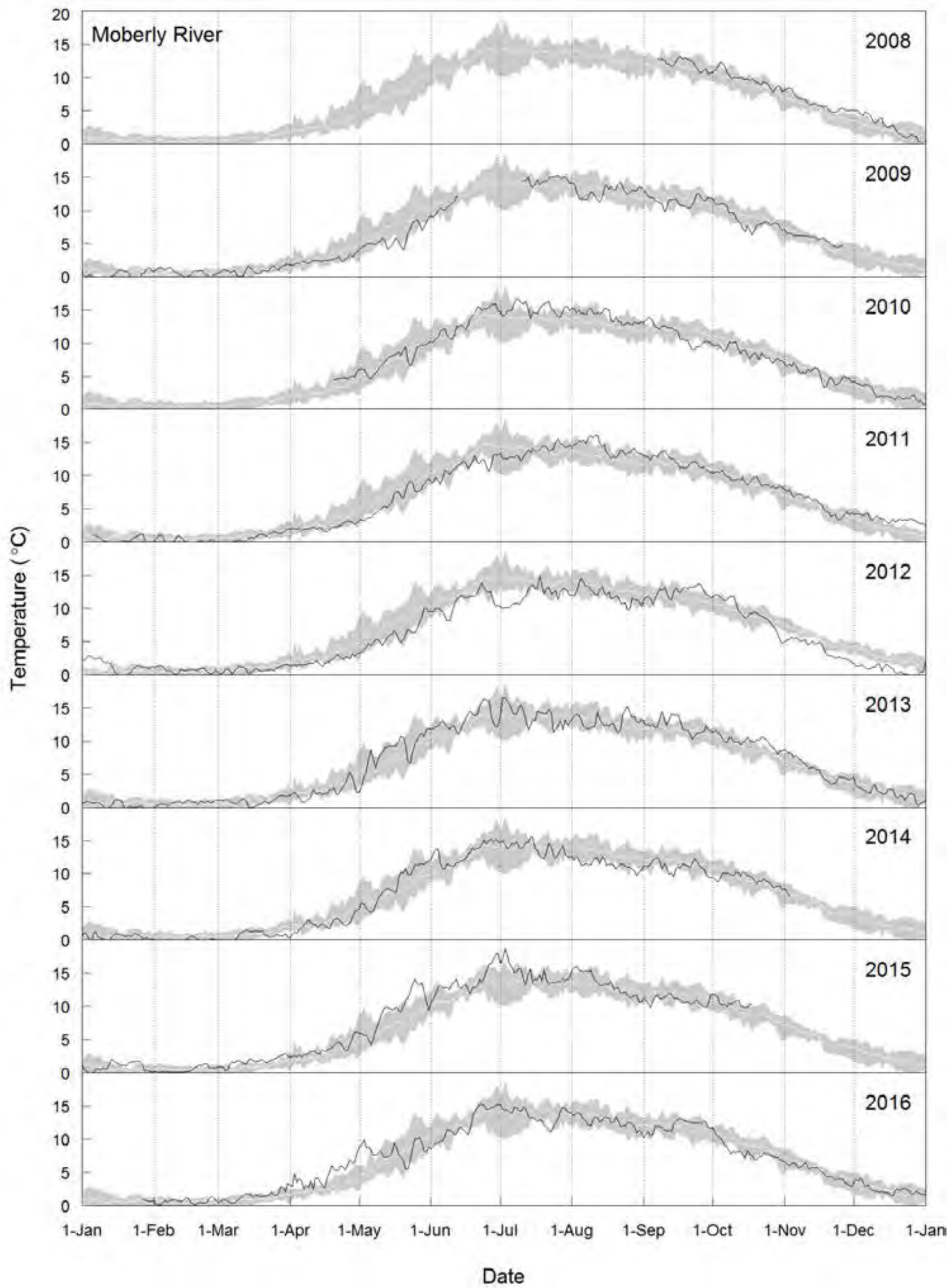


Figure C5: Mean daily water temperature (°C) for the Peace River downstream of the Moberly River confluence (black line), 2008 to 2016. The shaded area represents minimum and maximum water temperatures recorded at the site during other study years between 2008 and 2016. The white line represents average mean daily water temperatures over the same time period. Data were collected under GMSWORKS-2 (DES 2014).

APPENDIX D

Habitat Data

Table D1 Lengths of boat electroshocking sites by habitat type in the Peace River, 2016. 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[c]			
		A1[d]	A2[d]	A3[d]	Total	A2[d]	A3[d]	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, 23 August to 01 October 2016.

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	20	9.6	160	Clear		Medium	Medium		n/a	100							
1	119	2	12	9.8	133	Overcast		Medium	Medium		1	40	5	50				2	
1	119	3	12	8.6	129	Mostly cloudy		Medium	Medium		1.6	20						80	
1	119	4	15	11.7	129	Mostly cloudy		Medium	High		1.8	90						10	
1	119	5	13	12.0	190	Mostly cloudy		Low	High		1.9	90		5				5	
1	119	6	13	11.8	140	Partly cloudy		Low	High		2	33		33				34	
1	116	1	22	9.8	120	Mostly cloudy		Medium	Medium		n/a	100							
1	116	2	10	8.0	131	Overcast		High	Medium		1		5						
1	116	3	12	8.9	131	Overcast		Medium	Medium		1.3	100							
1	116	4	15	11.4	129	Clear		High	Medium		1.8	95						5	
1	116	5	14	12.2	190	Mostly cloudy		Medium	Medium		1.9	100							
1	116	6	13	12.0	140	Partly cloudy		Medium	Medium		2	100							
1	114	1	22	9.9	120	Mostly cloudy		High	Medium		n/a	100							
1	114	2	13	7.9	131	Overcast		Medium	Medium		1	95	2						
1	114	3	12	9.1	131	Overcast		High	Medium		1.3	100							
1	114	4	15	11.4	129	Partly cloudy		Medium	Medium		1.8	90						10	
1	114	5	14	12.2	190	Mostly cloudy		Medium	Medium		1.9	90						10	
1	114	6	15	11.9	140	Partly cloudy		Medium	Medium		2	90						10	
1	113	1	22	10.1	120	Partly cloudy		Medium	Medium		n/a	90	3		1	1		5	
1	113	2	10	8.0	131	Overcast		Medium	Medium		1	95		2					
1	113	3	12	8.9	131	Overcast		Medium	Medium		1.3	100							
1	113	4	15	11.4	129	Partly cloudy		High	Medium		1.8	95						5	
1	113	5	13	12.2	190	Mostly cloudy		Medium	Medium		1.9	95						5	
1	113	6	14	11.9	140	Partly cloudy		Medium	Medium		2	100							
1	112	1	20	9.9	120	Partly cloudy		Medium	Medium		n/a	79	1					20	
1	112	2	12	8.1	131	Overcast		Medium	Medium		1	95	2						
1	112	3	12	9.1	131	Overcast		Medium			1.3	100							
1	112	4	15	11.4	129	Clear		High	Medium		1.8	90						10	
1	112	5	13	12.1	190	Mostly cloudy		Medium	Medium		1.9	90		5				5	
1	112	6	13	11.9	140	Partly cloudy		Medium	High		2	90		5				5	
1	111	1	20	9.7	120	Clear		Medium	Medium		n/a	70						30	
1	111	2	12	9.0	131	Overcast		Medium	Medium		1	95		2					
1	111	3	12	9.1	131	Overcast		High	Low		1.3	70						30	
1	111	4	15	11.3	129	Mostly cloudy		Medium	Medium		1.8	90						10	
1	111	5	13	12.2	190	Mostly cloudy		Medium	Medium		1.9	90						10	
1	111	6	13	11.9	140	Partly cloudy		High	Medium		2	90						10	
1	110	1	20	10.5	160	Partly cloudy		High	Medium		n/a	70						30	
1	110	2	5	7.9	131	Overcast		High	Medium		1		5		5				
1	110	3	15	9.1	129	Mostly cloudy		High	Medium		1.6	40						60	
1	110	4	15	11.2	129	Clear		High	Medium		1.8	90						10	
1	110	5	13	12.0	190	Mostly cloudy		Medium	Medium		1.9	90		5				5	
1	110	6	14	11.8	140	Partly cloudy		Medium	Medium		2	95						5	
1	109	1	14	9.4	120	Partly cloudy		High	Low		n/a	100							
1	109	2	12	8.7	133	Overcast		Medium	Medium		1	90		5					
1	109	3	10	8.6	130	Overcast		High	Low		1.3	100							
1	109	4	15	11.1	129	Mostly cloudy		Medium	Medium		1.8	95						5	
1	109	5	13	12.1	190	Mostly cloudy		Medium	Medium		1.9	90						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	13	11.2	140	Partly cloudy		Medium	High		2	90		10					
1	108	1	14	9.4	120	Partly cloudy		High	Low		n/a	99	1						
1	108	2	13	8.6	135	Overcast		High	Medium		1	90						5	
1	108	3	15	9.3	130	Mostly cloudy		High			1	30						20	
1	108	4	13	11.1	130	Partly cloudy		High	Medium		1.8	95						5	
1	108	5	13	12.1	190	Mostly cloudy		Medium	Medium		1.9	100							
1	108	6	14	11.8	140	Partly cloudy		Low	Medium		2	100							
1	107	1	20	10.0	160	Clear		High	Medium		n/a	50						50	
1	107	2	5	7.9	131	Overcast		High	Medium		1		5		5				
1	107	3	14	8.9	129	Mostly cloudy		High	Medium		1.6	30						70	
1	107	4	20	11.7	129	Overcast		High	Medium		1.8	80						20	
1	107	5	13	12.0	190	Mostly cloudy		Medium	Medium		1.9	80		10				10	
1	107	6	13	11.8	140	Partly cloudy		Medium	High		2	33		33				34	
1	105	1	16	9.1	160	Clear		Medium	Medium		n/a	90	1	4			5		
1	105	2	8	8.7	130	Overcast		High	High		1	75		20				5	
1	105	4	20	11.8	129	Partly cloudy		Medium	High		1.8	80		10				10	
1	105	5	12	11.9	190	Mostly cloudy		Medium	High		1.9	90		10					
1	105	6	12	11.7	140	Partly cloudy		Low	High		2	80		10				10	
1	104	1	20	9.7	160	Clear		Medium	Low		n/a	91		3	3		3		
1	104	2	12	8.7	130	Overcast		Medium	Medium		1	95		2	2				
1	104	4	15	11.8	129	Mostly cloudy		Medium	Medium		1.8	95						5	
1	104	5	13	11.9	190	Mostly cloudy		Medium	Medium		1.9	100							
1	104	6	12	11.8	140	Partly cloudy		Medium	Medium		2	100							
1	103	1	16	9.6	160	Clear		Medium	Medium		n/a	90	1	1	0	0	8	0	0
1	103	2	8	8.7	130	Mostly cloudy		High	Medium		1	60	5	30				5	
1	103	4	15	11.7	129	Mostly cloudy		Medium	High		1.8	90	5	5					
1	103	5	11	11.9	190	Mostly cloudy		Medium	High		1.9	95	5						
1	103	6	12	11.7	140	Partly cloudy		Medium	High		2	95	2					2	
1	102	1	20	9.6	160	Clear		Low	High		n/a	50		50					
1	102	2	12	9.9	140	Overcast		Low	High		1	5		95					
1	102	3	12	8.2	129	Overcast		Low	High		1.6	40		40				20	
1	102	4	20	11.8	129	Mostly cloudy		Medium	High		1.8	80		10			10		
1	102	5	15	12.0	190	Mostly cloudy		Low	High		1.9	90		10					
1	102	6	12	11.7	140	Partly cloudy		Low	High		2	80		20					
1	101	1	17	9.7	160	Clear		Low	High		n/a	30		70					
1	101	2	12	8.1	130	Overcast		Low	High		1	10		90					
1	101	3	10	8.3	129	Overcast		Medium	High		1.6	80		20					
1	101	4	20	11.8	129	Partly cloudy		High	Medium		1.8	50					50		
1	101	5	13	12.0	190	Mostly cloudy		Low	High		1.9	90		10					
1	101	6	12	11.8	140	Partly cloudy		Low	High		2	50		50					
3	316	1	4	8.7	138	Overcast		High	Medium		0.2		7						
3	316	2	14	9.6	130	Partly cloudy		Medium	Medium		0.2	85	5	5					
3	316	3	12	9.2	133	Overcast		Medium	High		0.9	95							
3	316	4	13	11.0	137	Overcast		Medium	Medium		1.4	95	2					2	
3	316	5	15	11.5	200	Overcast		Medium	Medium		1.2	90	5					5	
3	316	6	3	10.8	210	Partly cloudy		Medium	Medium		1.8	90						10	
3	315	1	12	10.0	134	Overcast		High	Low		1.5	85			5			10	
3	315	2	12	8.9	126	Partly cloudy		High	Medium		0.1								

[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	315	3	12	9.1	133	Overcast		Medium	Medium		0.9	80	5						
3	315	4	12	10.9	137	Overcast		Medium	Medium		1.4	95	2					2	
3	315	5	12	11.3	200	Overcast		High	Medium		1.2	95						5	
3	315	6	1	10.8	210	Partly cloudy		High	Medium		1.8	80						20	
3	314	1	9	11.0	134	Overcast		High	Low		1.5	88	2					10	
3	314	2	10	7.9	126	Clear		High	Medium		0.1								
3	314	3	12	9.0	133	Overcast		High	Medium		0.9	80						5	
3	314	4	12	10.9	137	Overcast		Medium	Medium		1.4	90	1					9	
3	314	5	12	11.3	200	Overcast		High	Medium		1.2	90						10	
3	314	6	5	10.9	210	Partly cloudy		Medium	Medium		1.8	90						10	
3	312	1	12	10.2	136	Mostly cloudy		High	Low		0.2		2						
3	312	2	15	9.0	172	Partly cloudy		Low	Medium		0.1	95							
3	312	3	20	9.7	220	Clear		High	Medium		0.2								
3	312	4	17	10.7	155	Partly cloudy		Medium	Medium		0.3								
3	312	5	12	10.2	200	Overcast		Medium	Medium		1.2	100							
3	312	6	15	10.5	220	Clear		Medium	Medium		0.9	10						40	
3	311	1	18	11.8	134	Partly cloudy		High	Low		1.5	89	6					5	
3	311	2	12	8.5	172	Partly cloudy		Medium	Medium		0.1	90						5	
3	311	3	5	8.6	220	Fog		High	Medium		0.2								
3	311	4	15	10.3	155	Partly cloudy		Medium	Medium		0.3								
3	311	5	15	10.9	200	Partly cloudy		Medium	Medium		0.4	30						30	
3	311	6	13	10.2	220	Clear		High	Medium		0.9	10					10	40	
3	310	1	12	9.6	136	Mostly cloudy		High	Low		0.2		2						
3	310	2	12	9.0	172	Partly cloudy		Medium	Medium		0.1	85	5	5					
3	310	3	16	9.8	220	Clear		Medium	Medium		0.2								
3	310	4	17	11.6	155	Partly cloudy		Medium	Medium		0.3								
3	310	5	16	12.0	200	Partly cloudy		Medium	Medium		0.4	70						30	
3	310	6	17	11.2	220	Clear		Medium	Medium		1.0	10	2		3		30	30	
3	309	1	22	10.9	134	Partly cloudy		High	Low		1.5	97	2		1				
3	309	2	12	8.5	172	Partly cloudy		Medium	Medium		0.1	90							
3	309	3	12	9.6	220	Clear		High	Low		0.2								
3	309	4	17	11.5	155	Partly cloudy		Medium	Medium		0.3								
3	309	5	15	11.9	200	Partly cloudy		Medium	Medium		0.4	30				30	40		
3	309	6	17	11.3	220	Clear		Medium	Low		1.2	10			10		40	40	
3	308	1	10	9.2	138	Overcast		High	Medium		0.2								
3	308	2	15	9.9	126	Partly cloudy		High	Medium		0.1								
3	308	3	15	9.4	133	Overcast		Medium	Medium		0.9	80							
3	308	4	17	11.6	137	Overcast		Medium	Medium		1.4	80							
3	308	5	12	11.3	200	Overcast		Medium	Medium		1.2	100							
3	308	6	17	11.4	220	Clear		Medium	Medium		1.2	10					40	40	
3	307	1	22	10.7	134	Overcast		High	Low		1.5	98	2						
3	307	2	15	9.4	126	Partly cloudy		High	Medium		0.1								
3	307	3	15	9.1	133	Overcast		High	Low		0.9	95							
3	307	4	14	11.3	137	Overcast		Medium	Low		1.4	90							
3	307	5	13	11.2	200	Overcast		High	Low		1.2	100							
3	307	6	17	11.4	220	Partly cloudy		Medium	Medium		1.2	20						50	
3	306	1	9	11.0	134	Overcast		High	Low		1.5	98	2						
3	306	2	5	7.9	126	Overcast		High	Medium		0.1								

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

Continued...

[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.

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	0306	3	3	8.6	220	Fog		High	Medium		0.2								
3	0306	4	11	10.3	155	Fog		High	Low		0.3								
3	0306	5	14	10.5	200	Partly cloudy		Medium	Medium		0.4								
3	0306	6	11	9.9	220	Partly cloudy		High	Medium		0.9	15						55	
3	0305	1	22	12.2	130	Partly cloudy		High	Medium		1.9	97						3	
3	0305	2	5	7.9	126	Overcast		High	Medium		0.1								
3	0305	3	15	9.0	179	Overcast		Medium	Low		0.2								
3	0305	4	18	11.3	195	Partly cloudy		High	Medium		0.4					10			
3	0305	5	12	10.8	200	Partly cloudy		Medium	Medium		0.4	40							
3	0305	6	10	9.8	220	Partly cloudy		Medium	Medium		0.6	5						30	
3	0304	1	20	10.7	130	Partly cloudy		High	Medium		1.9	100							
3	0304	2	10	10.1	190	Mostly cloudy		High	Medium		0.3					20		10	
3	0304	3	15	9.6	120	Overcast		Medium	Medium		0.7	95							
3	0304	4	16	11.5	126	Partly cloudy		High	Medium		1.2				10	10	50		
3	0304	5	15	11.6	200	Partly cloudy		High	Medium		0.9	50		5		10	35		
3	0304	6	8	10.8	220	Mostly cloudy		Medium	Medium		1.2	25	3		2			70	
3	0303	1	16	10.6	130	Partly cloudy		High	Medium		1.9	100							
3	0303	2	7	8.7	250	Overcast		High	Medium		0.1		3			15			
3	0303	3	15	9.1	130	Mostly cloudy		Medium	Medium		0.5	5							
3	0303	4	18	11.1	141	Clear		High	Medium		0.6	10					10		
3	0303	5	10	11.2	200	Clear		High	Medium		0.9	50					50		
3	0303	6	5	10.7	220	Mostly cloudy		Medium	Medium		1.2	20						80	
3	0302	1	12	10.2	130	Partly cloudy		High	Medium		1.9	98	2						
3	0302	2	6	8.9	250	Overcast		High	Medium		0.1		5			5			
3	0302	3	14	8.8	130	Partly cloudy		Medium	Medium		0.5	5							
3	0302	4	15	10.9	144	Clear		High	Medium		0.6	30	5						
3	0302	5	10	11.3	200	Clear		High	Medium		0.9	50					50		
3	0302	6	5	10.6	220	Mostly cloudy		High	Medium		1.2	30						70	
3	0301	1	14	10.2	130	Partly cloudy		High	Medium		1.9	97	2	1					
3	0301	2	6	8.7	190	Overcast		High	Medium		0.3					10			
3	0301	3	15	9.5	119	Mostly cloudy		Medium	High		0.7	80	5						
3	0301	4	18	11.3	126	Mostly cloudy		High	Medium		1.2	10	5		5		50	30	
3	0301	5	8	11.4	200	Partly cloudy		Medium	Medium		0.9	70						30	
3	0301	6	8	10.7	220	Overcast		Medium	Medium		1.2	35	5					60	
5	05SC060	1	11	10.1	210	Overcast		High	Low		0.1				30		20		
5	05SC060	2	5	11.6	340	Overcast		High	Low		0.3				80			10	
5	05SC060	3	18	13.8	230	Mostly cloudy		Medium	Low		0.4				20	10			
5	05SC060	4	17	13.5	210	Clear		High	Low		0.6				20		30	50	
5	05SC060	5	17	12.5	210	Mostly cloudy		Low	Low		0.9				50	10			
5	05SC060	6	1	8.4	220	Overcast		High	Low		1.6				50			50	
5	0517	1	11	10.3	220	Overcast		High	Low		0.1								
5	0517	2	5	10.0	260	Overcast		High	Low		1.8	50					20		
5	0517	3	18	12.9	190	Partly cloudy		Medium	Medium		0.4	3				2	5		
5	0517	4	15	12.9	180	Clear		Low	Low		0.5				10		70	20	
5	0517	5	17	13.1	180	Mostly cloudy		High	Medium		1.0	50					40	10	
5	0517	6	0	9.9	220	Overcast		Medium	Medium		0.8	60						40	
5	0516	1	11	10.1	220	Overcast		High	Medium		0.1	5	5						
5	0516	3	18	12.6	180	Partly cloudy		Medium	Medium		0.5		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
5	516	4	15	12.6	190	Clear		Low	Low		0.4					5	75	20	
5	516	5	17	13.0	190	Mostly cloudy		High	High		0.9	80					10	10	
5	516	6	0	10.0	220	Overcast		Medium	Medium		0.9	70	20					10	
5	515	1	8	10.1	210	Mostly cloudy		High	Low		0.1		5			5			
5	515	2	15	10.7	260	Mostly cloudy		High	Medium		0.2	70					10		
5	515	3	19	11.7	154	Mostly cloudy		Medium	Medium		0.5	20							
5	515	4	15	13.0	200	Clear		High	Low		0.4	30					40		
5	515	5	10	12.6	190	Clear		Medium	Low		0.9	30				40	30		
5	515	6	0	10.0	220	Overcast		Medium	Medium		0.9	20	20	10				50	
5	514	1	10	10.1	210	Mostly cloudy		High	Low		0.1					2			
5	514	2	10	11.1	240	Overcast		Medium	Medium		0.2	10					10		
5	514	3	14	13.0	200	Mostly cloudy		High	Medium		0.5	68				2			
5	514	4	12	12.4	190	Clear		High	Medium		0.9	48				2	50		
5	514	5	15	12.6	180	Partly cloudy		High	Medium		0.9					30	70		
5	514	6	0	9.9	220	Overcast		Medium	Medium		0.9	60	20					20	
5	513	1	13	10.1	210	Mostly cloudy		High	Low		0.1								
5	513	2	15	11.4	260	Overcast		High	Medium		0.2	50							
5	513	3	13	13.0	200	Mostly cloudy		Medium	Medium		0.5	48				2			
5	513	4	8	12.2	190	Clear		High	Medium		0.9	68				2	30		
5	513	5	12	12.5	190	Partly cloudy		High	Medium		0.9					30	70		
5	513	6	0	9.9	220	Overcast		Medium	Medium		0.9	40						60	
5	512	1	11	10.1	210	Overcast		Medium	Medium		0.1	5					10		
5	512	2	5	10.0	260	Overcast		High	Medium		1.8	50					10		
5	512	3	19	13.1	190	Partly cloudy		Medium	High		0.4	36		5		2	5	2	
5	512	4	17	12.9	180	Clear		High	Medium		0.3	20				50	30		
5	512	5	16	13.1	190	Mostly cloudy		Low	High		0.9	55		15		20	5	5	
5	512	6	0	10.0	220	Overcast		Medium	Medium		0.9	50		20				30	
5	511	1	7	10.0	210	Mostly cloudy		High	Medium		0.1		2			5			
5	511	2	10	10.6	260	Mostly cloudy		High	Medium		0.1	30					20		
5	511	3	17	13.0	180	Mostly cloudy		Medium	Medium		0.4	25		3		2			
5	511	4	7	12.1	190	Clear		Medium	High		0.9	80	1	2		2	5		
5	511	5	10	12.4	190	Clear		High	Medium		0.9	5				30		5	
5	511	6	0	10.0	220	Overcast		Medium	Medium		0.8	40	20					40	
5	510	1	7	10.0	210	Mostly cloudy		High	Medium		0.1		5			2			
5	510	2	5	10.8	260	Mostly cloudy		High	Medium		0.1	50							
5	510	3	18	13.3	180	Partly cloudy		Medium	High		0.4					5	5		
5	510	4	6	11.9	210	Clear		High	Medium		0.5	10	1	10		4			
5	510	5	10	12.3	190	Clear		High	Medium		0.9	20	2			30	5	5	
5	510	6	0	9.8	220	Overcast		Medium	Medium		0.9	80						20	
5	509	1	11	9.8	210	Overcast		High	Medium		0.1		5						
5	509	2	10	10.3	250	Overcast		Medium	Medium		0.2	10					10		
5	509	3	18	12.5	190	Partly cloudy		Medium	High		0.5	20					20		
5	509	4	9	12.5	180	Clear		High	Medium		0.6	50	1						
5	509	5	18	13.0	180	Mostly cloudy		High	Medium		0.9	95					5		
5	509	6	0	10.0	220	Overcast		Medium	Medium		0.9	60	10					30	
5	508	1	9	10.7	220	Overcast		High	Medium		0.1					20			
5	508	2	10	11.1	240	Overcast		High	Medium		0.2	45	5						
5	508	3	17	11.2	154	Partly cloudy		Medium	Low		0.5	20							

[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	0508	4	15	13.0	190	Clear		High	Medium		0.4	18	1			2			
5	0508	5	15	12.8	170	Partly cloudy		High	Medium		0.7		10			30	60		
5	0508	6	1	9.9	220	Overcast		Medium	Medium		0.3								
5	0507	1	11	10.8	210	Overcast		High	Medium		0.1		10						
5	0507	2	10	11.1	240	Overcast		Medium	Low		0.2	50							
5	0507	3	16	12.5	190	Partly cloudy		Medium	Medium		0.5	48				2	10		
5	0507	4	10	12.0	180	Clear		High	Medium		0.4	20				5	75		
5	0507	5	18	13.1	180	Mostly cloudy		High	Medium		0.8	60					40		
5	0507	6	-1	9.8	220	Overcast		Medium	Medium		0.8	100							
5	0506	1	10	9.9	220	Overcast		High	Medium		0.1	50							
5	0506	2	10	11.1	240	Overcast		High	Medium		0.2	50							
5	0506	3	16	12.2	200	Partly cloudy		Medium	High		0.5	40		10				50	
5	0506	4	6	12.2	210	Clear		High			0.5	50		2				10	
5	0506	5	16	13.0	180	Partly cloudy		High	High		0.8	50						50	
5	0506	6	0	10.1	220	Overcast		Low	Medium		0.9	80						20	
5	0505	1	10	9.8	210	Overcast		High	Medium		0.1	30						20	
5	0505	2	10	10.1	240	Mostly cloudy		Medium			0.2	70		15				15	
5	0505	3	16	12.1	200	Mostly cloudy		High	High		0.5	50		10				30	
5	0505	4	5	12.1	210	Partly cloudy		High	High		0.5	30						70	
5	0505	5	16	12.9	180	Partly cloudy		Medium	High		0.8	25		25				50	
5	0505	6	0	10.0	220	Overcast		Low	Medium		0.9	60						40	
5	0502	1	10	10.4	210	Overcast		High	Low		0.1	10	10					10	
5	0502	2	10	10.8	240	Mostly cloudy		High	Low		0.2	20							
5	0502	3	12	12.2	190	Partly cloudy		High	High		0.4	47	3						
5	0502	4	5	11.7	200	Fog		Medium	Medium		0.4	30	5	5			50	10	
5	0502	5	18	12.8	180	Mostly cloudy		Medium	High		0.8	30		10			50	10	
5	0502	6	1	9.8	210	Overcast		Medium	Medium		0.8	50						50	
6	06SC047	1	9	11.9	310	Overcast		High	Low		0.1		3			2			
6	06SC047	2	8	10.1	250	Mostly cloudy		High	Low		0.1		4			1			
6	06SC047	3	15	10.5	270	Overcast		High	Low		0.2		10				30		
6	06SC047	4	17	13.0	290	Overcast		High	Low		0.2	5	5			2	5		
6	06SC047	5	10	9.8	260	Clear		High	Medium		0.4		2						
6	06SC047	6	10	9.5	310	Clear		High	Low		0.6	4	1						
6	06SC036	1	9	10.0	210	Overcast		High	Low		0.2		15		10	10			
6	06SC036	2	15	10.9	250	Partly cloudy		High	Low		0.1				30				
6	06SC036	3	9	10.8	200	Mostly cloudy		Medium	Low		0.2		1					4	
6	06SC036	4	14	13.3	190	Mostly cloudy		Medium	Low		0.6	60	5					20	
6	06SC036	5	15	12.8	170	Partly cloudy		Medium	Low		0.3								
6	06SC036	6	15	11.2	220	Mostly cloudy		High	Low		1.0							75	
6	06PIN02	1	9	11.3	290	Overcast		High	Medium		0.1		10						
6	06PIN02	2	7	9.7	250	Mostly cloudy		High	Medium		0.1		10					10	
6	06PIN02	3	12	10.3	290	Overcast		Medium	Medium		1.3		30						
6	06PIN02	4	15	12.9	270	Overcast		High	High		0.3	10	20					25	
6	06PIN02	5	9	12.4	200	Clear		Medium	High		0.4	15	15					55	
6	06PIN02	6	7	9.8	310	Mostly cloudy		High	Medium		0.5	10	20				40	30	
6	06PIN01	1	9	11.3	290	Overcast		High	Low		0.1		10						
6	06PIN01	2	7	9.6	260	Partly cloudy		High	Medium		0.1		5						
6	06PIN01	3	12	10.3	290	Overcast		High	Low		1.3	30	20			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	06PIN01	4	15	12.8	270	Overcast		High	Medium		0.3		10						
6	06PIN01	5	9	9.9	290	Clear		Medium	Medium		0.3	5	10			2		30	
6	06PIN01	6	15	10.8	320	Partly cloudy		High	High		0.7		20	5			55	20	
6	0614	1	9	11.4	200	Overcast		High	Low		0.2				10				
6	0614	2	12	11.5	200	Partly cloudy		High	Medium		0.1					10			
6	0614	3	13	10.5	210	Overcast		Medium	Medium		0.2		5				20		
6	0614	4	17	13.3	210	Overcast		High	Low		0.6	20			5		20		
6	0614	5	12	13.1	180	Partly cloudy		Medium	Low		0.6	30				5	40		
6	0614	6	10	12.2	200	Clear		High	Low		1.0	30				10	50		
6	0613	1	9	9.5	210	Overcast		High	Low		0.1								
6	0613	2	15	10.9	250	Partly cloudy		High	Low		0.1								
6	0613	3	9	10.8	250	Overcast		High	Low		0.2	50							
6	0613	4	13	12.3	220	Mostly cloudy		High	Medium		0.4	50	5						
6	0613	5	15	11.6	220	Partly cloudy		Medium	Low		0.6	50	1			20	5		
6	0613	6	15	9.3	210	Partly cloudy		Medium	Medium		0.5	90							
6	0612	1	9	9.7	210	Overcast		High	Medium		0.1		5			5			
6	0612	2	16	10.9	250	Partly cloudy		High	Low		0.1								
6	0612	3	10	10.9	220	Mostly cloudy		Medium	Low		0.2	50							
6	0612	4	12	12.7	230	Overcast		Medium	Medium		0.6	49	2						
6	0612	5	16	12.6	200	Partly cloudy		High	Medium		0.6	30		20		10	20	20	
6	0612	6	15	11.1	210	Mostly cloudy		High	Medium		1.0	95						5	
6	0611	1	9	9.8	210	Overcast		High	Low		0.1								
6	0611	2	15	10.9	250	Clear		High	Low		0.1	50							
6	0611	3	9	10.5	270	Overcast		High	Low		0.2	50							
6	0611	4	17	12.0	230	Partly cloudy		High	Medium		0.4	60				2	10		
6	0611	5	15	10.3	240	Overcast		Medium	Medium		0.7	85	15						
6	0611	6	11	11.0	250	Clear		High	Low		0.7	50				5	45		
6	0610	1	9	8.9	210	Overcast		High	Medium		0.1								
6	0610	2	15	10.9	250	Clear		High	Low		0.1	50							
6	0610	3	9	10.9	250	Overcast		High	Low		0.2	40	10						
6	0610	4	12	12.2	230	Mostly cloudy		High	Low		0.6	50	5			2	10	10	
6	0610	5	16	10.2	240	Overcast		High	Medium		0.7	100							
6	0610	6	10	11.1	250	Clear		High	Low		0.7	5	2			5	80		
6	0609	1	9	9.8	210	Overcast		High	Low		0.2						10		
6	0609	2	15	10.9	250	Clear		High	Low		0.1	50							
6	0609	3	9	10.5	270	Overcast		High	Low		0.2	100							
6	0609	4	17	12.0	230	Partly cloudy		High	Medium		0.4	50					25		
6	0609	5	17	10.2	240	Overcast		High	Low		0.7	100							
6	0609	6	11	11.0	250	Clear		High	Low		0.7	30					70		
6	0608	1	11	10.2	193	Overcast		High	Medium		0.1						15		
6	0608	2	15	10.1	240	Partly cloudy		High	Low		0.1	50							
6	0608	3	12	10.7	260	Overcast		High	High		0.2	20		10		10			
6	0608	4	16	12.3	230	Partly cloudy		High			0.5	37	1			2	10		
6	0608	5	13	11.2	230	Clear		Medium	Medium		0.4	50					40		
6	0608	6	15	10.7	260	Clear		High	Medium		0.8	30					50		
6	0607	1	9	8.9	210	Overcast		High	Low		0.1		5			20			
6	0607	2	18	10.9	250	Clear		High	Low		0.1	40	10						
6	0607	3	13	10.9	220	Partly cloudy		High	Low		0.2	35	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
6	0607	4	9	12.4	200	Mostly cloudy		High	Low		0.6	48	2						
6	0607	5	15	11.5	190	Mostly cloudy		High	Low		0.6	30	2			30	30		
6	0607	6	12	11.0	210	Mostly cloudy		Medium	Medium		1.0	80					10	10	
6	0606	1	9	9.8	210	Overcast		High	Low		0.2								
6	0606	2	5	10.5	220	Fog		High	Medium		0.2								
6	0606	3	5	10.4	220	Overcast		High	Low		0.3	70							
6	0606	4	17	13.1	200	Partly cloudy		High	Medium		0.6	50							
6	0606	5	12	13.0	210	Clear		Medium	Medium		0.7	50				1	5		
6	0606	6	15	12.5	190	Clear		High	Medium		0.9	50						10	
6	0605	1	11	9.6	193	Overcast		High	Medium		0.1						20		
6	0605	2	15	10.7	240	Partly cloudy		High	Medium		0.1	40				10			
6	0605	3	5	10.4	220	Overcast		High	Low		0.3	70							
6	0605	4	16	12.7	200	Partly cloudy		High	Medium		0.5	29				1	30		
6	0605	5	12	12.8	210	Clear		Medium	Medium		0.4	45				1	45		
6	0605	6	15	12.2	190	Clear		High	Low		1.0	50					50		
6	0604	1	13	10.1	193	Overcast		High	Medium		0.1		1				5	20	
6	0604	2	15	10.7	240	Partly cloudy		High	Medium		0.1		3					2	
6	0604	3	15	10.6	250	Overcast		Medium	Medium		0.2	20	15	5					
6	0604	4	16	12.2	230	Partly cloudy		High	Medium		0.5	5	10				5		
6	0604	5	11	11.1	240	Clear		Medium	Medium		0.4	50	3						
6	0604	6	15	10.7	260	Clear		High	Medium		0.8	2	3				5	5	
6	0603	1	9	11.4	200	Overcast		High	Low		0.2	50							
6	0603	2	14	11.5	200	Partly cloudy		High	Medium		0.1	50							
6	0603	3	14	10.2	230	Overcast		Medium	Medium		0.2	50							
6	0603	4	13	12.5	190	Partly cloudy		High	Medium		0.6	25				3	22		
6	0603	5	11	12.8	190	Clear		Medium	High		0.4	20		5		5	50		
6	0603	6	10	12.2	190	Partly cloudy		High	Medium		1.0	50					50		
6	0602	1	10	11.3	270	Overcast		High	Medium		0.1	30	30						
6	0602	2	8	10.2	240	Partly cloudy		High	Medium		0.1		5	10				10	
6	0602	3	14	10.3	260	Overcast		Medium	High		0.2	10	20	5				5	
6	0602	4	15	13.0	260	Overcast		High	High		0.4	25	10	15				25	
6	0602	5	10	10.6	230	Clear		Medium	High		0.5	10	10	5				10	
6	0602	6	10	10.1	270	Partly cloudy		High	High		0.7	10	5	5				10	
6	0601	1	9	10.7	200	Overcast		High	Medium		0.2	10	10						
6	0601	2	8	10.8	210	Mostly cloudy		High			0.1					10		50	
6	0601	3	13	9.9	220	Overcast		High	High		0.2	20	10			10			
6	0601	4	15	12.9	200	Overcast		High	High		0.5	20	1	20		1			
6	0601	5	10	12.4	190	Clear		Medium	High		0.6	30	2	2		3		10	
6	0601	6	10	11.7	180	Mostly cloudy		High	High		1.0	70		5		20		5	
7	07SC022	1	9	10.4	161	Overcast		High	Low		0.1		10					45	
7	07SC022	2	15	10.4	183	Mostly cloudy		Low	Low		0.1		5						
7	07SC022	3	16	11.8	200	Clear		High	Low		0.3		10					10	
7	07SC022	4	6	12.5	230	Partly cloudy		High	Low		0.4		2					23	
7	07SC022	5	14	11.9	210	Mostly cloudy		High	Low		0.8		5					5	
7	07SC022	6	13	10.8	220	Mostly cloudy		High	Low		0.8		3					5	
7	07SC012	2	15	8.9	112	Mostly cloudy		Low	Low		0.1		5						
7	07SC012	3	18	12.1	160	Partly cloudy		High	Low		0.1		2						
7	07SC012	4	7	12.3	190	Mostly cloudy		High	Low		0.2								

[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
7	07SC012	5	14	12.1	180	Mostly cloudy		High	Low		0.3							50	
7	07SC012	6	15	11.3	190	Partly cloudy		High	Low		0.5							50	
7	0722	1	11	8.8	150	Overcast		High	Medium		0.2							15	
7	0722	2	12	10.8	250	Partly cloudy		High	Low		0.2	50							
7	0722	3	14	11.6	210	Partly cloudy		High	Low		0.4	3				2			
7	0722	4	12	12.9	210	Partly cloudy		Medium	Medium		0.6	50							
7	0722	5	7	12.5	200	Overcast		High	Medium		0.5	3				2	30		
7	0722	6	1	11.5	220	Fog		High	Low		1.0	30					70		
7	0721	1	10	9.1	150	Overcast		High	Medium		0.2						5	5	
7	0721	2	13	11.6	250	Partly cloudy		High	Medium		0.2	40					10		
7	0721	3	16	11.3	210	Partly cloudy		Low	Medium		0.3						5		
7	0721	4	12	12.5	210	Mostly cloudy		High	Low		0.2	10						40	
7	0721	5	8	11.9	220	Overcast		High	Medium		0.4	30				2	20	5	
7	0721	6	2	10.7	270	Clear		High	Medium		0.8	20	1			10	69		
7	0720	1	11	9.3	150	Overcast		High	Low		0.2		1					5	
7	0720	2	13	10.8	250	Partly cloudy		High	Low		0.2								
7	0720	3	15	11.0	210	Partly cloudy		High	Low		0.3		2						
7	0720	4	12	12.5	210	Mostly cloudy		High	Low		0.4		1					30	
7	0720	5	8	11.8	220	Overcast		Medium	Low		0.4	5	2			3	40	5	
7	0720	6	2	10.6	270	Partly cloudy		High	Low		0.8	5	1					10	
7	0719	1	10	9.3	146	Overcast		High	Medium		0.1		5			10		20	
7	0719	2	15	8.8	112	Mostly cloudy		Medium	Medium		0.1			5					
7	0719	3	18	12.1	160	Mostly cloudy		Medium	Medium		0.1	10		5					
7	0719	4	7	12.4	190	Mostly cloudy		High	Low		0.2		1			2			
7	0719	5	14	12.0	180	Mostly cloudy		High	Medium		0.3	40				2			
7	0719	6	15	11.3	190	Mostly cloudy		High	Medium		0.5							50	
7	0718	1	8	9.1	150	Overcast		High	Low		0.1					15			
7	0718	2	15	11.6	250	Mostly cloudy		Medium	Low		0.0								
7	0718	3	17	11.7	200	Overcast		High	Medium		0.3	50							
7	0718	4	10	12.3	210	Clear		High	Medium		0.4	4	1			5		50	
7	0718	5	12	12.0	200	Overcast		High	High		0.5	70	2	3		2	5		
7	0718	6	15	11.0	220	Partly cloudy		High	Low		0.8	20					30	10	
7	0717	1	11	9.8	150	Overcast		High	Low		0.1							10	
7	0717	2	14	10.4	140	Partly cloudy		Medium	Low		0.0								
7	0717	3	20	11.8	150	Clear		High	Medium		0.1						5		
7	0717	4	12	12.9	180	Partly cloudy		High	Low		0.2								
7	0717	5	14	11.7	170	Mostly cloudy		High	Low		0.2	10					30		
7	0717	6	15	11.1	190	Partly cloudy		High	Low		0.4						50		
7	0716	1	11	9.8	150	Overcast		High	Medium		0.1		1			1	5	10	
7	0716	2	14	10.3	120	Partly cloudy		Medium	Low		0.0								
7	0716	3	18	11.6	150	Partly cloudy		High	Medium		0.1								
7	0716	4	12	12.9	180	Partly cloudy		High	Medium		0.2								
7	0716	5	14	11.7	170	Mostly cloudy		High	Medium		0.2	10	2	5					
7	0716	6	15	11.1	190	Partly cloudy		High	Medium		0.4					20	40		
7	0715	1	12	9.1	150	Overcast		High	Medium		0.1			5				15	
7	0715	2	15	10.5	140	Partly cloudy		High	Medium		0.0								
7	0715	3	16	10.7	150	Mostly cloudy		High	High		0.1								
7	0715	4	12	12.1	170	Clear		High	Medium		0.2	10				1			

[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	0715	5	11	11.0	180	Overcast		High	Medium		0.2								
7	0715	6	5	10.3	200	Mostly cloudy		High	Medium		0.3	10					40		
7	0709	1	10	9.2	150	Overcast		High	Medium		0.2						15		
7	0709	2	15	11.5	250	Partly cloudy		High	Medium		0.2	50							
7	0709	3	16	11.7	200	Mostly cloudy		Medium	Medium		0.3	10	2				20		
7	0709	4	8	12.0	220	Clear		High	Medium		0.4	25				5	30		
7	0709	5	8	12.0	220	Overcast		High	Medium		0.4	22				3	60		
7	0709	6	5	10.8	220	Partly cloudy		High	Low		0.8	50					50		
7	0706	1	9	9.9	146	Overcast		High	Low		0.1		5			5			
7	0706	2	15	10.1	183	Mostly cloudy		Medium	Low		0.1		5						
7	0706	3	17	12.0	200	Partly cloudy		High	Medium		0.3		2						
7	0706	4	7	12.5	230	Mostly cloudy		High	Medium		0.4		1						
7	0706	5	14	12.0	200	Mostly cloudy		High	Low		0.4	10						5	
7	0706	6	12	10.9	220	Partly cloudy		High	Low		0.8	15	10				10		
7	0705	1	9	10.1	146	Overcast		High	Low		0.1		4			6			
7	0705	2	15	10.1	183	Mostly cloudy		Medium	Low		0.1		5	5					
7	0705	3	16	11.9	200	Clear		High	High		0.3	8		2				5	
7	0705	4	9	12.5	230	Partly cloudy		High	High		0.4	4	1						
7	0705	5	15	12.0	200	Mostly cloudy		High	Medium		0.4	30	3	2				10	
7	0705	6	12	10.9	220	Partly cloudy		High	Medium		0.8	30	5	5					
7	0704	1	9	10.2	146	Overcast		High	Medium		0.1		5						
7	0704	2	15	9.6	112	Mostly cloudy		Medium	Low		0.1								
7	0704	3	16	11.6	180	Clear		High	Medium		0.1								
7	0704	4	10	12.8	180	Partly cloudy		High	High		0.3	30	2			1	15		
7	0704	5	14	12.3	180	Overcast		High	Medium		0.4		1			10	40		
7	0704	6	13	11.5	190	Mostly cloudy		High	Low		0.9								
7	0703	1	11	10.0	150	Overcast		High	Low		0.1		2						
7	0703	2	15	10.5	140	Partly cloudy		High	Low		0.0								
7	0703	3	16	10.8	150	Mostly cloudy		High	Low		0.1								
7	0703	4	12	12.1	170	Clear		High	Medium		0.2					1	30		
7	0703	5	11	11.2	180	Overcast		High	Medium		0.2								
7	0703	6	7	10.6	190	Mostly cloudy		High	Medium		0.4					1			
7	0702	1	10	9.1	150	Overcast		High	Medium		0.2						2		
7	0702	2	13	11.5	250	Mostly cloudy		High	Medium		0.2	50							
7	0702	3	16	11.5	210	Partly cloudy		Low	Medium		0.3	10					10		
7	0702	4	7	11.9	220	Clear		High	High		0.4	21				2	15	2	
7	0702	5	8	11.9	220	Overcast		High	Medium		0.4	48				2	50		
7	0702	6	5	10.8	270	Partly cloudy		High	Medium		0.8	40					60		
9	09SC061	1	13	10.5	168	Overcast		High	Low		0.1								
9	09SC061	2	16	10.3	150	Clear		High	Medium		0.1		2		2				
9	09SC061	3	9	10.5	174	Clear		High	Low		0.2								
9	09SC061	4	12	10.8	145	Clear		Medium	Medium		0.4								
9	09SC061	5	16	11.3	210	Mostly cloudy		Medium	Medium		0.4								
9	09SC061	6	4	9.6	220	Overcast		Medium	Medium		0.6							10	
9	09SC053	1	10	10.5	177	Overcast		Low	Low		0.1		2				30		
9	09SC053	2	11	9.9	153	Clear		High	Low		0.0								
9	09SC053	3	11	9.9	165	Mostly cloudy		Medium	Medium		0.2								
9	09SC053	4	12	10.9	145	Clear		High	Low		0.3		10		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
9	09SC053	5	10	10.7	210	Mostly cloudy		High	Medium		0.6	80							
9	09SC053	6	8	9.4	220	Overcast		Medium	Medium		0.7	5							
9	0914	1	12	10.5	168	Overcast		High	Low		0.1						2		
9	0914	2	15	9.9	150	Clear		High	Medium		0.1						10		
9	0914	3	14	10.6	174	Clear		High	Medium		0.2								
9	0914	4	12	10.9	145	Clear		Medium	Medium		0.4								
9	0914	5	16	11.2	210	Partly cloudy		Medium	Medium		0.4	50						50	
9	0914	6	5	9.9	220	Overcast		Low	Medium		0.6	25					20	5	
9	0913	1	13	10.5	168	Overcast		High	Low		0.1								
9	0913	2	15	10.3	150	Clear		High	Medium		0.1					2			
9	0913	3	12	10.5	174	Clear		Medium	Medium		0.2								
9	0913	4	12	10.8	145	Clear		Medium	Medium		0.4							10	
9	0913	5	16	11.3	210	Mostly cloudy		Medium	Medium		0.4	30							
9	0913	6	4	9.6	220	Overcast		Medium	Medium		0.6						5	20	
9	0912	1	12	10.7	168	Overcast		High	Low		0.1	2					5		
9	0912	2	15	8.8	150	Clear		High	Medium		0.1					5			
9	0912	3	16	10.6	174	Clear		Medium	Medium		0.2								
9	0912	4	13	11.0	145	Clear		Medium	Medium		0.4								
9	0912	5	16	11.3	210	Mostly cloudy		Medium	Medium		0.4	40						30	
9	0912	6	5	9.8	220	Overcast		Low	Medium		0.6	40						20	
9	0911	1	12	10.4	168	Overcast		High	Low		0.1						10		
9	0911	2	16	9.9	151	Clear		High	Medium		0.1								
9	0911	3	20	10.5	165	Partly cloudy		Medium	Medium		0.2								
9	0911	4	15	11.6	145	Clear		High	Medium		0.3								
9	0911	5	16	11.3	210	Mostly cloudy		Medium	Medium		0.4	40						40	
9	0911	6	5	9.8	220	Overcast		Medium	Medium		0.6	10					10	10	
9	0910	1	10	10.6	177	Overcast		Low	Low		0.1						5		
9	0910	2	13	10.1	151	Clear		High	Medium		0.1	2				3			
9	0910	3	14	9.9	165	Partly cloudy		Medium	Medium		0.2								
9	0910	4	14	11.1	145	Clear		High	Low		0.3	10	10						
9	0910	5	12	11.1	210	Partly cloudy		High	Low		0.4	60	20					20	
9	0910	6	7	9.7	220	Overcast		Medium	Medium		0.4							5	
9	0909	1	10	10.5	177	Overcast		Low	Low		0.1						10		
9	0909	2	15	10.2	152	Clear		High	Medium		0.1					5			
9	0909	3	20	10.6	165	Partly cloudy		Medium	Medium		0.2								
9	0909	4	17	11.6	145	Partly cloudy		Medium	Medium		0.3								
9	0909	5	15	11.3	210	Mostly cloudy		Medium	Medium		0.4	50							
9	0909	6	5	9.8	220	Overcast		Low	Medium		0.6	25					25		
9	0908	1	10	10.5	177	Overcast		Low	Low		0.1						10		
9	0908	2	15	10.2	152	Clear		High	Medium		0.1					2			
9	0908	3	20	10.6	165	Partly cloudy		Medium	Medium		0.2								
9	0908	4	16	11.6	145	Partly cloudy		Medium	Medium		0.3								
9	0908	5	15	11.3	210	Partly cloudy		Medium	Medium		0.4	50							
9	0908	6	7	9.7	220	Overcast		Medium	Medium		0.6						10		
9	0907	1	10	10.5	177	Overcast		Low	Low		0.1						5		
9	0907	2	15	10.2	151	Clear		High	Medium		0.1					5		5	
9	0907	3	18	10.5	165	Partly cloudy		Medium	Medium		0.2								
9	0907	4	18	11.6	145	Clear		High	Medium		0.3					5			

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

Continued...

[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.

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	907	5	14	11.2	210	Partly cloudy		Medium	Low		0.4	50							
9	907	6	7	9.8	220	Overcast		Medium	Medium		0.5	5						10	
9	906	1	10	10.6	177	Overcast		Low	Low		0.1					2	10		
9	906	2	14	9.9	151	Clear		High	Low		0.1								
9	906	3	16	10.3	165	Partly cloudy		Medium	Medium		0.2								
9	906	4	18	11.6	145	Clear		High	Low		0.3						20		
9	906	5	10	11.1	210	Partly cloudy		High	Low		0.4								
9	906	6	8	9.8	220	Overcast		Medium	Medium		0.7	25							
9	905	1	10	10.5	177	Overcast		Low	Low		0.1								
9	905	2	12	9.7	151	Clear		High	Medium		0.1					2			
9	905	3	13	9.8	165	Mostly cloudy		Medium	Medium		0.2								
9	905	4	15	11.2	145	Clear		High	Medium		0.3	5							
9	905	5	10	11.0	210	Mostly cloudy		Medium	Medium		0.4	40							
9	905	6	8	9.8	220	Overcast		Medium	Medium		0.6	5					10	10	
9	904	1	10	10.5	177	Overcast		Low	Low		0.1						20		
9	904	2	9	9.8	151	Clear		High	Medium		0.1				5				
9	904	3	10	9.6	165	Mostly cloudy		Medium	Medium		0.2								
9	904	4	10	11.0	145	Clear		High	Low		0.3								
9	904	5	9	10.9	210	Partly cloudy		Medium	Medium		0.4	60							
9	904	6	8	9.7	220	Overcast		Medium	Medium		0.6	20						20	
9	903	1	10	10.5	177	Overcast		Low	Low		0.1						50		
9	903	2	9	9.8	151	Clear		High	Medium		0.1								
9	903	3	10	9.6	165	Overcast		Medium	Medium		0.2								
9	903	4	6	10.9	145	Fog		High	Medium		0.3								
9	903	5	9	10.9	210	Mostly cloudy		Medium	Medium		0.4	40							
9	903	6	8	9.7	220	Overcast		Medium	Medium		0.7	20						5	
9	902	1	10	10.5	177	Overcast		Low			0.1		1						
9	902	2	8	9.3	138	Fog		High	Medium		0.1							5	
9	902	3	8	9.4	165	Fog		Medium	Medium		0.2								
9	902	4	7	10.9	145	Fog		Medium	Medium		0.3								
9	902	5	8	10.9	210	Overcast		Medium	Medium		0.4							50	
9	902	6	8	9.8	220	Overcast		Medium	Medium		0.6	5						10	
9	901	1	10	10.5	177	Overcast		Low	Low		0.1								
9	901	2	8	9.3	138	Fog		High	Medium		0.1					2		3	
9	901	3	8	9.4	165	Fog		Medium	Medium		0.2								
9	901	4	7	10.9	145	Fog		Medium	Medium		0.3								
9	901	5	8	10.8	210	Overcast		Medium	Medium		0.4	40							
9	901	6	8	9.8	220	Overcast		Medium	Medium		0.6							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.

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 2016.

	2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
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]
Sportfish		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*
Arctic Grayling	13	*<1*	54	*1*	270	*3*	282	*3*	93	*1*	344	*3*	202	*2*	122	*1*	36	*<1*	114	*1*	43	*<1*	27	*<1*	10	*<1*	48	*1*	85	*1*
Bull Trout	105	*2*	91	*2*	122	*1*	176	*2*	76	*1*	158	*1*	170	*1*	155	*1*	97	*1*	198	*1*	187	*2*	182	*2*	144	*2*	169	*2*	205	*3*
Burbot					5	*<1*	2	*<1*	5	*<1*	4	*<1*			2	*<1*	2	*<1*			3	*<1*	1	*<1*	1	*<1*			3	*<1*
Kokanee	24	*<1*	5	*<1*	18	*<1*	43	*<1*	16	*<1*	154	*1*	49	*<1*	28	*<1*	26	*<1*	59	*<1*	99	*1*	27	*<1*	20	*<1*	20	*<1*	21	*<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*
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	5485	*97*	5674	*96*	10 217	*95*	10 628	*95*	6309	*96*	10 391	*93*	11 539	*95*	9949	*95*	10 525	*97*	13 077	*96*	10 792	*95*	8349	*96*	7275	*96*	6735	*95*	7112	*93*
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*
Rainbow Trout	50	*1*	63	*1*	107	*1*	94	*1*	39	*1*	102	*1*	169	*1*	171	*2*	131	*1*	146	*1*	138	*1*	67	*1*	106	*1*	105	*1*	176	*2*
Walleye	3	*<1*			6	*<1*	5	*<1*			17	*<1*	58	*<1*	17	*<1*	3	*<1*	49	*<1*	47	*<1*	43	*<1*	19	*<1*	12	*<1*	34	*<1*
Yellow Perch											1	*<1*															8	*<1*	2	*<1*
Sportfish subtotal	5682	*91*	5889	*93*	10 760	*92*	11 235	*91*	6540	*96*	11 184	*93*	12 196	*92*	10 458	*93*	10 825	*96*	13 663	*95*	11 323	*91*	8706	*89*	7581	*87*	7101	*70*	7646	*74*
Non-sportfish		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*		*0*
Finescale Dace																							1	*<1*						
Lake Chub																									4	*<1*	1	*<1*	2	*<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*
Peamouth	3	*1*																			1	*<1*								
Redside Shiner	2	*<1*																							1	*<1*	15	*<1*	71	*3*
Sculpin spp.[d]	2	*<1*																							78	*7*	44	*1*	53	*2*
Spottail Shiner																											5	*<1*	4	*<1*
Sucker spp.[d]	533	*95*	435	*95*	879	*94*	1087	*97*	238	*98*	835	*97*	1102	*98*	791	*98*	491	*97*	712	*97*	1118	*96*	1011	*96*	963	*89*	2836	*94*	2485	*91*
Non-sportfish subtotal	560	*9*	460	*7*	936	*8*	1121	*9*	244	*4*	859	*7*	1130	*8*	807	*7*	504	*4*	733	*5*	1160	*9*	1049	*11*	1085	*13*	3003	*30*	2737	*26*
All species	6242		6349		11 696		12 356		6784		12 043		13 326		11 265		11 329		14 396		12 483		9755		8668		10 107		10 390	

[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, 2016.

	2015		2016	
Species	*n*[a]	%[b]	*n*[a]	%[b]
Sportfish		*0*		*0*
Arctic Grayling	7	*<1*	26	*1*
Bull Trout	88	*3*	92	*3*
Burbot	3	*<1*	34	*1*
Goldeye	1	*<1*	8	*<1*
Kokanee	1	*<1*	2	*<1*
Lake Trout	1	*<1*		
Mountain Whitefish	3253	*93*	2768	*88*
Northern Pike	13	*<1*	12	*<1*
Rainbow Trout	24	*1*	10	*<1*
Walleye	103	*3*	197	*6*
Yellow Perch	3	*<1*		
Sportfish subtotal	3497	*44*	3149	*48*
Non-sportfish		*0*		*0*
Finescale Dace	1	*<1*		
Flathead Chub	3	*<1*	18	*1*
Lake Chub	41	*1*	26	*1*
Northern Pikeminnow	152	*3*	88	*3*
Redside Shiner	137	*3*	95	*3*
Sculpin spp.[d]	6	*<1*	55	*2*
Spottail Shiner	10	*<1*	9	*<1*
Sucker spp.[d]	4087	*92*	3039	*91*
Troutperch	5	*<1*	9	*<1*
Non-sportfish subtotal	4442	*56*	3339	*51*
All species	7948		6497	

[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, 23 August to 01 October 2016.

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	23-Aug-16	241	0.60															115	2863.07			1	24.9					116	2887.97
		00102	23-Aug-16	281	0.98															133	1747.6									133	1747.6
		00103	23-Aug-16	544	1.20															15	82.72									15	82.72
		00104	23-Aug-16	327	0.50															20	440.37									20	440.37
		00105	23-Aug-16	423	1.10															55	425.53									55	425.53
		00107	23-Aug-16	418	0.55									1	15.66					19	297.52									20	313.18
		00108	24-Aug-16	471	0.85			1	8.99											3	26.98									4	35.97
		00109	24-Aug-16	515	0.98			1	7.17											64	458.85									65	466.02
		00110	23-Aug-16	623	0.65									1	8.89					15	133.35			1	8.89					17	151.13
		00111	24-Aug-16	648	1.00			1	5.56											23	127.78			4	22.22					28	155.56
		00112	24-Aug-16	622	1.07															60	324.55			3	16.23					63	340.78
		00113	24-Aug-16	361	0.75			1	13.3											49	651.52			1	13.3					51	678.12
		00114	24-Aug-16	589	0.95															45	289.52			7	45.04					52	334.55
		00116	24-Aug-16	439	0.98															25	208.13									25	208.13
		00119	23-Aug-16	534	0.75															28	251.69			4	35.96					32	287.64
	Session Summary			**469**	**12.90**	**0**	**0**	**4**	**2.38**	**0**	**0**	**0**	**0**	**2**	**1.19**	**0**	**0**	**0**	**0**	**669**	**398.08**	**0**	**0**	**21**	**12.5**	**0**	**0**	**0**	**0**	**696**	**414.14**
Section 1	2	00101	02-Sep-16	160	0.60															124	4650									124	4650
		00102	02-Sep-16	279	0.98															67	886.68									67	886.68
		00103	02-Sep-16	502	1.20															53	316.73									53	316.73
		00104	02-Sep-16	268	0.50															82	2202.99									82	2202.99
		00105	02-Sep-16	383	1.10															47	401.61									47	401.61
		00107	03-Sep-16	300	0.55			2	43.64					5	109.09					50	1090.91			2	43.64					59	1287.27
		00108	02-Sep-16	463	0.85															316	2890.61									316	2890.61
		00109	02-Sep-16	490	0.98															142	1070.02									142	1070.02
		00110	03-Sep-16	418	0.65															139	1841.74									139	1841.74
		00111	03-Sep-16	501	1.00	1	7.19	1	7.19											173	1243.11			4	28.74					179	1286.23
		00112	03-Sep-16	562	1.07	1	5.99	2	11.97					1	5.99					187	1119.5			4	23.95					195	1167.39
		00113	03-Sep-16	344	0.75			1	13.95											118	1646.51			1	13.95					120	1674.42
		00114	03-Sep-16	459	0.95			2	16.51					1	8.26					131	1081.53			5	41.28					139	1147.57
		00116	03-Sep-16	496	0.98															296	2181.1									296	2181.1
		00119	02-Sep-16	320	0.75															18	270			1	15					19	285
	Session Summary			**396**	**12.90**	**2**	**1.41**	**8**	**5.64**	**0**	**0**	**0**	**0**	**7**	**4.93**	**0**	**0**	**0**	**0**	**1943**	**1369.27**	**0**	**0**	**17**	**11.98**	**0**	**0**	**0**	**0**	**1977**	**1393.23**
Section 1	3	00101	08-Sep-16	266	0.60															98	2210.53									98	2210.53
		00102	08-Sep-16	370	0.98															202	2015.8									202	2015.8
		00107	08-Sep-16	526	0.55			4	49.78					8	99.55					79	983.06			5	62.22					96	1194.61
		00108	08-Sep-16	700	0.85			1	6.05					5	30.25					61	369.08									67	405.38
		00109	09-Sep-16	617	0.98			1	5.98					2	11.97					255	1525.99			1	5.98					259	1549.93
		00110	08-Sep-16	343	0.27			1	38.87											53	2060.25			1	38.87					55	2138
		00111	09-Sep-16	612	0.70									2	16.81					46	386.55									48	403.36
		00112	09-Sep-16	619	1.07			1	5.44					2	10.87					244	1326.23			1	5.44					248	1347.97
		00113	09-Sep-16	378	0.75	1	12.7	1	12.7											76	965.08									78	990.48
		00114	09-Sep-16	482	0.95			1	7.86											336	2641.62									337	2649.49
		00116	09-Sep-16	424	0.98			3	25.86											142	1224.02									145	1249.88
		00119	08-Sep-16	578	0.75			7	58.13					1	8.3					105	871.97			1	8.3					114	946.71
	Session Summary			**493**	**9.40**	**1**	**0.78**	**20**	**15.54**	**0**	**0**	**0**	**0**	**20**	**15.54**	**0**	**0**	**0**	**0**	**1697**	**1318.29**	**0**	**0**	**9**	**6.99**	**0**	**0**	**0**	**0**	**1747**	**1357.13**

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 1	4	00101	15-Sep-16	285	0.60			1	21.05											384	8084.21									385	8105.26
		00102	15-Sep-16	344	0.98															299	3209.3									299	3209.3
		00103	15-Sep-16	646	1.20			2	9.29											114	529.41									116	538.7
		00104	15-Sep-16	384	0.50															87	1631.25			1	18.75					88	1650
		00105	15-Sep-16	440	1.10			1	7.44					1	7.44					89	661.98			2	14.88					93	691.74
		00107	15-Sep-16	381	0.55															95	1632.07			1	17.18					96	1649.25
		00108	17-Sep-16	573	0.85															53	391.75									53	391.75
		00109	17-Sep-16	596	0.98			2	12.39					1	6.2					149	923.08									152	941.66
		00110	17-Sep-16	561	0.65			2	19.74					2	19.74					46	454.13			1	9.87					51	503.5
		00111	17-Sep-16	642	1.00			2	11.21											61	342.06			5	28.04					68	381.31
		00112	17-Sep-16	667	1.07															103	519.55			3	15.13					106	534.69
		00113	17-Sep-16	427	0.75			3	33.72											33	370.96			2	22.48					38	427.17
		00114	17-Sep-16	563	0.95															64	430.77			1	6.73					65	437.51
		00116	17-Sep-16	529	0.98															34	234.9			1	6.91					35	241.81
		00119	15-Sep-16	503	0.75															94	897.02									94	897.02
	Session Summary			**503**	**12.90**	**0**	**0**	**13**	**7.21**	**0**	**0**	**0**	**0**	**4**	**2.22**	**0**	**0**	**0**	**0**	**1705**	**945.95**	**0**	**0**	**17**	**9.43**	**0**	**0**	**0**	**0**	**1739**	**964.82**
Section 1	5	00101	23-Sep-16	270	0.60															281	6244.44									281	6244.44
		00102	23-Sep-16	586	0.98			1	6.3											77	485.17			1	6.3					79	497.77
		00103	23-Sep-16	612	1.20			2	9.8											33	161.76									35	171.57
		00104	23-Sep-16	375	0.50															70	1344									70	1344
		00105	23-Sep-16	445	1.10			1	7.35											30	220.63									31	227.99
		00107	23-Sep-16	329	0.55															74	1472.23			2	39.79					76	1512.02
		00108	23-Sep-16	527	0.85			5	40.18											55	442.01									60	482.2
		00109	23-Sep-16	466	0.98			1	7.92											54	427.86			1	7.92					56	443.71
		00110	23-Sep-16	424	0.65			2	26.12					1	13.06					54	705.37			2	26.12					59	770.68
		00111	23-Sep-16	535	1.00									3	20.19					46	309.53			1	6.73					50	336.45
		00112	23-Sep-16	468	1.07															95	682.96			2	14.38					97	697.34
		00113	23-Sep-16	329	0.75			2	29.18											52	758.66									54	787.84
		00114	23-Sep-16	453	0.95															52	434.99			2	16.73					54	451.73
		00116	23-Sep-16	485	0.98			1	7.54											94	708.36									95	715.89
		00119	23-Sep-16	408	0.75			4	47.06											99	1164.71			2	23.53					105	1235.29
	Session Summary			**447**	**12.90**	**0**	**0**	**19**	**11.86**	**0**	**0**	**0**	**0**	**4**	**2.5**	**0**	**0**	**0**	**0**	**1166**	**727.95**	**0**	**0**	**13**	**8.12**	**0**	**0**	**0**	**0**	**1202**	**750.43**
Section 1	6	00101	27-Sep-16	288	0.60															163	3395.83									163	3395.83
		00102	27-Sep-16	351	0.98															80	841.55									80	841.55
		00103	27-Sep-16	574	1.20			2	10.45											69	360.63									71	371.08
		00104	27-Sep-16	388	0.50															67	1243.3									67	1243.3
		00105	27-Sep-16	445	1.10															29	213.28									29	213.28
		00107	27-Sep-16	374	0.55									2	35					81	1417.6									83	1452.6
		00108	27-Sep-16	475	0.85															65	579.57									65	579.57
		00109	27-Sep-16	491	0.98			1	7.52											65	488.8			1	7.52					67	503.84
		00110	27-Sep-16	445	0.65															43	535.18			2	24.89					45	560.07
		00111	27-Sep-16	612	1.00															29	170.59			2	11.76					31	182.35
		00112	27-Sep-16	562	1.07															99	592.68			2	11.97					101	604.65
		00113	27-Sep-16	366	0.75															63	826.23									63	826.23
		00114	27-Sep-16	491	0.95											1	7.72			59	455.35			1	7.72					61	470.79
		00116	27-Sep-16	484	0.98			1	7.55											71	536.14									72	543.69
		00119	27-Sep-16	434	0.75															52	575.12			1	11.06					53	586.18
	Session Summary			**452**	**12.90**	**0**	**0**	**4**	**2.47**	**0**	**0**	**0**	**0**	**2**	**1.23**	**1**	**0.62**	**0**	**0**	**1035**	**639.02**	**0**	**0**	**9**	**5.56**	**0**	**0**	**0**	**0**	**1051**	**648.9**
Section Total All Samples				**39929**	**73.95**	**3**	**0**	**68**	**0**	**0**	**0**	**0**	**0**	**39**	**0**	**1**	**0**	**0**	**0**	**8215**	**0**	**0**	**0**	**86**	**0**	**0**	**0**	**0**	**0**	**8412**	**0**
Section Average All Samples				**459**	**0.85**	**0**	**0.32**	**1**	**7.21**	**0**	**0**	**0**	**0**	**0**	**4.14**	**0**	**0.11**	**0**	**0**	**94**	**871.28**	**0**	**0**	**1**	**9.12**	**0**	**0**	**0**	**0**	**97**	**892.18**
Section Standard Error of Mean						**0.02**	**0.18**	**0.13**	**1.39**	**0**	**0**	**0**	**0**	**0.13**	**1.79**	**0.01**	**0.09**	**0**	**0**	**8.41**	**136.45**	**0**	**0**	**0.16**	**1.44**	**0**	**0**	**0**	**0**	**8.39**	**136.26**

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 3	1	00301	25-Aug-16	1033	1.80			1	1.94											36	69.7			7	13.55					44	85.19
		00302	25-Aug-16	908	1.90			4	8.35											153	319.27			2	4.17					159	331.79
		00303	25-Aug-16	726	1.45			1	3.42											101	345.4									102	348.82
		00304	25-Aug-16	472	1.35															47	265.54			1	5.65					48	271.19
		00305	25-Aug-16	812	1.55															145	414.75									145	414.75
		00306	26-Aug-16	705	1.00			2	10.21											52	265.53					1	5.11			55	280.85
		00307	26-Aug-16	606	0.95			1	6.25											37	231.37									38	237.62
		00308	28-Aug-16	744	1.35			1	3.58											213	763.44									214	767.03
		00309	26-Aug-16	581	0.95			1	6.52											47	306.55									48	313.07
		00310	28-Aug-16	750	1.20			3	12											151	604			1	4					155	620
		00311	26-Aug-16	764	1.25			1	3.77											60	226.18			1	3.77					62	233.72
		00312	28-Aug-16	836	1.17															162	596.25			2	7.36					164	603.61
		00314	26-Aug-16	596	0.98															26	161.07			2	12.39					28	173.46
		00315	26-Aug-16	1246	1.70															21	35.69			6	10.2					27	45.89
		00316	28-Aug-16	1098	1.48	6	13.34	2	4.45											379	842.46			32	71.13					419	931.37
	Session Summary			**792**	**20.10**	**6**	**1.36**	**17**	**3.84**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1630**	**368.61**	**0**	**0**	**54**	**12.21**	**1**	**0.23**	**0**	**0**	**1708**	**386.25**
Section 3	2	00301	03-Sep-16	1100	1.80	9	16.36	2	3.64					1	1.82					178	323.64			10	18.18					200	363.64
		00302	03-Sep-16	1058	1.90															99	177.3			2	3.58					101	180.88
		00303	03-Sep-16	792	1.45			1	3.13											206	645.77			1	3.13					208	652.04
		00304	03-Sep-16	747	1.35	2	7.14	1	3.57											251	896.03			3	10.71					257	917.45
		00305	04-Sep-16	762	1.55															30	91.44			2	6.1					32	97.54
		00306	04-Sep-16	562	1.00															64	409.96									64	409.96
		00307	04-Sep-16	532	0.95															225	1602.69									225	1602.69
		00308	04-Sep-16	737	1.35			5	18.09											179	647.67			2	7.24					186	673
		00309	05-Sep-16	552	0.95															11	75.51									11	75.51
		00310	05-Sep-16	724	1.20			2	8.29											85	352.21			3	12.43					90	372.93
		00311	05-Sep-16	568	1.25															12	60.85									12	60.85
		00312	05-Sep-16	670	1.17															14	64.29									14	64.29
		00314	04-Sep-16	560	0.98			1	6.59											42	276.92									43	283.52
		00315	04-Sep-16	992	1.70															112	239.09			1	2.13					113	241.22
		00316	05-Sep-16	754	1.48	1	3.24	1	3.24											151	488.78			9	29.13					162	524.39
	Session Summary			**741**	**20.10**	**12**	**2.9**	**13**	**3.14**	**0**	**0**	**0**	**0**	**1**	**0.24**	**0**	**0**	**0**	**0**	**1659**	**400.99**	**0**	**0**	**33**	**7.98**	**0**	**0**	**0**	**0**	**1718**	**415.25**
Section 3	3	00301	10-Sep-16	1011	1.80	2	3.96	1	1.98											127	251.24			2	3.96					132	261.13
		00302	10-Sep-16	952	1.90			3	5.97											311	618.97									314	624.94
		00303	10-Sep-16	824	1.45	1	3.01	1	3.01											624	1880.15									626	1886.17
		00304	10-Sep-16	864	1.35	3	9.26	1	3.09											476	1469.14									480	1481.48
		00305	10-Sep-16	934	1.55			2	4.97											384	954.89									386	959.87
		00306	12-Sep-16	725	1.00															95	471.72									95	471.72
		00307	11-Sep-16	718	0.95	2	10.56	1	5.28											373	1968.63									376	1984.46
		00308	11-Sep-16	741	1.35	2	7.2	1	3.6											423	1522.27									426	1533.06
		00309	12-Sep-16	630	0.95			2	12.03											69	415.04									71	427.07
		00310	12-Sep-16	740	1.20	1	4.05													71	287.84			1	4.05					73	295.95
		00311	12-Sep-16	688	1.25			2	8.37											72	301.4									74	309.77
		00312	12-Sep-16	754	1.17			1	4.08											102	416.24									103	420.32
		00314	11-Sep-16	685	0.98			2	10.78											69	371.93			2	10.78					73	393.49
		00315	11-Sep-16	1153	1.70	1	1.84	2	3.67											108	198.36			7	12.86					118	216.72
		00316	11-Sep-16	774	1.48	4	12.61													150	473			8	25.23					162	510.84
	Session Summary			**813**	**20.10**	**16**	**3.52**	**19**	**4.19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3454**	**760.92**	**0**	**0**	**20**	**4.41**	**0**	**0**	**0**	**0**	**3509**	**773.04**

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 3	4	00301	18-Sep-16	992	1.80	2	***4.03***	3	***6.05***											76	***153.23***			2	***4.03***					83	***167.34***
		00302	18-Sep-16	879	1.90			1	***2.16***											108	***232.8***			3	***6.47***					112	***241.42***
		00303	18-Sep-16	761	1.45			1	***3.26***											128	***417.6***			1	***3.26***					130	***424.12***
		00304	18-Sep-16	630	1.35			1	***4.23***											75	***317.46***									76	***321.69***
		00305	18-Sep-16	806	1.55			2	***5.76***									1	***2.88***	91	***262.23***									94	***270.87***
		00306	20-Sep-16	787	1.00			2	***9.15***											187	***855.4***									189	***864.55***
		00307	19-Sep-16	634	0.95	2	***11.95***													197	***1177.49***									199	***1189.44***
		00308	19-Sep-16	784	1.35			1	***3.4***											190	***646.26***					1	***3.4***			192	***653.06***
		00309	20-Sep-16	589	0.95	1	***6.43***	2	***12.87***											202	***1299.62***			1	***6.43***					206	***1325.35***
		00310	20-Sep-16	770	1.20	1	***3.9***	1	***3.9***											119	***463.64***			1	***3.9***					122	***475.32***
		00311	20-Sep-16	720	1.25			3	***12***											81	***324***			2	***8***					86	***344***
		00312	20-Sep-16	862	1.17			1	***3.57***											84	***299.84***									85	***303.41***
		00314	19-Sep-16	663	0.98	1	***5.57***	2	***11.14***											52	***289.59***			3	***16.71***					58	***323.01***
		00315	19-Sep-16	108	1.70	1	***19.61***													136	***2666.67***			8	***156.86***					145	***2843.14***
		00316	19-Sep-16	784	1.48			2	***6.23***											93	***289.52***			8	***24.9***					103	***320.65***
	Session Summary			**718**	**20.10**	**8**	***2***	**22**	***5.49***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**1**	***0.25***	**1819**	***453.75***	**0**	***0***	**29**	***7.23***	**1**	***0.25***	**0**	***0***	**1880**	***468.96***
Section 3	5	00301	24-Sep-16	993	1.80	3	***6.04***	3	***6.04***											138	***277.95***			2	***4.03***					146	***294.06***
		00302	24-Sep-16	865	1.90	1	***2.19***	4	***8.76***					1	***2.19***					96	***210.28***			1	***2.19***					103	***225.62***
		00303	24-Sep-16	789	1.45	1	***3.15***	1	***3.15***											127	***399.63***			1	***3.15***					130	***409.07***
		00304	24-Sep-16	750	1.35	1	***3.56***	4	***14.22***											147	***522.67***					1	***3.56***			153	***544***
		00305	24-Sep-16	753	1.55			3	***9.25***											87	***268.35***									90	***277.6***
		00306	24-Sep-16	572	1.00															78	***490.91***									78	***490.91***
		00307	25-Sep-16	740	0.95			2	***10.24***											192	***983.21***					1	***5.12***			195	***998.58***
		00308	25-Sep-16	794	1.35			2	***6.72***											214	***718.72***									216	***725.44***
		00309	24-Sep-16	454	0.95			1	***8.35***											62	***517.51***			2	***16.69***					65	***542.55***
		00310	24-Sep-16	630	1.20	1	***4.76***	2	***9.52***											66	***314.29***									69	***328.57***
		00311	24-Sep-16	548	1.25															62	***325.84***			2	***10.51***					64	***336.35***
		00312	25-Sep-16	764	1.17			4	***16.11***											132	***531.61***					1	***4.03***			137	***551.75***
		00314	25-Sep-16	794	0.98	2	***9.3***													74	***344.12***			3	***13.95***	1	***4.65***			80	***372.02***
		00315	25-Sep-16	1203	1.70	1	***1.76***	2	***3.52***					1	***1.76***					108	***190.11***			7	***12.32***					119	***209.48***
		00316	25-Sep-16	794	1.48	3	***9.22***	1	***3.07***											174	***534.86***			2	***6.15***					180	***553.3***
	Session Summary			**763**	**20.10**	**13**	***3.05***	**29**	***6.81***	**0**	***0***	**0**	***0***	**2**	***0.47***	**0**	***0***	**0**	***0***	**1757**	***412.43***	**0**	***0***	**20**	***4.69***	**4**	***0.94***	**0**	***0***	**1825**	***428.4***
Section 3	6	00301	28-Sep-16	1021	1.80	2	***3.92***	2	***3.92***											83	***162.59***			9	***17.63***					96	***188.05***
		00302	28-Sep-16	933	1.90			1	***2.03***											144	***292.44***			1	***2.03***	1	***2.03***			147	***298.53***
		00303	28-Sep-16	761	1.45			2	***6.52***											214	***698.17***			1	***3.26***					217	***707.96***
		00304	28-Sep-16	786	1.35	1	***3.39***	2	***6.79***											114	***386.77***			2	***6.79***	3	***10.18***			122	***413.91***
		00305	28-Sep-16	811	1.55			3	***8.59***	1	***2.86***									152	***435.3***									156	***446.76***
		00306	28-Sep-16	725	1.00			4	***19.86***											125	***620.69***									129	***640.55***
		00307	28-Sep-16	583	0.95			5	***32.5***											113	***734.49***									118	***766.99***
		00308	28-Sep-16	743	1.35			3	***10.77***											108	***387.62***			1	***3.59***					112	***401.97***
		00309	28-Sep-16	517	0.95	2	***14.66***													91	***667.01***					3	***21.99***			96	***703.65***
		00310	28-Sep-16	680	1.20	1	***4.41***	1	***4.41***											65	***286.76***			1	***4.41***					68	***300***
		00311	28-Sep-16	655	1.25			2	***8.79***											90	***395.73***									92	***404.52***
		00312	28-Sep-16	731	1.17			1	***4.21***											100	***420.92***									101	***425.13***
		00314	29-Sep-16	652	0.98															54	***305.8***									54	***305.8***
		00315	29-Sep-16	1206	1.70			1	***1.76***											81	***142.23***									82	***143.99***
		00316	29-Sep-16	881	1.48	2	***5.54***	2	***5.54***											78	***216.09***			4	***11.08***					86	***238.25***
	Session Summary			**779**	**20.10**	**8**	***1.84***	**29**	***6.67***	**1**	***0.23***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**1612**	***370.62***	**0**	***0***	**19**	***4.37***	**7**	***1.61***	**0**	***0***	**1676**	***385.34***
Section Total All Samples				**69077**	**120.42**	**63**	***0***	**129**	***0***	**1**	***0***	**0**	***0***	**3**	***0***	**0**	***0***	**1**	***0***	**11931**	***0***	**0**	***0***	**175**	***0***	**13**	***0***	**0**	***0***	**12316**	***0***
Section Average All Samples				**768**	**1.34**	**1**	***2.45***	**1**	***5.02***	**0**	***0.04***	**0**	***0***	**0**	***0.12***	**0**	***0***	**0**	***0.04***	**133**	***464.43***	**0**	***0***	**2**	***6.81***	**0**	***0.51***	**0**	***0***	**137**	***479.42***
Section Standard Error of Mean						**0.15**	***0.45***	**0.13**	***0.56***	**0.01**	***0.03***	**0**	***0***	**0.02**	***0.04***	**0**	***0***	**0.01**	***0.03***	**10.97**	***47.04***	**0**	***0***	**0.43**	***1.96***	**0.05**	***0.29***	**0**	***0***	**11.1**	***48.13***

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	1	00502	01-Sep-16	559	0.95			2	13.56											22	149.14			1	6.78					25	169.48
		00505	01-Sep-16	739	0.94			1	5.18											12	62.19			11	57.01	1	5.18			25	129.56
		00506	01-Sep-16	790	1.00			2	9.11											4	18.23			1	4.56					7	31.9
		00507	01-Sep-16	578	0.78	1	7.99			1	7.99									48	383.28									50	399.25
		00508	02-Sep-16	625	0.92					1	6.23									75	467.03									76	473.25
		00509	01-Sep-16	585	0.98			2	12.62	1	6.31									44	277.71									47	296.65
		00510	02-Sep-16	624	1.13															30	153.17			2	10.21	1	5.11			33	168.48
		00511	02-Sep-16	475	0.72															21	221.05					1	10.53			22	231.58
		00512	01-Sep-16	542	1.28															21	108.97									21	108.97
		00513	02-Sep-16	469	0.77															72	717.75					1	9.97			73	727.72
		00514	02-Sep-16	467	0.56	1	13.77													105	1445.4									106	1459.16
		00515	02-Sep-16	628	0.97	1	5.91	2	11.82											84	496.42					1	5.91			88	520.06
		00516	01-Sep-16	338	0.80	1	13.31													5	66.57			1	13.31					7	93.2
		00517	01-Sep-16	503	0.70															6	61.35									6	61.35
		005SC060	01-Sep-16	607	0.53									1	11.19							1	11.19	1	11.19					3	33.57
	Session Summary			**569**	**13.00**	**4**	**1.95**	**9**	**4.38**	**3**	**1.46**	**0**	**0**	**1**	**0.49**	**0**	**0**	**0**	**0**	**549**	**267.19**	**1**	**0.49**	**17**	**8.27**	**5**	**2.43**	**0**	**0**	**589**	**286.66**
Section 5	2	00502	09-Sep-16	566	0.65													1	9.79	8	78.28									9	88.07
		00505	09-Sep-16	1276	0.70			1	4.03											8	32.24			1	4.03					10	40.3
		00506	09-Sep-16	1032	1.00			1	3.49											14	48.84			1	3.49					16	55.81
		00507	09-Sep-16	485	0.78			1	9.52											6	57.1	1	9.52							8	76.13
		00508	09-Sep-16	747	0.92			3	15.63	1	5.21									72	375.12			1	5.21	2	10.42			79	411.59
		00509	09-Sep-16	759	0.98															43	209.18									43	209.18
		00510	08-Sep-16	863	1.13			3	11.07					1	3.69					18	66.45			1	3.69	1	3.69			24	88.6
		00511	08-Sep-16	421	0.72			1	11.88	1	11.88									43	510.69									45	534.44
		00512	08-Sep-16	805	1.28			1	3.49											70	244.57									71	248.06
		00513	08-Sep-16	620	0.77			1	7.54											67	505.24									68	512.78
		00514	09-Sep-16	471	0.56															43	586.9									43	586.9
		00515	08-Sep-16	628	0.97															159	939.65									159	939.65
		00517	08-Sep-16	475	0.45															13	218.95									13	218.95
		005SC060	08-Sep-16	673	0.53															4	40.37	1	10.09					2	20.19	7	70.65
	Session Summary			**702**	**11.40**	**0**	**0**	**12**	**5.4**	**2**	**0.9**	**0**	**0**	**1**	**0.45**	**0**	**0**	**1**	**0.45**	**568**	**255.51**	**2**	**0.9**	**4**	**1.8**	**3**	**1.35**	**2**	**0.9**	**595**	**267.66**
Section 5	3	00502	15-Sep-16	591	0.95			2	12.82											24	153.89									26	166.71
		00505	15-Sep-16	699	0.80			1	6.44											9	57.94									10	64.38
		00506	15-Sep-16	625	1.00															11	63.36			1	5.76					12	69.12
		00507	15-Sep-16	496	0.78			1	9.31											35	325.68					1	9.31			37	344.29
		00508	14-Sep-16	624	0.92	2	12.47	2	12.47											100	623.7									104	648.65
		00509	15-Sep-16	527	0.98															24	168.15									24	168.15
		00510	15-Sep-16	736	1.13			1	4.33											70	303									71	307.33
		00511	15-Sep-16	427	0.72			1	11.71											47	550.35									48	562.06
		00512	15-Sep-16	633	1.28			1	4.44											96	426.54					1	4.44			98	435.43
		00513	16-Sep-16	455	0.77			3	30.83											27	277.44									30	308.26
		00514	16-Sep-16	401	0.56	1	16.03													23	368.72									24	384.75
		00515	14-Sep-16	575	0.97	1	6.45	3	19.36											226	1458.72					1	6.45			231	1490.99
		00516	15-Sep-16	424	0.80	2	21.23	1	10.61											28	297.17									31	329.01
		00517	15-Sep-16	505	0.70			3	30.55											62	631.4									65	661.95
		005SC060	15-Sep-16	495	0.53																							1	13.72	1	13.72
	Session Summary			**548**	**12.90**	**6**	**3.06**	**19**	**9.68**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**782**	**398.23**	**0**	**0**	**1**	**0.51**	**3**	**1.53**	**1**	**0.51**	**812**	**413.51**

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	21-Sep-16	562	0.95			1	6.74											12	80.91									13	87.66
		00505	21-Sep-16	850	1.00			3	12.71											3	12.71			6	25.41					12	50.82
		00506	21-Sep-16	754	1.00	1	4.77	2	9.55											12	57.29			4	19.1	1	4.77			20	95.49
		00507	21-Sep-16	563	0.78			2	16.4											14	114.77	1	8.2							17	139.36
		00508	20-Sep-16	556	0.92															70	489.99					1	7			71	496.99
		00509	21-Sep-16	741	0.98															24	119.59									24	119.59
		00510	22-Sep-16	648	1.12															30	148.81			2	9.92	1	4.96			33	163.69
		00511	22-Sep-16	562	0.72	1	8.9	4	35.59											22	195.73									27	240.21
		00512	21-Sep-16	724	1.28			1	3.88											64	248.62					1	3.88			66	256.39
		00513	22-Sep-16	491	0.77	1	9.52	3	28.57											37	352.32									41	390.4
		00514	22-Sep-16	504	0.56	2	25.51													21	267.86	1	12.76							24	306.12
		00515	20-Sep-16	720	0.97	1	5.15	1	5.15											132	680.41					2	10.31			136	701.03
		00516	21-Sep-16	444	0.80															22	222.97									22	222.97
		00517	21-Sep-16	586	0.70			1	8.78											20	175.52					1	8.78			22	193.08
		005SC060	21-Sep-16	1177	0.53																							1	5.77	1	5.77
	Session Summary			**659**	**13.10**	**6**	**2.5**	**18**	**7.51**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**483**	**201.42**	**2**	**0.83**	**12**	**5**	**7**	**2.92**	**1**	**0.42**	**529**	**220.6**
Section 5	5	00502	26-Sep-16	464	0.95			1	8.17											34	277.68									35	285.84
		00505	26-Sep-16	939	0.77	1	4.98													3	14.94			1	4.98	1	4.98			6	29.87
		00506	26-Sep-16	709	1.00															2	10.16									2	10.16
		00507	26-Sep-16	485	0.78			1	9.52											14	133.23									15	142.74
		00508	27-Sep-16	630	0.92	6	37.07	2	12.36											67	413.9	1	6.18							76	469.5
		00509	26-Sep-16	545	0.98															25	169.37									25	169.37
		00510	27-Sep-16	656	1.13	1	4.86	1	4.86											55	267.11			1	4.86					58	281.67
		00511	27-Sep-16	450	0.72			3	33.33											23	255.56									26	288.89
		00512	26-Sep-16	675	1.28			1	4.17											92	383.33					1	4.17			94	391.67
		00513	27-Sep-16	450	0.77															69	716.88									69	716.88
		00514	27-Sep-16	417	0.56															24	369.99									24	369.99
		00515	27-Sep-16	540	0.97			1	6.87											58	398.63					2	13.75			61	419.24
		00516	26-Sep-16	459	0.80			1	9.8											27	264.71					2	19.61			30	294.12
		00517	26-Sep-16	569	0.70															51	460.96					2	18.08			53	479.04
		005SC060	26-Sep-16	576	0.53													2	23.58							1	11.79			3	35.38
	Session Summary			**571**	**12.90**	**8**	**3.91**	**11**	**5.38**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0.98**	**544**	**265.87**	**1**	**0.49**	**2**	**0.98**	**9**	**4.4**	**0**	**0**	**577**	**282**
Section 5	6	00502	01-Oct-16	501	0.95															40	302.55									40	302.55
		00505	01-Oct-16	789	1.00			2	9.13											16	73			3	13.69					21	95.82
		00506	01-Oct-16	673	1.00	1	5.35	2	10.7											12	64.19			1	5.35					16	85.59
		00507	01-Oct-16	506	0.78			1	9.12											48	437.82									49	446.94
		00508	01-Oct-16	591	0.92	5	32.93	1	6.59											140	921.94									146	961.45
		00509	01-Oct-16	554	0.98															49	326.58			1	6.66					50	333.24
		00510	01-Oct-16	684	1.13	1	4.66	2	9.32											58	270.14									61	284.12
		00511	01-Oct-16	449	0.72			1	11.14											30	334.08					2	22.27			33	367.48
		00512	01-Oct-16	612	1.28															54	248.16									54	248.16
		00513	01-Oct-16	479	0.77	1	9.76	2	19.52											65	634.44					1	9.76			69	673.48
		00514	01-Oct-16	370	0.56															73	1268.34									73	1268.34
		00515	01-Oct-16	505	0.97			1	7.35											60	440.95					2	14.7			63	463
		00516	01-Oct-16	335	0.80	1	13.43													23	308.96			1	13.43					25	335.82
		00517	01-Oct-16	484	0.70			2	21.25											15	159.39									17	180.64
	Session Summary			**538**	**12.60**	**9**	**4.78**	**14**	**7.43**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**683**	**362.72**	**0**	**0**	**6**	**3.19**	**5**	**2.66**	**0**	**0**	**717**	**380.78**
Section Total All Samples				**52541**	**75.86**	**33**	**0**	**83**	**0**	**5**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**3**	**0**	**3609**	**0**	**6**	**0**	**42**	**0**	**32**	**0**	**4**	**0**	**3819**	**0**
Section Average All Samples				**597**	**0.86**	**0**	**2.62**	**1**	**6.6**	**0**	**0.4**	**0**	**0**	**0**	**0.16**	**0**	**0**	**0**	**0.24**	**41**	**286.88**	**0**	**0.48**	**0**	**3.34**	**0**	**2.54**	**0**	**0.32**	**43**	**303.57**
Section Standard Error of Mean						**0.1**	**0.75**	**0.11**	**0.89**	**0.02**	**0.2**	**0**	**0**	**0.02**	**0.13**	**0**	**0**	**0.03**	**0.29**	**4.11**	**31.43**	**0.03**	**0.27**	**0.16**	**0.79**	**0.07**	**0.53**	**0.03**	**0.28**	**4.13**	**31.46**

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	1	00601	30-Aug-16	666	1.20			1	4.5											46	207.21			1	4.5					48	216.22
		00602	30-Aug-16	531	0.90			1	7.53											2	15.07									3	22.6
		00603	30-Aug-16	472	1.30			1	5.87											164	962.19					1	5.87			166	973.92
		00604	30-Aug-16	629	1.00			1	5.72											19	108.74									20	114.47
		00605	30-Aug-16	428	0.80					1	10.51									147	1545.56									148	1556.07
		00606	31-Aug-16	823	1.40	2	6.25	4	12.5											84	262.45			1	3.12					91	284.33
		00607	31-Aug-16	768	1.00			1	4.69											227	1064.06					1	4.69			229	1073.44
		00608	30-Aug-16	569	1.00					1	6.33									58	366.96									59	373.29
		00609	31-Aug-16	735	1.00															29	142.04									29	142.04
		00610	31-Aug-16	588	0.85															22	158.46									22	158.46
		00611	31-Aug-16	629	0.90															22	139.9									22	139.9
		00612	31-Aug-16	519	0.85			1	8.16											37	301.94									38	310.1
		00613	31-Aug-16	592	0.90					1	6.76									31	209.46					1	6.76			33	222.97
		00614	30-Aug-16	678	0.98			1	5.45											87	473.79									88	479.24
		006PIN01	30-Aug-16	942	1.50															3	7.64									3	7.64
		006PIN02	30-Aug-16	530	1.00															4	27.17									4	27.17
		006SC036	31-Aug-16	482	0.50																	1	14.94							1	14.94
	Session Summary			**622**	**17.10**	**2**	**0.68**	**11**	**3.72**	**3**	**1.02**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**982**	**332.37**	**1**	**0.34**	**2**	**0.68**	**3**	**1.02**	**0**	**0**	**1004**	**339.82**
Section 6	2	00601	05-Sep-16	666	1.20															20	90.09			2	9.01					22	99.1
		00602	05-Sep-16	545	0.87					1	7.59									1	7.59									2	15.19
		00603	05-Sep-16	756	1.30			1	3.66											151	553.11					1	3.66			153	560.44
		00604	05-Sep-16	678	1.00			1	5.31	2	10.62									22	116.81									25	132.74
		00605	05-Sep-16	542	0.80	1	8.3	1	8.3											133	1104.24			1	8.3					136	1129.15
		00606	06-Sep-16	1043	1.40	1	2.47	1	2.47											67	165.18			1	2.47	3	7.4			73	179.98
		00607	06-Sep-16	800	1.00					1	4.5									116	522									117	526.5
		00608	05-Sep-16	665	1.00	1	5.41	1	5.41	1	5.41									76	411.43	1	5.41							80	433.08
		00609	06-Sep-16	790	1.00															75	341.77									75	341.77
		00610	06-Sep-16	635	0.85			2	13.34	2	13.34									42	280.13									46	306.81
		00611	06-Sep-16	667	0.90															27	161.92					1	6			28	167.92
		00612	06-Sep-16	494	0.85			1	8.57											44	377.23									45	385.81
		00613	06-Sep-16	698	0.90															52	297.99					1	5.73			53	303.72
		00614	05-Sep-16	717	0.98			1	5.15											58	298.68									59	303.83
		006PIN01	05-Sep-16	760	1.50			1	3.16	1	3.16									6	18.95	1	3.16							9	28.42
		006PIN02	05-Sep-16	562	1.00															4	25.62									4	25.62
		006SC036	06-Sep-16	411	0.40			1	21.9																					1	21.9
		006SC047	05-Sep-16	384	0.52																	1	18.03			1	18.03			2	36.06
	Session Summary			**656**	**17.50**	**3**	**0.94**	**11**	**3.45**	**8**	**2.51**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**894**	**280.35**	**3**	**0.94**	**4**	**1.25**	**7**	**2.2**	**0**	**0**	**930**	**291.64**
Section 6	3	00601	10-Sep-16	688	1.20			1	4.36											32	139.53									33	143.9
		00602	10-Sep-16	463	0.90			5	43.2											5	43.2									10	86.39
		00603	10-Sep-16	673	1.30															160	658.36									160	658.36
		00604	10-Sep-16	667	1.00							1	5.4							38	205.1									39	210.49
		00605	11-Sep-16	411	0.80															76	832.12									76	832.12
		00606	11-Sep-16	865	1.40	1	2.97	3	8.92											75	222.96			1	2.97					80	237.82
		00607	11-Sep-16	699	1.00															91	468.67									91	468.67
		00608	10-Sep-16	536	1.00															41	275.37									41	275.37
		00609	11-Sep-16	593	1.00															20	121.42									20	121.42
		00610	11-Sep-16	584	0.85			1	7.25											28	203.06									29	210.31
		00611	11-Sep-16	629	0.90	1	6.36													21	133.55									22	139.9
		00612	11-Sep-16	515	0.85			1	8.22											89	731.92					1	8.22			91	748.37
		00613	11-Sep-16	653	0.90															36	220.52	1	6.13							37	226.65
		00614	10-Sep-16	640	0.98															36	207.69									36	207.69
		006PIN01	10-Sep-16	735	1.50													5	16.33	11	35.92									16	52.24
		006PIN02	10-Sep-16	501	1.00			1	7.19											10	71.86					3	21.56			14	100.6
		006SC036	11-Sep-16	451	0.43																					2	37.13			2	37.13
		006SC047	10-Sep-16	479	0.55	2	27.33													7	95.65									9	122.98
	Session Summary			**599**	**17.60**	**4**	**1.37**	**12**	**4.1**	**0**	**0**	**1**	**0.34**	**0**	**0**	**0**	**0**	**5**	**1.71**	**776**	**264.99**	**1**	**0.34**	**1**	**0.34**	**6**	**2.05**	**0**	**0**	**806**	**275.23**

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	16-Sep-16	690	1.20															37	160.87									37	160.87
		00602	16-Sep-16	494	0.90			4	32.39											4	32.39					1	8.1			9	72.87
		00603	17-Sep-16	682	1.30			1	4.06											81	328.9	1	4.06							83	337.02
		00604	17-Sep-16	639	1.00			1	5.63											11	61.97			1	5.63	1	5.63			14	78.87
		00605	17-Sep-16	450	0.80	1	10													85	850									86	860
		00606	17-Sep-16	771	1.40			1	3.34											39	130.07	1	3.34							41	136.74
		00607	18-Sep-16	733	1.00															40	196.45					7	34.38			47	230.83
		00608	17-Sep-16	545	1.00															27	178.35									27	178.35
		00609	17-Sep-16	693	1.00			1	5.19											40	207.79	1	5.19							42	218.18
		00610	18-Sep-16	538	0.85															20	157.45									20	157.45
		00611	17-Sep-16	550	0.90															16	116.36									16	116.36
		00612	18-Sep-16	471	0.85	3	26.98													54	485.58					4	35.97			61	548.52
		00613	18-Sep-16	525	0.70															26	254.69									26	254.69
		00614	16-Sep-16	680	0.98	1	5.43													52	282.35					1	5.43			54	293.21
		006PIN01	16-Sep-16	765	1.50	1	3.14													23	72.16									24	75.29
		006PIN02	16-Sep-16	459	1.00															18	141.18									18	141.18
		006SC036	18-Sep-16	484	0.50																					1	14.88			1	14.88
		006SC047	16-Sep-16	411	0.55															1	15.93									1	15.93
	Session Summary			**588**	**17.40**	**6**	**2.11**	**8**	**2.81**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**574**	**201.97**	**3**	**1.06**	**1**	**0.35**	**15**	**5.28**	**0**	**0**	**607**	**213.58**
Section 6	5	00601	24-Sep-16	633	1.20															26	123.22									26	123.22
		00602	24-Sep-16	534	0.90			2	14.98											5	37.45							1	7.49	8	59.93
		00603	24-Sep-16	674	1.30															98	402.65					4	16.43			102	419.08
		00604	24-Sep-16	604	1.00			1	5.96											20	119.21									21	125.17
		00605	24-Sep-16	369	0.80			4	48.78											50	609.76									54	658.54
		00606	24-Sep-16	771	1.40			2	6.67											68	226.79			1	3.34	1	3.34			72	240.13
		00607	26-Sep-16	628	1.00			1	5.73											54	309.55					2	11.46			57	326.75
		00608	24-Sep-16	986	0.92															40	157.89									40	157.89
		00609	25-Sep-16	768	1.00	1	4.69													40	187.5	1	4.69							42	196.88
		00610	25-Sep-16	579	0.85			1	7.31											102	746.11									103	753.43
		00611	25-Sep-16	549	0.90															82	597.45									82	597.45
		00612	26-Sep-16	498	0.85			1	8.5											62	527.29	1	8.5	1	8.5	2	17.01			67	569.81
		00613	26-Sep-16	594	0.90	1	6.73													12	80.81	1	6.73							14	94.28
		00614	24-Sep-16	610	0.98			1	6.05											48	290.54					3	18.16			52	314.75
		006PIN01	24-Sep-16	1028	1.50															37	86.38									37	86.38
		006PIN02	24-Sep-16	516	1.00															15	104.65									15	104.65
		006SC036	26-Sep-16	434	0.50															2	33.18									2	33.18
		006SC047	24-Sep-16	390	0.55															3	50.35									3	50.35
	Session Summary			**620**	**17.60**	**2**	**0.66**	**13**	**4.29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**764**	**252.05**	**3**	**0.99**	**2**	**0.66**	**12**	**3.96**	**1**	**0.33**	**797**	**262.94**
Section 6	6	00601	28-Sep-16	782	1.20			1	3.84											37	141.94			2	7.67					40	153.45
		00602	28-Sep-16	550	0.90			3	21.82											10	72.73									13	94.55
		00603	28-Sep-16	647	1.30			2	8.56											69	295.33									71	303.89
		00604	28-Sep-16	641	1.00															28	157.25									28	157.25
		00605	28-Sep-16	421	0.80	1	10.69													38	406.18					1	10.69			40	427.55
		00606	28-Sep-16	847	1.40	1	3.04	1	3.04											72	218.59					1	3.04			75	227.69
		00607	29-Sep-16	680	1.00			2	10.59											103	545.29					1	5.29			106	561.18
		00608	28-Sep-16	588	1.00	1	6.12	1	6.12											77	471.43									79	483.67
		00609	28-Sep-16	722	1.00															32	159.56					4	19.94			36	179.5
		00610	28-Sep-16	505	0.85															35	293.54									35	293.54
		00611	28-Sep-16	641	0.90															53	330.73									53	330.73
		00612	29-Sep-16	510	0.85	2	16.61													127	1054.67									129	1071.28
		00613	29-Sep-16	561	0.90	1	7.13	1	7.13											61	434.94									63	449.2
		00614	28-Sep-16	705	0.98			2	10.47											67	350.9	1	5.24			6	31.42			76	398.04
		006PIN01	27-Sep-16	961	1.50			3	7.49											75	187.3									78	194.8
		006PIN02	28-Sep-16	685	1.00			1	5.26					1	5.26					48	252.26									50	262.77
		006SC047	28-Sep-16	404	0.55															5	81.01									5	81.01
	Session Summary			**638**	**17.10**	**6**	**1.98**	**17**	**5.61**	**0**	**0**	**0**	**0**	**1**	**0.33**	**0**	**0**	**0**	**0**	**937**	**309.19**	**1**	**0.33**	**2**	**0.66**	**13**	**4.29**	**0**	**0**	**977**	**322.39**
Section Total All Samples				**65771**	**104.19**	**23**	**0**	**72**	**0**	**11**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**5**	**0**	**4927**	**0**	**12**	**0**	**12**	**0**	**56**	**0**	**1**	**0**	**5121**	**0**
Section Average All Samples				**620**	**0.98**	**0**	**1.28**	**1**	**4.01**	**0**	**0.61**	**0**	**0.06**	**0**	**0.06**	**0**	**0**	**0**	**0.28**	**46**	**274.57**	**0**	**0.67**	**0**	**0.67**	**1**	**3.12**	**0**	**0.06**	**48**	**285.38**
Section Standard Error of Mean						**0.05**	**0.44**	**0.1**	**0.77**	**0.04**	**0.22**	**0.01**	**0.05**	**0.01**	**0.05**	**0**	**0**	**0.05**	**0.15**	**4.06**	**26.82**	**0.03**	**0.26**	**0.04**	**0.17**	**0.12**	**0.77**	**0.01**	**0.07**	**4.09**	**26.94**

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	00702	31-Aug-16	458	0.95															18	148.93					1	8.27			19	157.21
		00703	31-Aug-16	688	0.95					1	5.51	1	5.51							7	38.56									9	49.57
		00704	01-Sep-16	463	1.00															64	497.62									64	497.62
		00705	01-Sep-16	499	1.00															11	79.36									11	79.36
		00706	01-Sep-16	670	1.00					1	5.37									4	21.49									5	26.87
		00709	31-Aug-16	598	1.00					1	6.02									58	349.16									59	355.18
		00715	31-Aug-16	558	0.90															9	64.52									9	64.52
		00716	31-Aug-16	1022	1.60					1	2.2									1	2.2									2	4.4
		00717	31-Aug-16	460	0.65															1	12.04									1	12.04
		00718	01-Sep-16	731	1.20															15	61.56									15	61.56
		00719	01-Sep-16	337	0.70					1	15.26																			1	15.26
		00720	31-Aug-16	1131	1.40			1	2.27	1	2.27									4	9.09					1	2.27			7	15.92
		00721	31-Aug-16	680	1.30															13	52.94									13	52.94
		00722	31-Aug-16	1033	1.10															24	76.04					4	12.67			28	88.71
		007SC022	01-Sep-16	341	0.36																					1	29.33			1	29.33
	Session Summary			**645**	**15.10**	**0**	**0**	**1**	**0.37**	**6**	**2.22**	**1**	**0.37**	**0**	**0**	**0**	**0**	**0**	**0**	**229**	**84.65**	**0**	**0**	**0**	**0**	**7**	**2.59**	**0**	**0**	**244**	**90.19**
Section 7	2	00702	07-Sep-16	413	0.95			1	9.18											30	275.26									31	284.44
		00703	07-Sep-16	700	0.95															2	10.83									2	10.83
		00704	07-Sep-16	586	1.00															38	233.45									38	233.45
		00705	07-Sep-16	694	1.00															30	155.62			1	5.19					31	160.81
		00706	07-Sep-16	798	1.00					2	9.02	1	4.51							17	76.69					1	4.51			21	94.74
		00709	07-Sep-16	688	1.00															53	277.33					2	10.47			55	287.79
		00716	07-Sep-16	1061	1.60			1	2.12											5	10.6									6	12.72
		00717	07-Sep-16	443	0.65															4	50.01									4	50.01
		00718	07-Sep-16	971	1.20															46	142.12					3	9.27			49	151.39
		00719	07-Sep-16	530	0.75															11	99.62									11	99.62
		00720	07-Sep-16	1248	1.40															4	8.24	1	2.06							5	10.3
		00721	07-Sep-16	717	1.30															34	131.32									34	131.32
		00722	07-Sep-16	796	1.10			1	4.11											8	32.89					3	12.33			12	49.34
		007SC022	07-Sep-16	423	0.36															4	94.56									4	94.56
	Session Summary			**719**	**14.30**	**0**	**0**	**3**	**1.05**	**2**	**0.7**	**1**	**0.35**	**0**	**0**	**0**	**0**	**0**	**0**	**286**	**100.14**	**1**	**0.35**	**1**	**0.35**	**9**	**3.15**	**0**	**0**	**303**	**106.09**
Section 7	3	00702	13-Sep-16	466	0.95			1	8.13											20	162.64					1	8.13			22	178.9
		00703	13-Sep-16	600	0.95					1	6.32																			1	6.32
		00704	14-Sep-16	535	1.00															70	471.03					2	13.46			72	484.49
		00705	14-Sep-16	651	1.00			2	11.06											12	66.36									14	77.42
		00706	14-Sep-16	733	1.00			1	4.91											3	14.73									4	19.65
		00709	13-Sep-16	571	1.00									1	6.3					71	447.64					2	12.61			74	466.55
		00715	13-Sep-16	518	0.90					2	15.44									1	7.72									3	23.17
		00717	14-Sep-16	346	0.65															1	16.01									1	16.01
		00718	13-Sep-16	916	1.20			1	3.28											45	147.38					2	6.55			48	157.21
		00719	14-Sep-16	393	0.75			1	12.21																	1	12.21			2	24.43
		00720	13-Sep-16	1171	1.40			1	2.2			1	2.2	1	2.2											1	2.2			4	8.78
		00721	13-Sep-16	558	1.30															20	99.26									20	99.26
		00722	13-Sep-16	798	1.10	1	4.1	1	4.1											48	196.86	1	4.1			1	4.1			52	213.26
	Session Summary			**635**	**13.20**	**1**	**0.43**	**8**	**3.44**	**3**	**1.29**	**1**	**0.43**	**2**	**0.86**	**0**	**0**	**0**	**0**	**291**	**124.98**	**1**	**0.43**	**0**	**0**	**10**	**4.29**	**0**	**0**	**317**	**136.15**

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	4	00702	20-Sep-16	416	0.95															32	291.5									32	291.5
		00703	20-Sep-16	617	0.95					2	12.28									9	55.28					1	6.14			12	73.7
		00704	19-Sep-16	613	1.00															69	405.22			1	5.87	1	5.87			71	416.97
		00705	19-Sep-16	687	1.00			3	15.72											12	62.88					1	5.24			16	83.84
		00706	19-Sep-16	835	1.00			3	12.93											1	4.31					2	8.62			6	25.87
		00709	20-Sep-16	618	1.00															41	238.83					1	5.83			42	244.66
		00715	20-Sep-16	577	0.90			1	6.93											9	62.39									10	69.32
		00716	19-Sep-16	1068	1.60					1	2.11									25	52.67									26	54.78
		00717	19-Sep-16	439	0.65															2	25.23					2	25.23			4	50.46
		00718	20-Sep-16	754	1.20															19	75.6									19	75.6
		00719	19-Sep-16	417	0.75			1	11.51											3	34.53					2	23.02			6	69.06
		00720	18-Sep-16	1010	1.40															2	5.09									2	5.09
		00721	18-Sep-16	620	1.30	1	4.47													27	120.6					1	4.47			29	129.53
		00722	18-Sep-16	755	1.10			1	4.33											38	164.72	1	4.33							40	173.39
		007SC012	19-Sep-16	275	0.22																					2	119.01			2	119.01
		007SC022	19-Sep-16	509	0.36																			1	19.65	3	58.94			4	78.59
	Session Summary			**638**	**15.40**	**1**	**0.37**	**9**	**3.3**	**3**	**1.1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**289**	**105.89**	**1**	**0.37**	**2**	**0.73**	**16**	**5.86**	**0**	**0**	**321**	**117.62**
Section 7	5	00702	25-Sep-16	534	0.95			1	7.1											73	518.04									74	525.13
		00703	25-Sep-16	642	0.95			1	5.9			1	5.9							12	70.83					4	23.61			18	106.25
		00704	25-Sep-16	600	1.00															59	354									59	354
		00705	25-Sep-16	649	1.00			2	11.09											5	27.73					2	11.09			9	49.92
		00706	25-Sep-16	752	0.98															3	14.65					2	9.77			5	24.42
		00709	25-Sep-16	679	1.00															54	286.3					1	5.3			55	291.61
		00715	25-Sep-16	621	0.90															10	64.41					1	6.44			11	70.85
		00716	25-Sep-16	982	1.60			1	2.29	1	2.29									33	75.61	1	2.29			2	4.58			38	87.07
		00717	25-Sep-16	363	0.65															10	152.57									10	152.57
		00718	25-Sep-16	954	1.20	1	3.14	1	3.14											36	113.21	1	3.14			1	3.14			40	125.79
		00719	25-Sep-16	447	0.75			1	10.74											5	53.69									6	64.43
		00720	25-Sep-16	1073	1.40															4	9.59					1	2.4			5	11.98
		00721	25-Sep-16	681	1.30															25	101.66					1	4.07			26	105.73
		00722	25-Sep-16	766	1.10															18	76.9					1	4.27			19	81.18
		007SC022	25-Sep-16	353	0.36																					1	28.33			1	28.33
	Session Summary			**673**	**15.10**	**1**	**0.35**	**7**	**2.48**	**1**	**0.35**	**1**	**0.35**	**0**	**0**	**0**	**0**	**0**	**0**	**347**	**122.92**	**2**	**0.71**	**0**	**0**	**17**	**6.02**	**0**	**0**	**376**	**133.2**
Section 7	6	00702	29-Sep-16	487	0.95															47	365.72									47	365.72
		00703	29-Sep-16	619	0.95															9	55.1					2	12.24			11	67.34
		00704	29-Sep-16	587	1.00			1	6.13											31	190.12					1	6.13			33	202.39
		00705	29-Sep-16	588	1.00			3	18.37											12	73.47					1	6.12			16	97.96
		00706	29-Sep-16	777	1.00															6	27.8					1	4.63			7	32.43
		00709	29-Sep-16	612	1.00			1	5.88											57	335.29					2	11.76			60	352.94
		00715	29-Sep-16	581	0.90															14	96.39					13	89.5			27	185.89
		00716	29-Sep-16	948	1.60			2	4.75											38	90.19									40	94.94
		00717	29-Sep-16	374	0.65															11	162.9					1	14.81			12	177.7
		00718	29-Sep-16	800	1.20															21	78.75					1	3.75			22	82.5
		00719	29-Sep-16	455	0.75															8	84.4					4	42.2			12	126.59
		00720	29-Sep-16	958	1.40			1	2.68											9	24.16									10	26.84
		00721	29-Sep-16	660	1.30															56	234.97									56	234.97
		00722	29-Sep-16	730	1.10															39	174.84					4	17.93			43	192.78
		007SC012	29-Sep-16	259	0.22			1	63.18																					1	63.18
		007SC022	29-Sep-16	330	0.36															1	30.3									1	30.3
	Session Summary			**610**	**15.40**	**0**	**0**	**9**	**3.45**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**359**	**137.58**	**0**	**0**	**0**	**0**	**30**	**11.5**	**0**	**0**	**398**	**152.52**
Section Total All Samples				**58064**	**88.47**	**3**	**0**	**37**	**0**	**15**	**0**	**4**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1801**	**0**	**5**	**0**	**3**	**0**	**89**	**0**	**0**	**0**	**1959**	**0**
Section Average All Samples				**652**	**0.99**	**0**	**0.19**	**0**	**2.31**	**0**	**0.94**	**0**	**0.25**	**0**	**0.12**	**0**	**0**	**0**	**0**	**20**	**112.4**	**0**	**0.31**	**0**	**0.19**	**1**	**5.55**	**0**	**0**	**22**	**122.26**
Section Standard Error of Mean						**0.02**	**0.08**	**0.08**	**0.81**	**0.05**	**0.32**	**0.02**	**0.11**	**0.02**	**0.07**	**0**	**0**	**0**	**0**	**2.2**	**13.49**	**0.02**	**0.08**	**0.02**	**0.24**	**0.18**	**1.88**	**0**	**0**	**2.21**	**13.28**

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	29-Aug-16	659	1.10															1	4.97					2	9.93			3	14.9
		00902	29-Aug-16	728	1.00					1	4.95																			1	4.95
		00903	29-Aug-16	717	1.10					2	9.13									9	41.08					1	4.56			12	54.77
		00904	29-Aug-16	800	1.10															5	20.45					1	4.09			6	24.55
		00905	29-Aug-16	952	1.10			1	3.44	5	17.19	1	3.44							1	3.44									8	27.5
		00906	29-Aug-16	981	1.00					1	3.67																			1	3.67
		00907	29-Aug-16	1010	1.20															3	8.91					3	8.91			6	17.82
		00908	29-Aug-16	724	1.08															23	105.41									23	105.41
		00909	29-Aug-16	614	0.95					1	6.17									17	104.92					1	6.17			19	117.26
		00910	29-Aug-16	1208	1.10					1	2.71									1	2.71					6	16.26			8	21.67
		00911	30-Aug-16	572	1.00					2	12.59																			2	12.59
		00912	30-Aug-16	808	1.10					1	4.05									7	28.35					2	8.1			10	40.5
		00913	30-Aug-16	571	0.90			1	7.01											1	7.01									2	14.01
		00914	30-Aug-16	564	0.95															10	67.19					1	6.72			11	73.91
		009SC053	29-Aug-16	782	0.20																					4	92.07			4	92.07
		009SC061	30-Aug-16	637	0.68																					4	33.49			4	33.49
	Session Summary			**770**	**15.60**	**0**	**0**	**2**	**0.6**	**14**	**4.2**	**1**	**0.3**	**0**	**0**	**0**	**0**	**0**	**0**	**78**	**23.38**	**0**	**0**	**0**	**0**	**25**	**7.49**	**0**	**0**	**120**	**35.96**
Section 9	2	00901	06-Sep-16	629	1.10															5	26.02									5	26.02
		00902	06-Sep-16	511	1.00															1	7.05									1	7.05
		00903	06-Sep-16	596	1.10					4	21.96									22	120.81									26	142.77
		00904	06-Sep-16	667	1.10															26	127.57									26	127.57
		00905	06-Sep-16	708	1.10															4	18.49									4	18.49
		00906	06-Sep-16	742	1.00															2	9.7									2	9.7
		00907	06-Sep-16	741	1.20					1	4.05									9	36.44									10	40.49
		00908	06-Sep-16	584	1.10															24	134.5									24	134.5
		00909	06-Sep-16	560	0.95															19	128.57									19	128.57
		00910	06-Sep-16	820	1.10															1	3.99									1	3.99
		00913	06-Sep-16	512	0.90															4	31.25									4	31.25
		00914	06-Sep-16	498	0.95															5	38.05									5	38.05
		009SC053	06-Sep-16	430	0.26					1	32.2															4	128.8			5	161
		009SC061	06-Sep-16	399	0.68																					1	13.37			1	13.37
	Session Summary			**600**	**13.50**	**0**	**0**	**0**	**0**	**6**	**2.67**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**122**	**54.22**	**0**	**0**	**0**	**0**	**5**	**2.22**	**0**	**0**	**133**	**59.11**
Section 9	3	00901	13-Sep-16	674	1.10					2	9.71							1	4.86	1	4.86					3	14.57			7	33.99
		00902	13-Sep-16	566	1.00					1	6.36									1	6.36									2	12.72
		00903	13-Sep-16	714	1.10			1	4.58											21	96.26	1	4.58			1	4.58			24	110.01
		00904	13-Sep-16	619	1.10															19	100.46									19	100.46
		00905	13-Sep-16	711	1.10															13	59.84					1	4.6			14	64.44
		00906	13-Sep-16	723	1.00															11	54.77					1	4.98			12	59.75
		00907	13-Sep-16	754	1.20					1	3.98									12	47.75					3	11.94			16	63.66
		00908	13-Sep-16	638	1.10					1	5.13									19	97.46									20	102.59
		00909	13-Sep-16	618	0.95															17	104.24					1	6.13			18	110.37
		00910	13-Sep-16	925	1.10							2	7.08					3	10.61	3	10.61					2	7.08			10	35.38
		00911	13-Sep-16	567	1.00			1	6.35	1	6.35									3	19.05									5	31.75
		00912	14-Sep-16	712	1.10					1	4.6									14	64.35					2	9.19			17	78.14
		00913	14-Sep-16	496	0.90															2	16.13					2	16.13			4	32.26
		00914	14-Sep-16	549	0.95															25	172.56									25	172.56
		009SC053	13-Sep-16	517	0.26																					1	26.78			1	26.78
		009SC061	14-Sep-16	610	0.68															4	34.97					1	8.74			5	43.72
	Session Summary			**650**	**15.60**	**0**	**0**	**2**	**0.71**	**7**	**2.49**	**2**	**0.71**	**0**	**0**	**0**	**0**	**4**	**1.42**	**165**	**58.58**	**1**	**0.36**	**0**	**0**	**18**	**6.39**	**0**	**0**	**199**	**70.65**

Table E3 Concluded.

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 9	4	00901	21-Sep-16	617	1.10			1	5.3											6	31.83									7	37.13
		00902	21-Sep-16	559	1.00							2	12.88							1	6.44									3	19.32
		00903	21-Sep-16	613	1.10			1	5.34											10	53.39					2	10.68			13	69.41
		00904	21-Sep-16	685	1.10															12	57.33					1	4.78			13	62.11
		00905	21-Sep-16	812	1.10			1	4.03											2	8.06					3	12.09			6	24.18
		00906	21-Sep-16	866	1.00					1	4.16									6	24.94					1	4.16			8	33.26
		00907	21-Sep-16	848	1.20			1	3.54											8	28.3					4	14.15			13	45.99
		00908	21-Sep-16	644	1.10			2	10.16											26	132.13					1	5.08			29	147.37
		00909	21-Sep-16	653	0.95			1	5.8											23	133.47									24	139.28
		00910	21-Sep-16	1104	1.10															1	2.96					3	8.89			4	11.86
		00911	21-Sep-16	509	1.00															5	35.36					1	7.07			6	42.44
		00912	22-Sep-16	679	1.10															4	19.28					2	9.64			6	28.92
		00913	22-Sep-16	555	0.90															3	21.62									3	21.62
		00914	22-Sep-16	621	0.95															3	18.31					1	6.1			4	24.41
		009SC053	21-Sep-16	470	0.26																					1	29.46			1	29.46
		009SC061	22-Sep-16	651	0.68															2	16.39					1	8.19			3	24.58
	Session Summary			**680**	**15.60**	**0**	**0**	**7**	**2.38**	**1**	**0.34**	**2**	**0.68**	**0**	**0**	**0**	**0**	**0**	**0**	**112**	**38.01**	**0**	**0**	**0**	**0**	**21**	**7.13**	**0**	**0**	**143**	**48.53**
Section 9	5	00901	26-Sep-16	669	1.10			1	4.89											3	14.68					3	14.68			7	34.24
		00902	26-Sep-16	662	1.00															3	16.31					1	5.44			4	21.75
		00903	26-Sep-16	718	1.10	1	4.56													8	36.46					1	4.56			10	45.58
		00904	26-Sep-16	763	1.10															22	94.36	1	4.29			1	4.29			24	102.94
		00905	26-Sep-16	801	1.10															3	12.26					2	8.17			5	20.43
		00906	26-Sep-16	848	1.00																					3	12.74			3	12.74
		00907	26-Sep-16	845	1.20			1	3.55											5	17.75					2	7.1			8	28.4
		00908	26-Sep-16	648	1.10															11	55.56					3	15.15			14	70.71
		00909	26-Sep-16	631	0.95															6	36.03									6	36.03
		00911	26-Sep-16	519	1.00															5	34.68									5	34.68
		00912	26-Sep-16	667	1.10															12	58.88									12	58.88
		00913	26-Sep-16	546	0.90															2	14.65									2	14.65
		00914	26-Sep-16	485	0.95															2	15.63									2	15.63
		009SC061	26-Sep-16	555	0.68																					1	9.61			1	9.61
	Session Summary			**668**	**14.30**	**1**	**0.38**	**2**	**0.75**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**82**	**30.9**	**1**	**0.38**	**0**	**0**	**17**	**6.41**	**0**	**0**	**103**	**38.82**
Section 9	6	00901	30-Sep-16	751	1.10			1	4.36											7	30.5					3	13.07			11	47.94
		00903	30-Sep-16	683	1.10			2	9.58											12	57.5					1	4.79			15	71.88
		00904	30-Sep-16	660	1.10															17	84.3					1	4.96			18	89.26
		00905	30-Sep-16	971	1.10															6	20.22					3	10.11			9	30.33
		00906	30-Sep-16	944	1.00															4	15.25					5	19.07			9	34.32
		00907	30-Sep-16	1056	1.20															6	17.05					7	19.89			13	36.93
		00908	30-Sep-16	712	1.10	1	4.6	1	4.6											10	45.97					3	13.79			15	68.95
		00909	30-Sep-16	668	0.95			1	5.67											6	34.04									7	39.71
		00910	30-Sep-16	1160	1.10																					2	5.64			2	5.64
		00911	30-Sep-16	465	1.00			1	7.74											3	23.23					2	15.48			6	46.45
		00912	30-Sep-16	674	1.10			1	4.86											6	29.13									7	33.99
		00913	30-Sep-16	541	0.90			1	7.39											3	22.18									4	29.57
		00914	30-Sep-16	629	0.95															3	18.07									3	18.07
		009SC053	30-Sep-16	579	0.26																	1	23.91							1	23.91
	Session Summary			**750**	**14.00**	**1**	**0.34**	**8**	**2.74**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**83**	**28.46**	**1**	**0.34**	**0**	**0**	**27**	**9.26**	**0**	**0**	**120**	**41.14**
Section Total All Samples				**61853**	**88.60**	**2**	**0**	**21**	**0**	**28**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**642**	**0**	**3**	**0**	**0**	**0**	**113**	**0**	**0**	**0**	**818**	**0**
Section Average All Samples				**687**	**0.98**	**0**	**0.12**	**0**	**1.24**	**0**	**1.66**	**0**	**0.3**	**0**	**0**	**0**	**0**	**0**	**0.24**	**7**	**37.97**	**0**	**0.18**	**0**	**0**	**1**	**6.68**	**0**	**0**	**9**	**48.38**
Section Standard Error of Mean						**0.02**	**0.07**	**0.05**	**0.26**	**0.08**	**0.52**	**0.03**	**0.17**	**0**	**0**	**0**	**0**	**0.04**	**0.13**	**0.78**	**4.24**	**0.02**	**0.27**	**0**	**0**	**0.16**	**1.82**	**0**	**0**	**0.77**	**4.28**
All Sections Total All Samples				**347235**	**551.50**	**32445**	**0.61**	**127**	**0**	**410**	**0.01**	**60**	**0**	**10**	**0**	**47**	**0**	**1**	**0**	**13**	**0**	**31125**	**0.59**	**26**	**0**	**318**	**0.01**	**303**	**0.01**	**5**	**0**
All Sections Average All Samples						**59**	**335.47**	**0**	**1.31**	**1**	**4.24**	**0**	**0.62**	**0**	**0.1**	**0**	**0.49**	**0**	**0.01**	**0**	**0.13**	**57**	**321.82**	**0**	**0.27**	**1**	**3.29**	**1**	**3.13**	**0**	**0.05**
All Sections Standard Error of Mean						**3.11**	**28.26**	**0.03**	**0.17**	**0.05**	**0.35**	**0.02**	**0.11**	**0.01**	**0.03**	**0.02**	**0.29**	**0**	**0.01**	**0.01**	**0.06**	**3.08**	**28.16**	**0.01**	**0.08**	**0.08**	**0.44**	**0.05**	**0.48**	**0**	**0.05**

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, 23 August to 01 October 2016.

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		Redside Shiner		Sculpin spp.		Shiner species		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	00107	23-Aug-16	418	0.55																	2	***31.32***			2	***31.32***
		00108	24-Aug-16	471	0.85																	1	***8.99***			1	***8.99***
		00109	24-Aug-16	515	0.98																	19	***136.22***			19	***136.22***
		00110	23-Aug-16	623	0.65																	3	***26.67***			3	***26.67***
		00111	24-Aug-16	648	1.00																	5	***27.78***			5	***27.78***
		00112	24-Aug-16	622	1.07																	6	***32.45***			6	***32.45***
		00113	24-Aug-16	361	0.75																	4	***53.19***			4	***53.19***
		00114	24-Aug-16	589	0.95											1	***6.43***					7	***45.04***			8	***51.47***
		00116	24-Aug-16	439	0.98																	5	***41.63***			5	***41.63***
		00119	23-Aug-16	534	0.75																	1	***8.99***			1	***8.99***
	Session Summary			**522**	**8.50**	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**1**	***0.81***	**0**	***0***	**0**	***0***	**53**	***43***	**0**	***0***	**54**	***43.81***
Section 1	2	00101	02-Sep-16	160	0.60																	1	***37.5***			1	***37.5***
		00103	02-Sep-16	502	1.20																	4	***23.9***			4	***23.9***
		00104	02-Sep-16	268	0.50																	22	***591.04***			22	***591.04***
		00105	02-Sep-16	383	1.10																	1	***8.54***			1	***8.54***
		00107	03-Sep-16	300	0.55																	2	***43.64***			2	***43.64***
		00108	02-Sep-16	463	0.85							1	***9.15***									4	***36.59***			5	***45.74***
		00109	02-Sep-16	490	0.98																	1	***7.54***			1	***7.54***
		00110	03-Sep-16	418	0.65																	7	***92.75***			7	***92.75***
		00111	03-Sep-16	501	1.00																	2	***14.37***			2	***14.37***
		00114	03-Sep-16	459	0.95																	5	***41.28***			5	***41.28***
		00116	03-Sep-16	496	0.98																	3	***22.11***			3	***22.11***
		00119	02-Sep-16	320	0.75																	1	***15***			1	***15***
	Session Summary			**397**	**10.10**	**0**	***0***	**0**	***0***	**0**	***0***	**1**	***0.9***	**0**	***0***	**0**	***0***	**0**	***0***	**0**	***0***	**53**	***47.58***	**0**	***0***	**54**	***48.48***
Section 1	3	00107	08-Sep-16	526	0.55							1	***12.44***			8	***99.55***					2	***24.89***			11	***136.88***
		00108	08-Sep-16	700	0.85																	6	***36.3***			6	***36.3***
		00109	09-Sep-16	617	0.98											2	***11.97***					25	***149.61***			27	***161.58***
		00110	08-Sep-16	343	0.27											6	***233.24***					30	***1166.18***			36	***1399.42***
		00111	09-Sep-16	612	0.70											1	***8.4***					7	***58.82***			8	***67.23***
		00112	09-Sep-16	619	1.07																	9	***48.92***			9	***48.92***
		00113	09-Sep-16	378	0.75																	1	***12.7***			1	***12.7***
		00114	09-Sep-16	482	0.95																	24	***188.69***			24	***188.69***
		00119	08-Sep-16	578	0.75							1	***8.3***									18	***149.48***			19	***157.79***
	Session Summary			**539**	**6.90**	**0**	***0***	**0**	***0***	**0**	***0***	**2**	***1.94***	**0**	***0***	**17**	***16.46***	**0**	***0***	**0**	***0***	**122**	***118.09***	**0**	***0***	**141**	***136.48***

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		Redside Shiner		Sculpin spp.		Shiner species		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	4	00103	15-Sep-16	646	1.20											2	9.29					25	116.1			27	125.39
		00104	15-Sep-16	384	0.50											4	75					37	693.75			41	768.75
		00105	15-Sep-16	440	1.10																	4	29.75			4	29.75
		00107	15-Sep-16	381	0.55																	1	17.18			1	17.18
		00108	17-Sep-16	573	0.85							4	29.57									34	251.31			38	280.87
		00109	17-Sep-16	596	0.98							2	12.39									27	167.27			29	179.66
		00110	17-Sep-16	561	0.65											4	39.49					20	197.45			24	236.94
		00111	17-Sep-16	642	1.00											2	11.21					15	84.11			17	95.33
		00112	17-Sep-16	667	1.07											3	15.13					14	70.62			17	85.75
		00113	17-Sep-16	427	0.75																	24	269.79			24	269.79
		00114	17-Sep-16	563	0.95											1	6.73					4	26.92			5	33.65
		00116	17-Sep-16	529	0.98							1	6.91									6	41.45			7	48.36
	Session Summary			**534**	**10.60**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**4.45**	**0**	**0**	**16**	**10.18**	**0**	**0**	**0**	**0**	**211**	**134.2**	**0**	**0**	**234**	**148.82**
Section 1	5	00101	23-Sep-16	270	0.60																	9	200			9	200
		00102	23-Sep-16	586	0.98																	3	18.9			3	18.9
		00103	23-Sep-16	612	1.20											8	39.22					11	53.92			19	93.14
		00104	23-Sep-16	375	0.50							1	19.2			4	76.8					22	422.4			27	518.4
		00105	23-Sep-16	445	1.10																	6	44.13			6	44.13
		00107	23-Sep-16	329	0.55																	2	39.79			2	39.79
		00108	23-Sep-16	527	0.85																	16	128.59			16	128.59
		00109	23-Sep-16	466	0.98																	4	31.69			4	31.69
		00110	23-Sep-16	424	0.65							1	13.06									9	117.56			10	130.62
		00111	23-Sep-16	535	1.00																	7	47.1			7	47.1
		00112	23-Sep-16	468	1.07																	8	57.51			8	57.51
		00113	23-Sep-16	329	0.75																	11	160.49			11	160.49
		00114	23-Sep-16	453	0.95											1	8.37					8	66.92			9	75.29
		00116	23-Sep-16	485	0.98																	17	128.11			17	128.11
		00119	23-Sep-16	408	0.75																	5	58.82			5	58.82
	Session Summary			**447**	**12.90**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1.25**	**0**	**0**	**13**	**8.12**	**0**	**0**	**0**	**0**	**138**	**86.16**	**0**	**0**	**153**	**95.52**
Section 1	6	00102	27-Sep-16	351	0.98											1	10.52					1	10.52			2	21.04
		00103	27-Sep-16	574	1.20											5	26.13					3	15.68			8	41.81
		00104	27-Sep-16	388	0.50																	9	167.01			9	167.01
		00105	27-Sep-16	445	1.10																	2	14.71			2	14.71
		00107	27-Sep-16	374	0.55							1	17.5			2	35					1	17.5			4	70
		00108	27-Sep-16	475	0.85							1	8.92									10	89.16			11	98.08
		00110	27-Sep-16	445	0.65											3	37.34					3	37.34			6	74.68
		00111	27-Sep-16	612	1.00																	3	17.65			3	17.65
		00112	27-Sep-16	562	1.07											17	101.77									17	101.77
		00113	27-Sep-16	366	0.75																	16	209.84			16	209.84
		00114	27-Sep-16	491	0.95											3	23.15									3	23.15
		00116	27-Sep-16	484	0.98							1	7.55			2	15.1					7	52.86			10	75.51
		00119	27-Sep-16	434	0.75											1	11.06					1	11.06			2	22.12
	Session Summary			**462**	**11.30**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2.07**	**0**	**0**	**34**	**23.45**	**0**	**0**	**0**	**0**	**56**	**38.62**	**0**	**0**	**93**	**64.13**
Section Total All Samples				**33957**	**60.32**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**81**	**0**	**0**	**0**	**0**	**0**	**633**	**0**	**0**	**0**	**729**	**0**
Section Average All Samples				**478**	**0.85**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.87**	**0**	**0**	**1**	**10.11**	**0**	**0**	**0**	**0**	**9**	**79.03**	**0**	**0**	**10**	**91.02**
Section Standard Error of Mean						**0**	**0**	**0**	**0**	**0**	**0**	**0.07**	**0.65**	**0**	**0**	**0.31**	**4.09**	**0**	**0**	**0**	**0**	**1.07**	**20.99**	**0**	**0**	**1.16**	**24**

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	Redside Shiner No.	CPUE	Sculpin spp. No.	CPUE	Shiner species No.	CPUE	Spottail Shiner No.	CPUE	Sucker spp. No.	CPUE	Troutperch No.	CPUE	All Species No.	CPUE
Section 3	1	00301	25-Aug-16	1033	1.80																	13	25.17			13	25.17
		00302	25-Aug-16	908	1.90																	63	131.46			63	131.46
		00303	25-Aug-16	726	1.45																	79	270.16			79	270.16
		00304	25-Aug-16	472	1.35																	12	67.8			12	67.8
		00305	25-Aug-16	812	1.55							4	11.44									164	469.09			168	480.53
		00306	26-Aug-16	705	1.00																	91	464.68			91	464.68
		00307	26-Aug-16	606	0.95																	26	162.58			26	162.58
		00308	28-Aug-16	744	1.35							1	3.58									10	35.84			11	39.43
		00309	26-Aug-16	581	0.95																	5	32.61			5	32.61
		00310	28-Aug-16	750	1.20							1	4									34	136			35	140
		00311	26-Aug-16	764	1.25							1	3.77	1	3.77							87	327.96			89	335.5
		00312	28-Aug-16	836	1.17							1	3.68									36	132.5			37	136.18
		00314	26-Aug-16	596	0.98																	18	111.51			18	111.51
		00315	26-Aug-16	1246	1.70							2	3.4									45	76.48			47	79.88
		00316	28-Aug-16	1098	1.48																	15	33.34			15	33.34
	Session Summary			**792**	**20.10**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**2.26**	**1**	**0.23**	**0**	**0**	**0**	**0**	**0**	**0**	**698**	**157.85**	**0**	**0**	**709**	**160.33**
Section 3	2	00301	03-Sep-16	1100	1.80											2	3.64					3	5.45			5	9.09
		00302	03-Sep-16	1058	1.90											2	3.58					7	12.54			9	16.12
		00303	03-Sep-16	792	1.45																	4	12.54			4	12.54
		00304	03-Sep-16	747	1.35																	30	107.1			30	107.1
		00305	04-Sep-16	762	1.55																	7	21.34			7	21.34
		00306	04-Sep-16	562	1.00																	3	19.22			3	19.22
		00307	04-Sep-16	532	0.95							1	7.12									8	56.98			9	64.11
		00308	04-Sep-16	737	1.35							1	3.62									31	112.17			32	115.78
		00309	05-Sep-16	552	0.95																	5	34.32			5	34.32
		00310	05-Sep-16	724	1.20							1	4.14									26	107.73			27	111.88
		00311	05-Sep-16	568	1.25																	4	20.28			4	20.28
		00312	05-Sep-16	670	1.17							3	13.78									11	50.52			14	64.29
		00314	04-Sep-16	560	0.98																	4	26.37			4	26.37
		00315	04-Sep-16	992	1.70																	5	10.67			5	10.67
		00316	05-Sep-16	754	1.48																	9	29.13			9	29.13
	Session Summary			**741**	**20.10**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**1.45**	**0**	**0**	**4**	**0.97**	**0**	**0**	**0**	**0**	**157**	**37.95**	**0**	**0**	**167**	**40.36**
Section 3	3	00301	10-Sep-16	1011	1.80																	8	15.83			8	15.83
		00302	10-Sep-16	952	1.90											1	1.99					16	31.84			17	33.83
		00303	10-Sep-16	824	1.45											1	3.01					50	150.65			51	153.67
		00304	10-Sep-16	864	1.35							1	3.09									55	169.75			56	172.84
		00305	10-Sep-16	934	1.55							2	4.97			6	14.92					69	171.58			77	191.48
		00306	12-Sep-16	725	1.00							1	4.97									26	129.1			27	134.07
		00307	11-Sep-16	718	0.95							2	10.56									74	390.56			76	401.11
		00308	11-Sep-16	741	1.35											1	3.6					59	212.33			60	215.92
		00309	12-Sep-16	630	0.95							4	24.06									30	180.45			34	204.51
		00310	12-Sep-16	740	1.20					1	4.05	4	16.22									32	129.73			37	150
		00311	12-Sep-16	688	1.25																	19	79.53			19	79.53
		00312	12-Sep-16	754	1.17							4	16.32	1	4.08							96	391.76			101	412.16
		00314	11-Sep-16	685	0.98							3	16.17			1	5.39					16	86.24			20	107.8
		00315	11-Sep-16	1153	1.70							1	1.84									27	49.59			28	51.43
		00316	11-Sep-16	774	1.48							1	3.15			1	3.15					8	25.23			10	31.53
	Session Summary			**813**	**20.10**	**0**	**0**	**0**	**0**	**1**	**0.22**	**23**	**5.07**	**1**	**0.22**	**11**	**2.42**	**0**	**0**	**0**	**0**	**585**	**128.88**	**0**	**0**	**621**	**136.81**

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		Redside Shiner		Sculpin spp.		Shiner species		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	18-Sep-16	992	1.80																	7	14.11			7	14.11
		00302	18-Sep-16	879	1.90							2	4.31	14	30.18							21	45.27			37	79.76
		00303	18-Sep-16	761	1.45																	17	55.46			17	55.46
		00304	18-Sep-16	630	1.35																	20	84.66			20	84.66
		00305	18-Sep-16	806	1.55							5	14.41							5	14.41	49	141.2			59	170.02
		00306	20-Sep-16	787	1.00							1	4.57			1	4.57					50	228.72			52	237.87
		00307	19-Sep-16	634	0.95							2	11.95	1	5.98							80	478.17			83	496.1
		00308	19-Sep-16	784	1.35									1	3.4							38	129.25			39	132.65
		00309	20-Sep-16	589	0.95					1	6.43	2	12.87									28	180.14			31	199.45
		00310	20-Sep-16	770	1.20					2	7.79											36	140.26			38	148.05
		00311	20-Sep-16	720	1.25							1	4									25	100			26	104
		00312	20-Sep-16	862	1.17							2	7.14									39	139.21			41	146.35
		00314	19-Sep-16	663	0.98							1	5.57									19	105.81			20	111.38
		00315	19-Sep-16	108	1.70							1	19.61			3	58.82					26	509.8			30	588.24
		00316	19-Sep-16	784	1.48							1	3.11			3	9.34					11	34.24			15	46.7
	Session Summary			**718**	**20.10**	**0**	**0**	**0**	**0**	**3**	**0.75**	**18**	**4.49**	**16**	**3.99**	**7**	**1.75**	**0**	**0**	**5**	**1.25**	**466**	**116.24**	**0**	**0**	**515**	**128.47**
Section 3	5	00301	24-Sep-16	993	1.80									20	40.28							14	28.2			34	68.48
		00302	24-Sep-16	865	1.90									6	13.14							16	35.05			22	48.19
		00303	24-Sep-16	789	1.45																	35	110.14			35	110.14
		00304	24-Sep-16	750	1.35											1	3.56					14	49.78			15	53.33
		00305	24-Sep-16	753	1.55																	28	86.36			28	86.36
		00306	24-Sep-16	572	1.00							2	12.59									24	151.05			26	163.64
		00307	25-Sep-16	740	0.95							4	20.48									45	230.44			49	250.92
		00308	25-Sep-16	794	1.35											5	16.79					38	127.62			43	144.42
		00309	24-Sep-16	454	0.95																	18	150.24			18	150.24
		00310	24-Sep-16	630	1.20							1	4.76									20	95.24			21	100
		00311	24-Sep-16	548	1.25							3	15.77									16	84.09			19	99.85
		00312	25-Sep-16	764	1.17							3	12.08	10	40.27	3	12.08					27	108.74			43	173.18
		00314	25-Sep-16	794	0.98											8	37.2					12	55.8			20	93.01
		00315	25-Sep-16	1203	1.70											10	17.6					11	19.36			21	36.97
		00316	25-Sep-16	794	1.48																	26	79.92			26	79.92
	Session Summary			**763**	**20.10**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**3.05**	**36**	**8.45**	**27**	**6.34**	**0**	**0**	**0**	**0**	**344**	**80.75**	**0**	**0**	**420**	**98.59**
Section 3	6	00301	28-Sep-16	1021	1.80																	8	15.67			8	15.67
		00302	28-Sep-16	933	1.90																	35	71.08			35	71.08
		00303	28-Sep-16	761	1.45																	25	81.56			25	81.56
		00304	28-Sep-16	786	1.35									2	6.79							26	88.21			28	95
		00305	28-Sep-16	811	1.55									6	17.18							36	103.1			42	120.28
		00306	28-Sep-16	725	1.00																	66	327.72			66	327.72
		00307	28-Sep-16	583	0.95							1	6.5									22	143			23	149.5
		00308	28-Sep-16	743	1.35																	18	64.6			18	64.6
		00309	28-Sep-16	517	0.95							1	7.33									12	87.96			13	95.29
		00310	28-Sep-16	680	1.20																	1	4.41			1	4.41
		00311	28-Sep-16	655	1.25							2	8.79									27	118.72			29	127.51
		00312	28-Sep-16	731	1.17							4	16.84									27	113.65			31	130.49
		00314	29-Sep-16	652	0.98											4	22.65					1	5.66			5	28.32
		00315	29-Sep-16	1206	1.70																	3	5.27			3	5.27
		00316	29-Sep-16	881	1.48																	8	22.16			8	22.16
	Session Summary			**779**	**20.10**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**1.84**	**8**	**1.84**	**4**	**0.92**	**0**	**0**	**0**	**0**	**315**	**72.42**	**0**	**0**	**335**	**77.02**
Section Total All Samples				**69077**	**120.42**	**0**	**0**	**0**	**0**	**4**	**0**	**78**	**0**	**62**	**0**	**53**	**0**	**0**	**0**	**5**	**0**	**2565**	**0**	**0**	**0**	**2767**	**0**
Section Average All Samples				**768**	**1.34**	**0**	**0**	**0**	**0**	**0**	**0.16**	**1**	**3.04**	**1**	**2.41**	**1**	**2.06**	**0**	**0**	**0**	**0.19**	**28**	**99.85**	**0**	**0**	**31**	**107.71**
Section Standard Error of Mean						**0**	**0**	**0**	**0**	**0.03**	**0.12**	**0.13**	**0.63**	**0.3**	**0.74**	**0.18**	**0.86**	**0**	**0**	**0.06**	**0.16**	**2.76**	**11.98**	**0**	**0**	**2.82**	**12.48**

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	Redside Shiner No.	Redside Shiner CPUE	Sculpin spp. No.	Sculpin spp. CPUE	Shiner species No.	Shiner species CPUE	Spottail Shiner No.	Spottail Shiner CPUE	Sucker spp. No.	Sucker spp. CPUE	Troutperch No.	Troutperch CPUE	All Species No.	All Species CPUE
Section 5	1	00502	01-Sep-16	559	0.95							3	20.34									2	13.56			5	33.9
		00505	01-Sep-16	739	0.94																	1	5.18			1	5.18
		00506	01-Sep-16	790	1.00																	10	45.57			10	45.57
		00507	01-Sep-16	578	0.78							1	7.99									6	47.91			7	55.9
		00508	02-Sep-16	625	0.92							1	6.23			2	12.45					17	105.86			20	124.54
		00509	01-Sep-16	585	0.98																	3	18.93			3	18.93
		00510	02-Sep-16	624	1.13																	3	15.32			3	15.32
		00511	02-Sep-16	475	0.72																	10	105.26			10	105.26
		00512	01-Sep-16	542	1.28							1	5.19									7	36.32			8	41.51
		00513	02-Sep-16	469	0.77											1	9.97					3	29.91			4	39.87
		00514	02-Sep-16	467	0.56							1	13.77			2	27.53					20	275.31			23	316.61
		00515	02-Sep-16	628	0.97							1	5.91									33	195.02			34	200.93
		00516	01-Sep-16	338	0.80											1	13.31					1	13.31			2	26.63
		00517	01-Sep-16	503	0.70																	5	51.12			5	51.12
		005SC060	01-Sep-16	607	0.53																	9	100.71			9	100.71
	Session Summary			**569**	**13.00**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**3.89**	**0**	**0**	**6**	**2.92**	**0**	**0**	**0**	**0**	**130**	**63.27**	**0**	**0**	**144**	**70.08**
Section 5	2	00502	09-Sep-16	566	0.65							3	29.36			1	9.79					49	479.48			53	518.62
		00505	09-Sep-16	1276	0.70									3	12.09							11	44.33			14	56.43
		00506	09-Sep-16	1032	1.00																	16	55.81			16	55.81
		00507	09-Sep-16	485	0.78									1	9.52	1	9.52					27	256.94			29	275.97
		00508	09-Sep-16	747	0.92							1	5.21	4	20.84	7	36.47					15	78.15			27	140.67
		00509	09-Sep-16	759	0.98									2	9.73							14	68.11			16	77.84
		00510	08-Sep-16	863	1.13							1	3.69			21	77.52					28	103.36			50	184.58
		00511	08-Sep-16	421	0.72											1	11.88					15	178.15			16	190.02
		00512	08-Sep-16	805	1.28																	19	66.38			19	66.38
		00513	08-Sep-16	620	0.77					1	7.54	2	15.08	13	98.03	42	316.72			1	7.54	40	301.63			99	746.54
		00514	09-Sep-16	471	0.56									2	27.3	15	204.73					21	286.62			38	518.65
		00515	08-Sep-16	628	0.97							1	5.91									25	147.74			26	153.65
		00517	08-Sep-16	475	0.45									1	16.84							3	50.53			4	67.37
		005SC060	08-Sep-16	673	0.53																	3	30.28			3	30.28
	Session Summary			**702**	**11.40**	**0**	**0**	**0**	**0**	**1**	**0.45**	**8**	**3.6**	**26**	**11.7**	**88**	**39.59**	**0**	**0**	**1**	**0.45**	**286**	**128.65**	**0**	**0**	**410**	**184.44**
Section 5	3	00502	15-Sep-16	591	0.95							3	19.24							1	6.41	18	115.42			22	141.06
		00505	15-Sep-16	699	0.80									4	25.75							4	25.75			8	51.5
		00506	15-Sep-16	625	1.00							1	5.76	2	11.52							17	97.92			20	115.2
		00507	15-Sep-16	496	0.78									17	158.19	5	46.53					36	334.99			58	539.7
		00508	14-Sep-16	624	0.92							2	12.47	17	106.03							43	268.19			62	386.69
		00509	15-Sep-16	527	0.98									25	175.16							4	28.03			29	203.18
		00510	15-Sep-16	736	1.13			1	4.33	1	4.33	2	8.66	17	73.59							38	164.49			59	255.39
		00511	15-Sep-16	427	0.72											1	11.71					22	257.61			23	269.32
		00512	15-Sep-16	633	1.28							3	13.33	2	8.89							50	222.16			55	244.37
		00513	16-Sep-16	455	0.77							2	20.55			3	30.83					25	256.89			30	308.26
		00514	16-Sep-16	401	0.56							1	16.03	4	64.13	1	16.03					35	561.1			41	657.29
		00515	14-Sep-16	575	0.97							3	19.36	11	71	1	6.45					165	1064.99			180	1161.81
		00516	15-Sep-16	424	0.80							1	10.61	5	53.07							18	191.04			24	254.72
		00517	15-Sep-16	505	0.70									5	50.92							28	285.15			33	336.07
		005SC060	15-Sep-16	495	0.53																	3	41.17			3	41.17
	Session Summary			**548**	**12.90**	**0**	**0**	**1**	**0.51**	**1**	**0.51**	**18**	**9.17**	**109**	**55.51**	**11**	**5.6**	**0**	**0**	**1**	**0.51**	**506**	**257.68**	**0**	**0**	**647**	**329.49**

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		Redside Shiner		Sculpin spp.		Shiner species		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	21-Sep-16	562	0.95																	8	53.94			8	53.94
		00505	21-Sep-16	850	1.00							1	4.24									6	25.41			7	29.65
		00506	21-Sep-16	754	1.00							2	9.55	1	4.77							9	42.97			12	57.29
		00507	21-Sep-16	563	0.78									4	32.79							4	32.79			8	65.58
		00508	20-Sep-16	556	0.92							2	14			1	7	20	140			57	398.99			80	559.98
		00509	21-Sep-16	741	0.98							1	4.98	2	9.97							20	99.66			23	114.61
		00510	22-Sep-16	648	1.12									4	19.84							2	9.92			6	29.76
		00511	22-Sep-16	562	0.72									1	8.9							7	62.28			8	71.17
		00512	21-Sep-16	724	1.28							1	3.88	16	62.15	1	3.88					41	159.27			59	229.2
		00513	22-Sep-16	491	0.77							1	9.52	16	152.35							6	57.13			23	219.01
		00514	22-Sep-16	504	0.56									3	38.27	1	12.76			2	25.51	21	267.86			27	344.39
		00515	20-Sep-16	720	0.97			1	5.15			1	5.15	11	56.7	8	41.24	45	231.96			136	701.03			202	1041.24
		00516	21-Sep-16	444	0.80							1	10.14									11	111.49			12	121.62
		00517	21-Sep-16	586	0.70									1	8.78							13	114.09			14	122.87
		005SC060	21-Sep-16	1177	0.53																	7	40.4			7	40.4
	Session Summary			**659**	**13.10**	**0**	**0**	**1**	**0.42**	**0**	**0**	**10**	**4.17**	**59**	**24.6**	**11**	**4.59**	**65**	**27.11**	**2**	**0.83**	**348**	**145.12**	**0**	**0**	**496**	**206.84**
Section 5	5	00502	26-Sep-16	464	0.95					1	8.17	1	8.17									3	24.5			5	40.83
		00505	26-Sep-16	939	0.77																	11	54.77			11	54.77
		00506	26-Sep-16	709	1.00																	2	10.16			2	10.16
		00507	26-Sep-16	485	0.78									6	57.1							8	76.13			14	133.23
		00508	27-Sep-16	630	0.92											2	12.36					28	172.97			30	185.33
		00509	26-Sep-16	545	0.98																	10	67.75			10	67.75
		00510	27-Sep-16	656	1.13							1	4.86									13	63.13			14	67.99
		00511	27-Sep-16	450	0.72											2	22.22					7	77.78			9	100
		00512	26-Sep-16	675	1.28					1	4.17			2	8.33							71	295.83			74	308.33
		00513	27-Sep-16	450	0.77																	11	114.29			11	114.29
		00514	27-Sep-16	417	0.56							1	15.42			1	15.42					21	323.74			23	354.57
		00515	27-Sep-16	540	0.97																	42	288.66			42	288.66
		00516	26-Sep-16	459	0.80									1	9.8							18	176.47			19	186.27
		00517	26-Sep-16	569	0.70									2	18.08							23	207.88			25	225.96
		005SC060	26-Sep-16	576	0.53																	2	23.58			2	23.58
	Session Summary			**571**	**12.90**	**0**	**0**	**0**	**0**	**2**	**0.98**	**3**	**1.47**	**11**	**5.38**	**5**	**2.44**	**0**	**0**	**0**	**0**	**270**	**131.96**	**0**	**0**	**291**	**142.22**
Section 5	6	00502	01-Oct-16	501	0.95																	2	15.13			2	15.13
		00505	01-Oct-16	789	1.00																	8	36.5			8	36.5
		00506	01-Oct-16	673	1.00																	2	10.7			2	10.7
		00507	01-Oct-16	506	0.78							1	9.12	2	18.24							6	54.73			9	82.09
		00508	01-Oct-16	591	0.92							1	6.59									25	164.63			26	171.22
		00509	01-Oct-16	554	0.98																	7	46.65			7	46.65
		00510	01-Oct-16	684	1.13																	7	32.6			7	32.6
		00512	01-Oct-16	612	1.28																	29	133.27			29	133.27
		00513	01-Oct-16	479	0.77																	17	165.93			17	165.93
		00514	01-Oct-16	370	0.56																	26	451.74			26	451.74
		00515	01-Oct-16	505	0.97																	24	176.38			24	176.38
		00516	01-Oct-16	335	0.80																	3	40.3			3	40.3
		00517	01-Oct-16	484	0.70																	9	95.63			9	95.63
		005SC060	01-Oct-16	556	0.53									1	12.22											1	12.22
	Session Summary			**546**	**12.40**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1.06**	**3**	**1.6**	**0**	**0**	**0**	**0**	**0**	**0**	**165**	**87.73**	**0**	**0**	**170**	**90.39**
Section Total All Samples				**52648**	**75.67**	**0**	**0**	**2**	**0**	**4**	**0**	**49**	**0**	**208**	**0**	**121**	**0**	**65**	**0**	**4**	**0**	**1705**	**0**	**0**	**0**	**2158**	**0**
Section Average All Samples				**598**	**0.86**	**0**	**0**	**0**	**0.16**	**0**	**0.32**	**1**	**3.9**	**2**	**16.55**	**1**	**9.63**	**1**	**5.17**	**0**	**0.32**	**19**	**135.64**	**0**	**0**	**25**	**171.68**
Section Standard Error of Mean						**0**	**0**	**0.02**	**0.08**	**0.02**	**0.14**	**0.09**	**0.68**	**0.53**	**3.81**	**0.56**	**4.38**	**0.56**	**3.06**	**0.03**	**0.31**	**2.64**	**17.74**	**0**	**0**	**3.42**	**22.47**

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	Redside Shiner No.	Redside Shiner CPUE	Sculpin spp. No.	Sculpin spp. CPUE	Shiner species No.	Shiner species CPUE	Spottail Shiner No.	Spottail Shiner CPUE	Sucker spp. No.	Sucker spp. CPUE	Troutperch No.	Troutperch CPUE	All Species No.	All Species CPUE
Section 6	1	00601	30-Aug-16	666	1.20																	6	27.03			6	27.03
		00602	30-Aug-16	531	0.90							1	7.53									3	22.6			4	30.13
		00603	30-Aug-16	472	1.30																	15	88.01			15	88.01
		00604	30-Aug-16	629	1.00											1	5.72					18	103.02			19	108.74
		00605	30-Aug-16	428	0.80																	23	241.82			23	241.82
		00606	31-Aug-16	823	1.40																	1	3.12			1	3.12
		00607	31-Aug-16	768	1.00											2	9.38					62	290.62			64	300
		00608	30-Aug-16	569	1.00											1	6.33					21	132.86			22	139.19
		00609	31-Aug-16	735	1.00							1	4.9									89	435.92			90	440.82
		00610	31-Aug-16	588	0.85											1	7.2					45	324.13			46	331.33
		00611	31-Aug-16	629	0.90											2	12.72					19	120.83			21	133.55
		00612	31-Aug-16	519	0.85							1	8.16									10	81.6			11	89.77
		00613	31-Aug-16	592	0.90											1	6.76					12	81.08			13	87.84
		00614	30-Aug-16	678	0.98																	58	315.86			58	315.86
		006PIN01	30-Aug-16	942	1.50																	7	17.83			7	17.83
		006SC036	31-Aug-16	482	0.50							1	14.94									19	283.82			20	298.76
		006SC047	30-Aug-16	407	0.55																	3	48.25			3	48.25
	Session Summary			**615**	**16.60**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**1.41**	**0**	**0**	**8**	**2.82**	**0**	**0**	**0**	**0**	**411**	**144.93**	**0**	**0**	**423**	**149.16**
Section 6	2	00601	05-Sep-16	666	1.20																	1	4.5			1	4.5
		00602	05-Sep-16	545	0.87									1	7.59							2	15.19			3	22.78
		00603	05-Sep-16	756	1.30											2	7.33					7	25.64			9	32.97
		00604	05-Sep-16	678	1.00																	8	42.48			8	42.48
		00605	05-Sep-16	542	0.80					1	8.3	3	24.91									7	58.12			11	91.33
		00606	06-Sep-16	1043	1.40							1	2.47			9	22.19					21	51.77			31	76.43
		00607	06-Sep-16	800	1.00																	47	211.5			47	211.5
		00608	05-Sep-16	665	1.00					2	10.83					7	37.89					7	37.89			16	86.62
		00609	06-Sep-16	790	1.00							1	4.56									51	232.41			52	236.96
		00610	06-Sep-16	635	0.85											20	133.4					26	173.41			46	306.81
		00611	06-Sep-16	667	0.90											2	11.99					35	209.9			37	221.89
		00612	06-Sep-16	494	0.85											15	128.6					17	145.75			32	274.35
		00613	06-Sep-16	698	0.90									1	5.73							17	97.42			18	103.15
		00614	05-Sep-16	717	0.98											2	10.3					20	102.99			22	113.29
		006PIN01	05-Sep-16	760	1.50																	5	15.79			5	15.79
		006PIN02	05-Sep-16	562	1.00							1	6.41									6	38.43			7	44.84
		006SC036	06-Sep-16	411	0.40															1	21.9	6	131.39			7	153.28
		006SC047	05-Sep-16	384	0.52																	3	54.09			3	54.09
	Session Summary			**656**	**17.50**	**0**	**0**	**0**	**0**	**3**	**0.94**	**6**	**1.88**	**2**	**0.63**	**57**	**17.87**	**0**	**0**	**1**	**0.31**	**286**	**89.69**	**0**	**0**	**355**	**111.32**
Section 6	3	00601	10-Sep-16	688	1.20											3	13.08					15	65.41			18	78.49
		00602	10-Sep-16	463	0.90							1	8.64									7	60.48			8	69.11
		00603	10-Sep-16	673	1.30							1	4.11									9	37.03			10	41.15
		00604	10-Sep-16	667	1.00							1	5.4			2	10.79					10	53.97			13	70.16
		00606	11-Sep-16	865	1.40									8	23.78	2	5.95					9	26.75			19	56.48
		00607	11-Sep-16	699	1.00																	28	144.21			28	144.21
		00608	10-Sep-16	536	1.00											1	6.72					13	87.31			14	94.03
		00609	11-Sep-16	593	1.00							1	6.07									64	388.53			65	394.6
		00610	11-Sep-16	584	0.85																	29	210.31			29	210.31
		00611	11-Sep-16	629	0.90																	26	165.34			26	165.34
		00612	11-Sep-16	515	0.85									29	238.49							20	164.48			49	402.97
		00613	11-Sep-16	653	0.90			1	6.13					2	12.25							32	196.02			35	214.4
		00614	10-Sep-16	640	0.98																	33	190.38			33	190.38
		006PIN01	10-Sep-16	735	1.50																	6	19.59			6	19.59
		006PIN02	10-Sep-16	501	1.00																	10	71.86			10	71.86
		006SC036	11-Sep-16	451	0.43									2	37.13							10	185.63			12	222.76
		006SC047	10-Sep-16	479	0.55																	4	54.66			4	54.66
	Session Summary			**610**	**16.80**	**0**	**0**	**1**	**0.35**	**0**	**0**	**4**	**1.41**	**41**	**14.4**	**8**	**2.81**	**0**	**0**	**0**	**0**	**325**	**114.17**	**0**	**0**	**379**	**133.14**

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		Redside Shiner		Sculpin spp.		Shiner species		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	16-Sep-16	690	1.20							3	***13.04***	3	***13.04***	1	***4.35***					26	***113.04***			33	***143.48***
		00602	16-Sep-16	494	0.90							1	***8.1***	6	***48.58***	1	***8.1***					5	***40.49***			13	***105.26***
		00603	17-Sep-16	682	1.30																	52	***211.14***			52	***211.14***
		00604	17-Sep-16	639	1.00									2	***11.27***	7	***39.44***					11	***61.97***			20	***112.68***
		00605	17-Sep-16	450	0.80							1	***10***									54	***540***			55	***550***
		00606	17-Sep-16	771	1.40							1	***3.34***									30	***100.06***			31	***103.39***
		00607	18-Sep-16	733	1.00									1	***4.91***							60	***294.68***			61	***299.59***
		00608	17-Sep-16	545	1.00							1	***6.61***	21	***138.72***							22	***145.32***			44	***290.64***
		00609	17-Sep-16	693	1.00									23	***119.48***					1	***5.19***	77	***400***			101	***524.68***
		00610	18-Sep-16	538	0.85																	29	***228.3***			29	***228.3***
		00611	17-Sep-16	550	0.90									2	***14.55***							41	***298.18***			43	***312.73***
		00612	18-Sep-16	471	0.85							2	***17.98***									43	***386.66***			45	***404.65***
		00613	18-Sep-16	525	0.70																	17	***166.53***			17	***166.53***
		00614	16-Sep-16	680	0.98							1	***5.43***	7	***38.01***							58	***314.93***			66	***358.37***
		006PIN01	16-Sep-16	765	1.50							1	***3.14***			1	***3.14***					39	***122.35***			41	***128.63***
		006PIN02	16-Sep-16	459	1.00							1	***7.84***									10	***78.43***			11	***86.27***
		006SC036	18-Sep-16	484	0.50							1	***14.88***	3	***44.63***			5	***74.38***			13	***193.39***			22	***327.27***
		006SC047	16-Sep-16	411	0.55									2	***31.85***							11	***175.18***			13	***207.03***
	Session Summary			**588**	**17.40**	**0**	***0***	**0**	***0***	**0**	***0***	**13**	***4.57***	**70**	***24.63***	**10**	***3.52***	**5**	***1.76***	**1**	***0.35***	**598**	***210.42***	**0**	***0***	**697**	***245.25***
Section 6	5	00601	24-Sep-16	633	1.20							2	***9.48***			2	***9.48***					16	***75.83***			20	***94.79***
		00602	24-Sep-16	534	0.90									12	***89.89***							1	***7.49***			13	***97.38***
		00603	24-Sep-16	674	1.30							2	***8.22***									57	***234.19***			59	***242.41***
		00604	24-Sep-16	604	1.00																	4	***23.84***			4	***23.84***
		00605	24-Sep-16	369	0.80																	24	***292.68***			24	***292.68***
		00606	24-Sep-16	771	1.40					1	***3.34***	1	***3.34***	19	***63.37***	2	***6.67***					40	***133.41***	1	***3.34***	64	***213.45***
		00607	26-Sep-16	628	1.00							3	***17.2***	2	***11.46***							56	***321.02***			61	***349.68***
		00608	24-Sep-16	986	0.92																	3	***11.84***			3	***11.84***
		00609	25-Sep-16	768	1.00									4	***18.75***							73	***342.19***			77	***360.94***
		00610	25-Sep-16	579	0.85							1	***7.31***									21	***153.61***			22	***160.93***
		00611	25-Sep-16	549	0.90																	25	***182.15***			25	***182.15***
		00612	26-Sep-16	498	0.85							2	***17.01***	6	***51.03***							49	***416.73***			57	***484.76***
		00613	26-Sep-16	594	0.90											1	***6.73***	1	***6.73***			15	***101.01***			17	***114.48***
		00614	24-Sep-16	610	0.98							1	***6.05***									58	***351.07***			59	***357.12***
		006PIN01	24-Sep-16	1028	1.50																	9	***21.01***			9	***21.01***
		006SC036	26-Sep-16	434	0.50							1	***16.59***	4	***66.36***							8	***132.72***			13	***215.67***
		006SC047	24-Sep-16	390	0.55																	1	***16.78***			1	***16.78***
	Session Summary			**626**	**16.60**	**0**	***0***	**0**	***0***	**1**	***0.35***	**13**	***4.5***	**47**	***16.28***	**5**	***1.73***	**1**	***0.35***	**0**	***0***	**460**	***159.36***	**1**	***0.35***	**528**	***182.92***
Section 6	6	00601	28-Sep-16	782	1.20							1	***3.84***			1	***3.84***					8	***30.69***			10	***38.36***
		00602	28-Sep-16	550	0.90							1	***7.27***									2	***14.55***			3	***21.82***
		00603	28-Sep-16	647	1.30																	43	***184.04***			43	***184.04***
		00604	28-Sep-16	641	1.00																	5	***28.08***			5	***28.08***
		00605	28-Sep-16	421	0.80											2	***21.38***					31	***331.35***			33	***352.73***
		00606	28-Sep-16	847	1.40									2	***6.07***							28	***85.01***			30	***91.08***
		00607	29-Sep-16	680	1.00							1	***5.29***									50	***264.71***			51	***270***
		00608	28-Sep-16	588	1.00									3	***18.37***							5	***30.61***			8	***48.98***
		00609	28-Sep-16	722	1.00									2	***9.97***							25	***124.65***			27	***134.63***
		00610	28-Sep-16	505	0.85									1	***8.39***							17	***142.57***			18	***150.96***
		00611	28-Sep-16	641	0.90									3	***18.72***	1	***6.24***					24	***149.77***			28	***174.73***
		00612	29-Sep-16	510	0.85											6	***49.83***					30	***249.13***			36	***298.96***
		00613	29-Sep-16	561	0.90																	6	***42.78***			6	***42.78***
		00614	28-Sep-16	705	0.98																	53	***277.58***			53	***277.58***
		006PIN01	27-Sep-16	961	1.50							1	***2.5***	11	***27.47***							17	***42.46***			29	***72.42***
		006PIN02	28-Sep-16	685	1.00							2	***10.51***									6	***31.53***			8	***42.04***
		006SC036	29-Sep-16	875	0.50					1500	***12342.86***											12	***98.74***			1512	***12441.6***
		006SC047	28-Sep-16	404	0.55																	1	***16.2***			1	***16.2***
	Session Summary			**651**	**17.60**	**0**	***0***	**0**	***0***	**1500**	***471.3***	**6**	***1.89***	**22**	***6.91***	**10**	***3.14***	**0**	***0***	**0**	***0***	**363**	***114.06***	**0**	***0***	**1901**	***597.3***
Section Total All Samples				**65596**	**102.44**	**0**	***0***	**1**	***0***	**1504**	***0***	**46**	***0***	**182**	***0***	**98**	***0***	**6**	***0***	**2**	***0***	**2443**	***0***	**1**	***0***	**4283**	***0***
Section Average All Samples				**625**	**0.98**	**0**	***0***	**0**	***0.06***	**14**	***84.56***	**0**	***2.59***	**2**	***10.23***	**1**	***5.51***	**0**	***0.34***	**0**	***0.11***	**23**	***137.36***	**0**	***0.06***	**41**	***240.81***
Section Standard Error of Mean						**0**	***0***	**0.01**	***0.06***	**14.29**	***117.55***	**0.07**	***0.5***	**0.47**	***3.14***	**0.27**	***1.88***	**0.05**	***0.71***	**0.01**	***0.21***	**1.96**	***11.63***	**0.01**	***0.03***	**14.3**	***117.58***

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		Redside Shiner		Sculpin spp.		Shiner species		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	00702	31-Aug-16	458	0.95							1	8.27									18	148.93			19	157.21
		00703	31-Aug-16	688	0.95																	15	82.62			15	82.62
		00704	01-Sep-16	463	1.00																	8	62.2			8	62.2
		00705	01-Sep-16	499	1.00																	1	7.21			1	7.21
		00706	01-Sep-16	670	1.00																	7	37.61			7	37.61
		00709	31-Aug-16	598	1.00							1	6.02									33	198.66			34	204.68
		00715	31-Aug-16	558	0.90							1	7.17									6	43.01			7	50.18
		00716	31-Aug-16	1022	1.60											1	2.2					19	41.83			20	44.03
		00717	31-Aug-16	460	0.65																	14	168.56			14	168.56
		00718	01-Sep-16	731	1.20							3	12.31									12	49.25			15	61.56
		00719	01-Sep-16	337	0.70																	2	30.52			2	30.52
		00720	31-Aug-16	1131	1.40																	15	34.1			15	34.1
		00721	31-Aug-16	680	1.30							1	4.07			1	4.07					18	73.3			20	81.45
		00722	31-Aug-16	1033	1.10																	19	60.2			19	60.2
		007SC022	01-Sep-16	341	0.36																	2	58.65			2	58.65
	Session Summary			**645**	**15.10**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**2.59**	**0**	**0**	**2**	**0.74**	**0**	**0**	**0**	**0**	**189**	**69.86**	**0**	**0**	**198**	**73.19**
Section 7	2	00702	07-Sep-16	413	0.95																	3	27.53			3	27.53
		00703	07-Sep-16	700	0.95							1	5.41									22	119.1			23	124.51
		00704	07-Sep-16	586	1.00							1	6.14									10	61.43			11	67.58
		00705	07-Sep-16	694	1.00																	3	15.56			3	15.56
		00706	07-Sep-16	798	1.00											4	18.05					12	54.14			16	72.18
		00709	07-Sep-16	688	1.00							1	5.23			1	5.23					16	83.72	1	5.23	19	99.42
		00715	07-Sep-16	629	0.90																	15	95.39			15	95.39
		00716	07-Sep-16	1061	1.60											3	6.36					25	53.02			28	59.38
		00717	07-Sep-16	443	0.65											2	25					12	150.03			14	175.03
		00718	07-Sep-16	971	1.20							1	3.09									30	92.69			31	95.78
		00719	07-Sep-16	530	0.75					2	18.11					6	54.34					8	72.45			16	144.91
		00720	07-Sep-16	1248	1.40											2	4.12					34	70.05			36	74.18
		00721	07-Sep-16	717	1.30					1	3.86											17	65.66			18	69.52
		00722	07-Sep-16	796	1.10											1	4.11					27	111.01			28	115.12
		007SC012	07-Sep-16	226	0.22																	1	72.41			1	72.41
		007SC022	07-Sep-16	423	0.36																	12	283.69			12	283.69
	Session Summary			**683**	**15.40**	**0**	**0**	**0**	**0**	**3**	**1.03**	**4**	**1.37**	**0**	**0**	**19**	**6.5**	**0**	**0**	**0**	**0**	**247**	**84.54**	**1**	**0.34**	**274**	**93.78**
Section 7	3	00702	13-Sep-16	466	0.95									3	24.4							12	97.58			15	121.98
		00703	13-Sep-16	600	0.95											1	6.32					28	176.84			29	183.16
		00704	14-Sep-16	535	1.00											1	6.73					5	33.64			6	40.37
		00705	14-Sep-16	651	1.00									1	5.53							11	60.83			12	66.36
		00706	14-Sep-16	733	1.00							1	4.91									27	132.61			28	137.52
		00709	13-Sep-16	571	1.00	1	6.3			2	12.61			6	37.83							49	308.93			58	365.67
		00715	13-Sep-16	518	0.90																	21	162.16			21	162.16
		00716	14-Sep-16	923	1.60																	25	60.94			25	60.94
		00717	14-Sep-16	346	0.65																	14	224.1			14	224.1
		00718	13-Sep-16	916	1.20			1	3.28			1	3.28									35	114.63			37	121.18
		00719	14-Sep-16	393	0.75																	9	109.92			9	109.92
		00720	13-Sep-16	1171	1.40									3	6.59							30	65.88			33	72.47
		00721	13-Sep-16	558	1.30																	32	158.81			32	158.81
		00722	13-Sep-16	798	1.10									20	82.02							7	28.71			27	110.73
		007SC012	14-Sep-16	246	0.22																	4	266.08			4	266.08
		007SC022	14-Sep-16	455	0.36																	5	109.89			5	109.89
	Session Summary			**618**	**15.40**	**1**	**0.38**	**1**	**0.38**	**2**	**0.76**	**2**	**0.76**	**33**	**12.48**	**2**	**0.76**	**0**	**0**	**0**	**0**	**314**	**118.77**	**0**	**0**	**355**	**134.28**

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	Redside Shiner No.	CPUE	Sculpin spp. No.	CPUE	Shiner species No.	CPUE	Spottail Shiner No.	CPUE	Sucker spp. No.	CPUE	Troutperch No.	CPUE	All Species No.	CPUE
Section 7	4	00702	20-Sep-16	416	0.95			1	9.11													2	18.22			3	27.33
		00703	20-Sep-16	617	0.95									1	6.14							34	208.82			35	214.96
		00704	19-Sep-16	613	1.00			1	5.87			3	17.62			2	11.75					29	170.31			35	205.55
		00705	19-Sep-16	687	1.00							3	15.72	3	15.72	1	5.24					6	31.44			13	68.12
		00706	19-Sep-16	835	1.00			1	4.31			1	4.31	8	34.49	15	64.67					11	47.43			36	155.21
		00709	20-Sep-16	618	1.00					1	5.83			3	17.48					2	11.65	50	291.26	1	5.83	57	332.04
		00715	20-Sep-16	577	0.90	2	13.86					1	6.93									19	131.72			22	152.51
		00716	19-Sep-16	1068	1.60							1	2.11									57	120.08			58	122.19
		00717	19-Sep-16	439	0.65									1	12.62	1	12.62					11	138.78			13	164.01
		00718	20-Sep-16	754	1.20					1	3.98	1	3.98	2	7.96							19	75.6			23	91.51
		00719	19-Sep-16	417	0.75											3	34.53					4	46.04			7	80.58
		00720	18-Sep-16	1010	1.40													2	5.09			12	30.55			14	35.64
		00721	18-Sep-16	620	1.30																	33	147.39			33	147.39
		00722	18-Sep-16	755	1.10							1	4.33	28	121.37							21	91.03			50	216.74
		007SC012	19-Sep-16	275	0.22							1	59.5									14	833.06			15	892.56
		007SC022	19-Sep-16	509	0.36			1	19.65					4	78.59	1	19.65					2	39.29			8	157.17
	Session Summary			**638**	**15.40**	**2**	**0.73**	**4**	**1.47**	**2**	**0.73**	**12**	**4.4**	**50**	**18.32**	**23**	**8.43**	**2**	**0.73**	**2**	**0.73**	**324**	**118.72**	**1**	**0.37**	**422**	**154.62**
Section 7	5	00702	25-Sep-16	534	0.95							1	7.1	4	28.39	2	14.19					10	70.96			17	120.64
		00703	25-Sep-16	642	0.95	1	5.9					2	11.81			1	5.9					15	88.54			19	112.15
		00704	25-Sep-16	600	1.00			1	6	1	6	1	6	6	36	1	6					6	36			16	96
		00705	25-Sep-16	649	1.00									1	5.55			1	5.55			7	38.83			9	49.92
		00706	25-Sep-16	752	0.98							1	4.88	4	19.54							13	63.5			18	87.93
		00709	25-Sep-16	679	1.00							1	5.3									37	196.17	1	5.3	39	206.77
		00715	25-Sep-16	621	0.90																	15	96.62			15	96.62
		00716	25-Sep-16	982	1.60							1	2.29	2	4.58							18	41.24			21	48.12
		00717	25-Sep-16	363	0.65																	2	30.51			2	30.51
		00718	25-Sep-16	954	1.20							2	6.29	3	9.43							21	66.04			26	81.76
		00719	25-Sep-16	447	0.75									2	21.48	1	10.74					16	171.81			19	204.03
		00720	25-Sep-16	1073	1.40									6	14.38							10	23.96			16	38.34
		00721	25-Sep-16	681	1.30									7	28.46	3	12.2					35	142.32			45	182.99
		00722	25-Sep-16	766	1.10							1	4.27	9	38.45							23	98.27			33	140.99
		007SC012	25-Sep-16	225	0.22																	7	509.09			7	509.09
		007SC022	25-Sep-16	353	0.36									1	28.33							4	113.31			5	141.64
	Session Summary			**645**	**15.40**	**1**	**0.36**	**1**	**0.36**	**1**	**0.36**	**10**	**3.62**	**45**	**16.31**	**8**	**2.9**	**1**	**0.36**	**0**	**0**	**239**	**86.62**	**1**	**0.36**	**307**	**111.27**
Section 7	6	00702	29-Sep-16	487	0.95									1	7.78							8	62.25			9	70.03
		00703	29-Sep-16	619	0.95																	46	281.61			46	281.61
		00704	29-Sep-16	587	1.00																	39	239.18			39	239.18
		00705	29-Sep-16	588	1.00																	2	12.24			2	12.24
		00706	29-Sep-16	777	1.00							3	13.9	2	9.27	1	4.63					9	41.7			15	69.5
		00709	29-Sep-16	612	1.00									1	5.88	1	5.88					29	170.59			31	182.35
		00715	29-Sep-16	581	0.90							2	13.77									18	123.92			20	137.69
		00716	29-Sep-16	948	1.60			3	7.12													43	102.06			46	109.18
		00717	29-Sep-16	374	0.65																	25	370.22			25	370.22
		00718	29-Sep-16	800	1.20																	17	63.75			17	63.75
		00719	29-Sep-16	455	0.75																	6	63.3			6	63.3
		00720	29-Sep-16	958	1.40									4	10.74							9	24.16			13	34.89
		00721	29-Sep-16	660	1.30																	14	58.74			14	58.74
		00722	29-Sep-16	730	1.10							1	4.48	11	49.32	2	8.97					6	26.9			20	89.66
		007SC012	29-Sep-16	259	0.22																	6	379.08			6	379.08
		007SC022	29-Sep-16	330	0.36							1	30.3													1	30.3
	Session Summary			**610**	**15.40**	**0**	**0**	**3**	**1.15**	**0**	**0**	**7**	**2.68**	**19**	**7.28**	**4**	**1.53**	**0**	**0**	**0**	**0**	**277**	**106.15**	**0**	**0**	**310**	**118.8**
Section Total All Samples				**60768**	**91.99**	**4**	**0**	**9**	**0**	**8**	**0**	**42**	**0**	**147**	**0**	**58**	**0**	**3**	**0**	**2**	**0**	**1590**	**0**	**3**	**0**	**1866**	**0**
Section Average All Samples				**640**	**0.97**	**0**	**0.24**	**0**	**0.55**	**0**	**0.49**	**0**	**2.57**	**2**	**8.99**	**1**	**3.55**	**0**	**0.18**	**0**	**0.12**	**17**	**97.23**	**0**	**0.18**	**20**	**114.1**
Section Standard Error of Mean						**0.03**	**0.17**	**0.04**	**0.26**	**0.04**	**0.25**	**0.08**	**0.78**	**0.41**	**1.97**	**0.18**	**1.03**	**0.02**	**0.08**	**0.02**	**0.12**	**1.28**	**12**	**0.02**	**0.1**	**1.39**	**12.32**

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		Redside Shiner		Sculpin spp.		Shiner species		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	29-Aug-16	659	1.10																	17	84.43			17	84.43
		00902	29-Aug-16	728	1.00							1	4.95									8	39.56			9	44.51
		00903	29-Aug-16	717	1.10							1	4.56									19	86.72			20	91.29
		00904	29-Aug-16	800	1.10							1	4.09									24	98.18			25	102.27
		00905	29-Aug-16	952	1.10																	15	51.57			15	51.57
		00906	29-Aug-16	981	1.00																	11	40.37			11	40.37
		00907	29-Aug-16	1010	1.20																	51	151.49			51	151.49
		00908	29-Aug-16	724	1.08							1	4.58			5	22.91					28	128.32			34	155.82
		00909	29-Aug-16	614	0.95					1	6.17					2	12.34					20	123.44			23	141.95
		00910	29-Aug-16	1208	1.10																	24	65.02			24	65.02
		00911	30-Aug-16	572	1.00																	20	125.87			20	125.87
		00912	30-Aug-16	808	1.10							1	4.05									20	81.01			21	85.06
		00913	30-Aug-16	571	0.90							1	7.01									9	63.05			10	70.05
		00914	30-Aug-16	564	0.95							1	6.72									9	60.47			10	67.19
		009SC053	29-Aug-16	782	0.20									1	23.02							10	230.18			11	253.2
		009SC061	30-Aug-16	637	0.68			1	8.37			1	8.37									9	75.35			11	92.1
	Session Summary			**770**	**15.60**	**0**	**0**	**1**	**0.3**	**1**	**0.3**	**8**	**2.4**	**1**	**0.3**	**7**	**2.1**	**0**	**0**	**0**	**0**	**294**	**88.11**	**0**	**0**	**312**	**93.51**
Section 9	2	00901	06-Sep-16	629	1.10																	7	36.42			7	36.42
		00902	06-Sep-16	511	1.00																	1	7.05			1	7.05
		00903	06-Sep-16	596	1.10			1	5.49							1	5.49					1	5.49			3	16.47
		00904	06-Sep-16	667	1.10											3	14.72					7	34.35			10	49.07
		00905	06-Sep-16	708	1.10																	3	13.87			3	13.87
		00906	06-Sep-16	742	1.00																	9	43.67			9	43.67
		00907	06-Sep-16	741	1.20																	14	56.68			14	56.68
		00908	06-Sep-16	584	1.10											1	5.6					2	11.21			3	16.81
		00909	06-Sep-16	560	0.95																	5	33.83			5	33.83
		00910	06-Sep-16	820	1.10																	15	59.87	2	7.98	17	67.85
		00911	06-Sep-16	409	1.00											2	17.6					1	8.8			3	26.41
		00913	06-Sep-16	512	0.90																	2	15.62			2	15.62
		009SC061	06-Sep-16	399	0.68																	8	106.93	1	13.37	9	120.3
	Session Summary			**606**	**13.30**	**0**	**0**	**1**	**0.45**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**3.13**	**0**	**0**	**0**	**0**	**75**	**33.5**	**3**	**1.34**	**86**	**38.41**
Section 9	3	00901	13-Sep-16	674	1.10											1	4.86					6	29.13			7	33.99
		00902	13-Sep-16	566	1.00																	2	12.72			2	12.72
		00903	13-Sep-16	714	1.10									1	4.58							4	18.33			5	22.92
		00904	13-Sep-16	619	1.10																	5	26.44			5	26.44
		00905	13-Sep-16	711	1.10											1	4.6					8	36.82			9	41.43
		00906	13-Sep-16	723	1.00																	16	79.67			16	79.67
		00907	13-Sep-16	754	1.20	1	3.98															50	198.94			51	202.92
		00908	13-Sep-16	638	1.10																	5	25.65			5	25.65
		00909	13-Sep-16	618	0.95																	5	30.66			5	30.66
		00910	13-Sep-16	925	1.10									1	3.54							17	60.15			18	63.69
		00911	13-Sep-16	567	1.00											3	19.05					15	95.24	1	6.35	19	120.63
		00912	14-Sep-16	712	1.10											2	9.19					10	45.97			12	55.16
		00914	14-Sep-16	549	0.95					1	6.9											2	13.81	1	6.9	4	27.61
		009SC053	13-Sep-16	517	0.26									2	53.56							5	133.91	1	26.78	8	214.25
		009SC061	14-Sep-16	610	0.68																	12	104.92			12	104.92
	Session Summary			**660**	**14.70**	**1**	**0.37**	**0**	**0**	**1**	**0.37**	**0**	**0**	**4**	**1.48**	**7**	**2.6**	**0**	**0**	**0**	**0**	**162**	**60.11**	**3**	**1.11**	**178**	**66.05**

Table E4 Concluded.

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	Redside Shiner No.	Redside Shiner CPUE	Sculpin spp. No.	Sculpin spp. CPUE	Shiner species No.	Shiner species CPUE	Spottail Shiner No.	Spottail Shiner CPUE	Sucker spp. No.	Sucker spp. CPUE	Troutperch No.	Troutperch CPUE	All Species No.	All Species CPUE
Section 9	4	00901	21-Sep-16	617	1.10							1	5.3									7	37.13			8	42.43
		00902	21-Sep-16	559	1.00							1	6.44									13	83.72			14	90.16
		00903	21-Sep-16	613	1.10																	16	85.42			16	85.42
		00904	21-Sep-16	685	1.10							1	4.78							1	4.78	15	71.67			17	81.22
		00905	21-Sep-16	812	1.10							2	8.06			1	4.03					31	124.94			34	137.04
		00906	21-Sep-16	866	1.00	1	4.16	1	4.16			1	4.16									51	212.01			54	224.48
		00907	21-Sep-16	848	1.20	1	3.54	2	7.08			1	3.54	9	31.84					1	3.54	57	201.65			71	251.18
		00908	21-Sep-16	644	1.10	1	5.08	1	5.08					1	5.08							53	269.34			56	284.58
		00909	21-Sep-16	653	0.95	1	5.8	2	11.61													61	353.99			64	371.4
		00910	21-Sep-16	1104	1.10			1	2.96			1	2.96	16	47.43					2	5.93	20	59.29			40	118.58
		00911	21-Sep-16	509	1.00	1	7.07															20	141.45			21	148.53
		00912	22-Sep-16	679	1.10			1	4.82													29	139.78			30	144.6
		00913	22-Sep-16	555	0.90							1	7.21									3	21.62			4	28.83
		00914	22-Sep-16	621	0.95	1	6.1															3	18.31			4	24.41
		009SC053	21-Sep-16	470	0.26									1	29.46					2	58.92	3	88.38			6	176.76
		009SC061	22-Sep-16	651	0.68			2	16.39													10	81.93			12	98.31
	Session Summary			**680**	**15.60**	**6**	**2.04**	**10**	**3.39**	**0**	**0**	**9**	**3.05**	**27**	**9.16**	**1**	**0.34**	**0**	**0**	**6**	**2.04**	**392**	**133.03**	**0**	**0**	**451**	**153.05**
Section 9	5	00901	26-Sep-16	669	1.10																	14	68.49			14	68.49
		00902	26-Sep-16	662	1.00			1	5.44					7	38.07							39	212.08			47	255.59
		00903	26-Sep-16	718	1.10	1	4.56							1	4.56							11	50.14			13	59.26
		00904	26-Sep-16	763	1.10									12	51.47							4	17.16			16	68.63
		00905	26-Sep-16	801	1.10			1	4.09					6	24.51							17	69.46			24	98.06
		00906	26-Sep-16	848	1.00																	30	127.36			30	127.36
		00907	26-Sep-16	845	1.20							1	3.55	2	7.1							41	145.56			44	156.21
		00908	26-Sep-16	648	1.10			1	5.05					3	15.15							24	121.21			28	141.41
		00909	26-Sep-16	631	0.95																	21	126.12			21	126.12
		00910	26-Sep-16	1065	1.10															10	30.73	33	101.41			43	132.14
		00911	26-Sep-16	519	1.00																	18	124.86			18	124.86
		00912	26-Sep-16	667	1.10			1	4.91													14	68.69			15	73.6
		00913	26-Sep-16	546	0.90									15	109.89							2	14.65			17	124.54
		00914	26-Sep-16	485	0.95																	1	7.81			1	7.81
		009SC053	26-Sep-16	509	0.26									8	217.62							10	272.03			18	489.65
		009SC061	26-Sep-16	555	0.68									35	336.34							7	67.27			42	403.6
	Session Summary			**683**	**15.60**	**1**	**0.34**	**4**	**1.35**	**0**	**0**	**1**	**0.34**	**89**	**30.07**	**0**	**0**	**0**	**0**	**10**	**3.38**	**286**	**96.63**	**0**	**0**	**391**	**132.11**
Section 9	6	00901	30-Sep-16	751	1.10			1	4.36			1	4.36									9	39.22			11	47.94
		00902	30-Sep-16	661	1.00																	9	49.02			9	49.02
		00903	30-Sep-16	683	1.10																	15	71.88			15	71.88
		00904	30-Sep-16	660	1.10																	5	24.79			5	24.79
		00905	30-Sep-16	971	1.10									1	3.37							20	67.41			21	70.78
		00906	30-Sep-16	944	1.00											1	3.81					42	160.17			43	163.98
		00907	30-Sep-16	1056	1.20									3	8.52							12	34.09	1	2.84	16	45.45
		00908	30-Sep-16	712	1.10																	9	41.37			9	41.37
		00909	30-Sep-16	668	0.95																	6	34.04			6	34.04
		00910	30-Sep-16	1160	1.10							1	2.82	6	16.93							16	45.14			23	64.89
		00911	30-Sep-16	465	1.00			2	15.48													9	69.68			11	85.16
		00912	30-Sep-16	674	1.10																	17	82.55			17	82.55
		00913	30-Sep-16	541	0.90									1	7.39							3	22.18			4	29.57
		00914	30-Sep-16	629	0.95	5	30.12	2	12.05													4	24.1			11	66.27
		009SC053	30-Sep-16	579	0.26	1	23.91							14	334.79					1	23.91	1	23.91			17	406.54
		009SC061	30-Sep-16	591	0.68																	10	90.24			10	90.24
	Session Summary			**734**	**15.60**	**6**	**1.89**	**5**	**1.57**	**0**	**0**	**2**	**0.63**	**25**	**7.86**	**1**	**0.31**	**0**	**0**	**1**	**0.31**	**187**	**58.79**	**1**	**0.31**	**228**	**71.68**
Section Total All Samples				**63664**	**90.53**	**14**	**0**	**21**	**0**	**2**	**0**	**20**	**0**	**146**	**0**	**23**	**0**	**0**	**0**	**17**	**0**	**1396**	**0**	**7**	**0**	**1646**	**0**
Section Average All Samples				**692**	**0.98**	**0**	**0.8**	**0**	**1.21**	**0**	**0.11**	**0**	**1.15**	**2**	**8.39**	**0**	**1.32**	**0**	**0**	**0**	**0.98**	**15**	**80.23**	**0**	**0.4**	**18**	**94.59**
Section Standard Error of Mean						**0.06**	**0.44**	**0.06**	**0.34**	**0.02**	**0.1**	**0.05**	**0.23**	**0.5**	**5.75**	**0.08**	**0.44**	**0**	**0**	**0.11**	**0.76**	**1.44**	**6.88**	**0.03**	**0.35**	**1.57**	**9.57**
All Sections Total All Samples				**345710**	**541.37**	**13449**	**0.26**	**18**	**0**	**33**	**0**	**1522**	**0.03**	**250**	**0**	**745**	**0.01**	**434**	**0.01**	**74**	**0**	**30**	**0**	**10332**	**0.2**	**11**	**0**
All Sections Average All Samples						**25**	**139.95**	**0**	**0.19**	**0**	**0.34**	**3**	**15.84**	**0**	**2.6**	**1**	**7.75**	**1**	**4.52**	**0**	**0.77**	**0**	**0.31**	**19**	**107.52**	**0**	**0.11**
All Sections Standard Error of Mean						**2.92**	**23.65**	**0.01**	**0.08**	**0.01**	**0.08**	**2.77**	**22.81**	**0.04**	**0.25**	**0.18**	**1.38**	**0.12**	**1**	**0.09**	**0.52**	**0.02**	**0.15**	**0.85**	**5.61**	**0.01**	**0.06**

Table E5 Summary of the number (N) of fish captured and recaptured in sampled sections of the Peace River, 23 August to 01 October 2016.

Species Name	Section	Session	N Captured	N Marked	N Recaptured (within year)	N Recaptured (between years)
Arctic Grayling	Section 1	1	0	0	-	0
		2	2	2	0	0
		3	1	1	0	0
		4	0	0	0	0
		5	0	0	0	0
		6	0	0	0	0
	Section 1 subtotal		3	3	0	0
	Section 3	1	6	5	-	1
		2	9	9	0	0
		3	17	13	2	1
		4	5	4	0	1
		5	14	10	3	1
		6	8	7	0	1
	Section 3 subtotal		59	48	5	5
	Section 5	1	4	4	-	0
		2	0	0	0	0
		3	5	5	0	0
		4	6	5	0	1
		5	7	7	0	0
		6	6	6	0	0
	Section 5 subtotal		28	27	0	1
	Section 6	1	2	2	-	0
		2	2	2	0	0
		3	3	3	0	0
		4	6	6	0	0
		5	2	2	0	0
		6	6	6	0	0
	Section 6 subtotal		21	21	0	0
	Section 7	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 7 subtotal		3	3	0	0
	Section 9	1	0	0	-	0
		2	0	0	0	0
		3	0	0	0	0
		4	0	0	0	0
		5	1	1	0	0
		6	1	1	0	0
	Section 9 subtotal		2	2	0	0
Arctic Grayling Total			116	104	5	6

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	4	4	-	0
		2	8	7	0	1
		3	16	13	2	1
		4	10	10	0	0
		5	14	13	1	0
		6	3	3	0	0
	Section 1 subtotal		55	50	3	2
	Section 3	1	15	13	-	2
		2	8	7	0	1
		3	15	12	0	3
		4	17	11	6	3
		5	31	23	6	2
		6	20	11	5	5
	Section 3 subtotal		106	77	17	16
	Section 5	1	7	7	-	0
		2	10	9	0	1
		3	15	14	0	1
		4	21	15	6	0
		5	9	7	2	1
		6	13	10	3	0
	Section 5 subtotal		75	62	11	3
	Section 6	1	10	9	-	1
		2	6	5	0	1
		3	8	8	0	0
		4	6	5	1	0
		5	10	8	1	1
		6	18	14	3	1
	Section 6 subtotal		58	49	5	4
	Section 7	1	1	1	-	0
		2	2	2	0	0
		3	6	5	1	0
		4	5	5	0	0
		5	5	4	0	1
		6	5	4	1	0
	Section 7 subtotal		24	21	2	1
	Section 9	1	2	1	-	1
		2	0	0	0	0
		3	1	1	0	0
		4	4	3	0	1
		5	2	2	0	0
		6	8	8	0	0
	Section 9 subtotal		17	15	0	2
Bull Trout Total			335	274	38	28

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	0	0	-	0
		2	3	3	0	0
		3	13	11	0	2
		4	45	42	2	1
		5	29	29	0	0
		6	16	16	0	0
	Section 1 subtotal		106	101	2	3
	Section 3	1	30	29	-	1
		2	11	10	0	1
		3	123	115	4	4
		4	125	116	8	1
		5	77	70	6	1
		6	45	43	3	0
	Section 3 subtotal		411	383	21	8
	Section 5	1	7	7	-	0
		2	43	43	0	0
		3	75	74	0	1
		4	59	51	6	2
		5	32	30	2	0
		6	23	22	1	0
	Section 5 subtotal		239	227	9	3
	Section 6	1	12	12	-	0
		2	17	16	0	1
		3	40	37	1	2
		4	71	62	3	7
		5	65	61	3	1
		6	54	54	0	0
	Section 6 subtotal		259	242	7	11
	Section 7	1	12	10	-	2
		2	31	29	0	2
		3	30	27	2	1
		4	27	25	1	1
		5	37	36	1	1
		6	33	33	0	0
	Section 7 subtotal		170	160	4	7
	Section 9	1	21	21	-	0
		2	2	2	0	0
		3	13	13	0	0
		4	25	25	0	0
		5	10	10	0	0
		6	13	12	1	0
	Section 9 subtotal		84	83	1	0
Largescale Sucker Total			1269	1196	44	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	11	11	-	0
		2	14	14	0	0
		3	23	20	0	3
		4	78	70	3	5
		5	41	38	1	2
		6	9	8	1	0
	Section 1 subtotal		176	161	5	10
	Section 3	1	224	205	-	15
		2	50	50	0	0
		3	189	175	11	6
		4	206	183	13	10
		5	99	91	6	2
		6	121	114	6	1
	Section 3 subtotal		889	818	40	34
	Section 5	1	53	50	-	3
		2	100	97	0	3
		3	199	192	5	2
		4	119	113	5	1
		5	88	82	3	3
		6	73	70	2	1
	Section 5 subtotal		632	604	15	13
	Section 6	1	154	142	-	12
		2	115	111	0	4
		3	118	115	1	3
		4	271	252	6	13
		5	207	187	11	10
		6	151	145	7	1
	Section 6 subtotal		1016	952	25	43
	Section 7	1	55	51	-	2
		2	91	85	2	5
		3	130	123	1	6
		4	143	131	3	9
		5	103	95	5	3
		6	143	136	5	2
	Section 7 subtotal		665	621	18	27
	Section 9	1	98	94	-	4
		2	28	28	0	0
		3	98	94	2	2
		4	258	245	7	6
		5	185	172	14	1
		6	131	122	5	4
	Section 9 subtotal		798	755	28	17
Longnose Sucker Total			4176	3911	131	144

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	175	139	-	34
		2	584	497	3	85
		3	655	546	14	96
		4	504	410	28	76
		5	359	302	13	48
		6	357	304	24	34
	Section 1 subtotal		2634	2198	84	373
	Section 3	1	417	313	-	98
		2	480	365	16	94
		3	780	607	51	138
		4	654	501	48	116
		5	730	591	62	98
		6	544	461	32	67
	Section 3 subtotal		3605	2838	215	611
	Section 5	1	178	143	-	34
		2	208	179	3	27
		3	167	144	6	20
		4	203	177	7	21
		5	196	164	6	28
		6	251	217	8	29
	Section 5 subtotal		1203	1024	31	159
	Section 6	1	341	307	-	31
		2	298	254	6	38
		3	326	278	11	38
		4	247	209	16	22
		5	282	256	12	19
		6	417	378	15	25
	Section 6 subtotal		1911	1682	64	173
	Section 7	1	71	66	-	4
		2	105	98	2	5
		3	89	81	5	5
		4	110	100	2	8
		5	146	131	4	11
		6	147	132	9	6
	Section 7 subtotal		668	608	22	39
	Section 9	1	30	27	-	3
		2	32	29	0	3
		3	69	61	4	5
		4	51	48	3	0
		5	48	42	2	4
		6	55	53	1	1
	Section 9 subtotal		285	260	10	16
Mountain Whitefish Total			10306	8610	426	1371

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	7	7	-	0
		2	11	10	0	1
		3	8	7	1	0
		4	13	11	0	0
		5	7	5	2	0
		6	9	8	1	0
	Section 1 subtotal		55	48	4	1
	Section 3	1	35	32	-	3
		2	19	15	1	2
		3	16	13	1	1
		4	23	18	3	1
		5	16	13	3	0
		6	12	8	3	1
	Section 3 subtotal		121	99	11	8
	Section 5	1	6	5	-	1
		2	2	2	0	0
		3	1	0	1	0
		4	5	3	2	0
		5	3	0	2	1
		6	3	3	0	0
	Section 5 subtotal		20	13	5	2
	Section 6	1	1	0	-	1
		2	1	1	0	0
		3	1	0	0	1
		4	2	1	1	1
		5	3	2	1	1
		6	2	1	1	0
	Section 6 subtotal		10	5	3	4
	Section 7	1	0	0	-	0
		2	1	1	0	0
		3	0	0	0	0
		4	2	2	0	0
		5	1	0	1	0
		6	0	0	0	0
	Section 7 subtotal		4	3	1	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
Rainbow Trout Total			210	168	24	15

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	4	4	-	0
		2	1	1	0	0
		3	6	6	0	0
		4	17	16	1	0
		5	4	3	0	1
		6	1	1	0	0
	Section 1 subtotal		33	31	1	1
	Section 3	1	7	6	-	0
		2	2	2	0	0
		3	14	14	0	0
		4	5	3	1	1
		5	7	7	0	0
		6	4	3	0	1
	Section 3 subtotal		39	35	2	2
	Section 5	1	7	7	-	0
		2	21	20	0	1
		3	9	9	0	0
		4	9	7	1	1
		5	8	7	0	1
		6	2	2	0	0
	Section 5 subtotal		56	52	1	3
	Section 6	1	11	11	-	0
		2	8	8	0	0
		3	20	19	1	0
		4	11	11	0	0
		5	2	2	0	0
		6	7	6	1	0
	Section 6 subtotal		59	57	2	0
	Section 7	1	0	0	-	0
		2	8	8	0	0
		3	1	1	0	0
		4	7	6	0	1
		5	7	7	0	0
		6	4	4	0	0
	Section 7 subtotal		27	26	0	1
	Section 9	1	0	0	-	0
		2	1	1	0	0
		3	9	8	0	1
		4	15	13	2	0
		5	15	12	2	1
		6	10	10	0	0
	Section 9 subtotal		50	44	4	2
White Sucker	**Total**		264	245	10	9

APPENDIX F

Life History Information

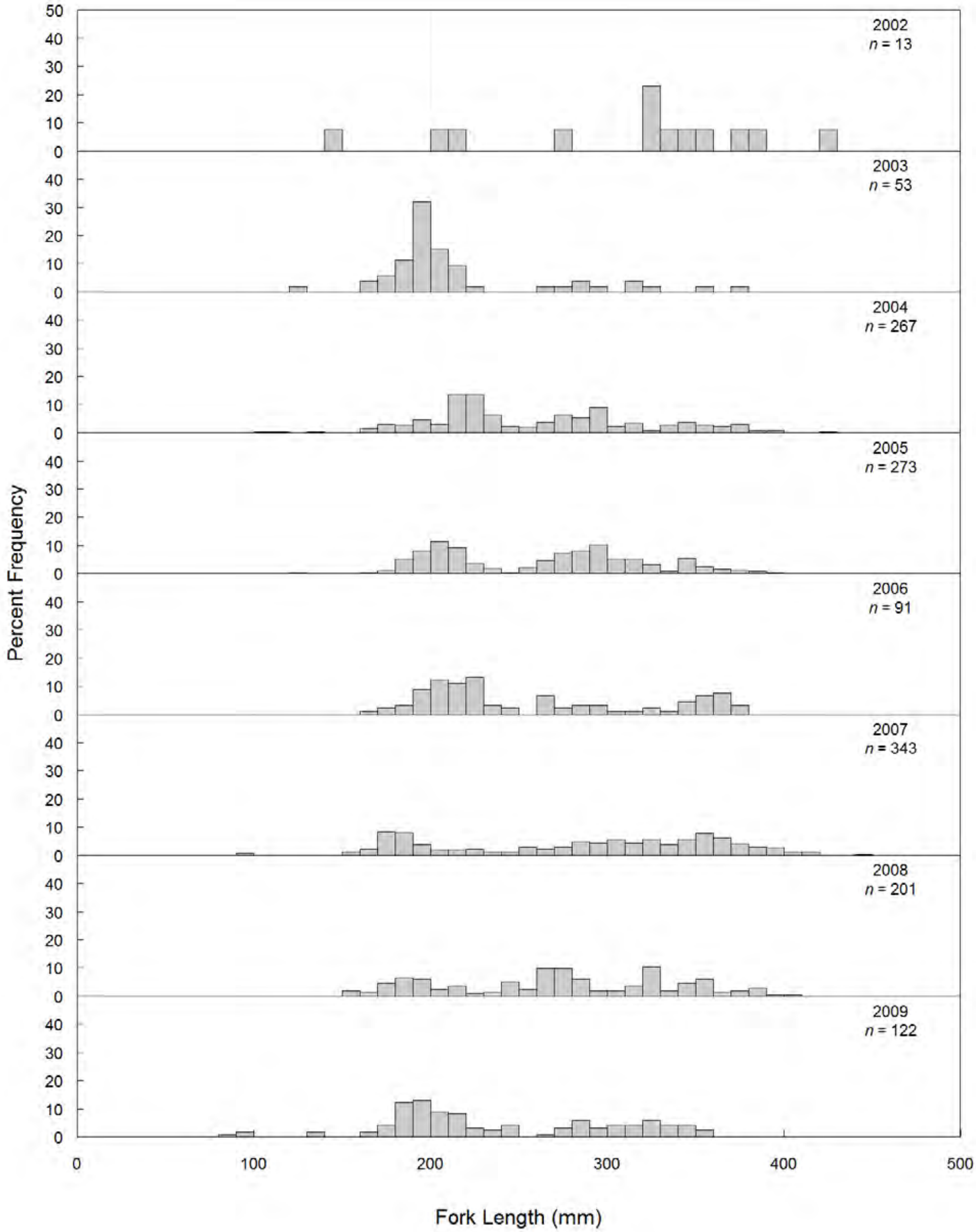


Figure F1 Length-frequency distributions by year for Arctic Grayling captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

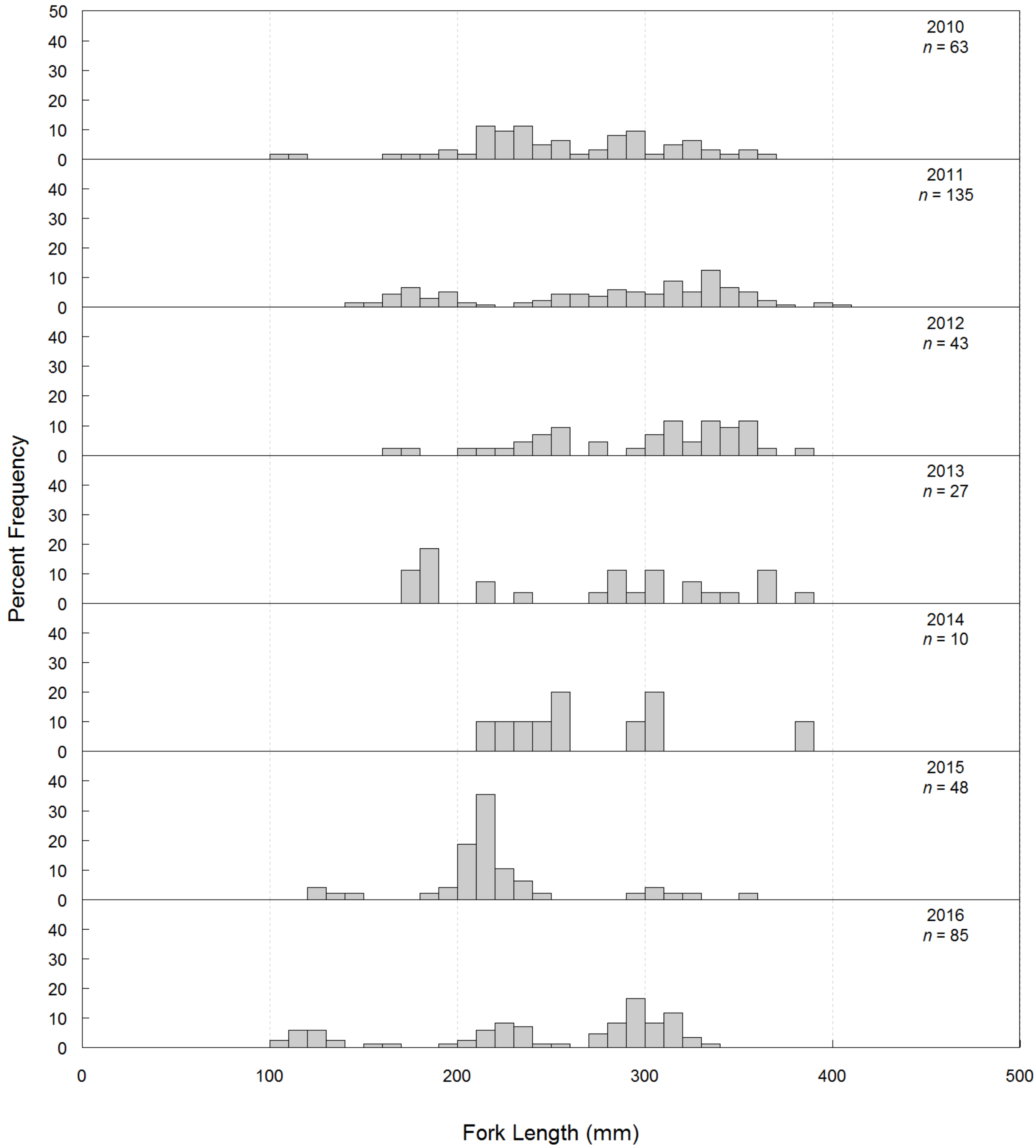


Figure F1 Concluded.

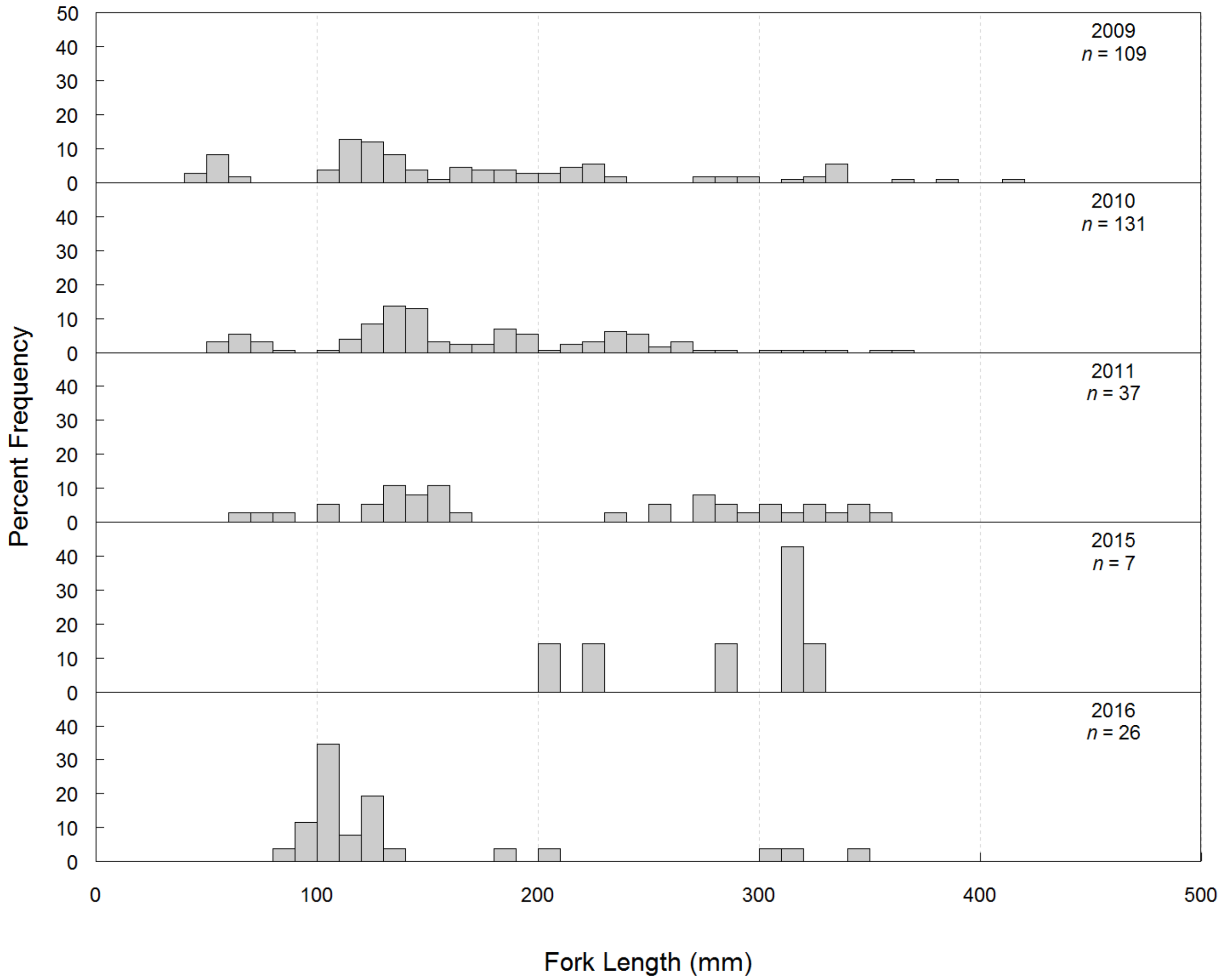


Figure F2 Length-frequency distributions by year for Arctic Grayling captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2009 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

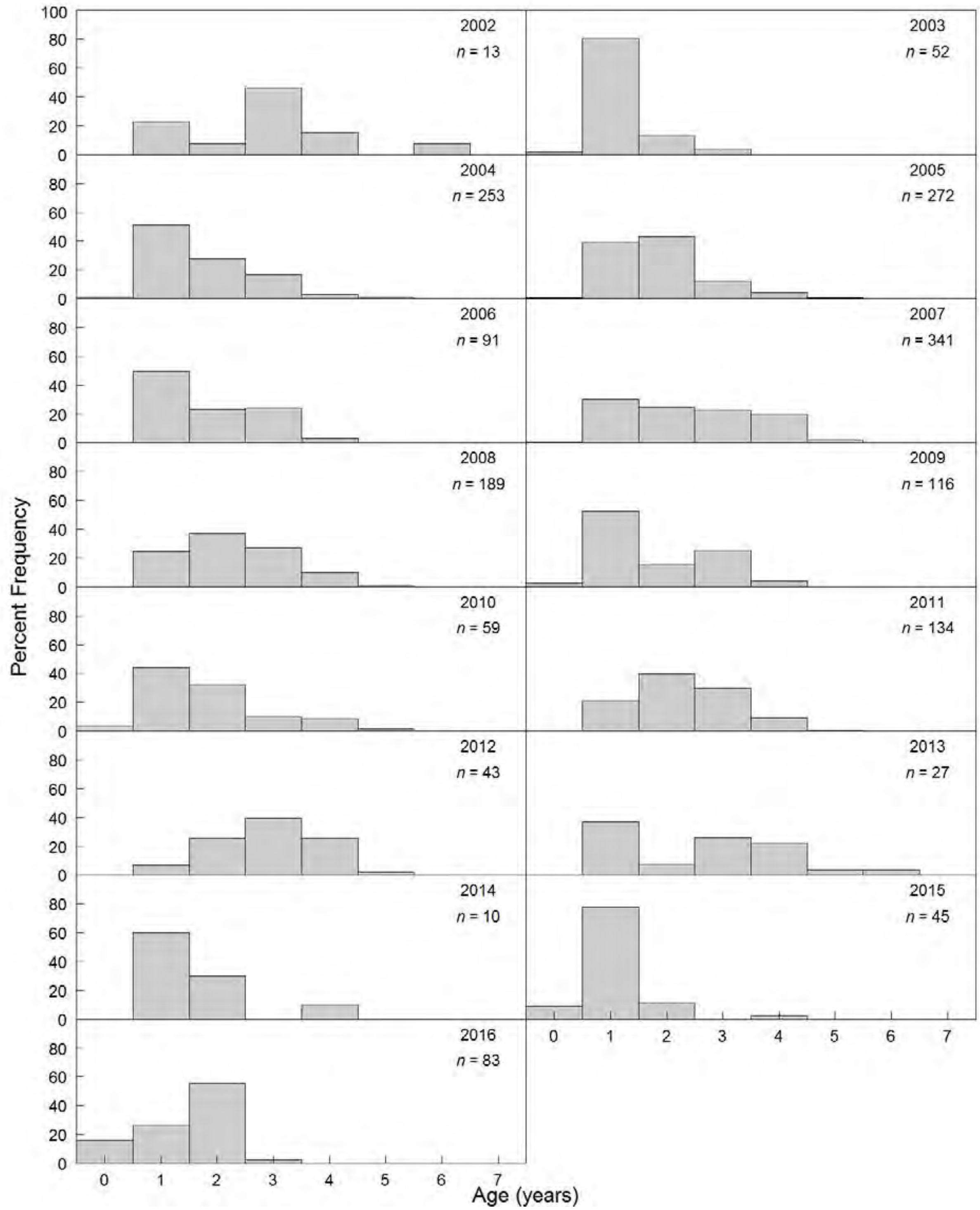


Figure F3 **Age-frequency distributions by year for Arctic Grayling captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.**

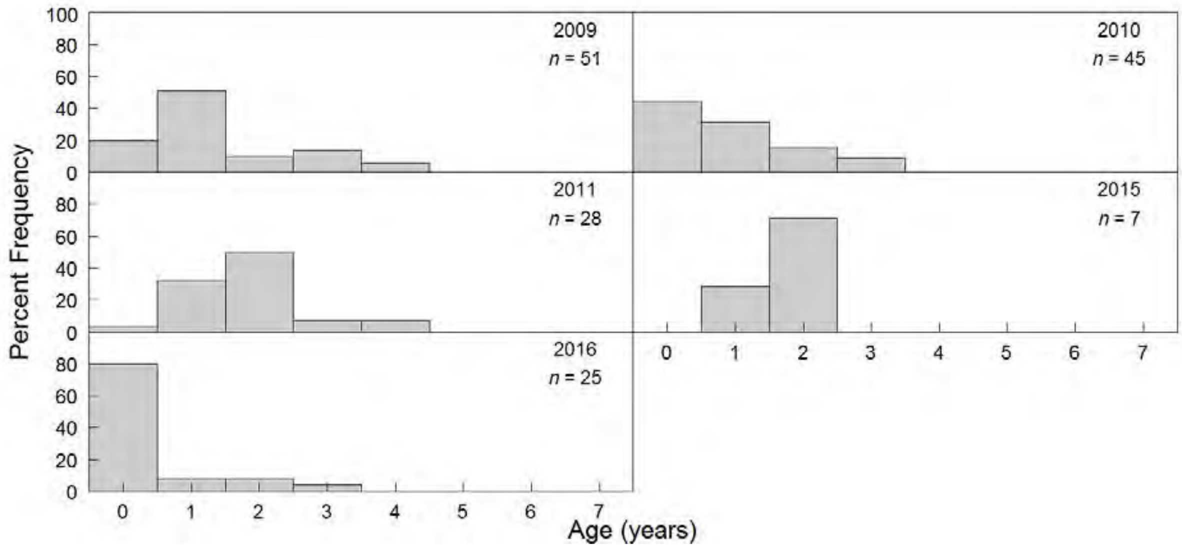
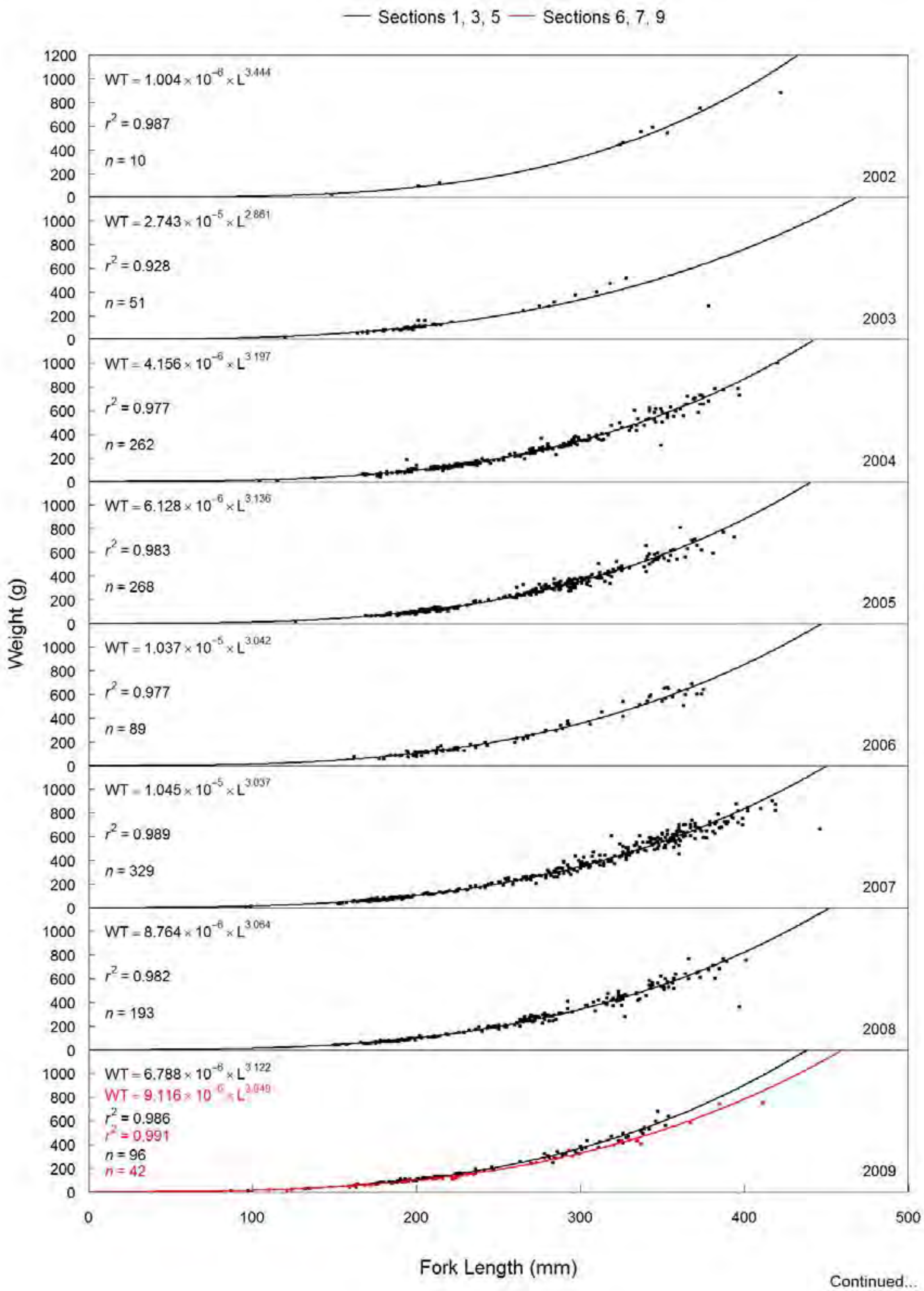


Figure F4 Age-frequency distributions by year for Arctic Grayling captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2009 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).



Continued...

Figure F5 Length-weight regressions for Arctic Grayling captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

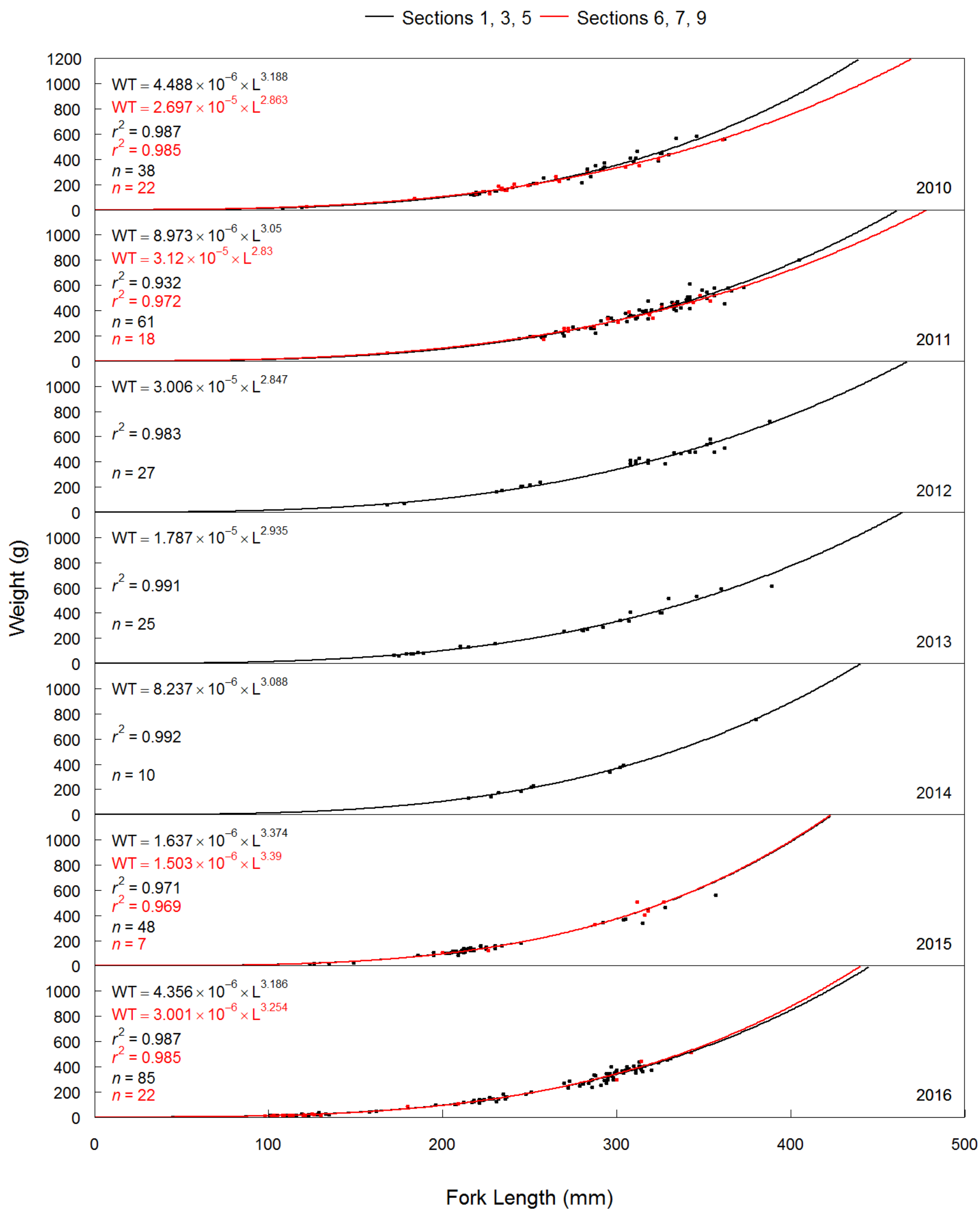


Figure F5 Concluded.

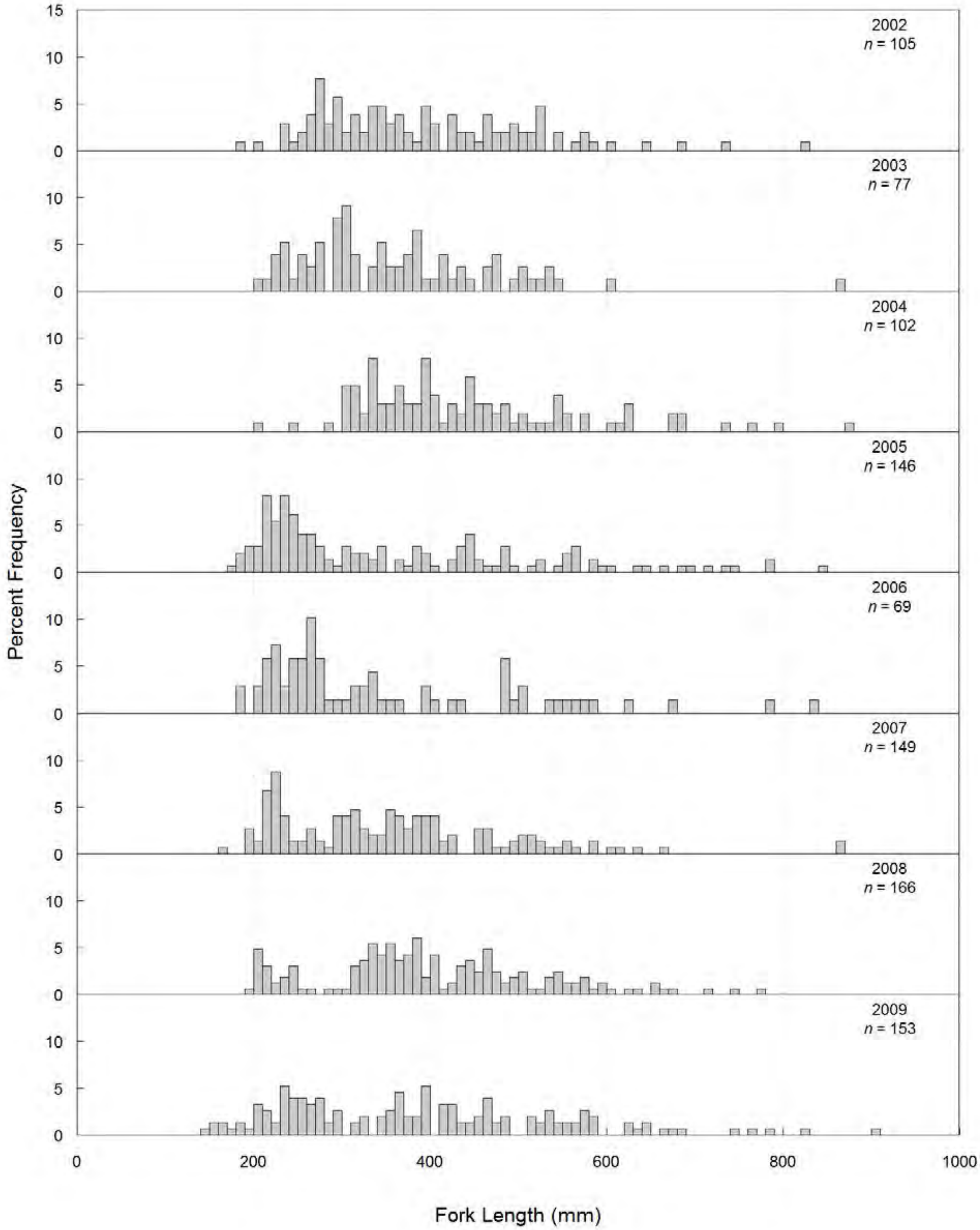


Figure F6 Length-frequency distributions by year for Bull Trout captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

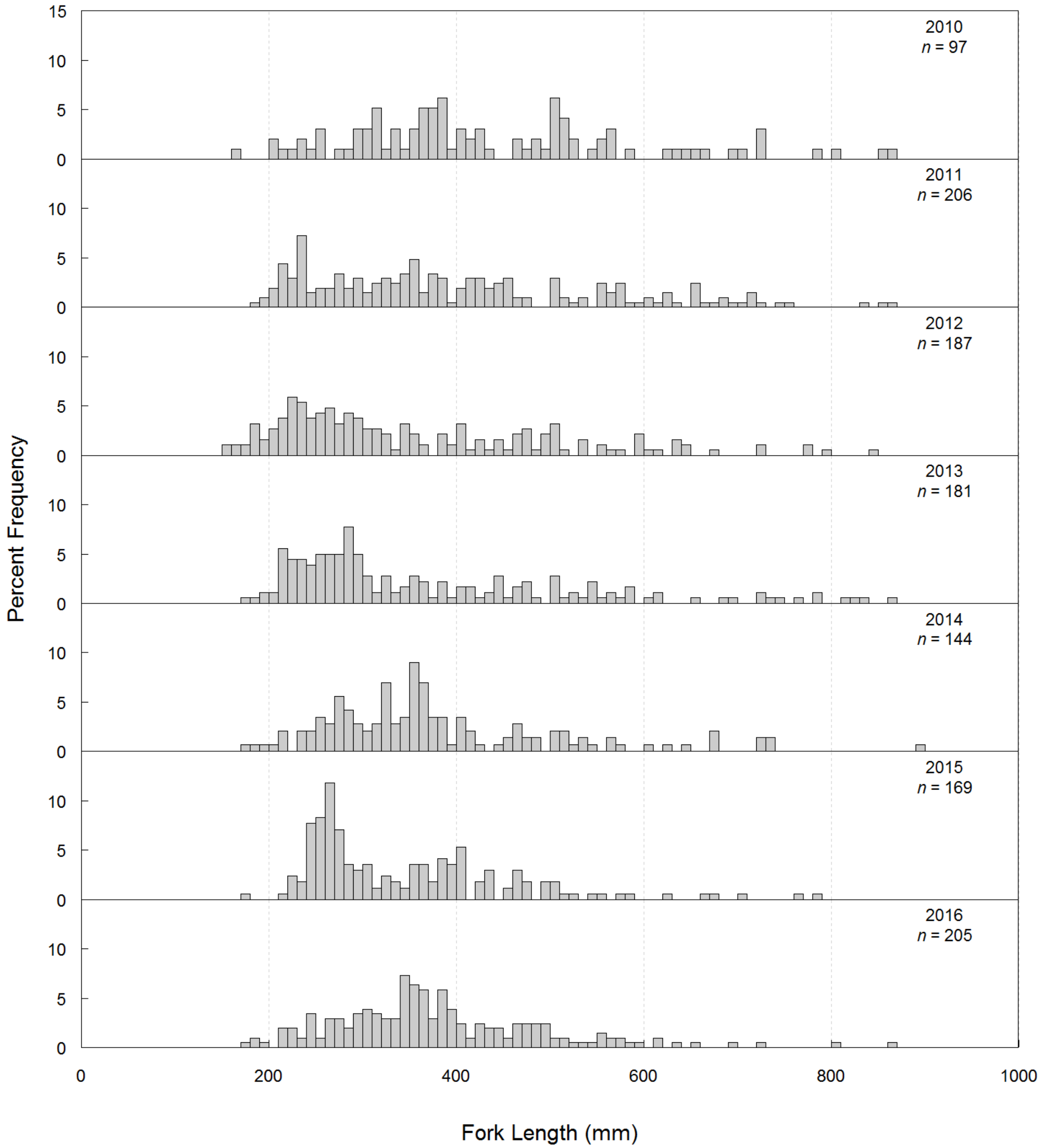


Figure F6 Concluded.

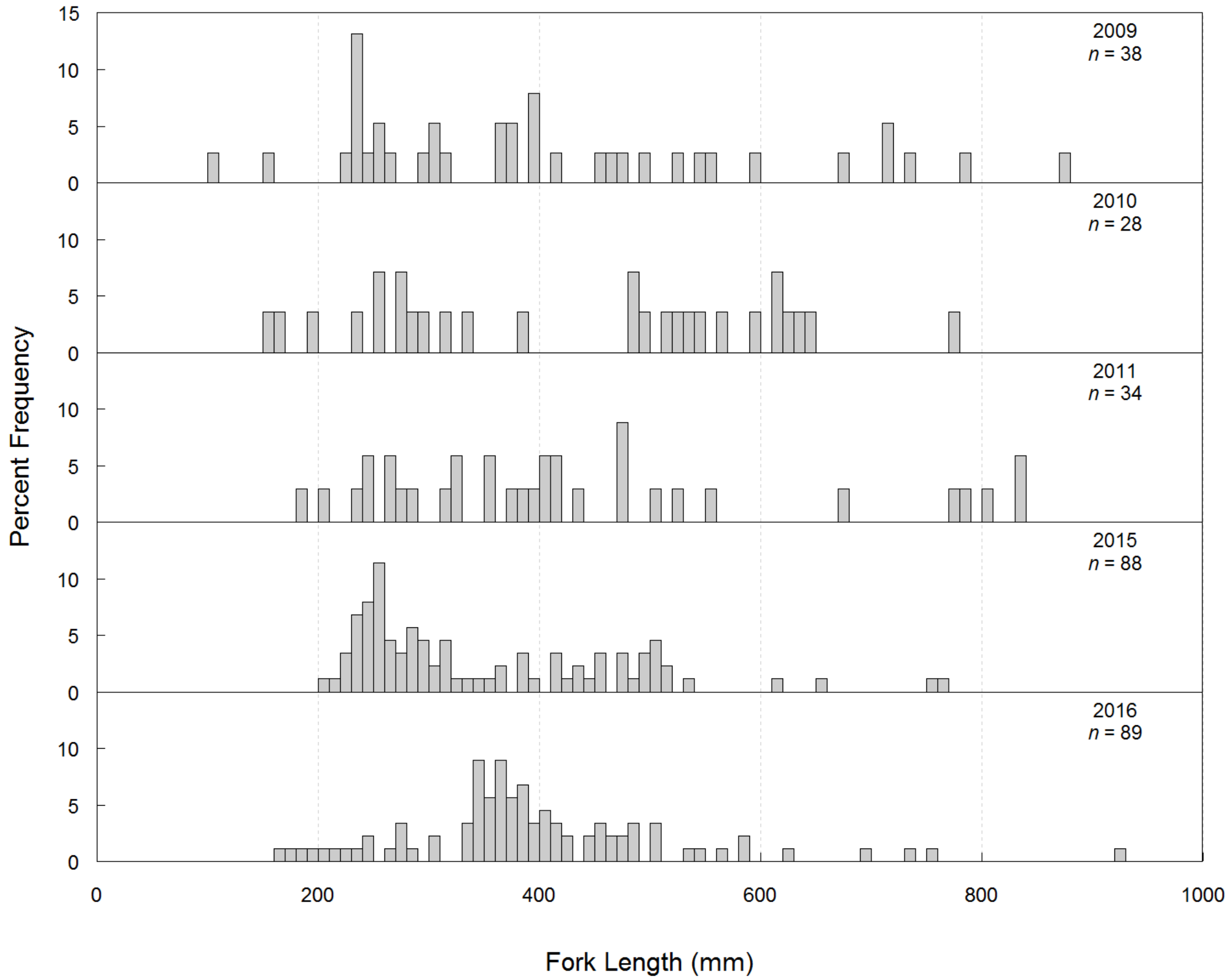


Figure F7 **Length-frequency distributions by year for Bull Trout captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2002 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).**

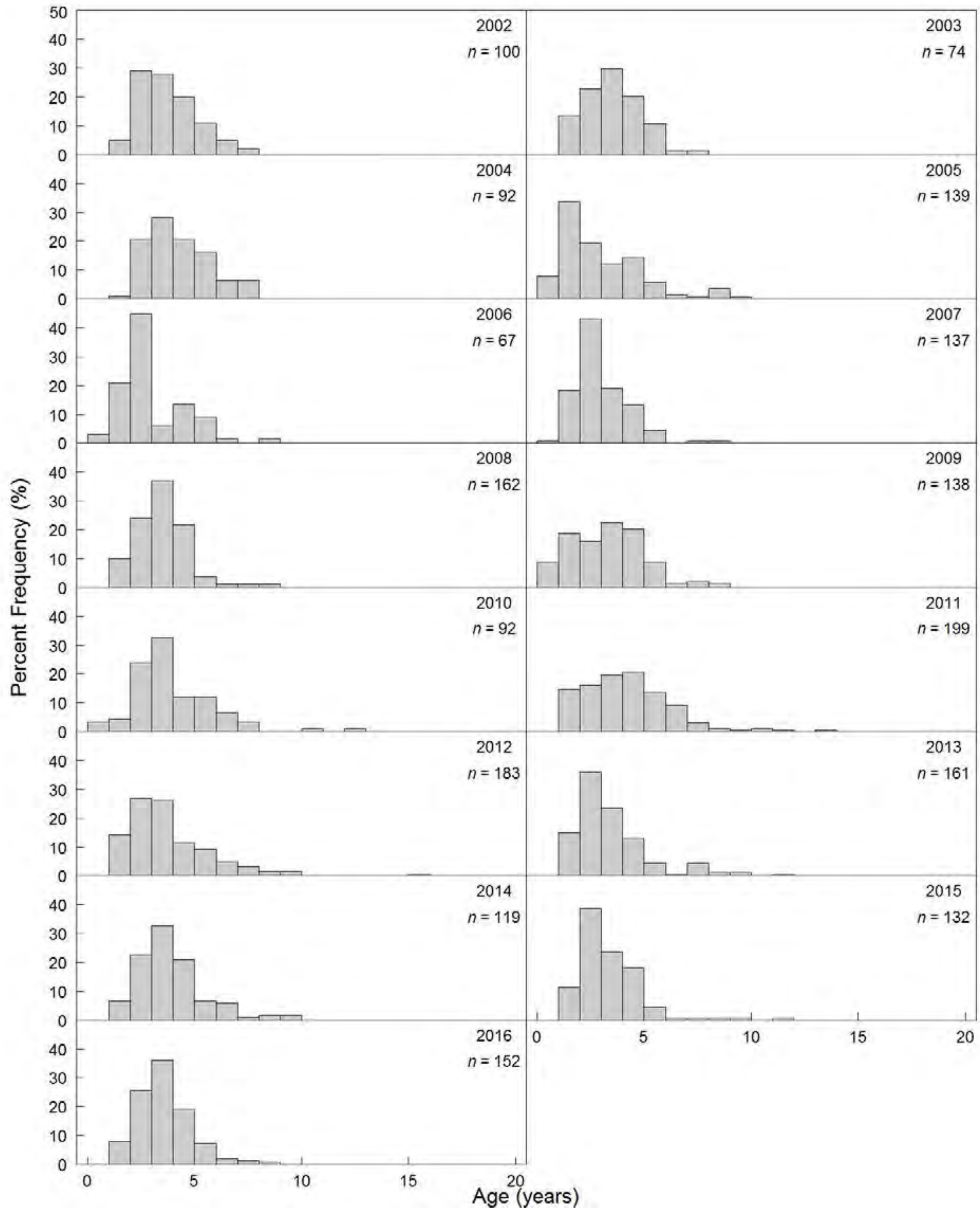


Figure F8 Age-frequency distributions by year for Bull Trout captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

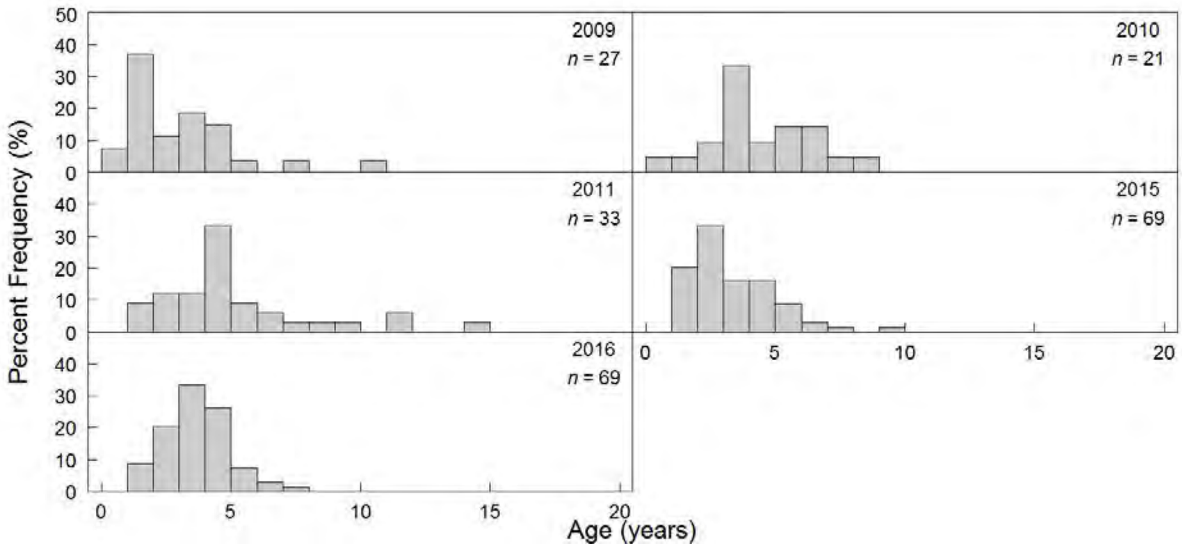
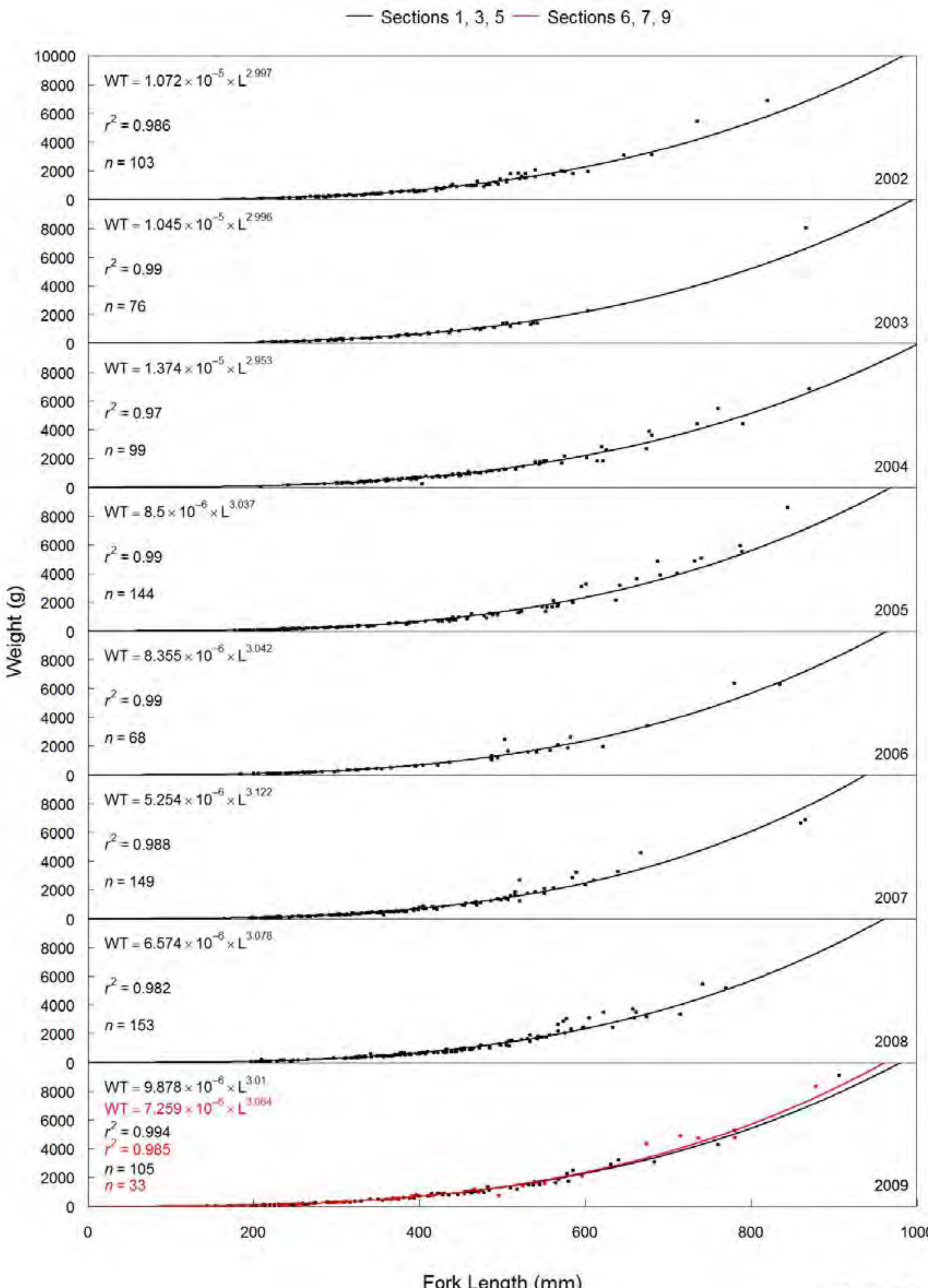


Figure F9 Age-frequency distributions by year for Bull Trout captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2002 to 2016. *Data from 2009 to 2011 courtesy of BC Hydro's* Site C Peace River Fish Inventory *(Mainstream 2010, 2011, 2013a).*



Continued...

Figure F10 **Length-weight regressions for Bull Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).**

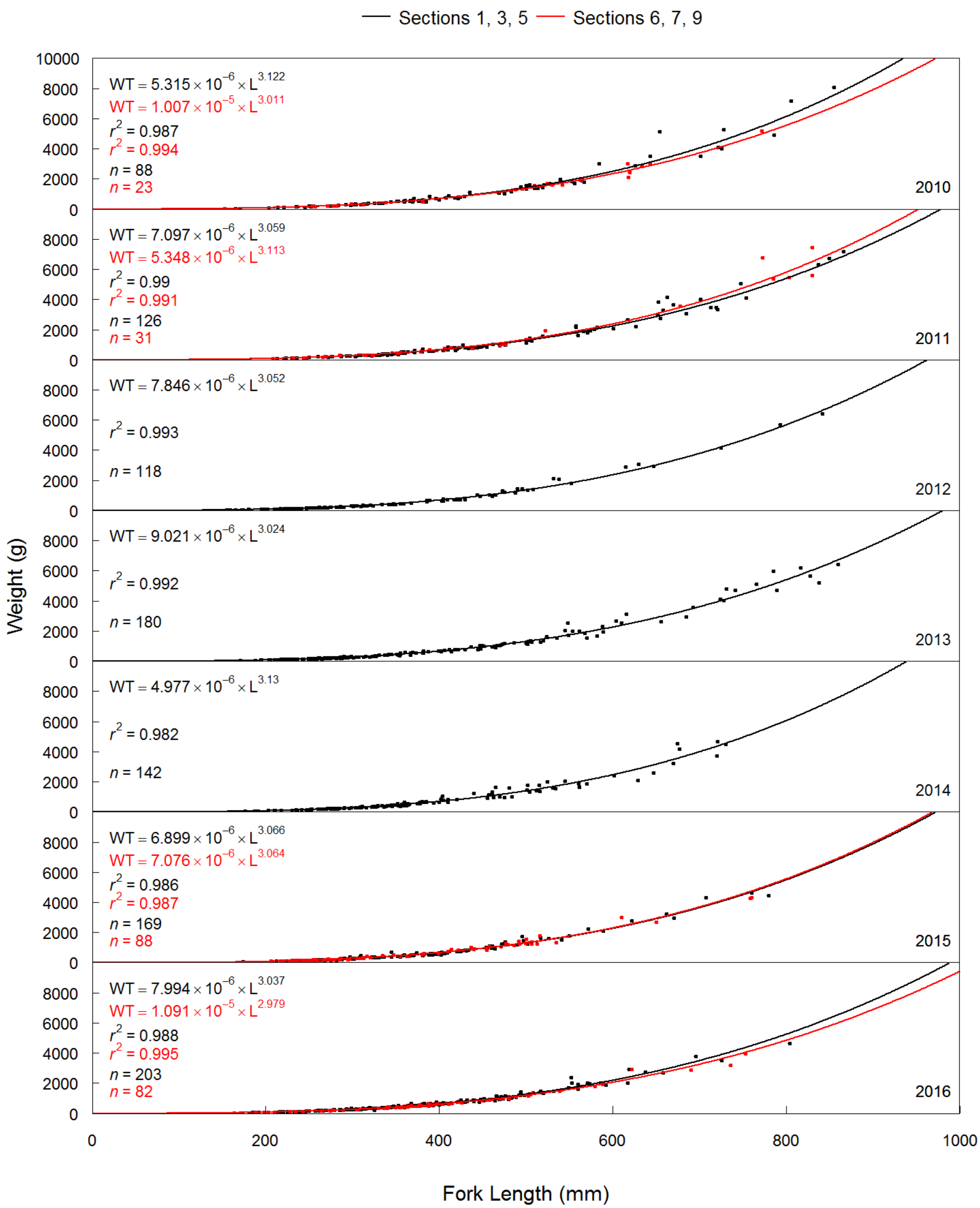


Figure F10 Concluded.

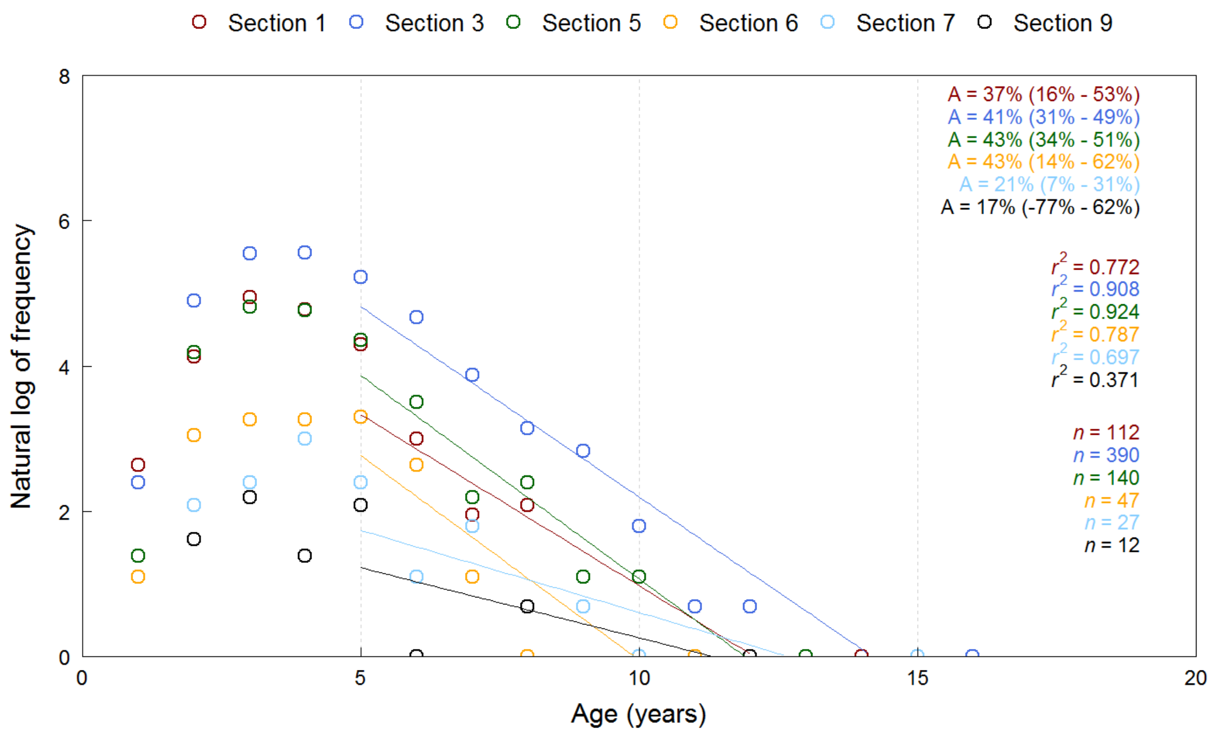


Figure F11 Catch curve and annual mortality estimates (A; mean and 95% confidence intervals) for Bull Trout, calculated for each sample section using data from 2003 to 2016 combined. Sample size, and r^2 of the catch curve regression, are provided for each section.

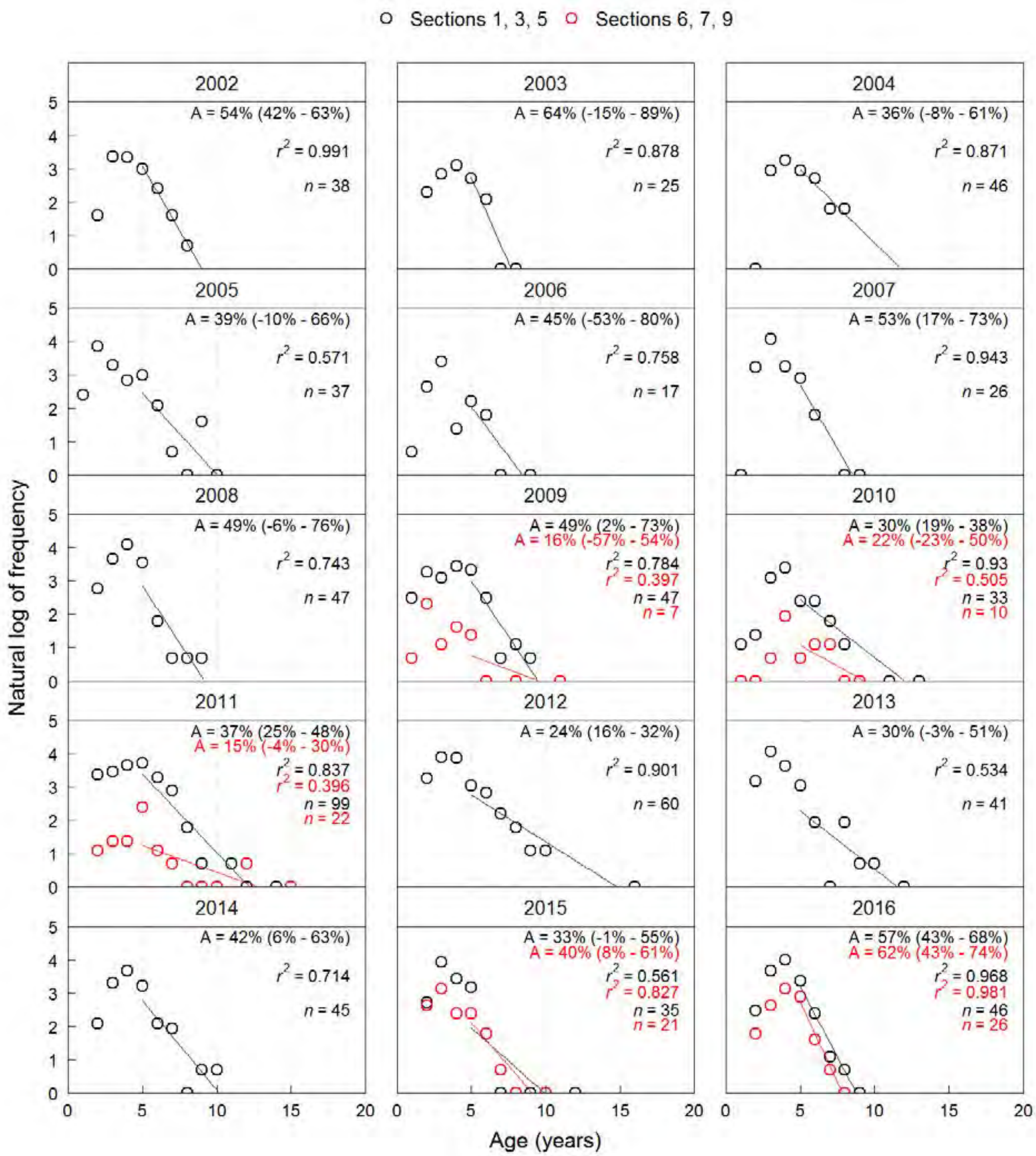


Figure F12 Catch curve and annual mortality estimates (A; mean and 95% confidence intervals) for Bull Trout, calculated for each sample year, by sample section. Sample size and r² of the catch curve regression are provided for each sample year.

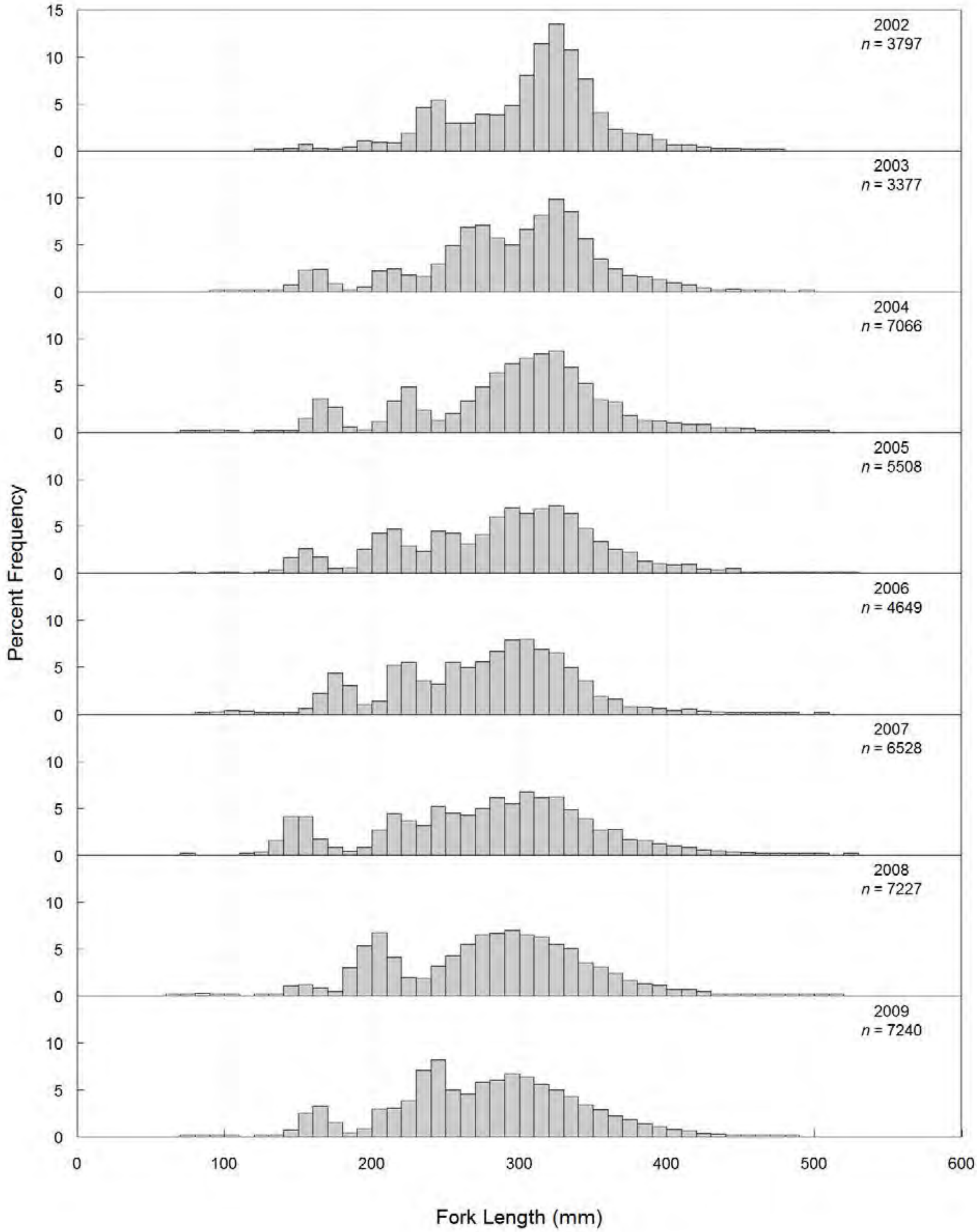


Figure F13 Length-frequency distributions by year for Mountain Whitefish captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

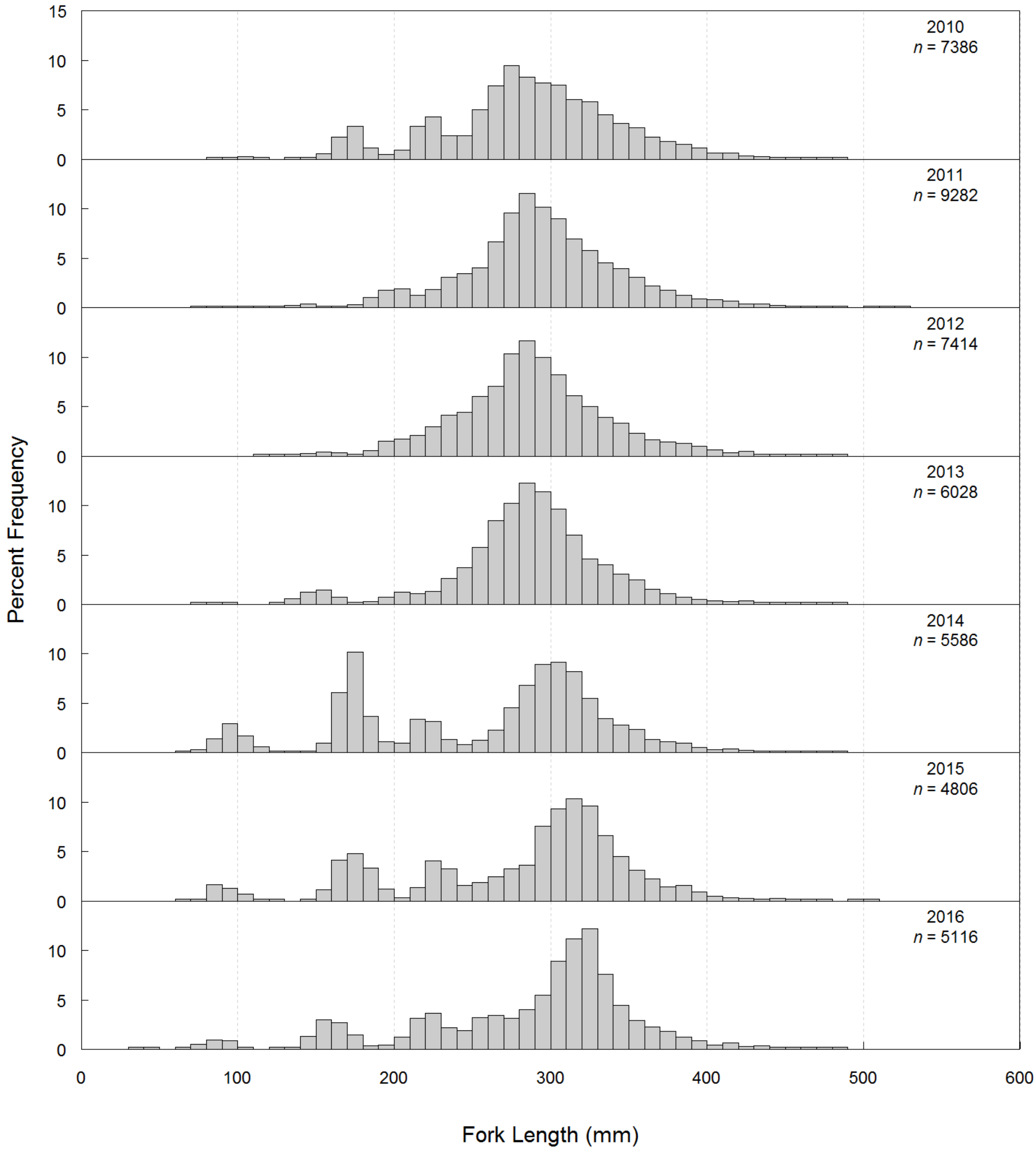


Figure F13 Concluded.

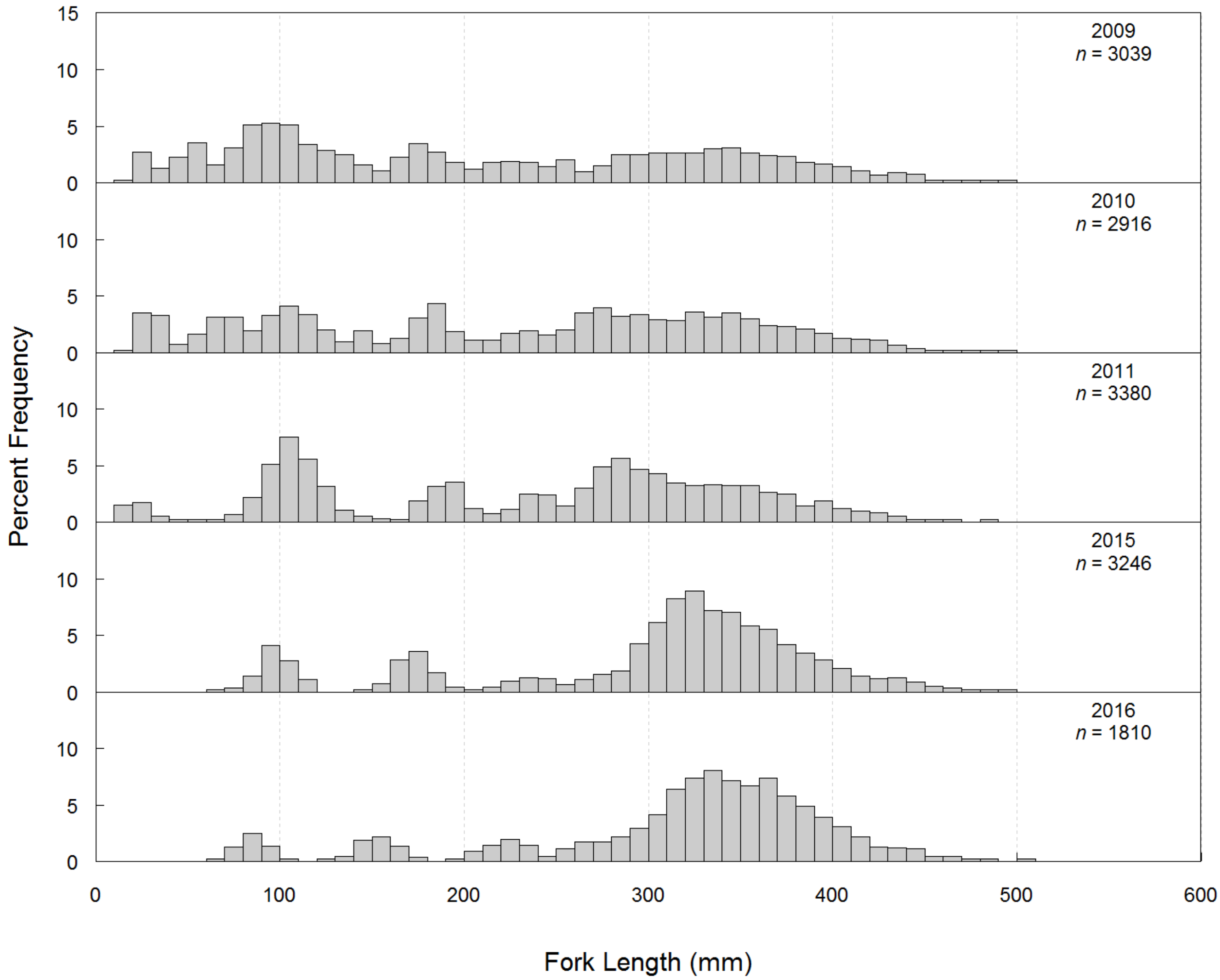


Figure F14 **Length-frequency distributions by year for Mountain Whitefish captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2009 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).**

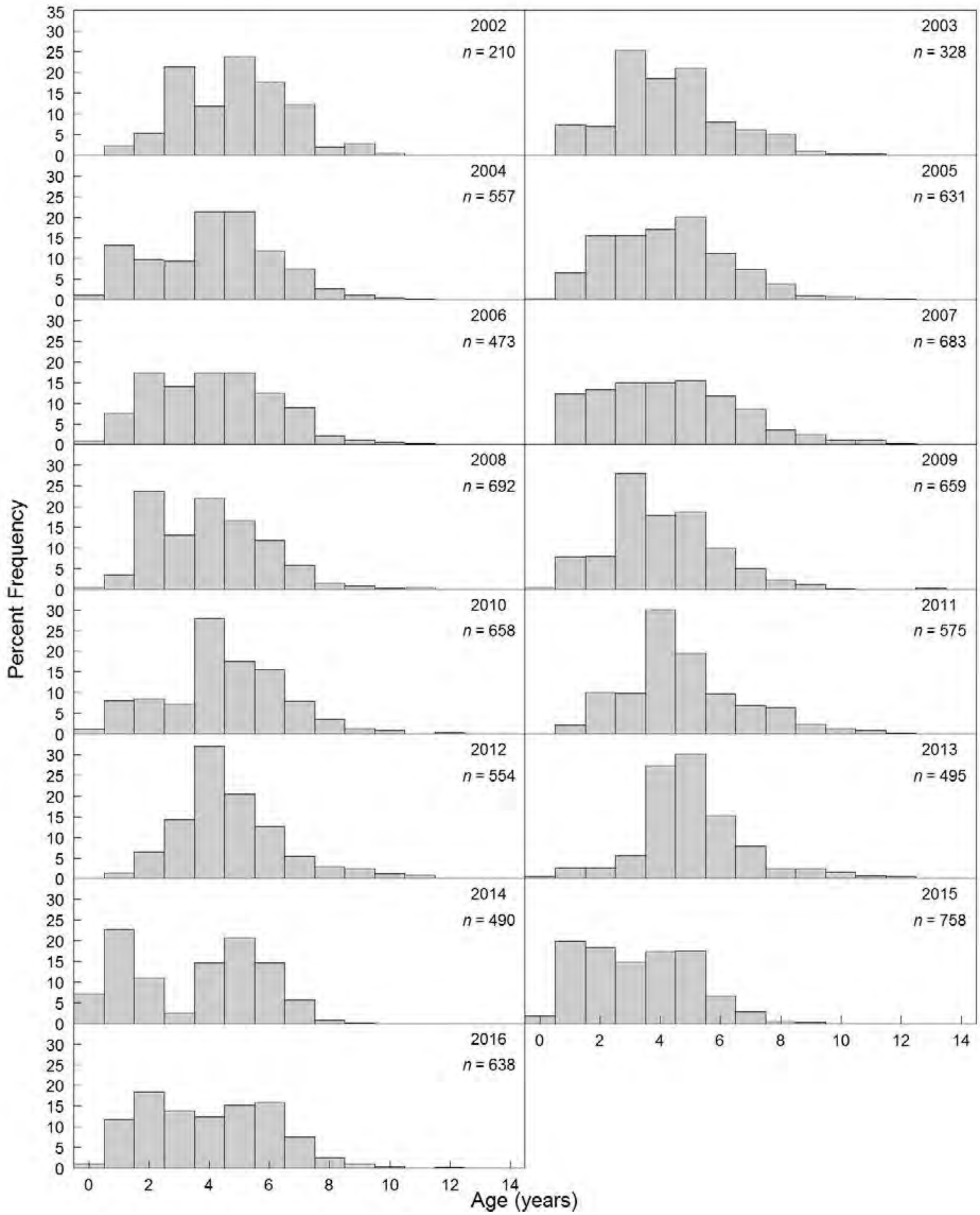


Figure F15 Age-frequency distributions by year for Mountain Whitefish captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

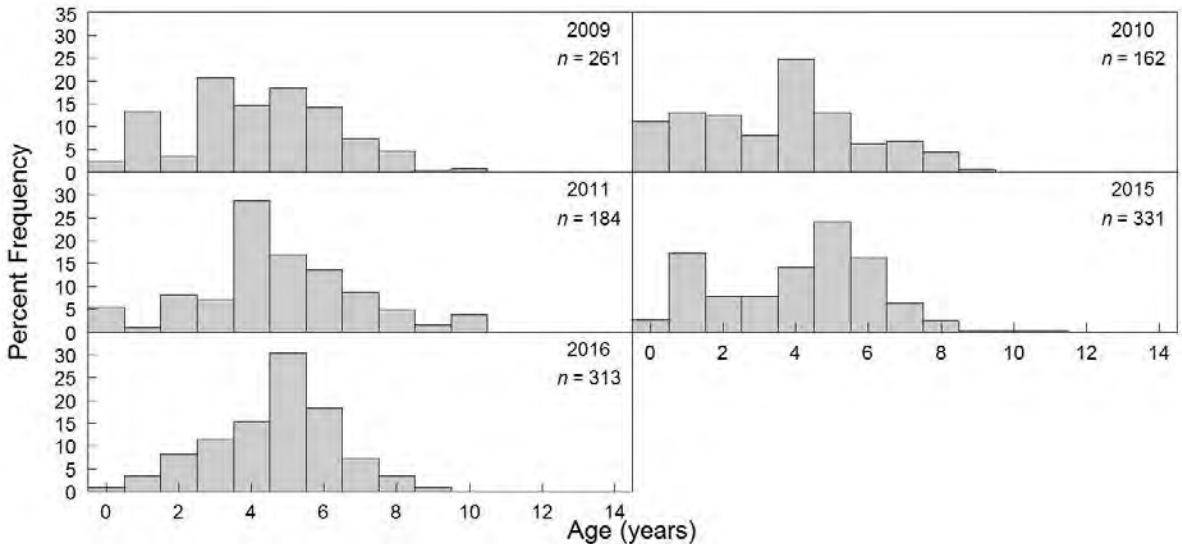
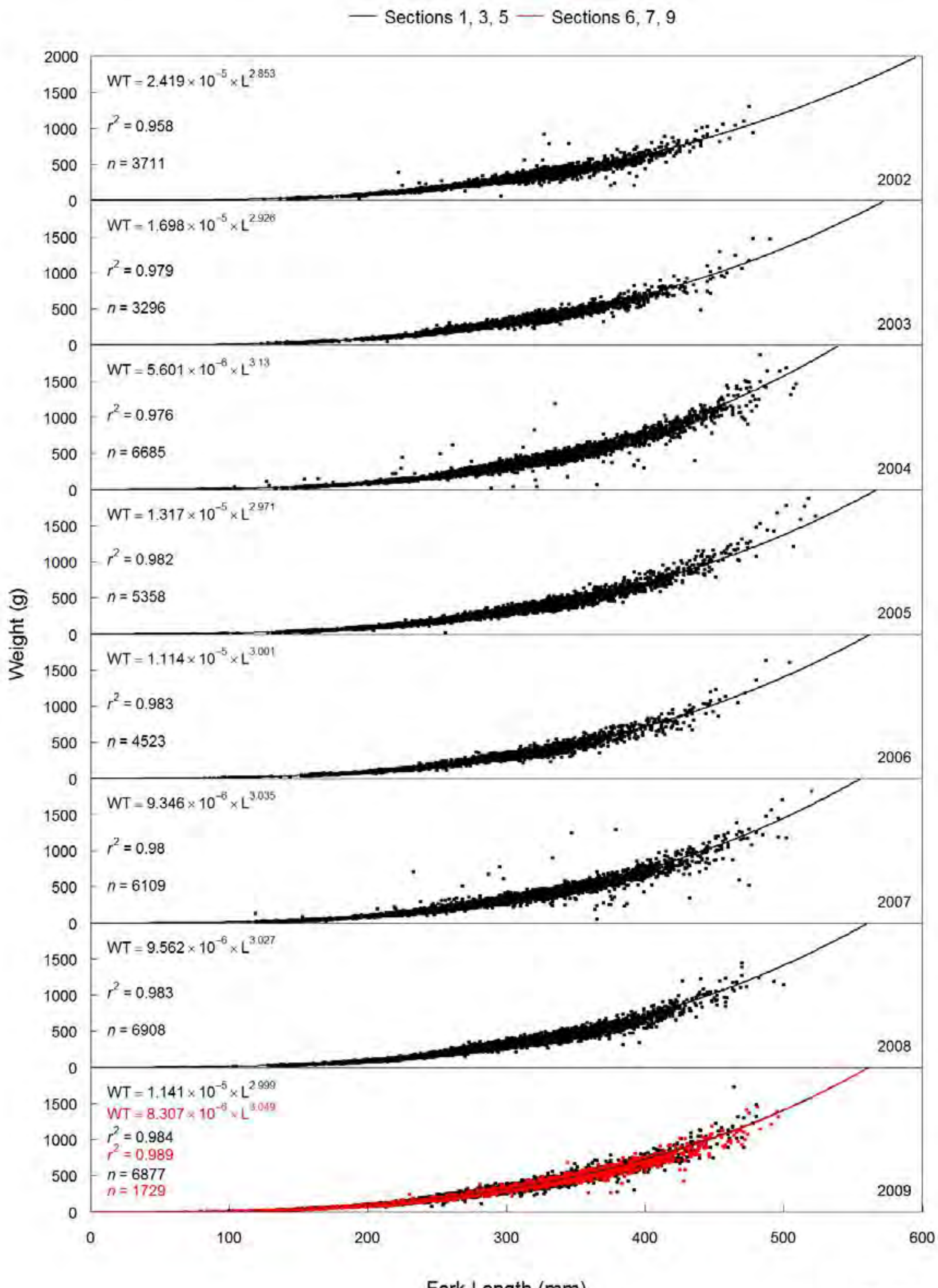


Figure F16 Age-frequency distributions by year for Mountain Whitefish captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2002 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).



Continued...

Figure F17 Length-weight regressions for Mountain Whitefish captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

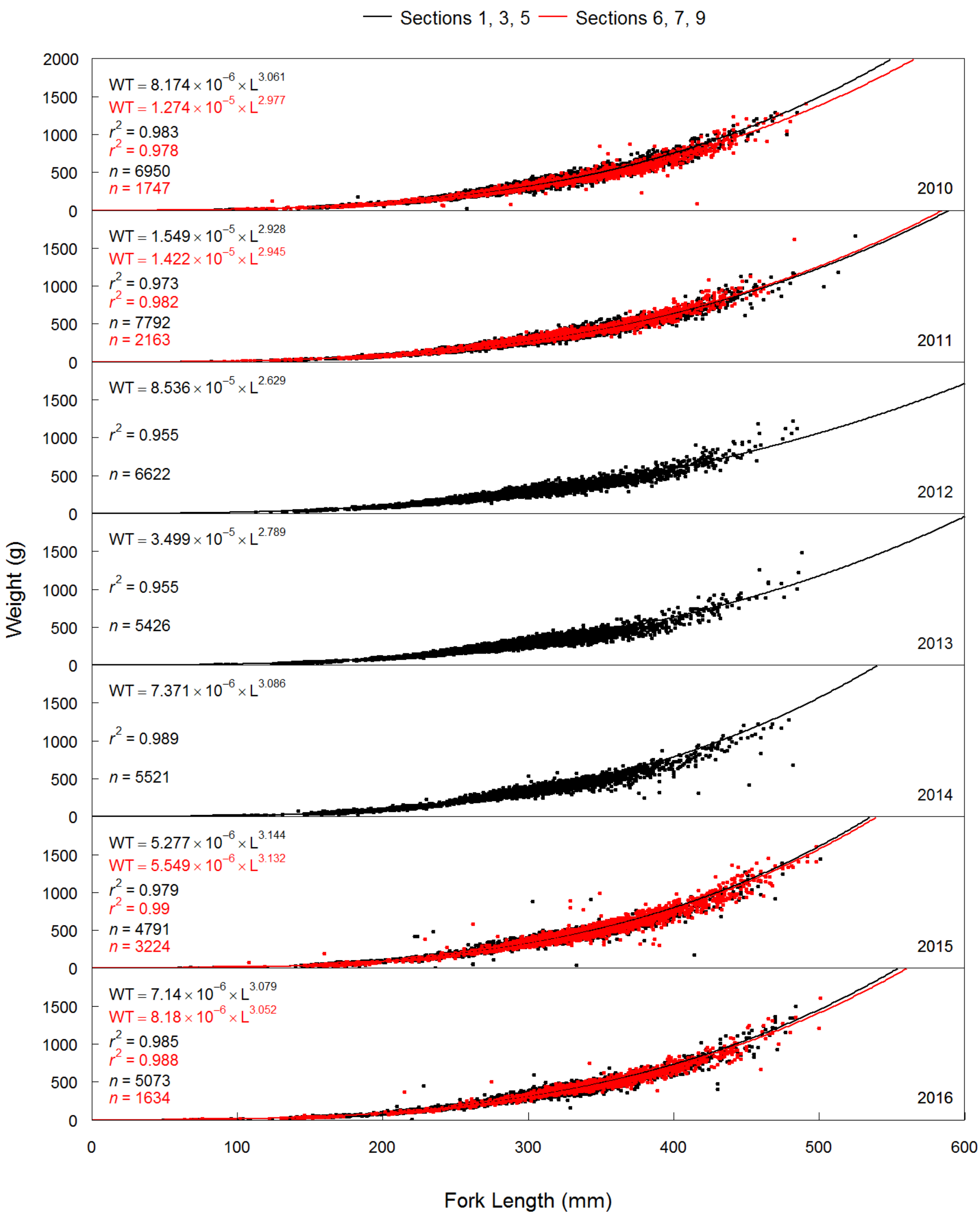


Figure F17 Concluded.

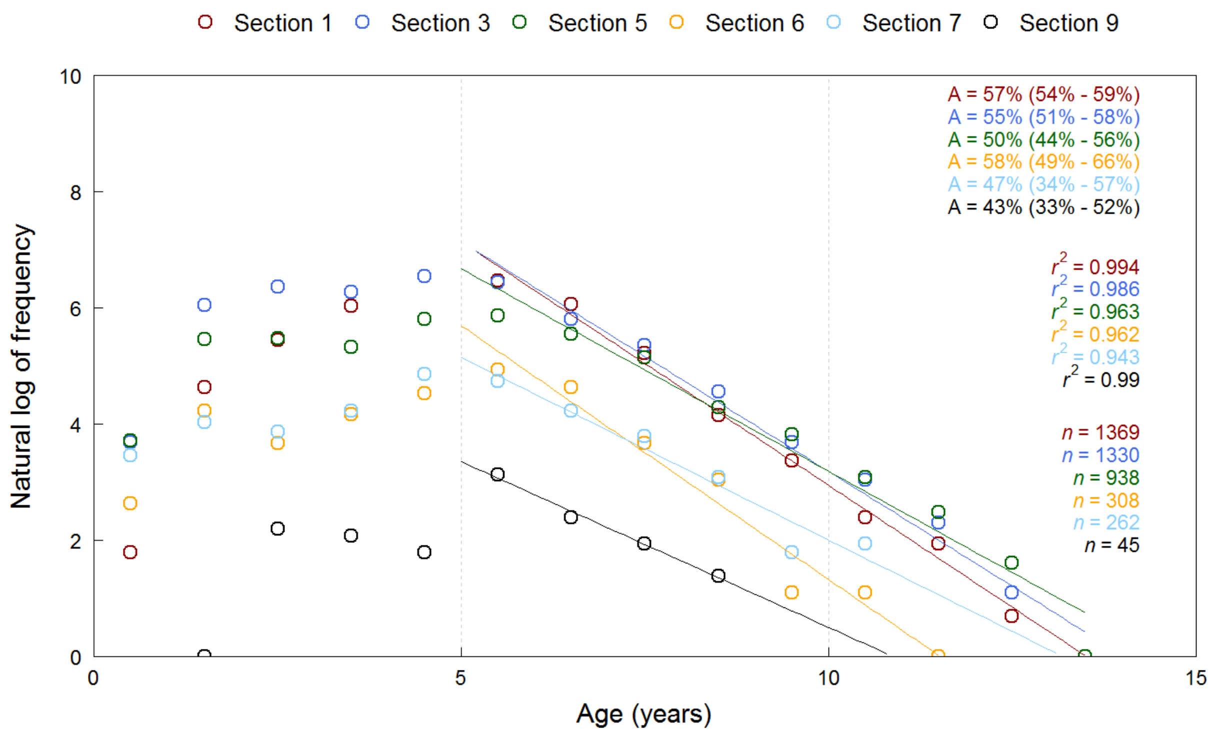


Figure F18 **Catch curve and annual mortality estimates (A; mean and 95% confidence intervals) for Mountain Whitefish, calculated for each sample section using data from 2002 to 2016 combined. Sample size, and r² of the catch curve regression, are provided for each section.**

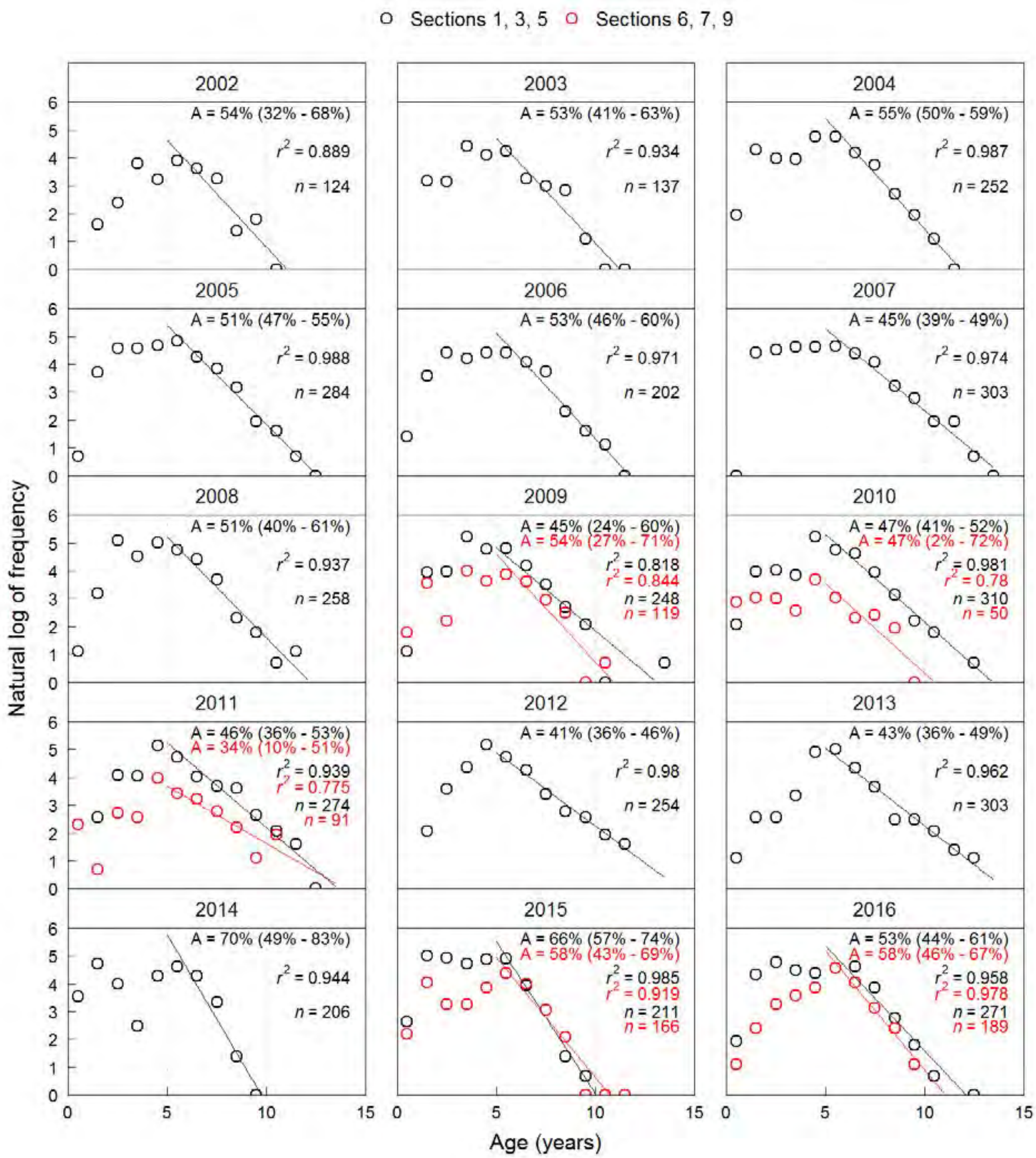


Figure F19 Catch curve and annual mortality estimates (A; mean and 95% confidence intervals) for Mountain Whitefish, calculated for each sample year. Sample size and r² of the catch curve regression are provided for each sample year.

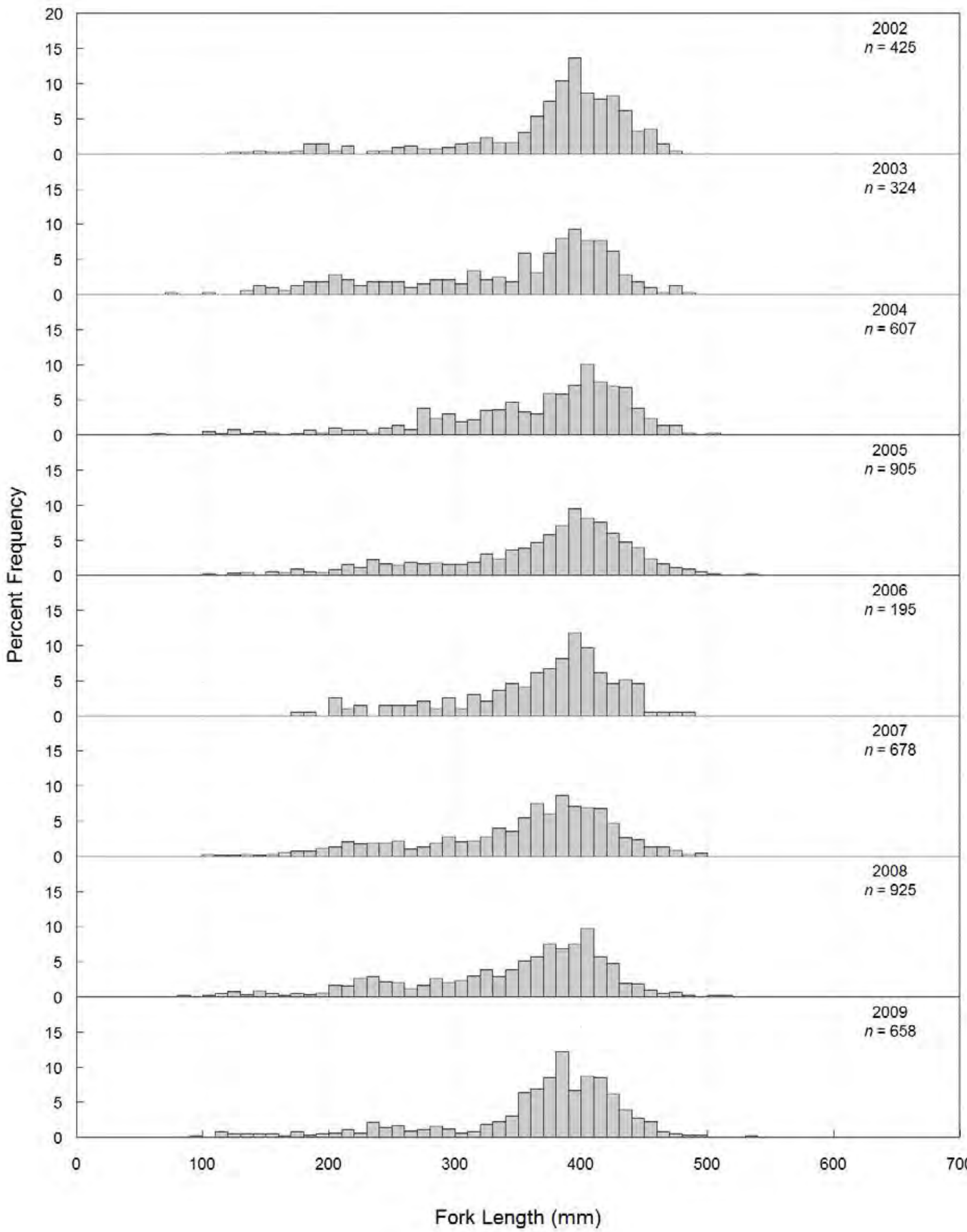


Figure F20 Length-frequency distributions by year for Longnose Sucker captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

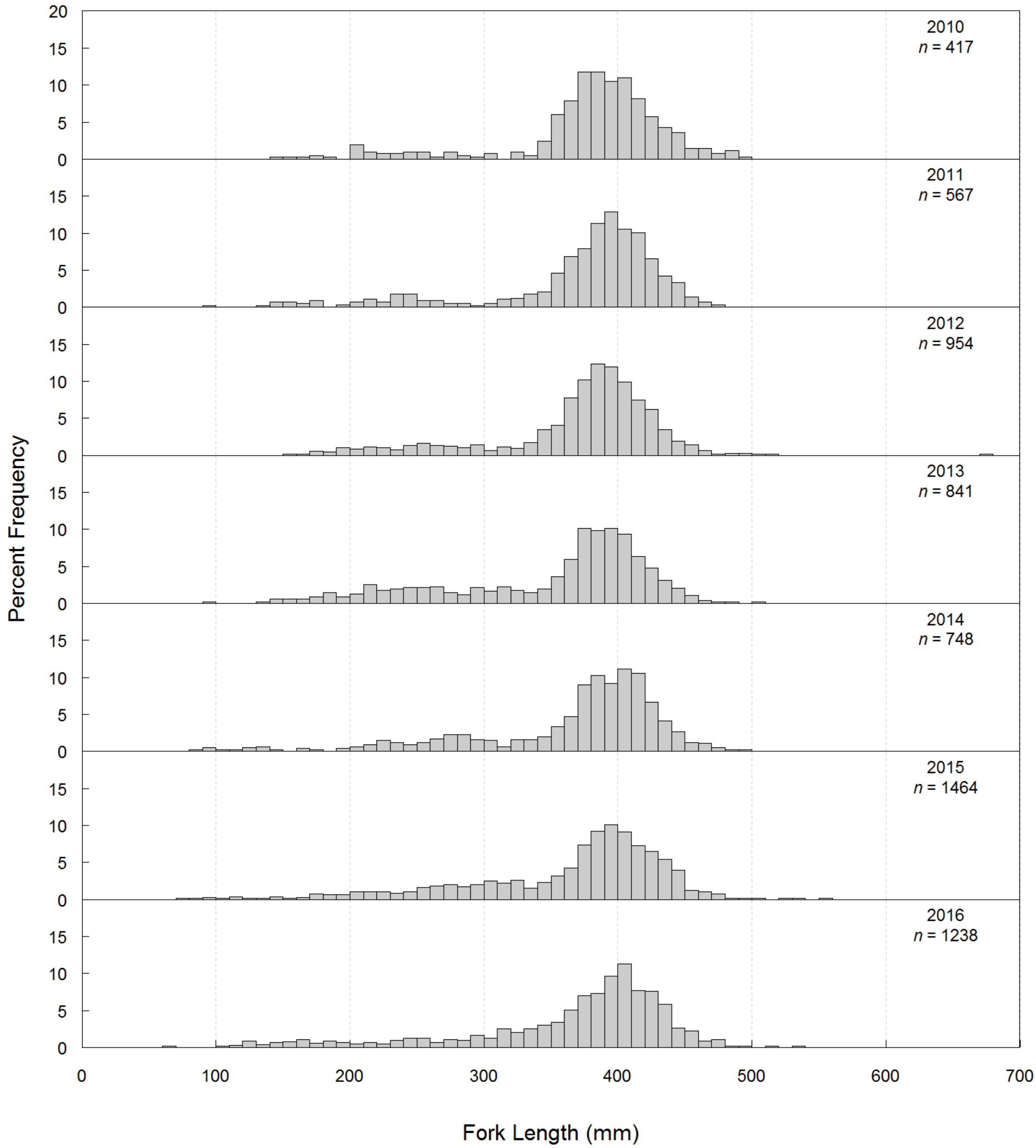


Figure F20 Concluded.

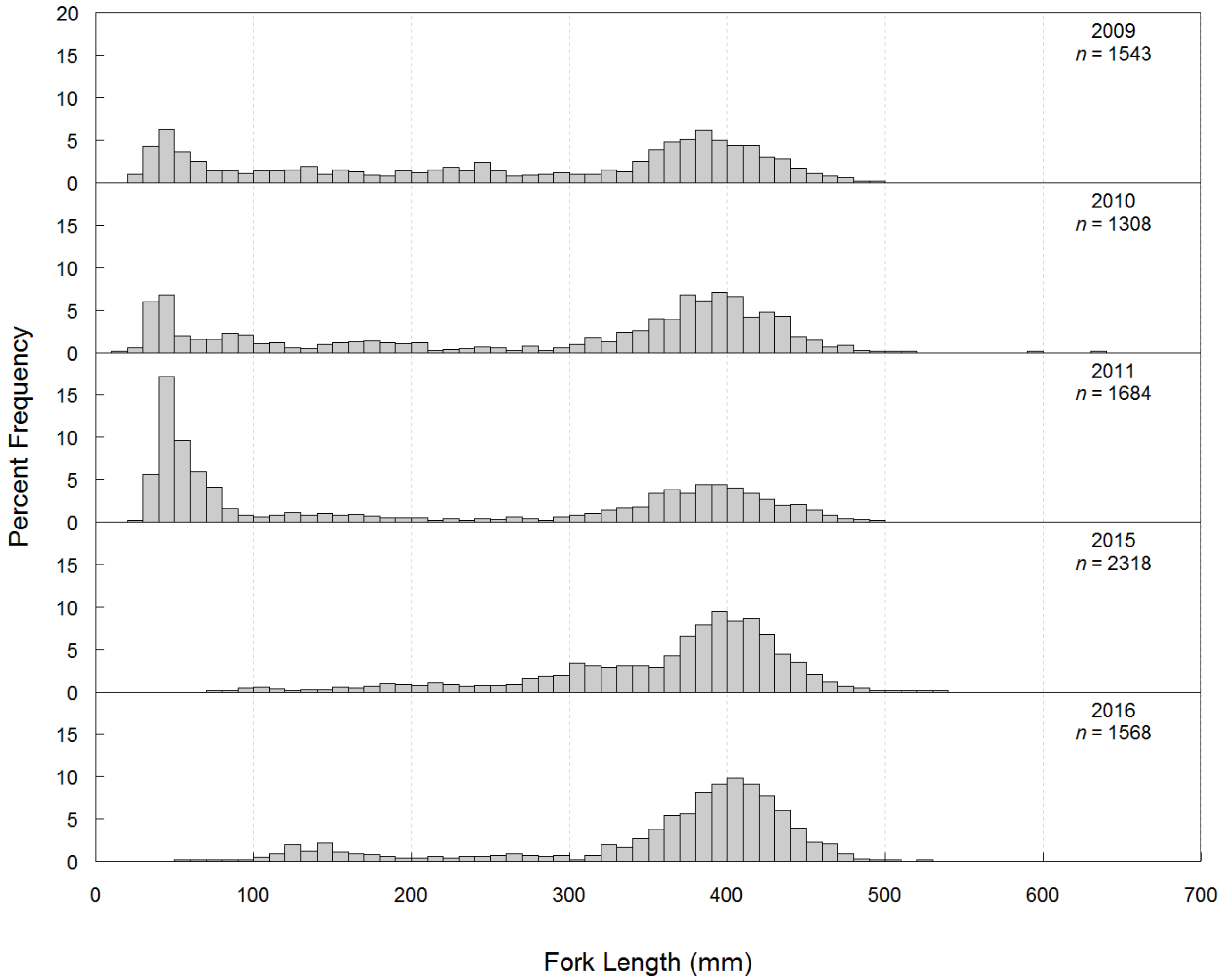


Figure F21 Length-frequency distributions by year for Longnose Sucker captured by boat electroshocking in sections 6, 7, and 9 of Peace River, 2002 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

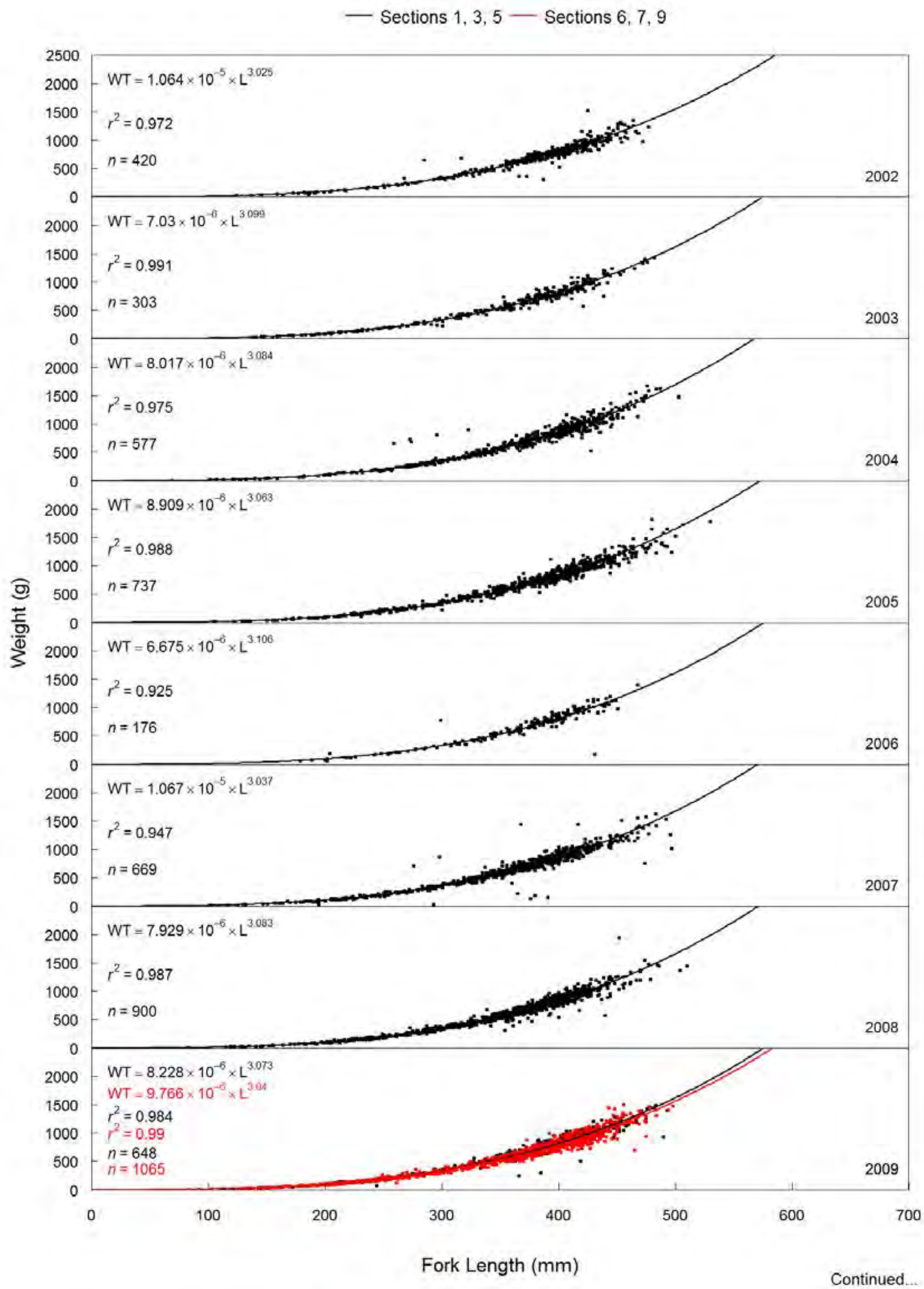


Figure F22 Length-weight regressions for Longnose Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

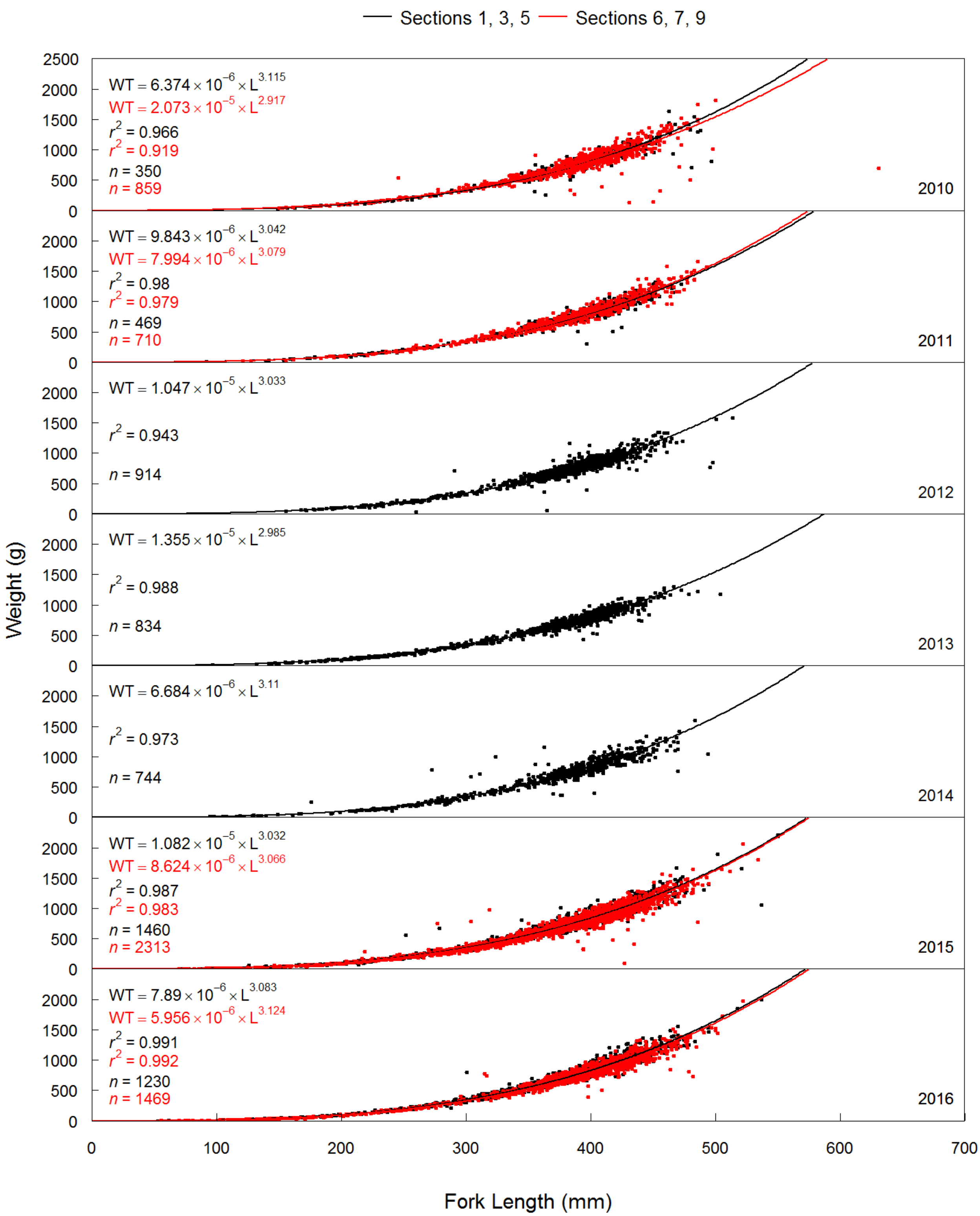


Figure F22 Concluded.

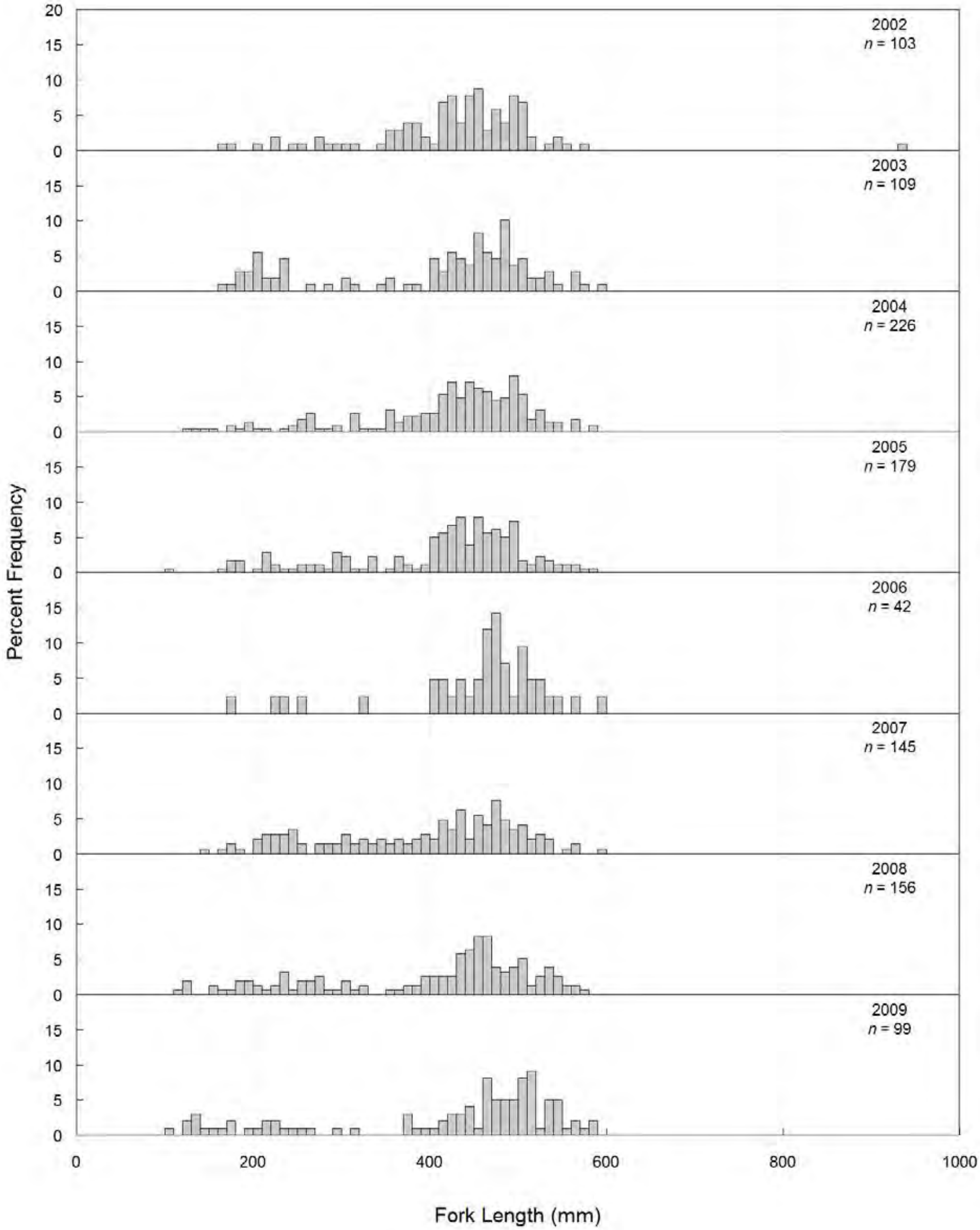


Figure F23 Length-frequency distributions by year for Largescale Sucker captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

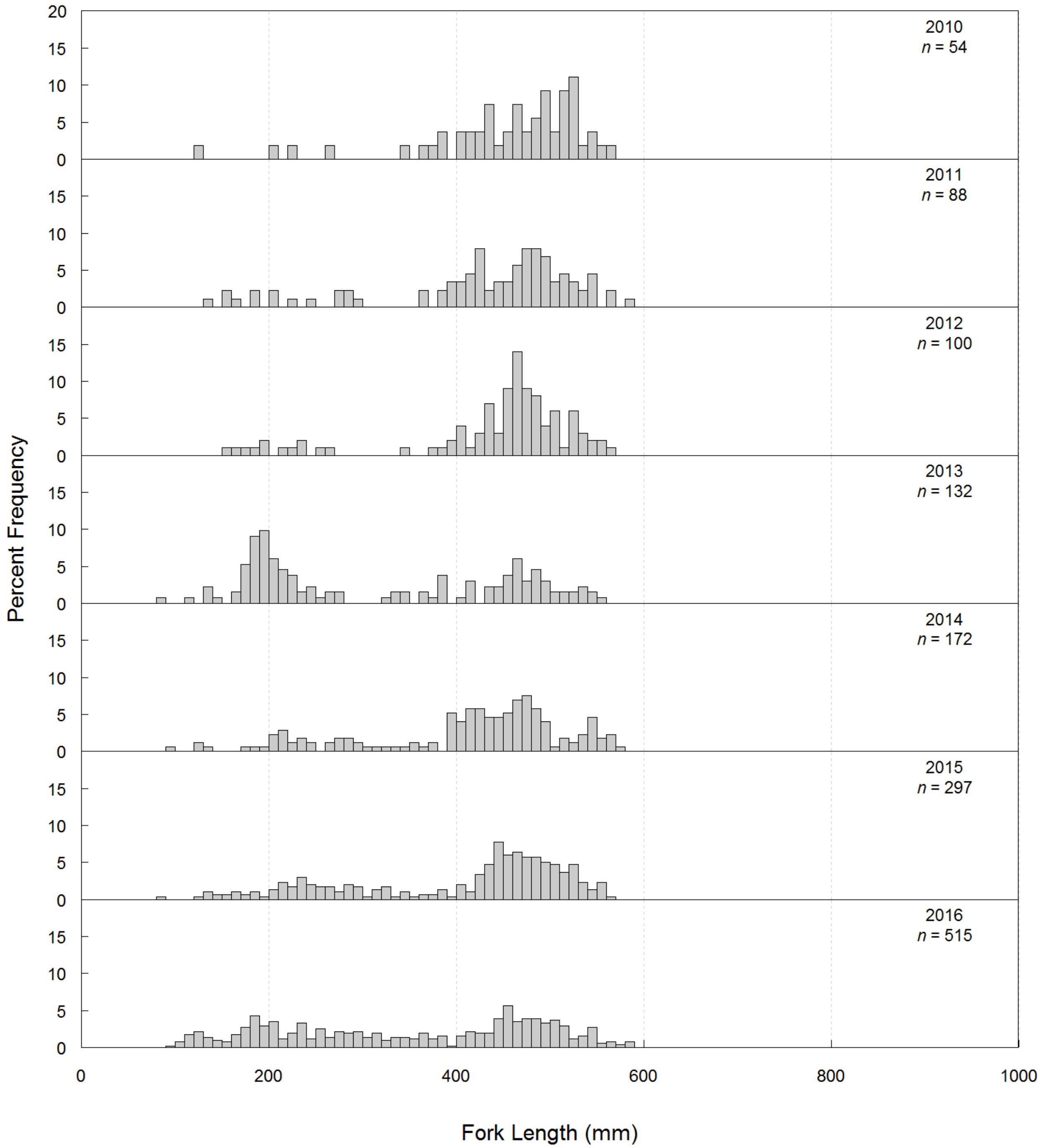


Figure F23 Concluded.

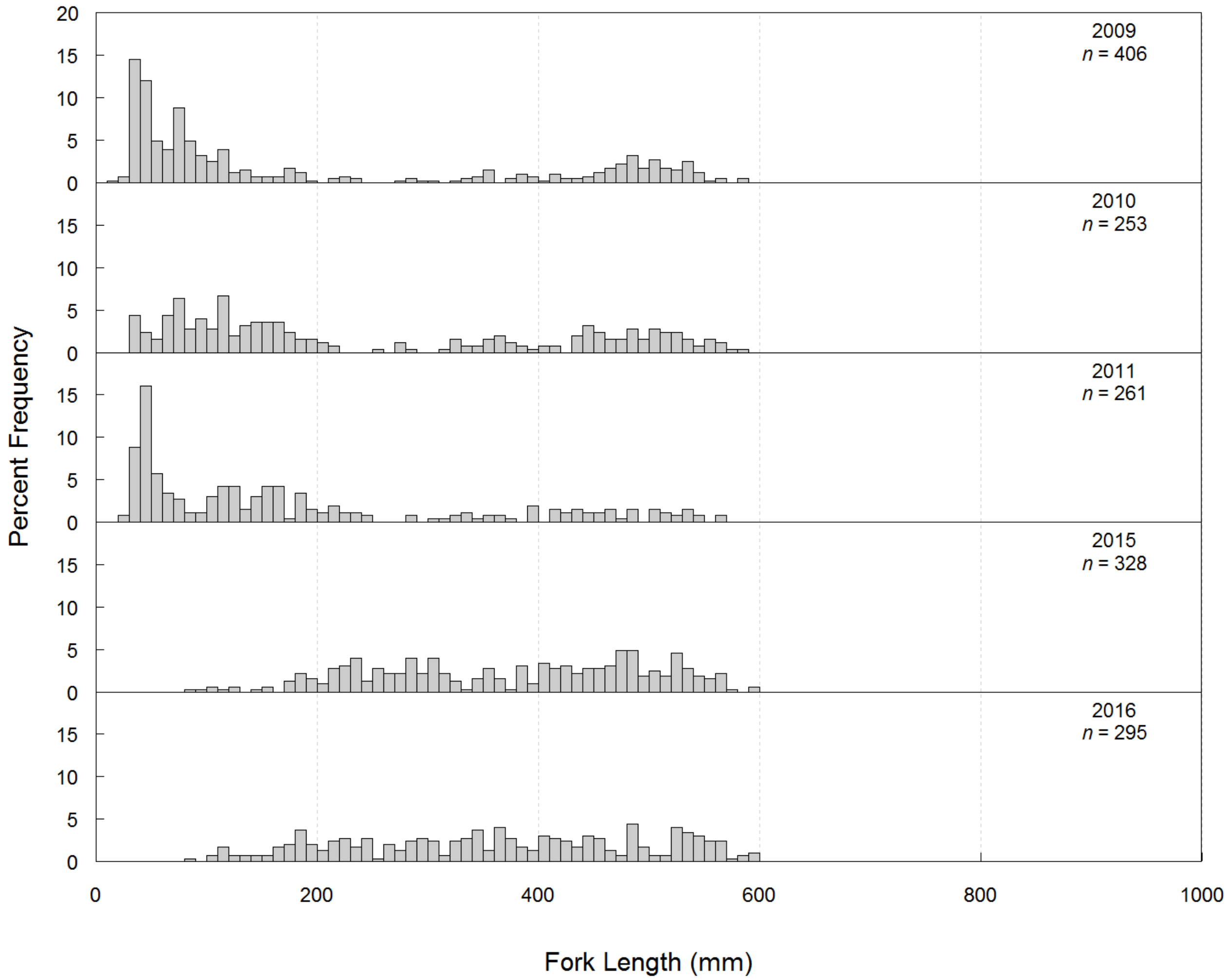


Figure F24 Length-frequency distributions by year for Largescale Sucker captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2009 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

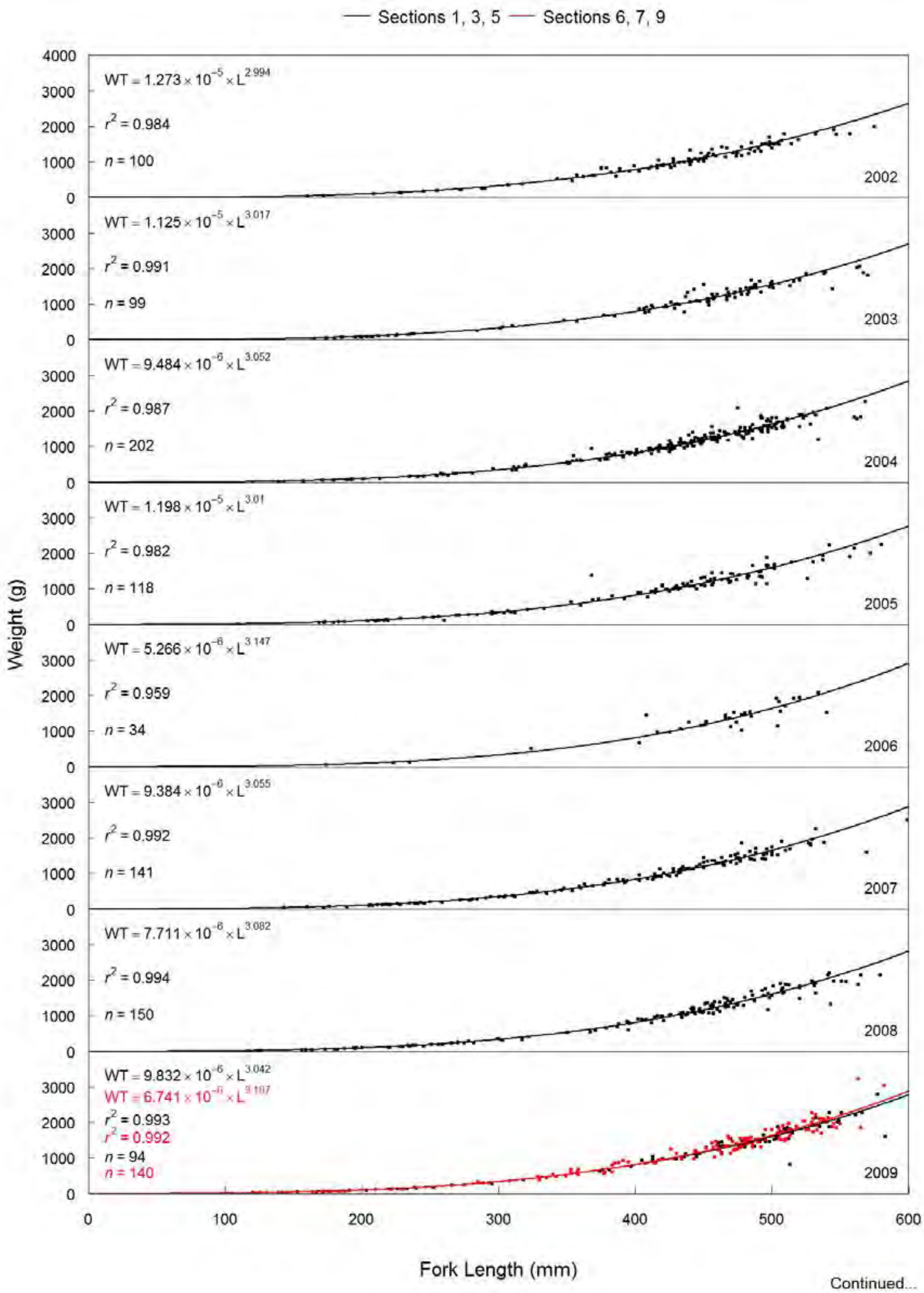


Figure F25 **Length-weight regressions for Largescale Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).**

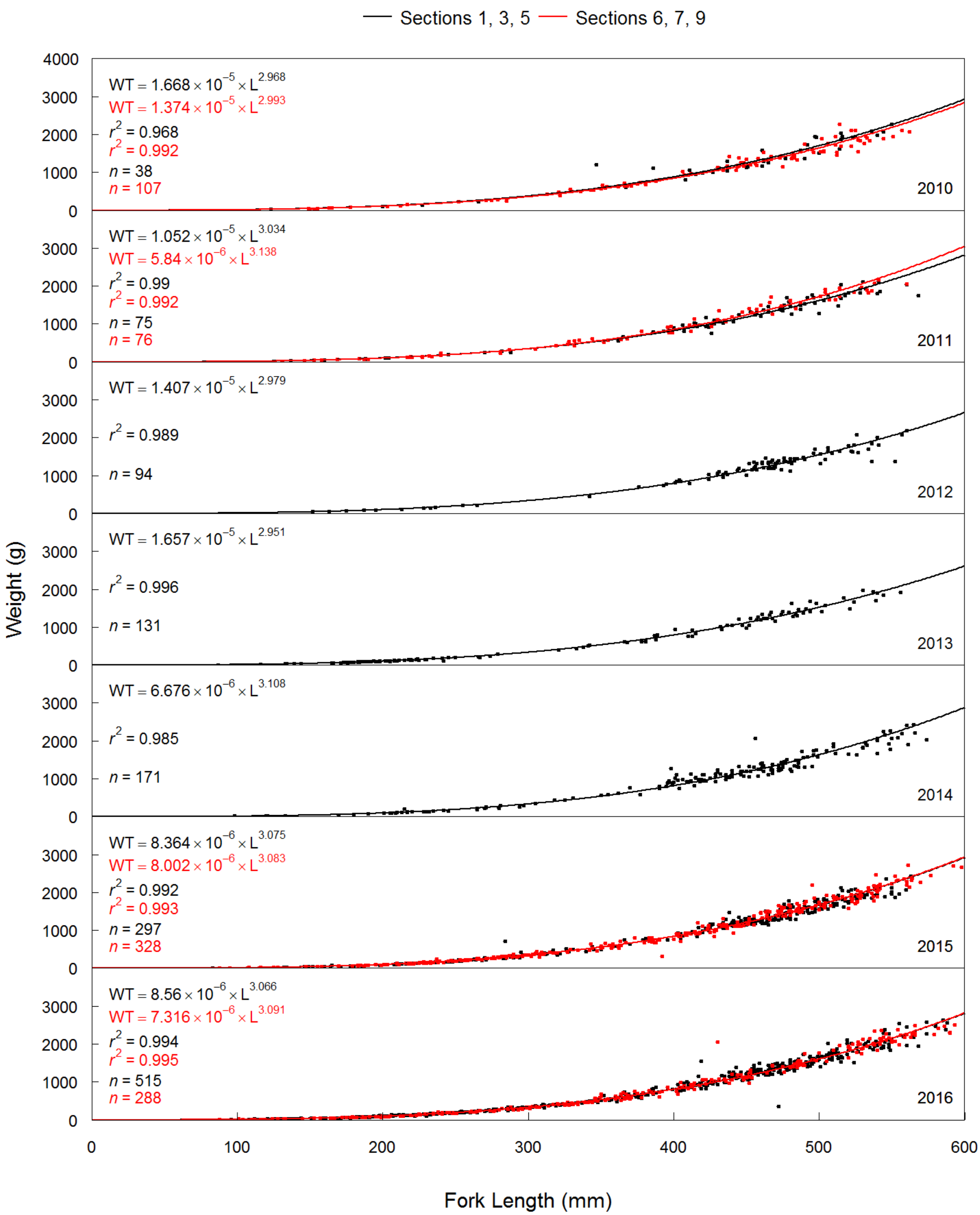


Figure F25 Concluded.

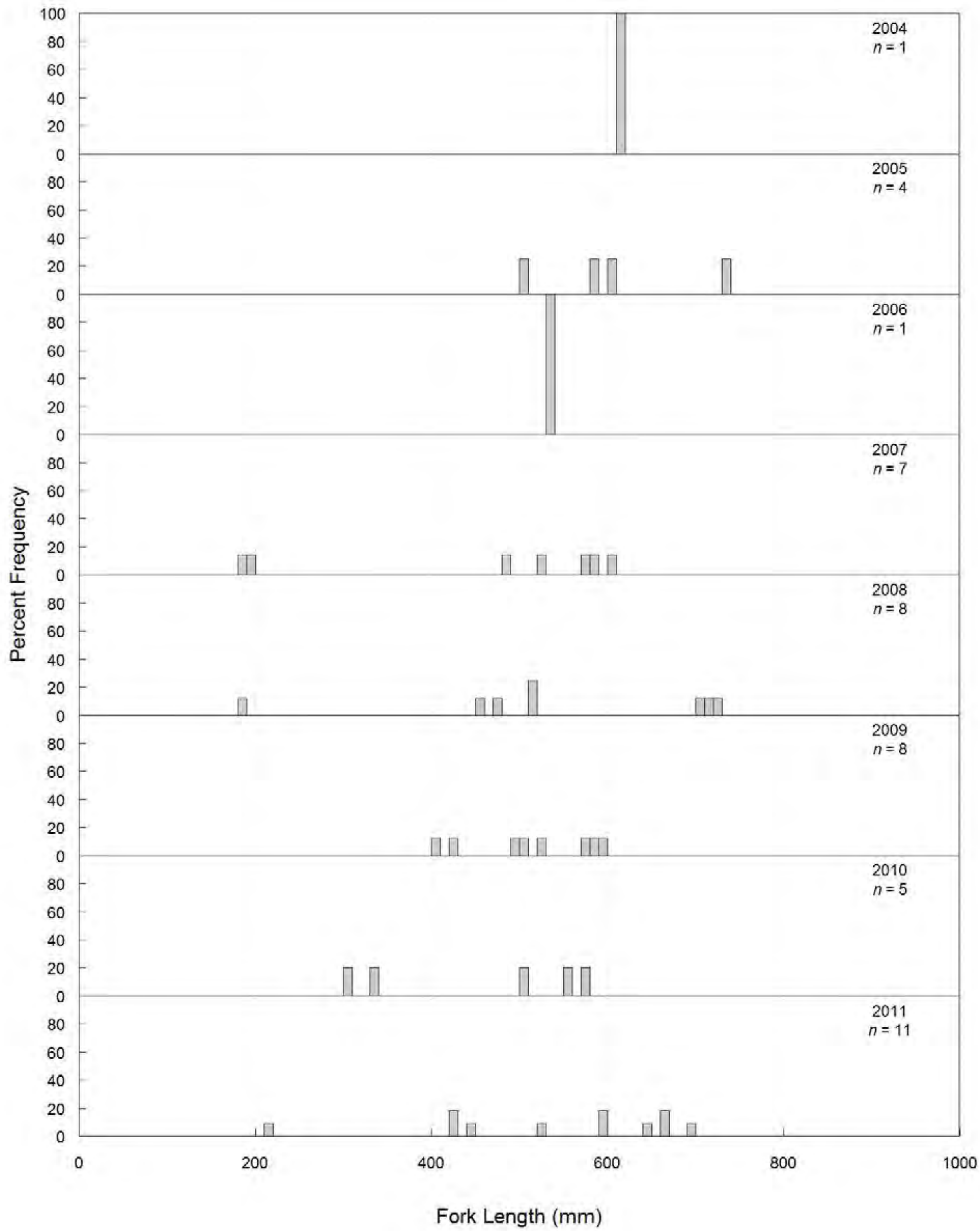


Figure F26 Length-frequency distributions by year for Northern Pike captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

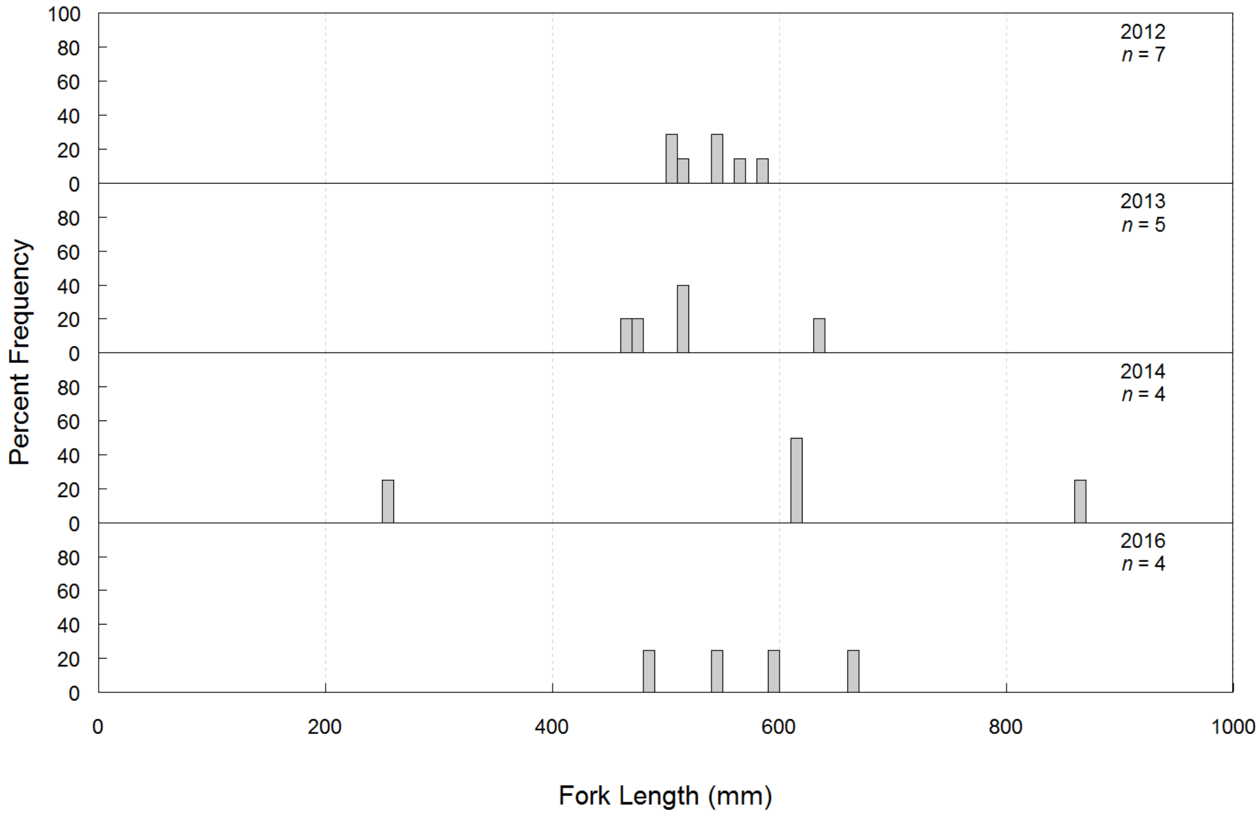


Figure F26 Concluded.

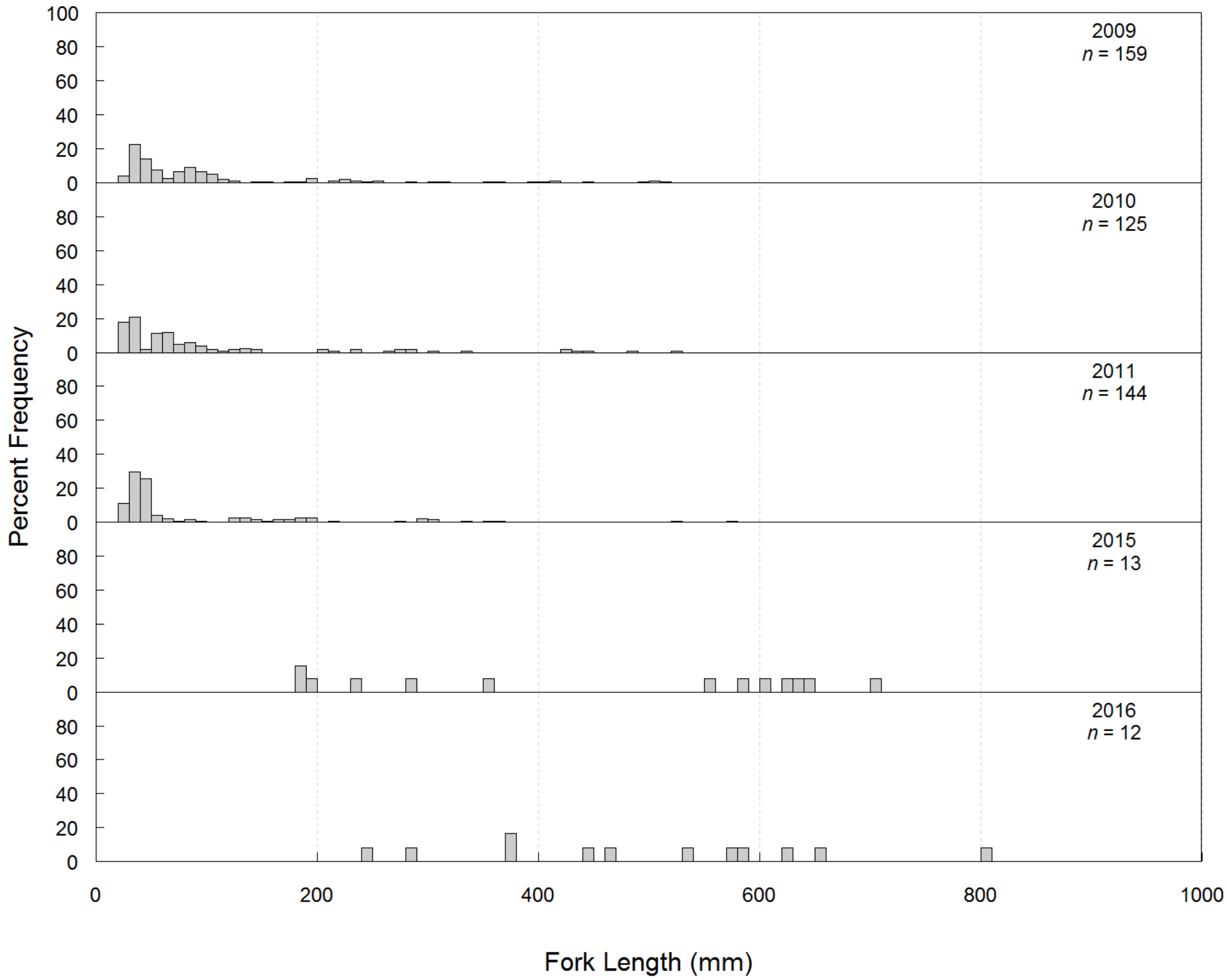
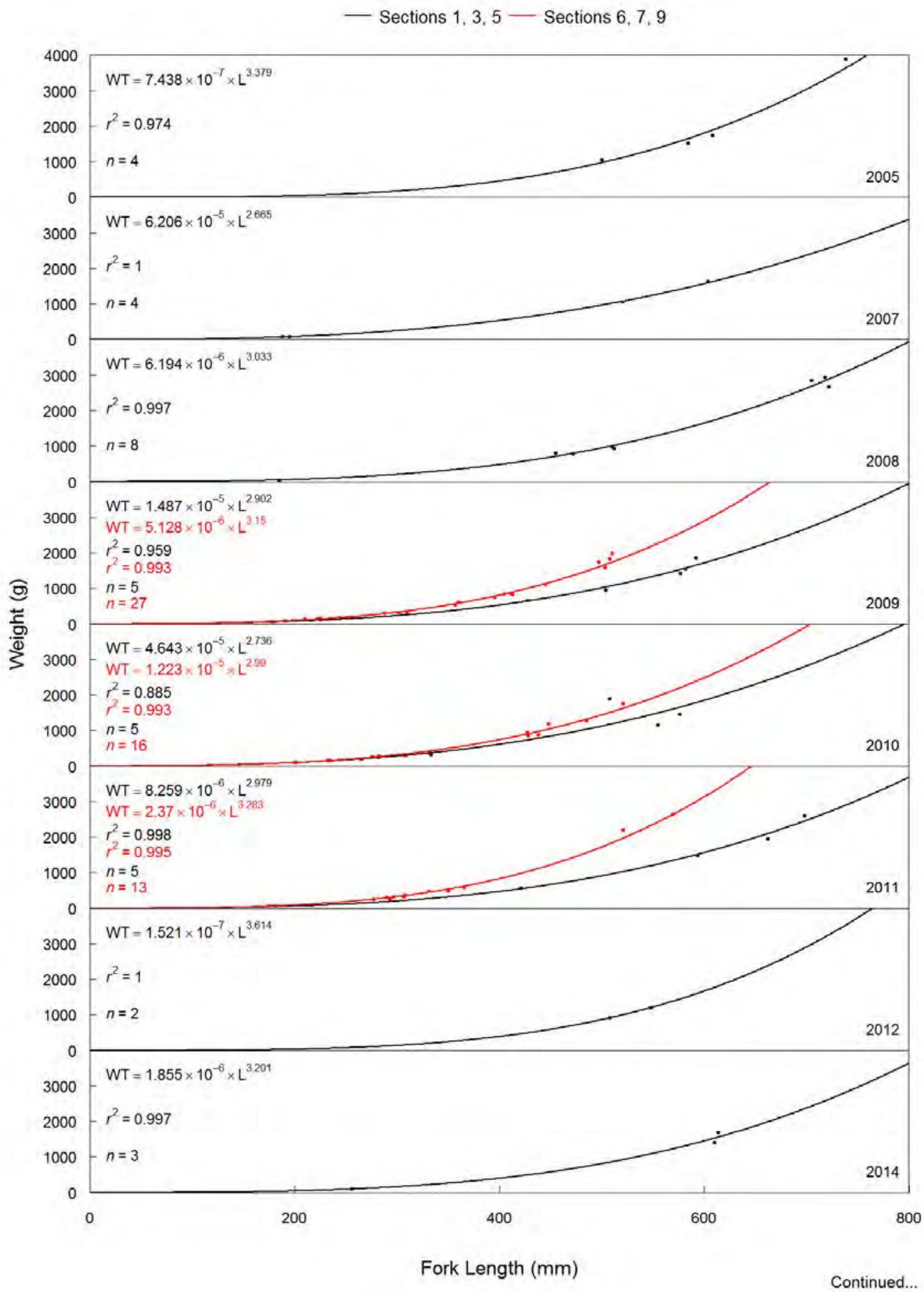


Figure F27 Length-frequency distributions by year for Northern Pike captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2009 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).



Continued...

Figure F28 Length-weight regressions for Northern Pike captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

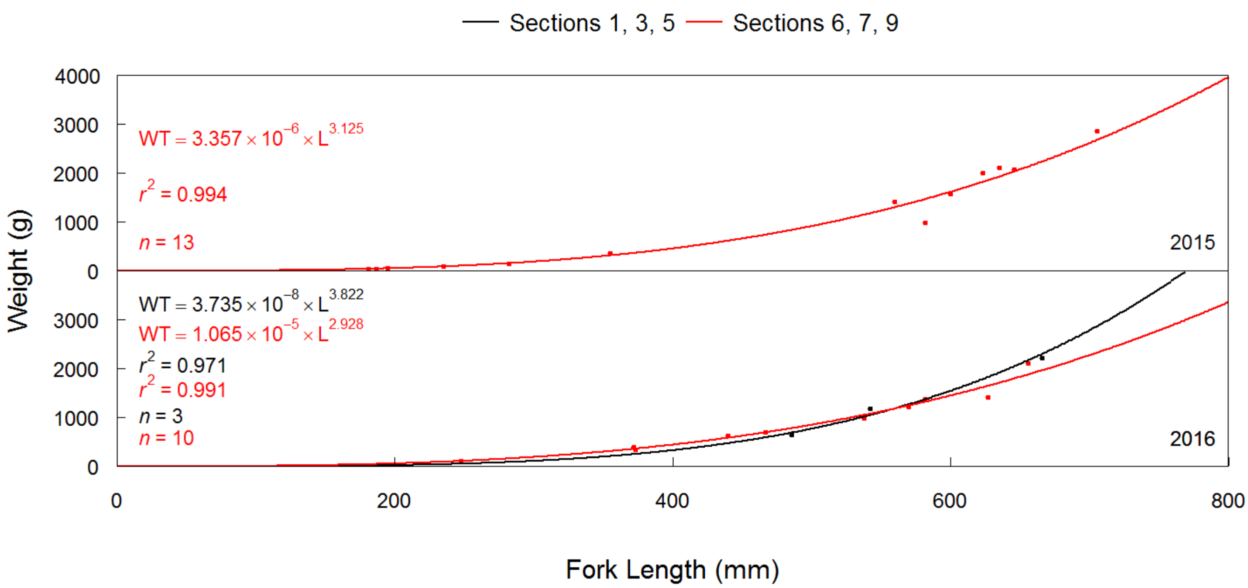


Figure F28 Concluded.

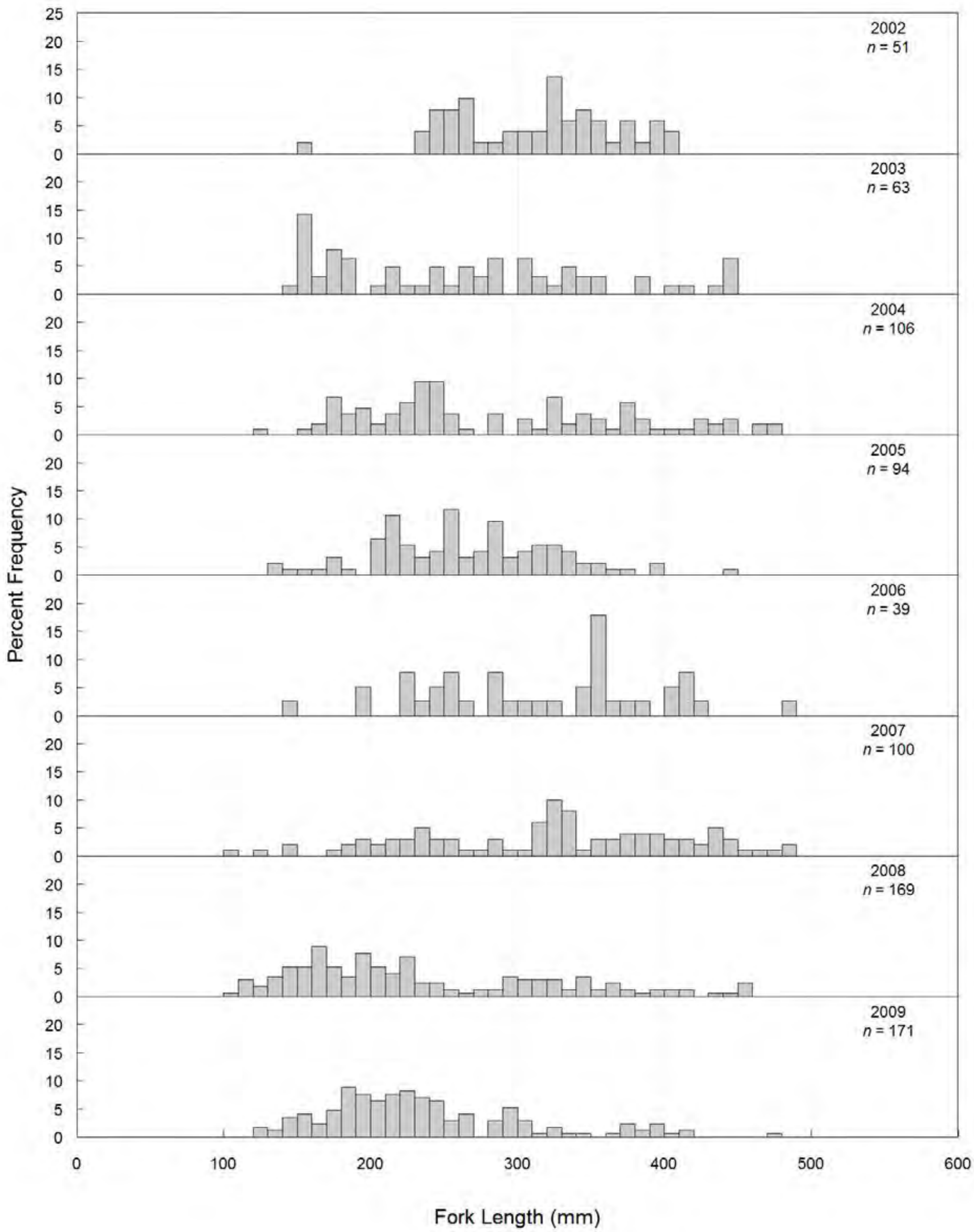


Figure F29 Length-frequency distributions by year for Rainbow Trout captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

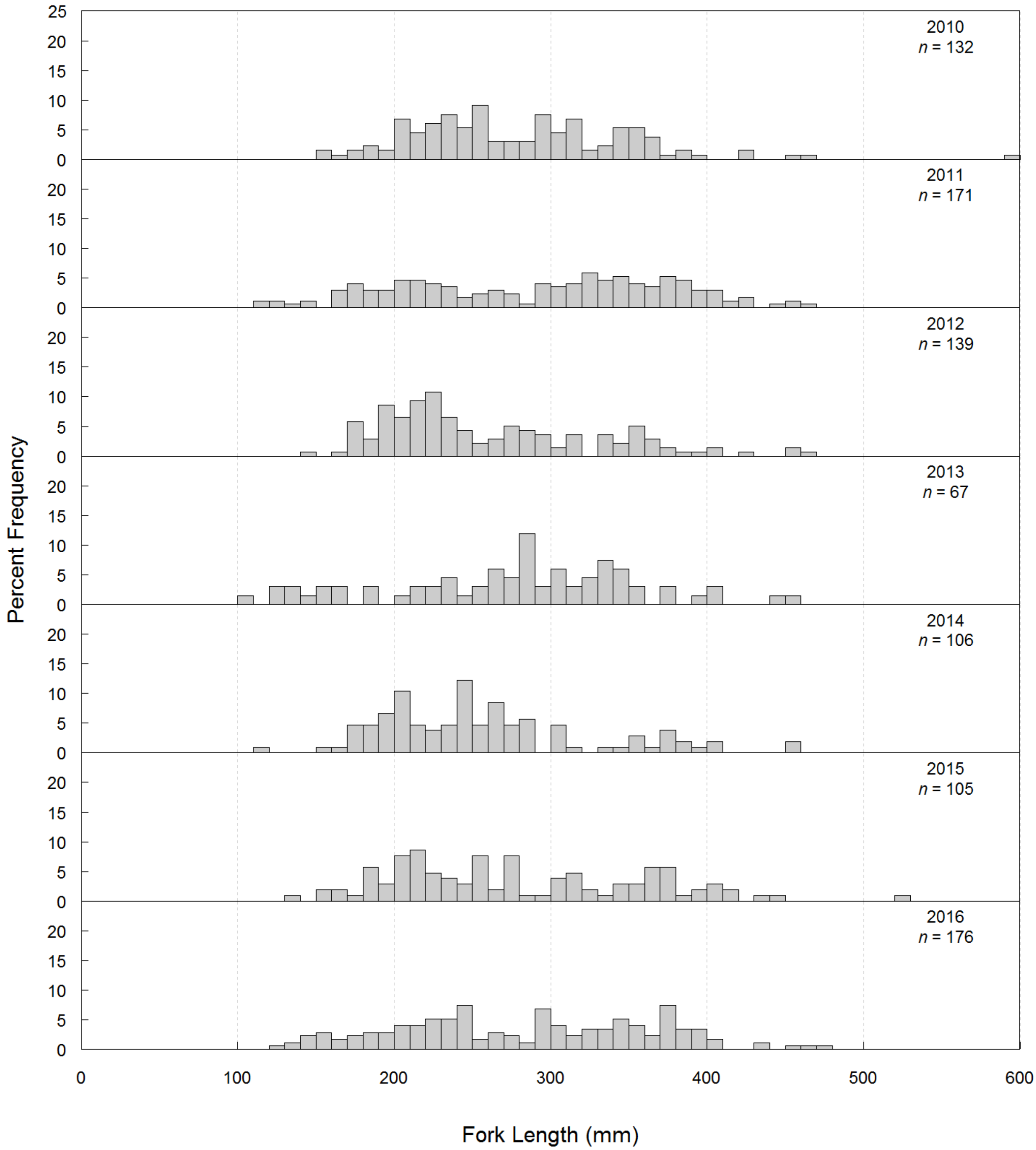


Figure F29 Concluded.

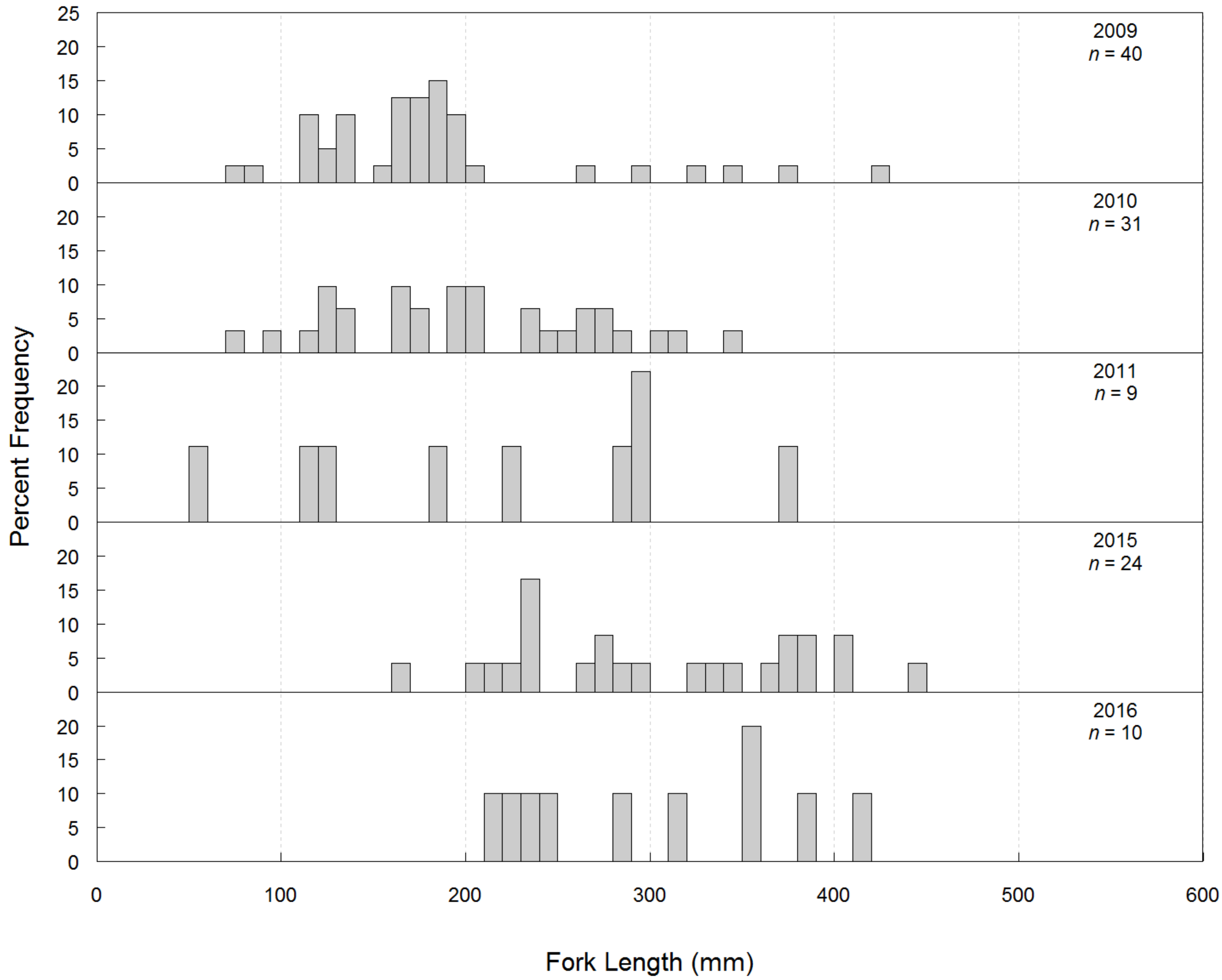


Figure F30 Length-frequency distributions by year for Rainbow Trout captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2002 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

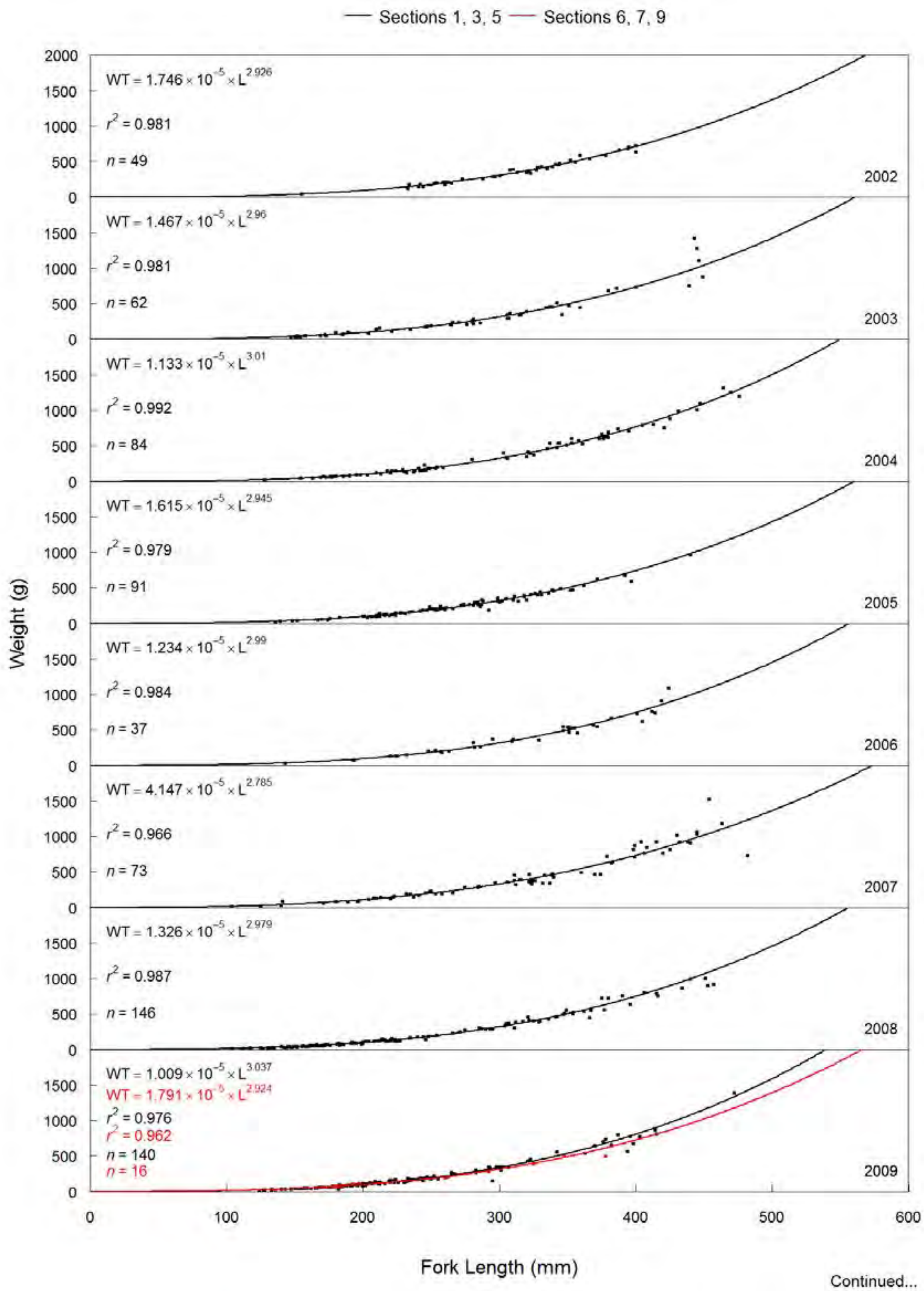


Figure F31 Length-weight regressions for Rainbow Trout captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

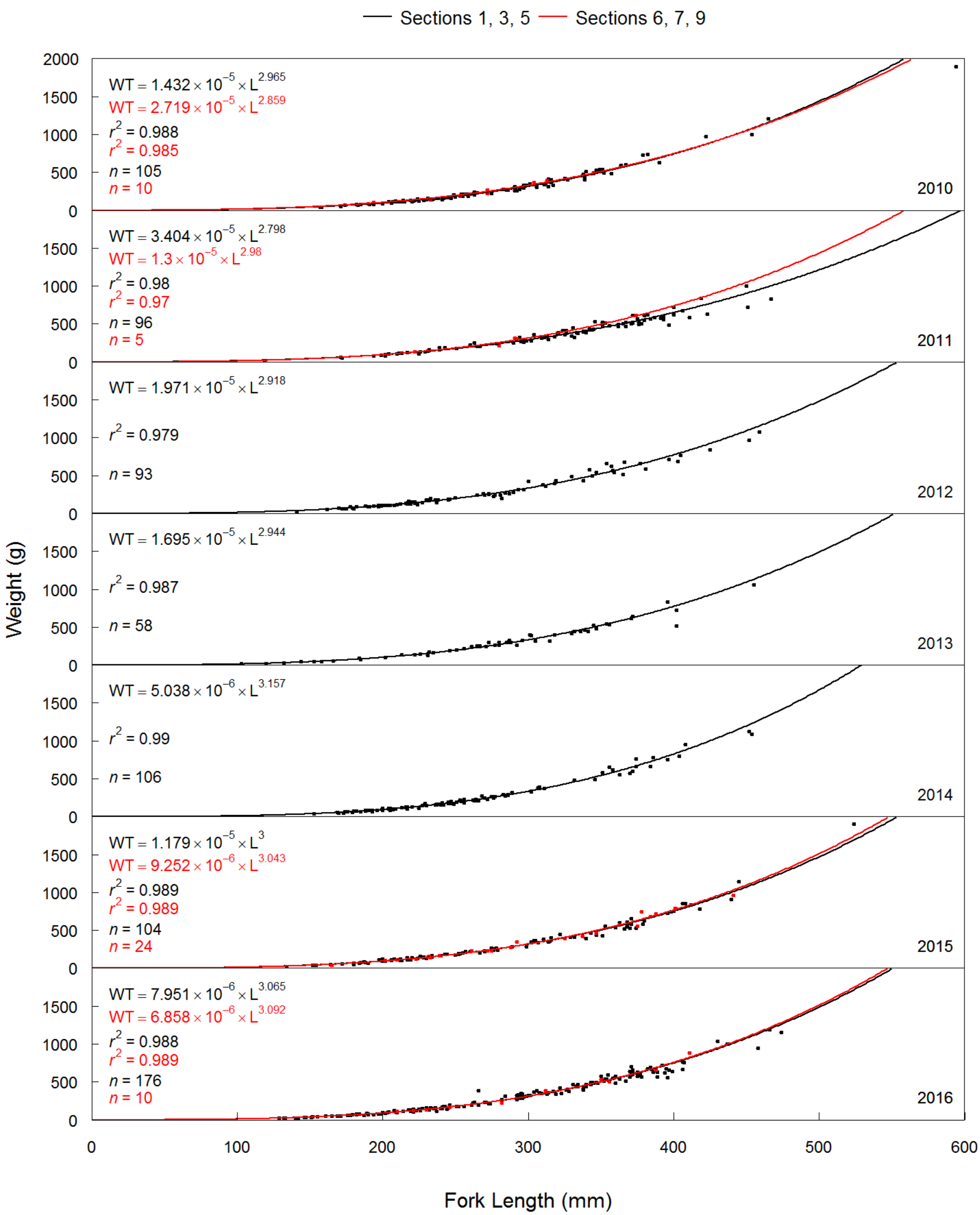


Figure F31 Concluded.

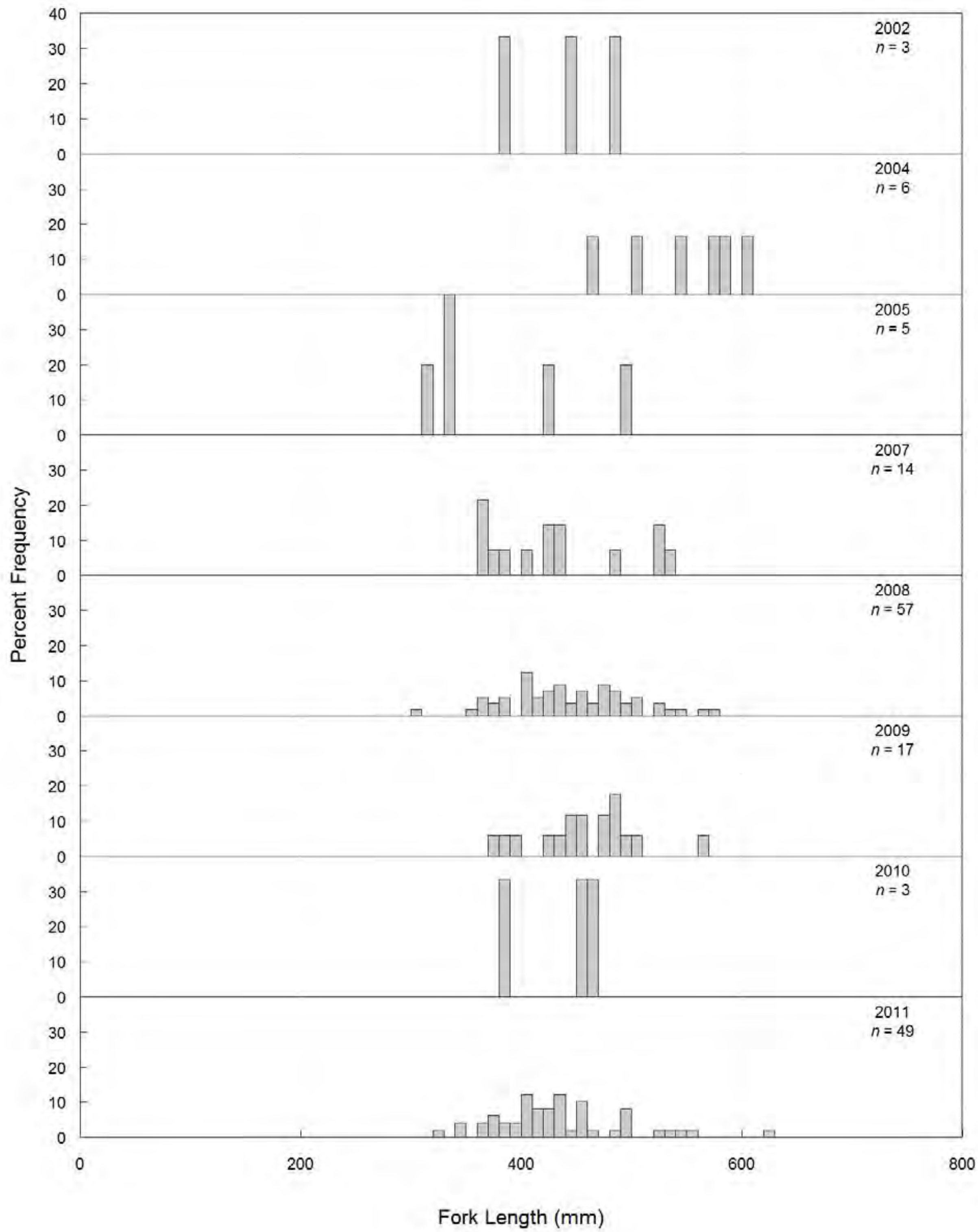


Figure F32 Length-frequency distributions by year for Walleye captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

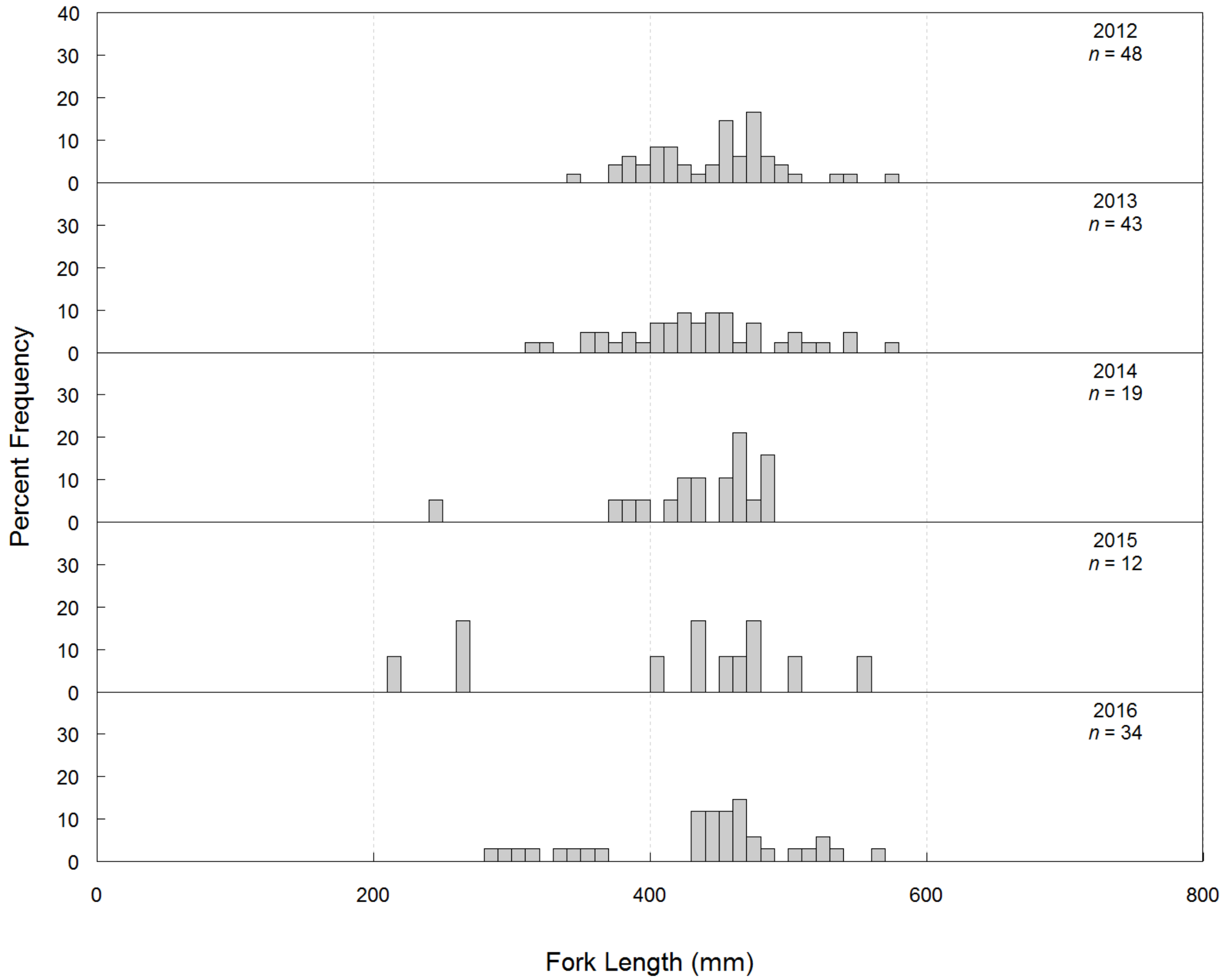


Figure F32 Concluded.

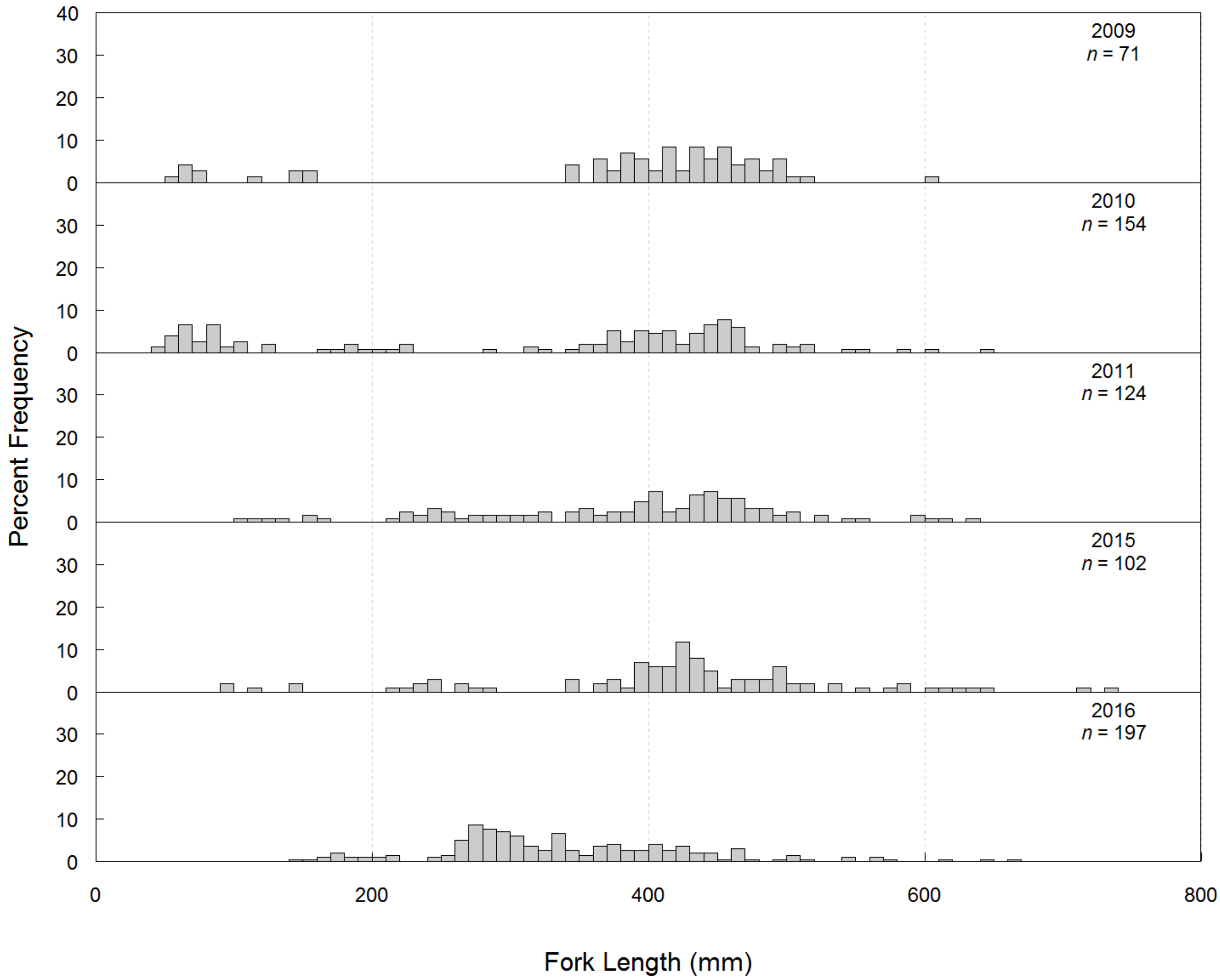


Figure F33 Length-frequency distributions by year for Walleye captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2002 to 2016. Data from 2009 to 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

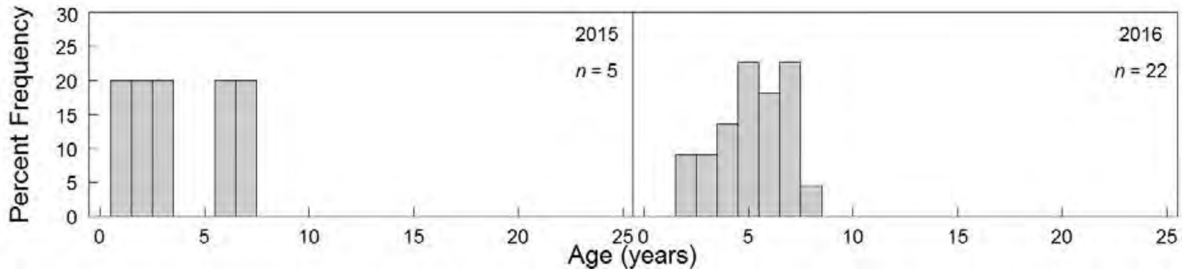


Figure F34 Age-frequency distributions by year for Walleye captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.

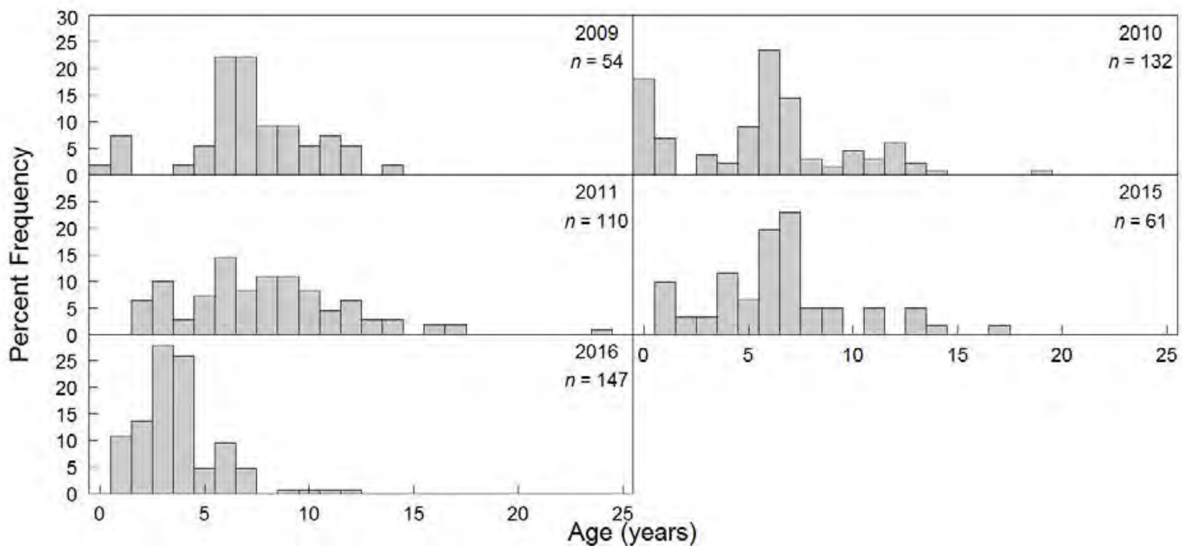
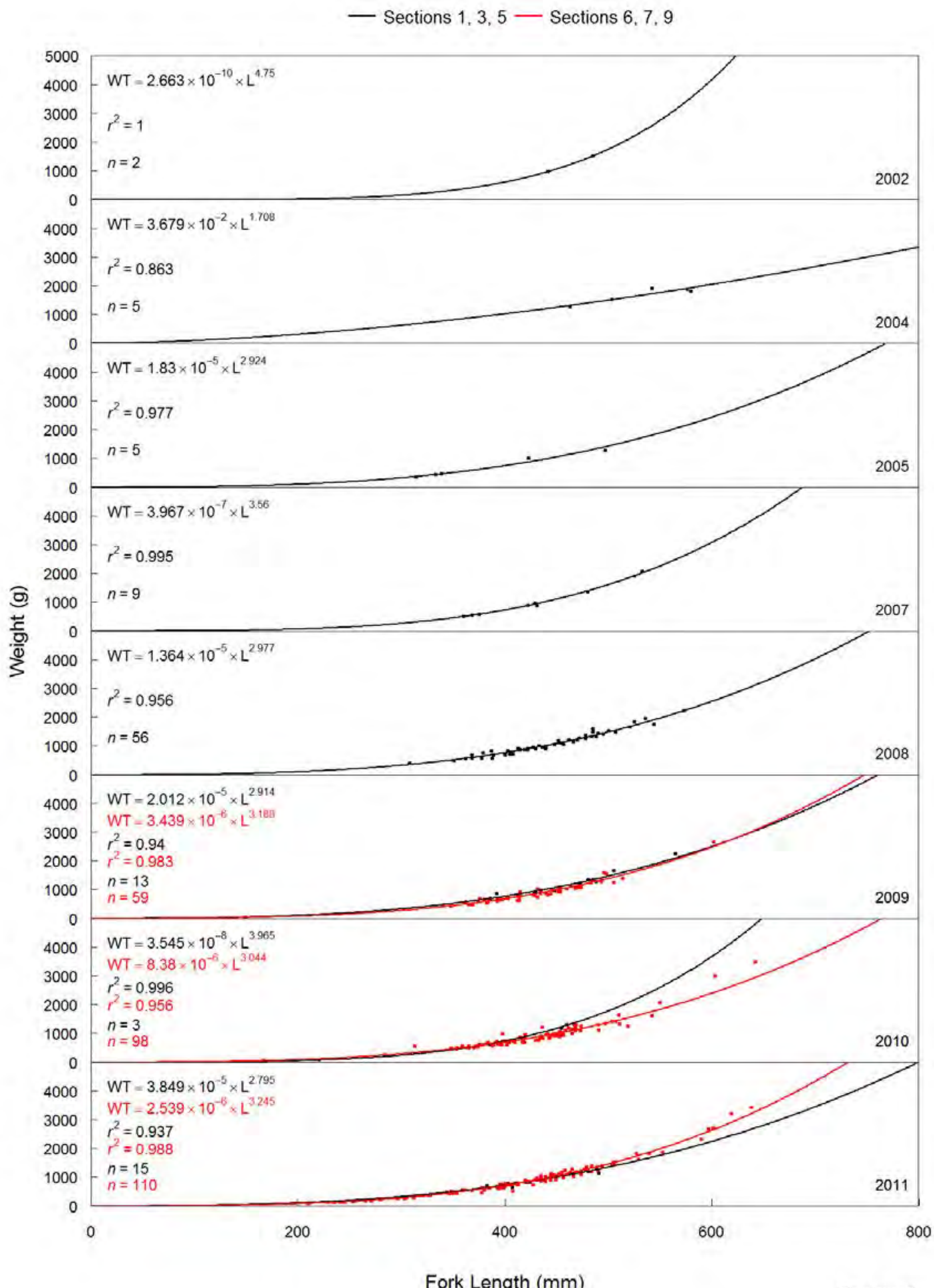


Figure F35 Age-frequency distributions by year for Walleye captured by boat electroshocking in Sections 6, 7, and 9 of the Peace River, 2002 to 2016. Data f*rom 2009 to 2011 courtesy of BC* Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).



Continued...

Figure F36 Length-weight regressions for Walleye captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

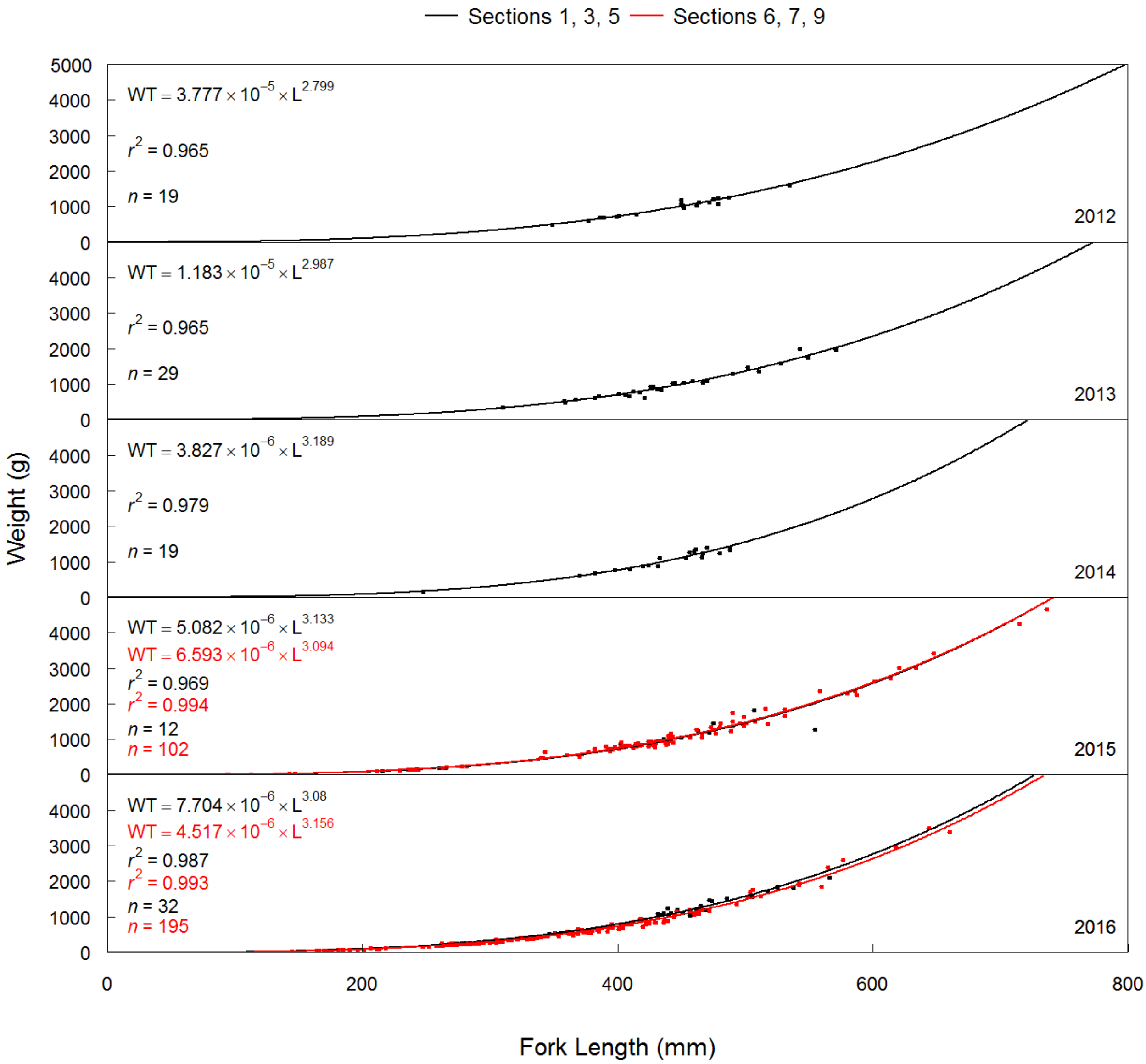


Figure F36 Concluded.

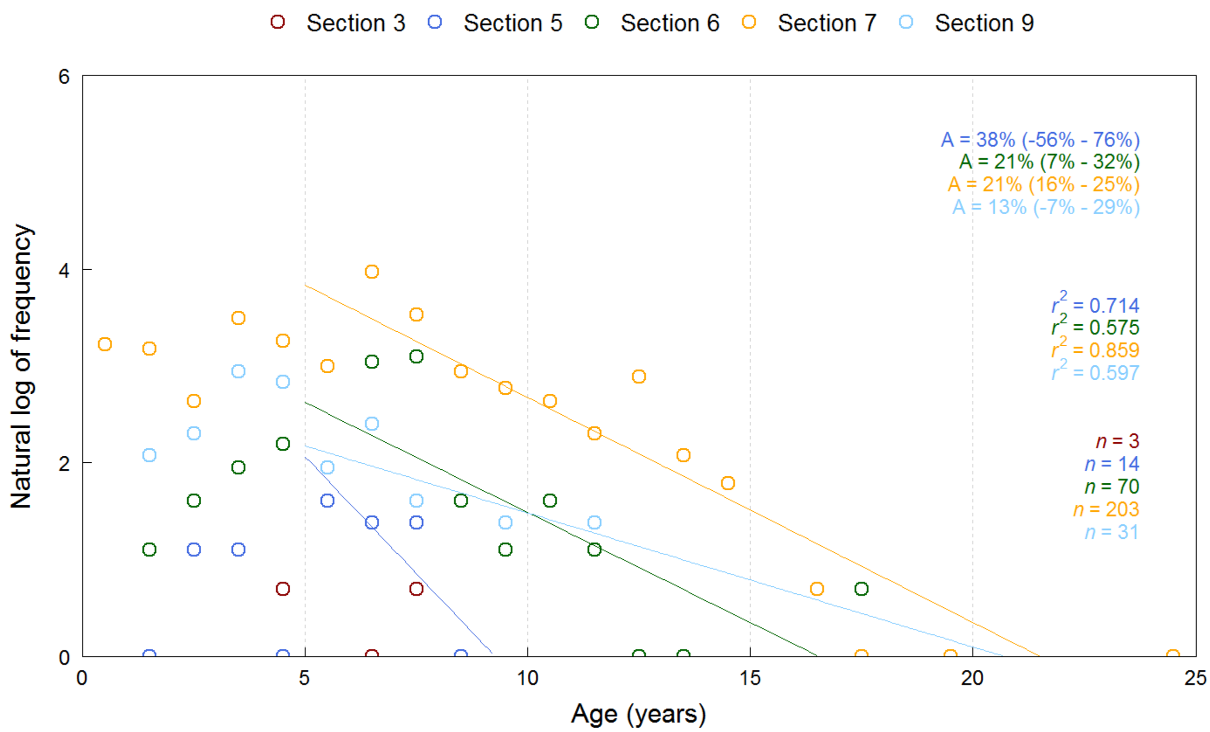


Figure F37 **Catch curve and annual mortality estimates (A; mean and 95% confidence intervals) for Walleye, calculated for each sample section using data from 2002 to 2016 combined. Sample size, and r^2 of the catch curve regression are provided for each section.**

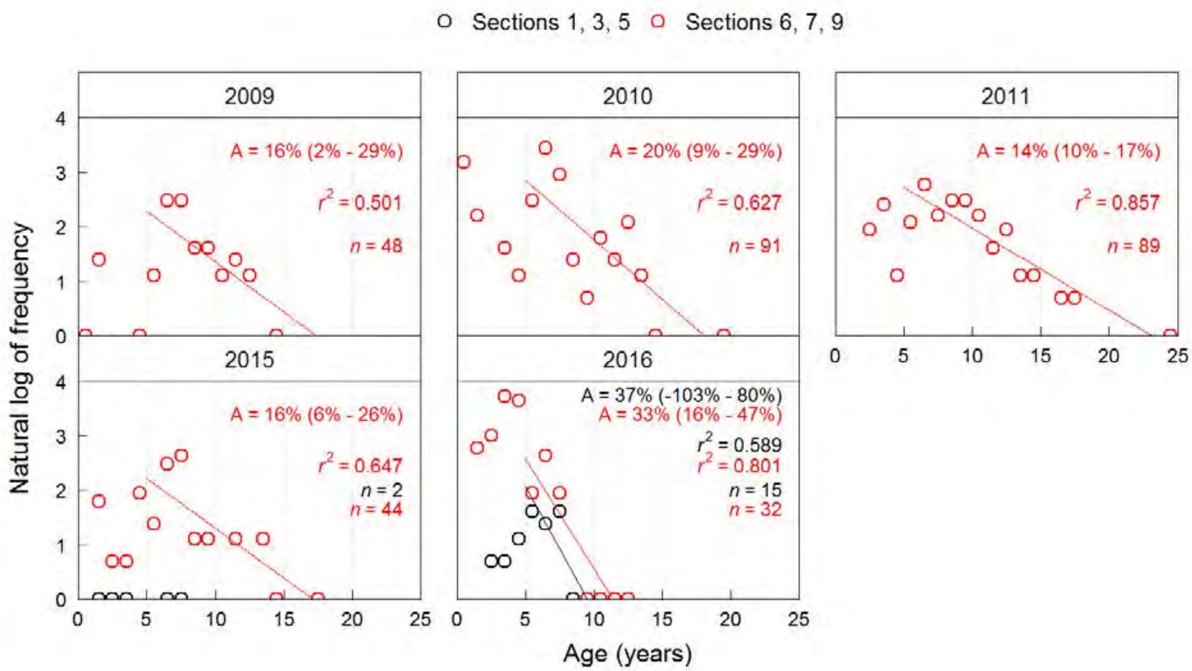


Figure F38 Catch curve and annual mortality estimates (A; mean and 95% confidence intervals) for Walleye, calculated for each sample year. Sample size and r^2 of the catch curve regression are provided for each sample year. Data from Sections 6, 7, and 9 in 2009, 2010, and 2011 courtesy of BC Hydro's Site C Peace River Fish Inventory (Mainstream 2010, 2011, 2013a).

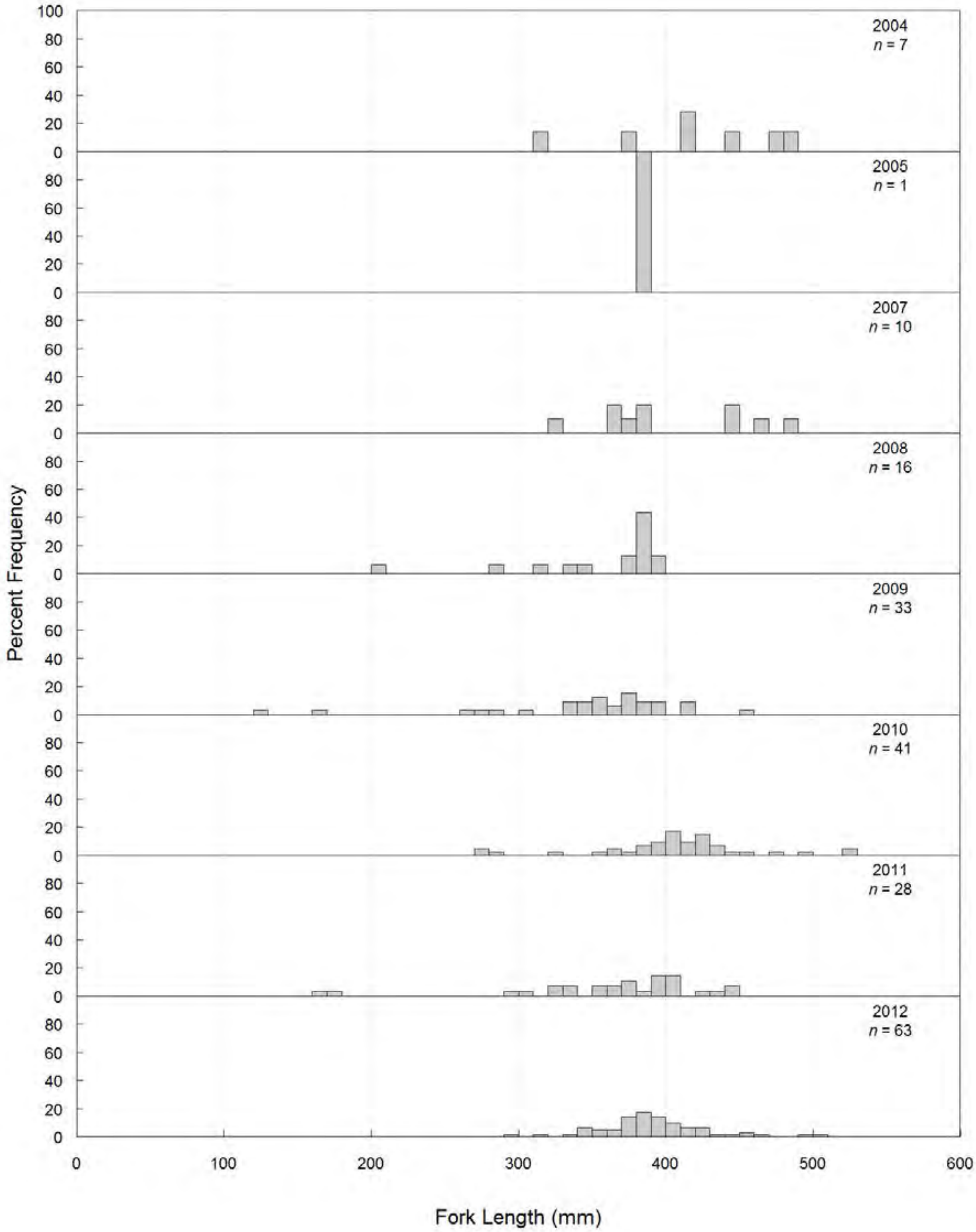


Figure F39 **Length-frequency distributions by year for White Sucker captured by boat electroshocking in Sections 1, 3, and 5 of the Peace River, 2002 to 2016.**

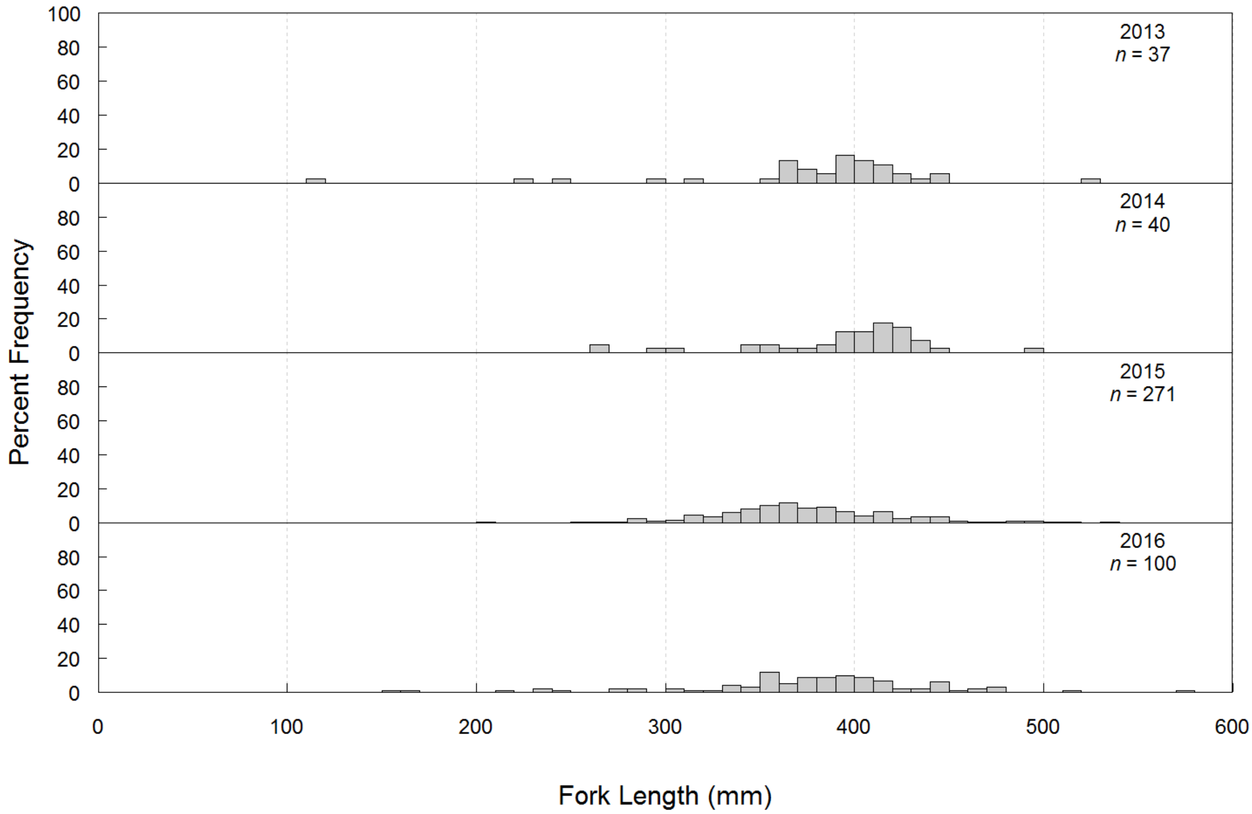


Figure F39 Concluded.

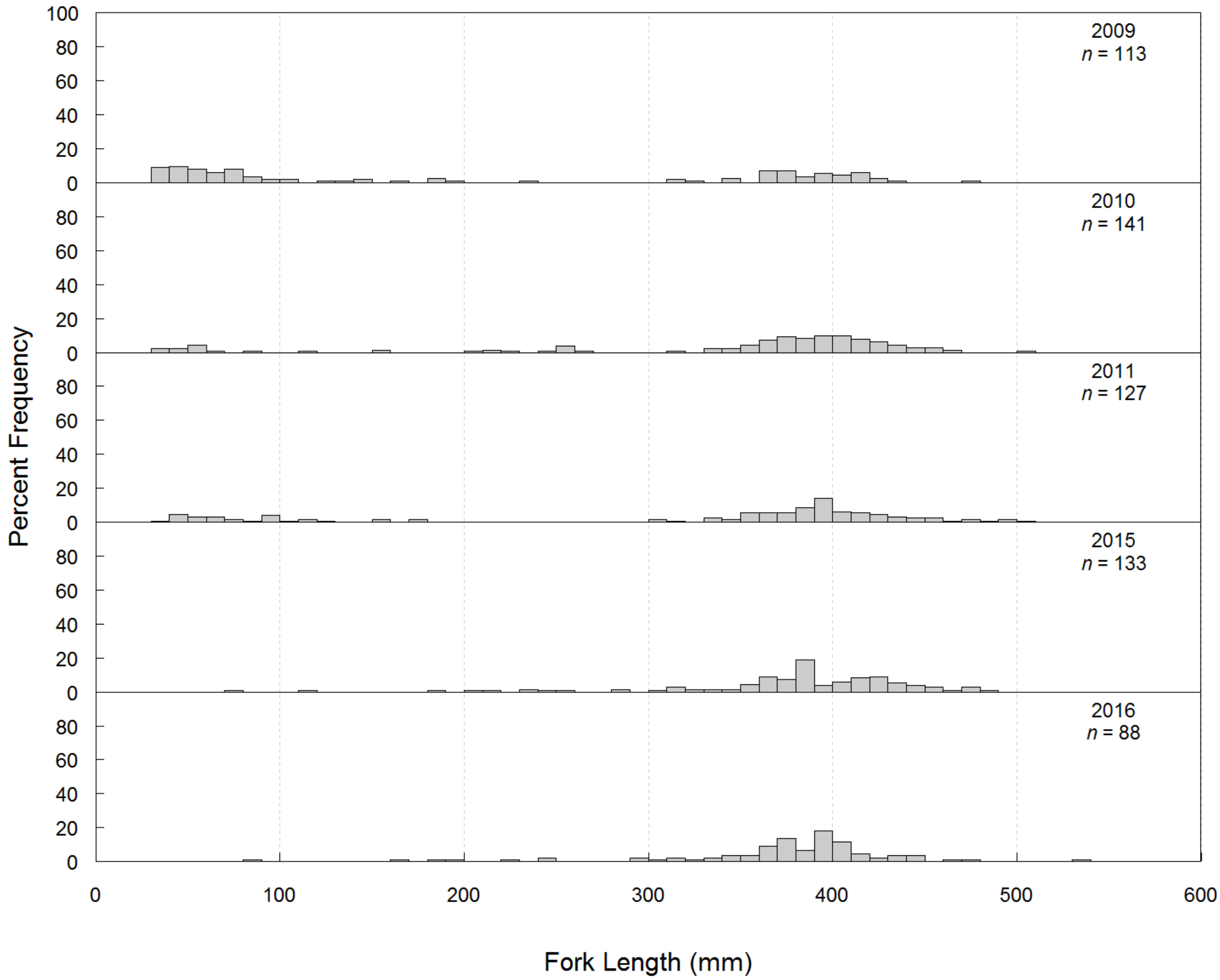


Figure F40 **Length-frequency distributions by year for White Sucker captured by boat electroshocking in Sections 6, 7, and 9 of Peace River, 2016.**

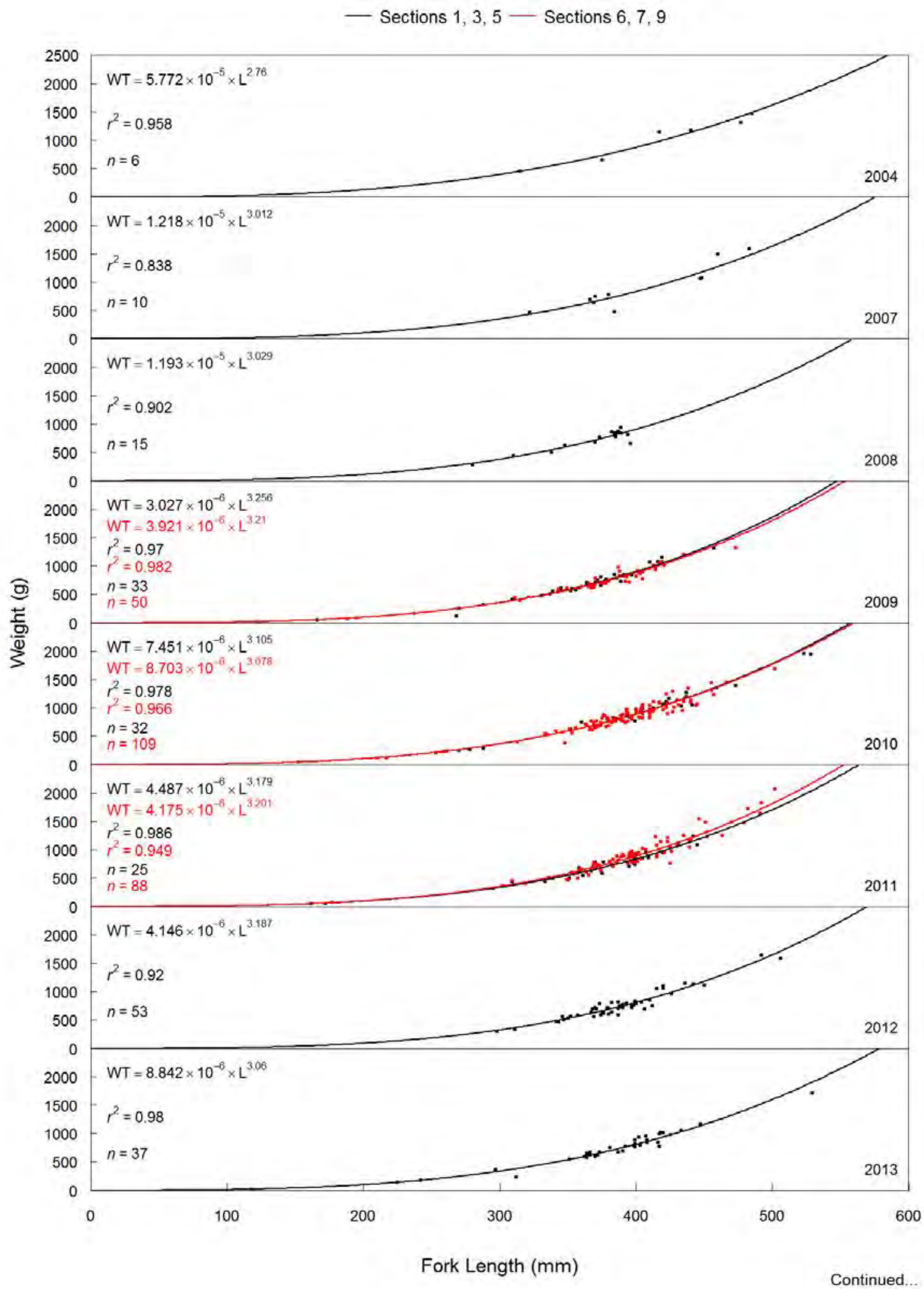


Figure F41 Length-weight regressions for White Sucker captured by boat electroshocking in sampled sections of the Peace River, 2002 to 2016.

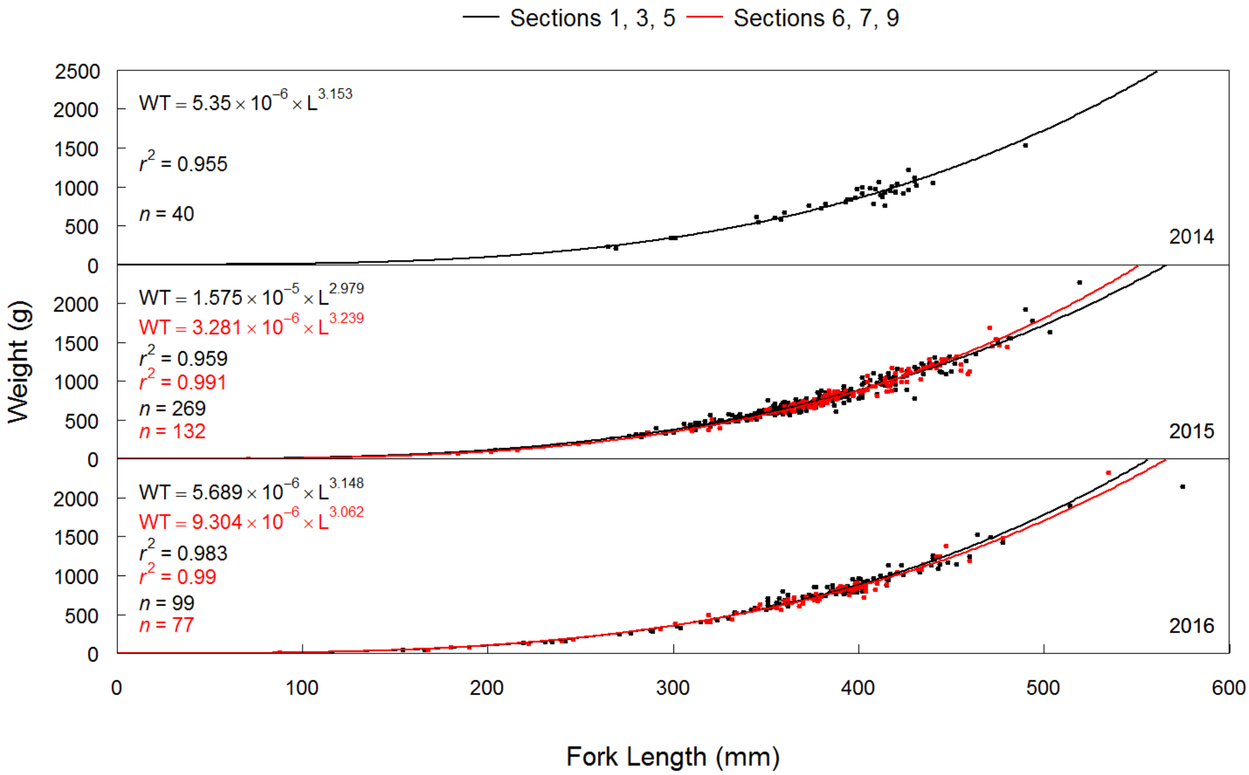


Figure F41 Concluded.

APPENDIX G

Population Analysis Output

Introduction

In 2016, 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 2016 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 2016 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 positive growth trend was not statistically significant ($P = 0.12$). The mean growth for a released and recaptured fish was approximately 0.8 mm and approximately 1.9 mm over the longest sampling period of the 2016 study (34 days for Section 1). The boarder histogram of the growth increment provides an indication of measurement error (residual standard deviation of 3.6 mm for each measurement), which was the second largest of past studies (3.8 mm in the 2015 study).

The summary of movements of recaptured Mountain Whitefish between sections during the 2016 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 2016. 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 1 and 3. 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; $P > 0.5$). Based on these results, no apparent mortality for Mountain Whitefish was applied within 2016.

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). There was not sufficient data to reliably estimate the time-varying catchability model for Section 9. In Sections 5, 6, and 7, the constant catchability model fit the data best whereas in Sections 1 and 3, the time-varying catchability model fit the data best. Population estimates for the time varying model always 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 6 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 2016 and PIT tags that were observed during 2016 that were originally applied in 2004 through 2015 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 in Sections 1, 5, 7, and 9 (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. For Section 3, the last four sampling days (Sessions 5 and 6) produced posterior densities that had little overlap with earlier densities (Figure G7). Section 6 displayed a trend in catchability and/or immigration of unmarked fish consistent with the catchability trend illustrated in Figure G6; however, all the posterior densities displayed considerable overlap.

Arctic Grayling

Mark-recapture data were extracted by section from the database using all available marks (smallest length 200 mm). There was no movement between sections. Table G9 lists Arctic Grayling examined for marks and recaptures by date and section. The releases are provided in Table G10. 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 G11. Only Section 3 recorded recaptures (n = 4). The sequential posterior probability plots for the population estimates are provided in Figure G9 and the population estimates are provided in Table G12. Given the sparse data, minimal population estimates were also calculated (see Figure G10). There was a 0.95 probability of at least 200 Arctic Grayling 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. There was no movement between sections. Table G13 lists Bull Trout examined for marks and recaptures by date and section. The releases by section and date are given in Table G14. 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 G15. The data were too sparse (0 recaptures) to generate diagnostic measures or a population estimate for Section 9. The population estimates using the Bayesian model are given in Table G16 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 G17 along with the estimates of the migration proportions adjusted for the number of fish examined (Equation 4). Table G18 lists Largescale Sucker examined for marks and recaptures by date and section. Releases by section and date are given in Table G19. No tagged fish were recovered in Section 1 and only a single recapture was recovered in Section 9; thus, population estimates were not computed for these two sections. 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 G20. The population estimates using the Bayesian model are given in Table G21 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 2016 is listed in Table G22 along with the estimates of the migration proportions adjusted for the number of fish examined (Equation 4). Table G23 lists Longnose Sucker examined for marks and recaptures by date and section. The releases by section and date are given in Table G24. 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 G25. The population estimates using the Bayesian model are given in Table G26 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 G27 lists Rainbow Trout examined for marks and recaptures by date and section. The releases by section and date are given in Table G28. Only a single tagged fish was recovered in Section 7 and no tagged Rainbow Trout fish were recaptured in Section 9; thus, population estimates were not generated for these sections. 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 G29. The population estimates using the Bayesian model are given in Table G30, 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.

Table G1: Mountain Whitefish 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	63	4	1	0	0	0	68
3	0	156	1	0	1	0	158
5	0	0	26	1	0	0	27
6	0	0	1	51	1	0	53
7	0	0	0	3	18	0	21
9	0	0	0	1	1	9	11
Sample:	2,221	2,496	762	1,541	519	195	7,734
Recap. %	2.84	6.41	3.81	3.63	4.05	4.62	4.37
Proportions:							
1	0.907	0.051	0.042	0.000	0.000	0.000	1.000
3	0.000	0.951	0.020	0.000	0.029	0.000	1.000
5	0.000	0.000	0.981	0.019	0.000	0.000	1.000
6	0.000	0.000	0.036	0.911	0.053	0.000	1.000
7	0.000	0.000	0.000	0.053	0.947	0.000	1.000
9	0.000	0.000	0.000	0.013	0.040	0.947	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	0	4	0	1	0	0
000101	8	8	1	1	4	1
000110	8	21	2	3	1	0
000111	0	1	0	0	0	0
001001	3	8	1	2	1	0
001010	1	14	2	2	0	0
001100	7	9	2	2	1	1
010001	9	5	2	2	3	1
010010	3	5	1	1	1	2
010100	8	12	0	2	0	0
010101	1	0	0	1	0	0
010110	0	1	0	0	0	0
011000	8	14	3	4	1	2
011100	0	1	0	1	0	0
011101	0	0	0	1	0	0
100001	1	4	3	2	0	0
100010	0	10	1	4	1	1
100011	1	0	0	0	0	0
100100	5	6	1	6	2	1
100101	0	0	0	1	0	0
100110	1	1	0	0	0	0
101000	1	13	3	3	3	1
101010	0	1	0	1	0	0
101100	0	3	0	0	0	0
110000	1	10	3	5	1	0
110100	0	1	0	0	0	0
111000	0	2	0	1	1	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
River Section 1:				
{S(.)p(t)}	0.0	0.861	1.000	6
{S(.)p(2 levels)}	4.4	0.095	0.111	3
{S(t)p(t)}	6.1	0.042	0.049	9
{S(t)p(2 levels)}	12.4	0.002	0.002	7
River Section 3:				
{S(.)p(t)}	0.0	0.875	1.000	6
{S(t)p(2 levels)}	5.2	0.063	0.073	7
{S(t)p(t)}	6.1	0.042	0.049	9
{S(.)p(2 levels)}	7.7	0.019	0.022	3
River Section 5:				
{S(.)p(2 levels)}	0.0	0.821	1.000	3
{S(.)p(t)}	3.3	0.157	0.191	6
{S(t)p(2 levels)}	8.0	0.015	0.018	7
{S(t)p(t)}	9.4	0.008	0.009	9
River Section 6:				
{S(.)p(2 levels)}	0.0	0.924	1.000	3
{S(.)p(t)}	5.6	0.057	0.062	6
{S(t)p(2 levels)}	8.0	0.017	0.018	7
{S(t)p(t)}	11.6	0.003	0.003	9
River Section 7:				
{S(.)p(2 levels)}	0.0	0.671	1.000	3
{S(.)p(t)}	1.6	0.302	0.450	6
{S(t)p(t)}	7.6	0.015	0.022	9

Model	ΔAIC	AIC Weights	Model Like.	Num. Par
{S(t)p(2 levels)}	8.0	0.012	0.018	7
River Section 9:				
{S(.)p(2 levels)}	0.0	0.824	1.000	3
{S(.)p(t)}	3.4	0.151	0.184	6
{S(t)p(2 levels)}	7.8	0.017	0.021	7
{S(t)p(t)}	9.4	0.007	0.009	9

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}	32,635	5,040	245.4	6	502.8	0.00	0.958	1.000
M_{0t}	26,479	3,286	253.5	1	509.1	6.26	0.042	0.044
Section 3:								
M_{tt}	15,370	1,894	550.7	13	1127.5	0.00	1.000	1.000
M_{0t}	14,619	1,104	577.0	1	1156.1	28.60	0.000	0.000
Section 5:								
M_{0t}	10,522	1,975	111.3	1	224.5	0.00	0.969	1.000
M_{tt}	16,835	2,006	104.7	11	231.4	6.90	0.031	0.032
Section 6:								
M_{0t}	15,194	1,996	225.6	1	453.2	0.00	0.997	1.000
M_{tt}	19,512	3,072	219.5	13	465.0	11.81	0.003	0.003
Section 7:								
M_{0t}	6,161	1,307	84.8	1	171.6	0.00	0.950	1.000
M_{tt}	12,291	1,828	80.7	8	177.4	5.89	0.050	0.053

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
8/23/2016	66	0	0	0	0	0	0	0	0	0	0	0	66	0
8/24/2016	74	0	0	0	0	0	0	0	0	0	0	0	74	0
8/25/2016	0	0	88	0	0	0	0	0	0	0	0	0	88	0
8/26/2016	0	0	57	0	0	0	0	0	0	0	0	0	57	0
8/27/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2016	0	0	150	0	0	0	0	0	0	0	0	0	150	0
8/29/2016	0	0	0	0	0	0	0	0	0	0	19	0	19	0
8/30/2016	0	0	0	0	0	0	134	0	0	0	4	0	138	0
8/31/2016	0	0	0	0	0	0	158	0	39	0	0	0	197	0
9/1/2016	0	0	0	0	36	0	0	0	26	0	0	0	62	0
9/2/2016	212	1	0	0	90	0	0	0	0	0	0	0	302	1
9/3/2016	322	0	132	2	0	0	0	0	0	0	0	0	454	2
9/4/2016	0	0	133	3	0	0	0	0	0	0	0	0	133	3
9/5/2016	0	0	39	7	0	0	126	4	0	0	0	0	165	11

	1		3		5		6		7		9		Total	
Date	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**	**Sample**	**Recap**
9/6/2016	0	0	0	0	0	0	116	2	0	0	25	0	141	2
9/7/2016	0	0	0	0	0	0	0	0	94	2	0	0	94	2
9/8/2016	217	3	0	0	78	3	0	0	0	0	0	0	295	6
9/9/2016	326	6	0	0	58	0	0	0	0	0	0	0	384	6
9/10/2016	0	0	212	8	0	0	153	7	0	0	0	0	365	15
9/11/2016	0	0	171	23	0	0	120	4	0	0	0	0	291	27
9/12/2016	0	0	114	3	0	0	0	0	0	0	0	0	114	3
9/13/2016	0	0	0	0	0	0	0	0	40	3	50	4	90	7
9/14/2016	0	0	0	0	32	3	0	0	26	2	12	0	70	5
9/15/2016	230	3	0	0	50	1	0	0	0	0	0	0	280	4
9/16/2016	0	0	0	0	20	1	50	4	0	0	0	0	70	5
9/17/2016	181	16	0	0	0	0	82	8	0	0	0	0	263	24
9/18/2016	0	0	176	9	0	0	54	2	22	0	0	0	252	11

Table G5 (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	164	15	0	0	0	0	22	1	0	0	186	16
9/20/2016	0	0	150	9	25	2	0	0	36	1	0	0	211	12
9/21/2016	0	0	0	0	53	0	0	0	0	0	19	1	72	1
9/22/2016	0	0	0	0	27	3	0	0	0	0	5	1	32	4
9/23/2016	295	13	0	0	0	0	0	0	0	0	0	0	295	13
9/24/2016	0	0	279	28	0	0	122	7	0	0	0	0	401	35
9/25/2016	0	0	246	26	0	0	74	2	107	3	0	0	427	31
9/26/2016	0	0	0	0	56	3	38	2	0	0	29	2	123	7
9/27/2016	298	21	0	0	63	3	25	0	0	0	0	0	386	24
9/28/2016	0	0	311	20	0	0	224	11	0	0	0	0	535	31
9/29/2016	0	0	74	7	0	0	65	2	107	9	0	0	246	18
9/30/2016	0	0	0	0	0	0	0	0	0	0	32	1	32	1
10/1/2016	0	0	0	0	172	8	0	0	0	0	0	0	172	8
Total	**2,221**	**63**	**2,496**	**160**	**760**	**27**	**1,541**	**55**	**519**	**21**	**195**	**9**	**7,732**	**335**

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

Date	1	3	5	6	7	9	Total
9/15/2016	205.8	11.6	57.6	1.0	0.0	0.0	276
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		Date	Sample	Marks	Recap
Section 1:					**Section 5:**			
9/3/2016	9	3			9/8/2016	1	2	
9/8/2016	3	12			9/9/2016	1	2	
9/9/2016	3	12	1		9/14/2016	1	4	1
9/15/2016	3	17			9/21/2016	2	4	
9/17/2016	2	17			9/26/2016	1	6	1
9/23/2016	3	22	2		9/27/2016	1	6	
9/27/2016	3	23	1		10/1/2016	1	7	
Section 3:					**Section 6:**			
8/28/2016	19	6			9/11/2016	1	1	
9/3/2016	5	29	1		9/17/2016	2	2	1
9/5/2016	6	29			9/24/2016	2	3	1
9/11/2016	7	39			9/28/2016	1	4	1
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					

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**

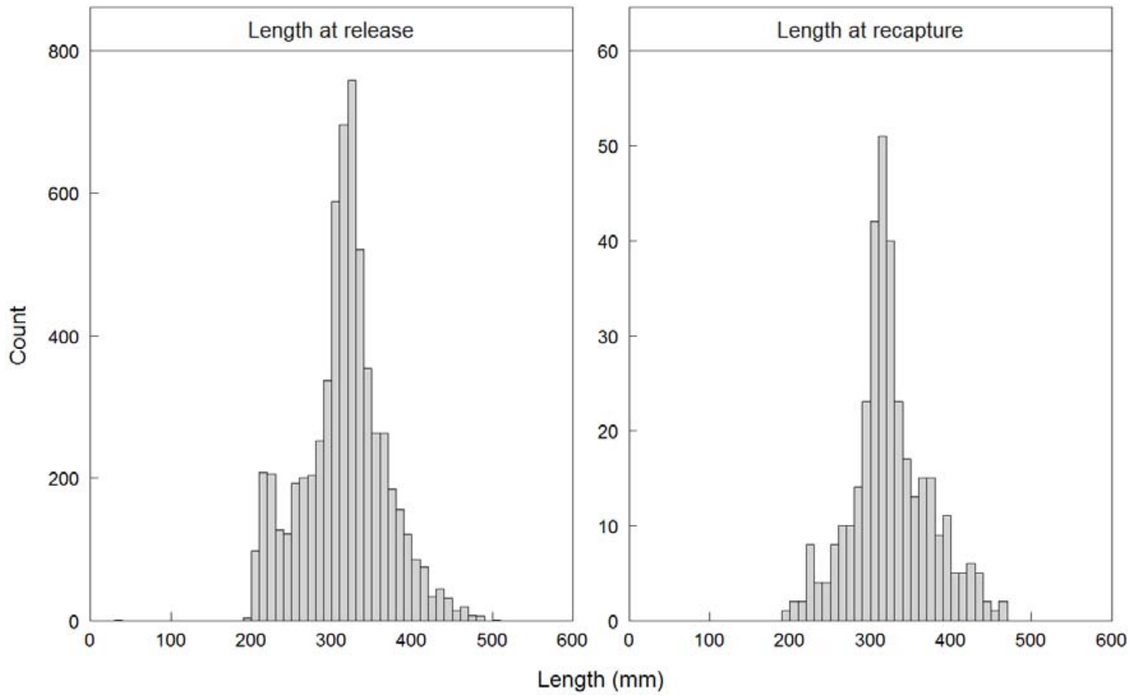


Figure G1 Histogram of Mountain Whitefish lengths at release (left) and recapture (right).

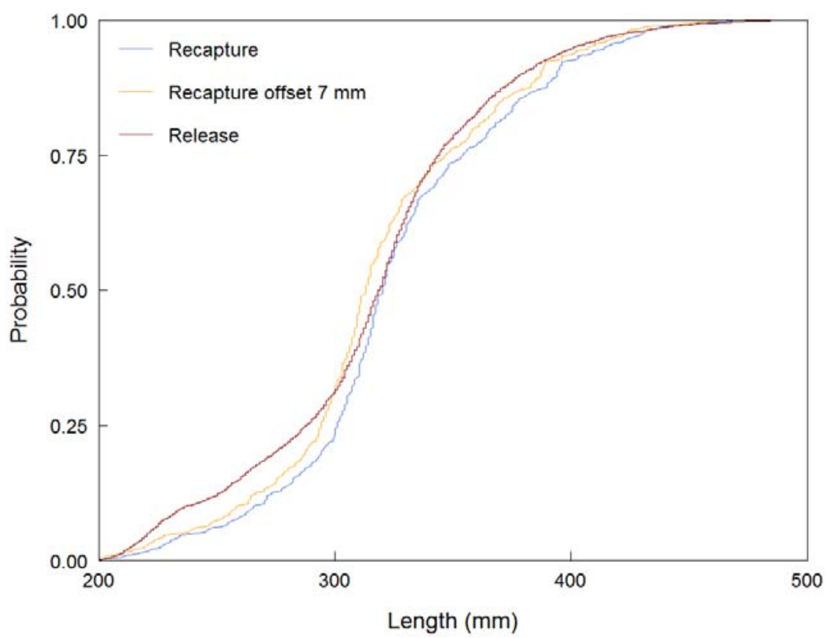


Figure G2 Mountain Whitefish cumulative proportion of length at release and recapture.

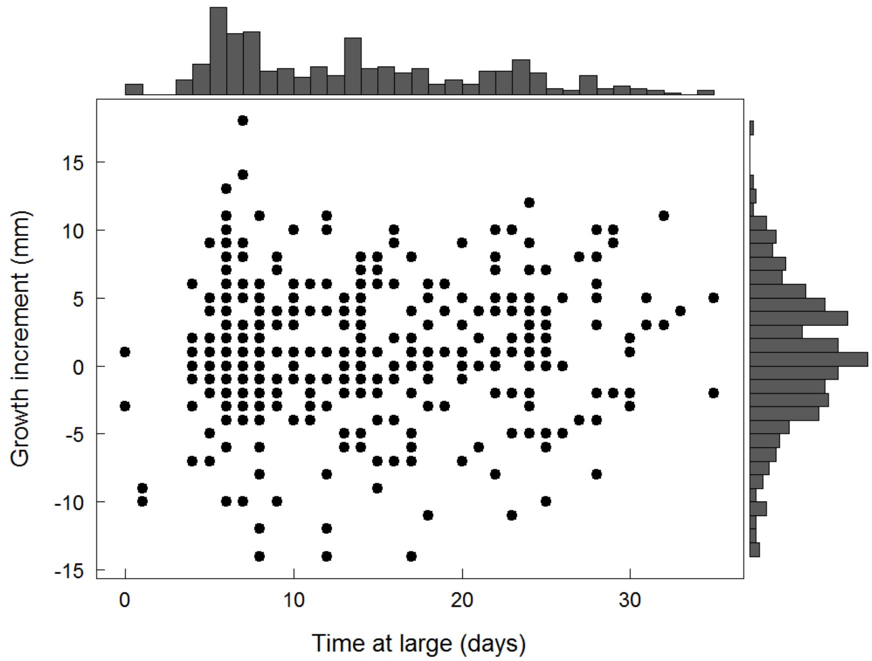


Figure G3 Growth over the study period of Mountain Whitefish with border histograms of time at large and growth increment.

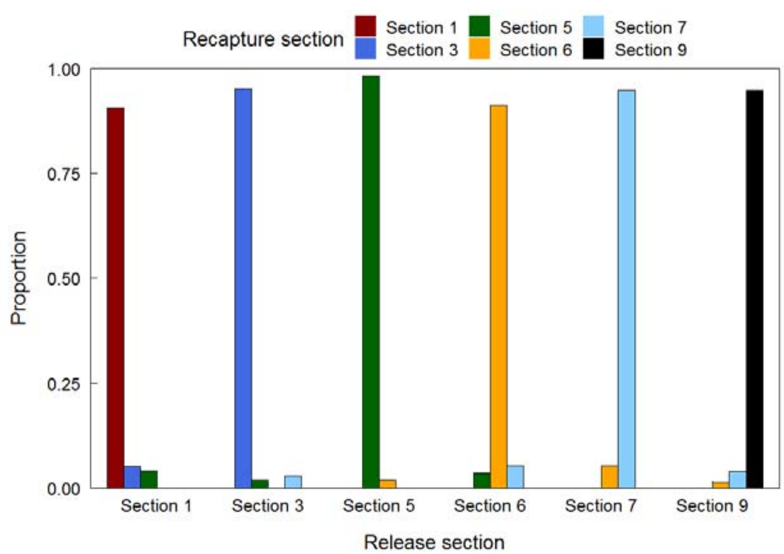


Figure G4 Distribution of recaptured marks in 2016 standardized for sampling effort by section of Mountain Whitefish released in 2016.

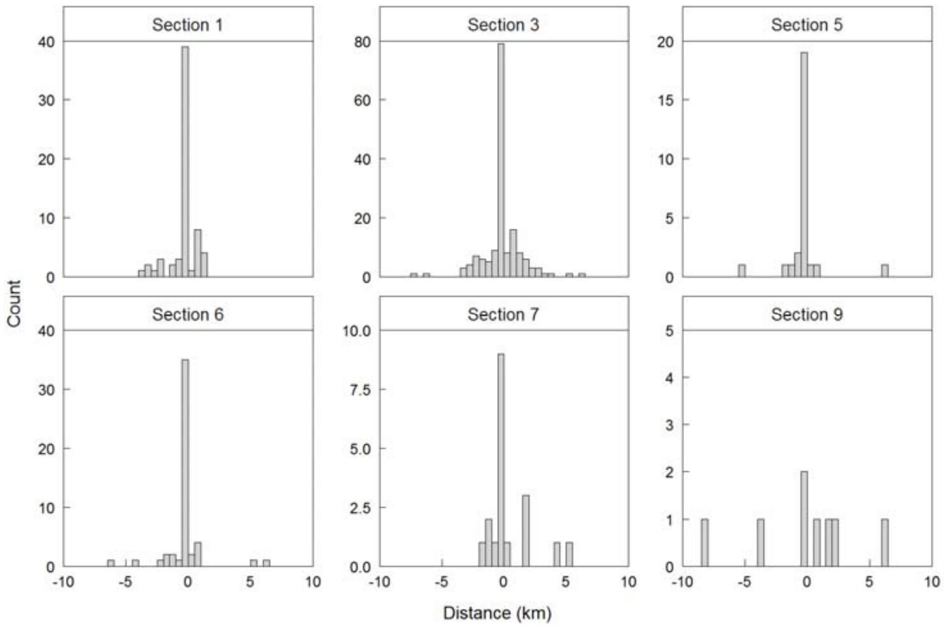


Figure G5 Bar plot of the travel distance of recaptured Mountain Whitefish released in 2016 within each of the sections sampled (positive values indicate upstream movement and negative values downstream movement). Each section is independently scaled.

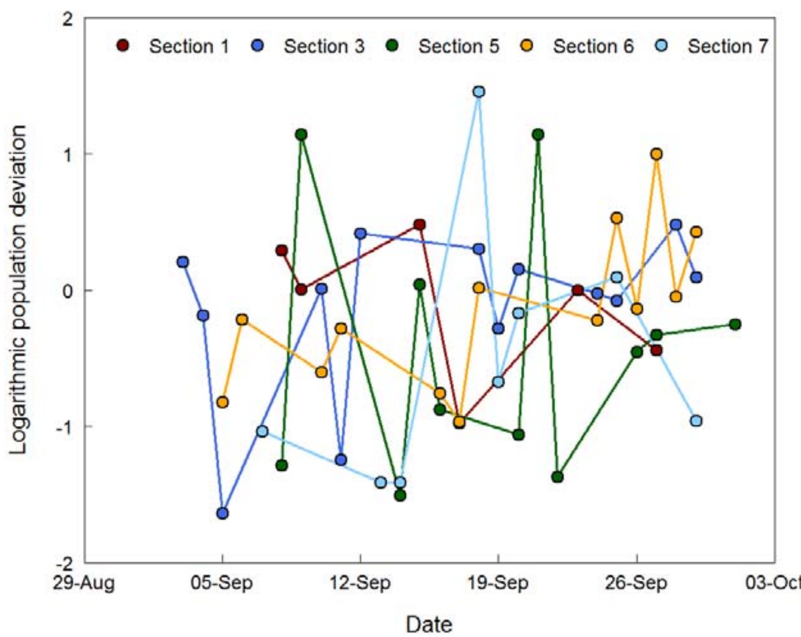


Figure G6 Logarithmic population deviation from the mean by section and date for Mountain Whitefish.

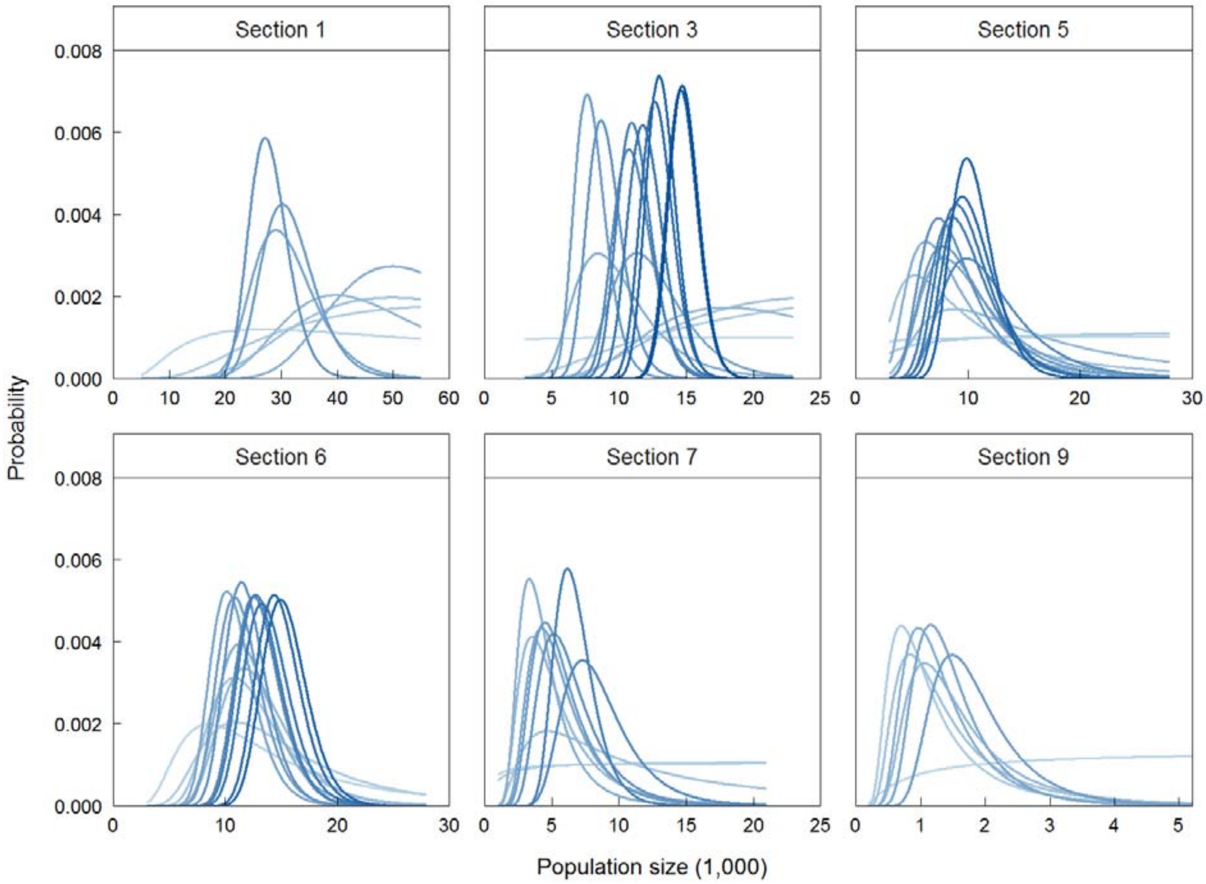


Figure G7 Sequential posterior probability plots of population size by section for Mountain Whitefish in 2016. Each line is the posterior probability updated by a sample day.

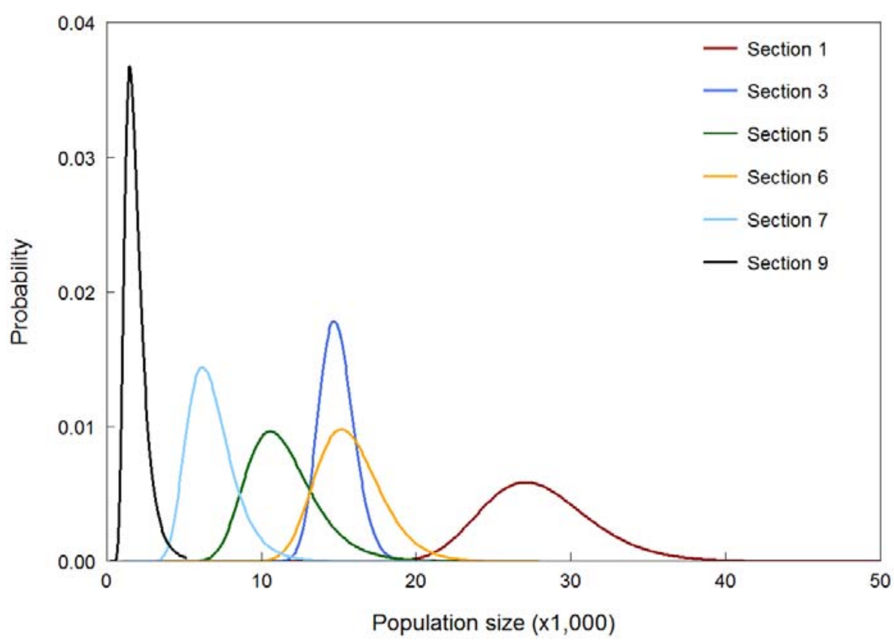


Figure G8 Final posterior distributions by section for Mountain Whitefish in 2016.

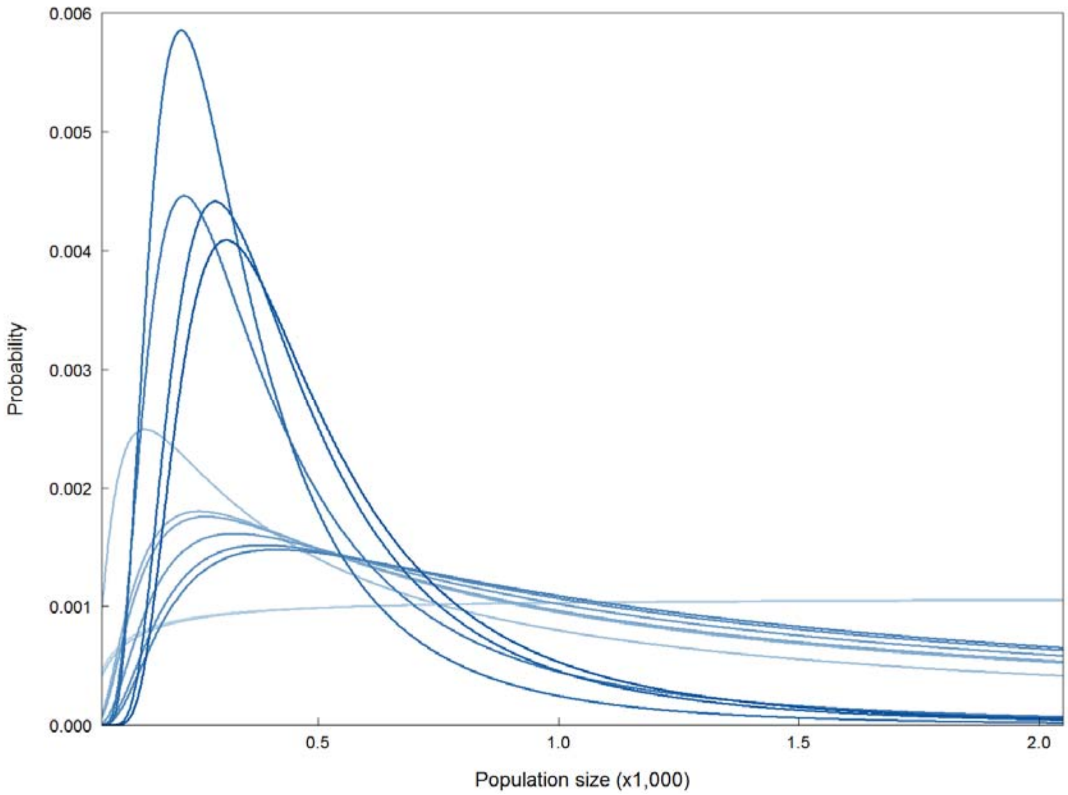


Figure G9 Sequential posterior probability plots of population size for Section 3 Arctic Grayling in 2016. Each line is the posterior probability updated by a sample day.

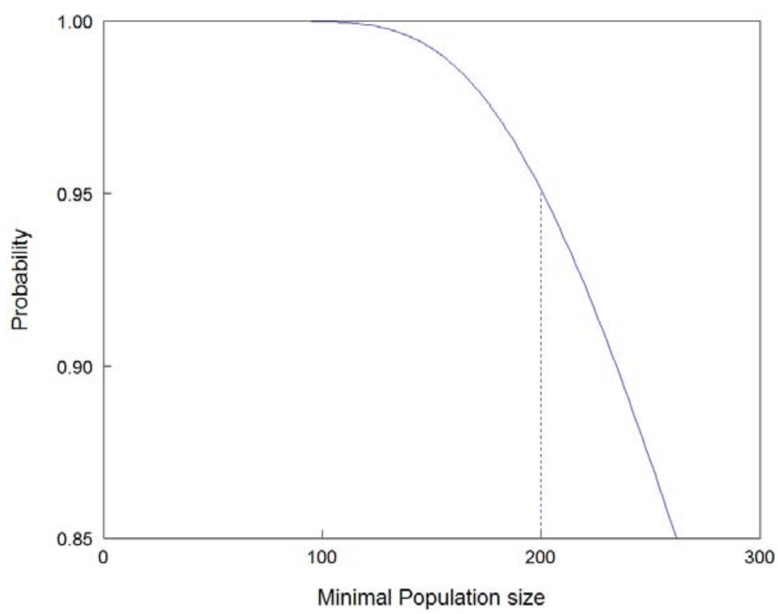


Figure G10 Minimal population estimates for Section 3 Arctic Grayling in 2016. The dashed vertical line indicates the 0.95 probability that the population size was at least 200 in Section 3.

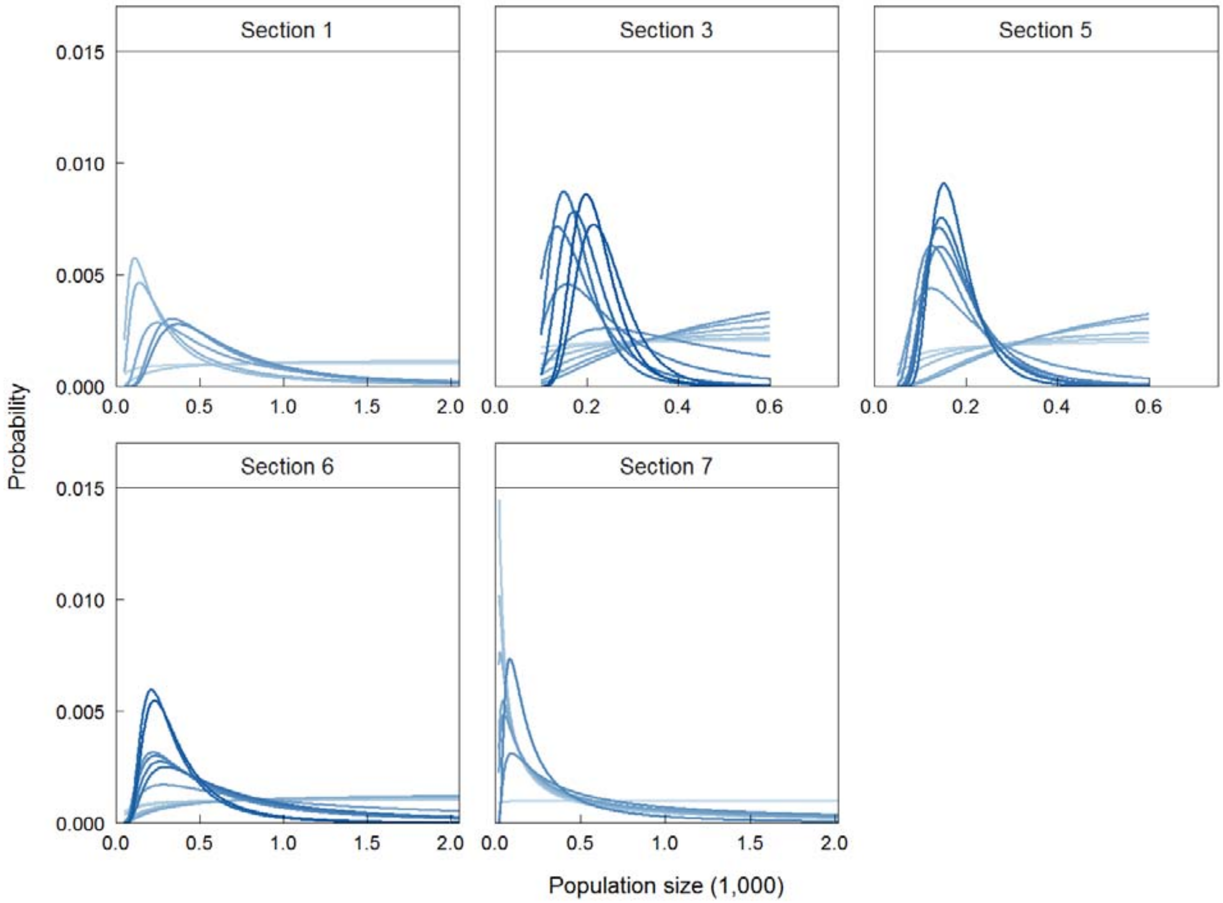


Figure G11 Sequential posterior probability plots of population size by section for Bull Trout in 2016. Each line is the posterior probability updated by a sample day.

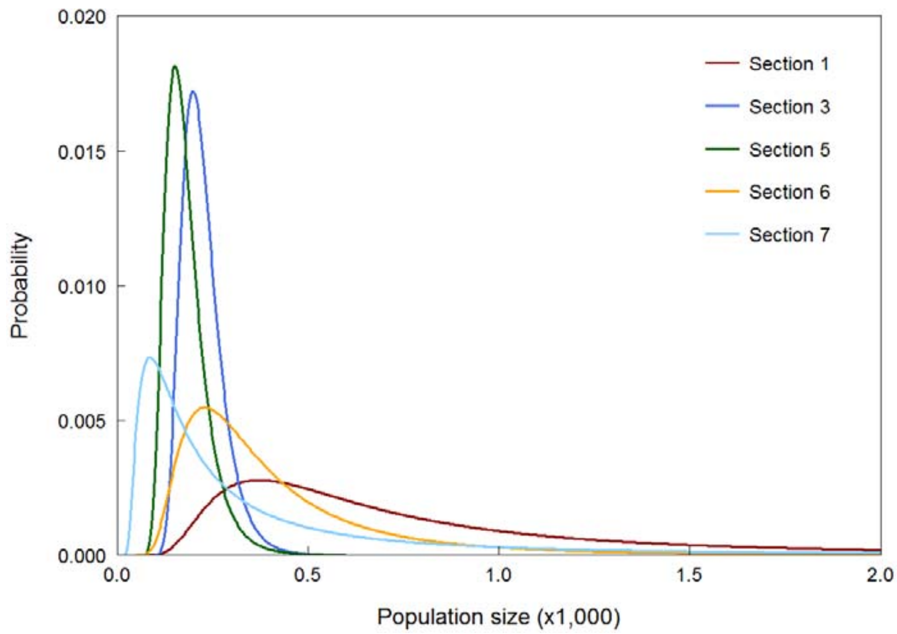


Figure G12 Final posterior distributions by section for Bull Trout.

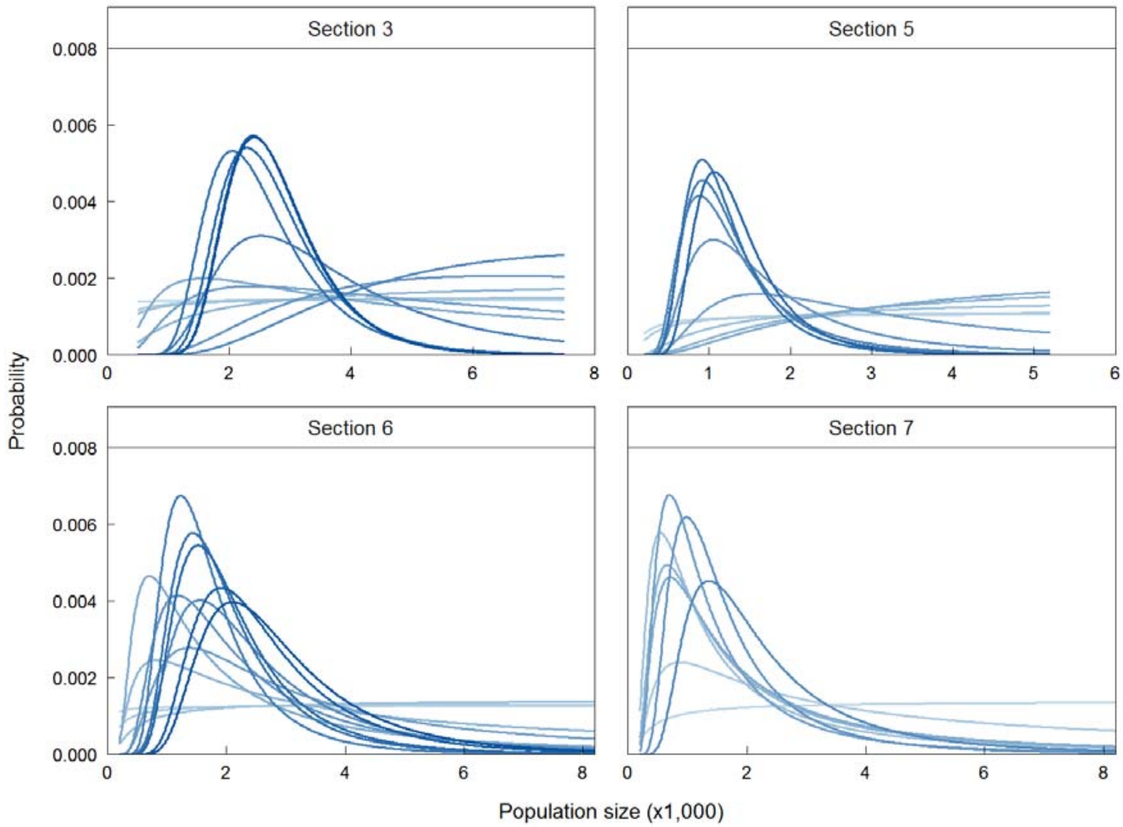


Figure G13 Sequential posterior probability plots of population size by section for Largescale Sucker in 2016. Each line is the posterior probability updated by a sample day.

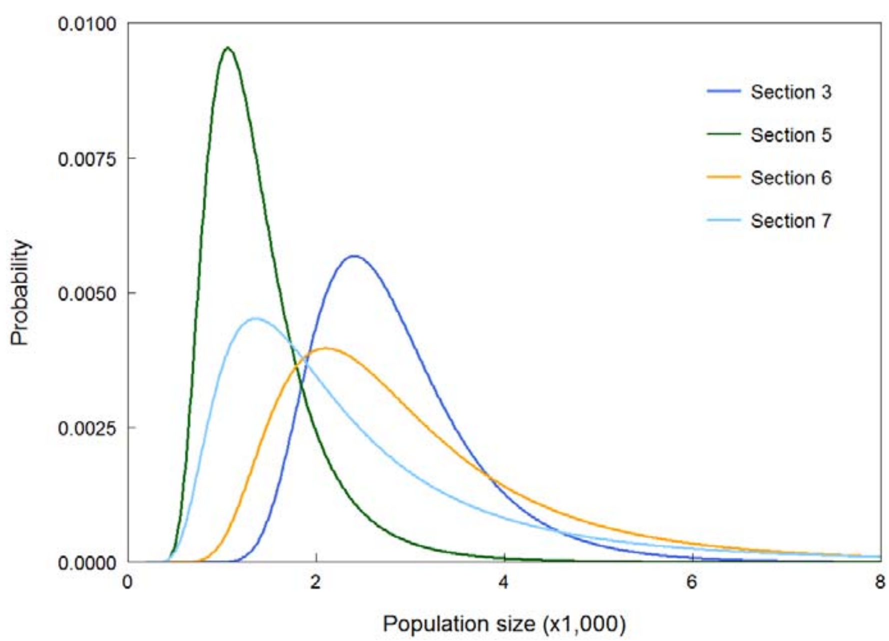


Figure G14 Final posterior distributions by section for Largescale Sucker.

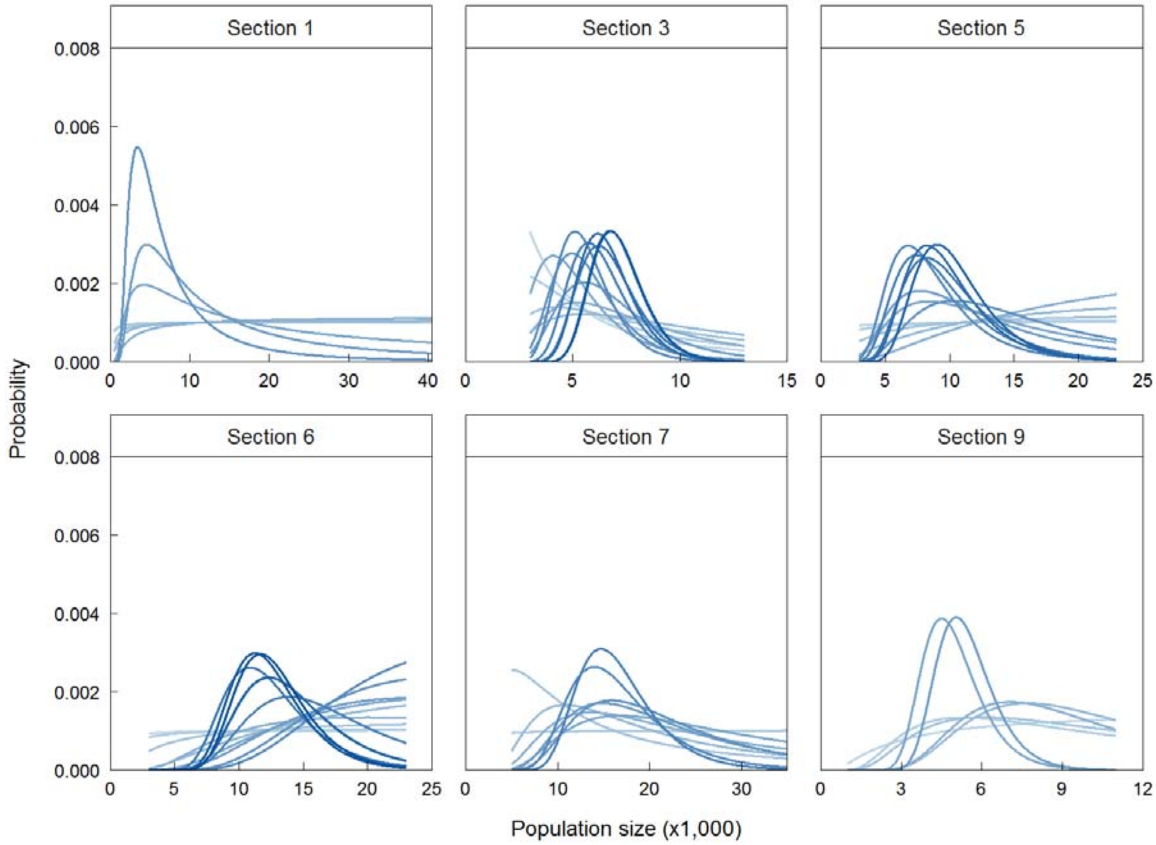


Figure G15 Sequential posterior probability plots of population size by section for Longnose Sucker in 2016. Each line is the posterior probability updated by a sample day.

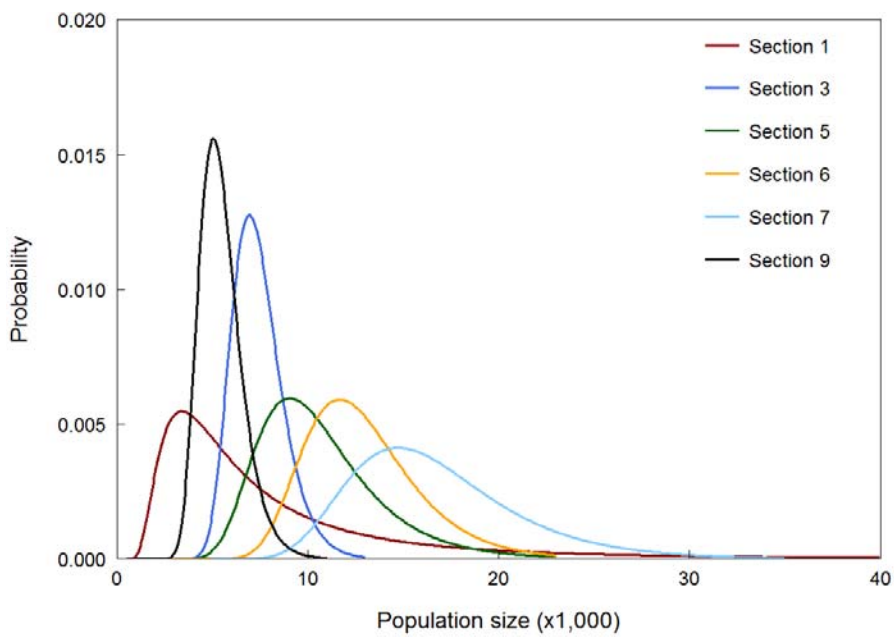


Figure G16 Final posterior distributions by section for Longnose Sucker.

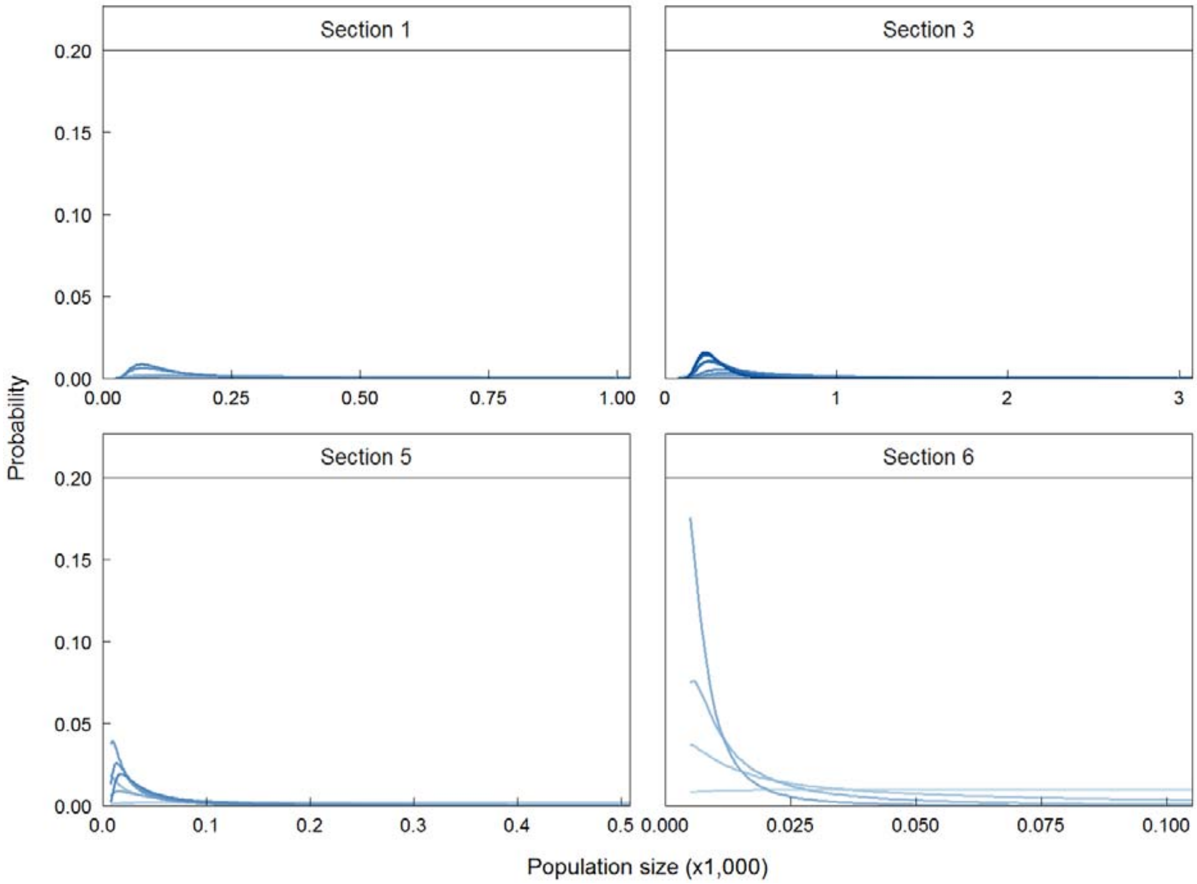


Figure G17 Sequential posterior probability plots of population size by section for Rainbow Trout in 2016. Each line is the posterior probability updated by a sample day.

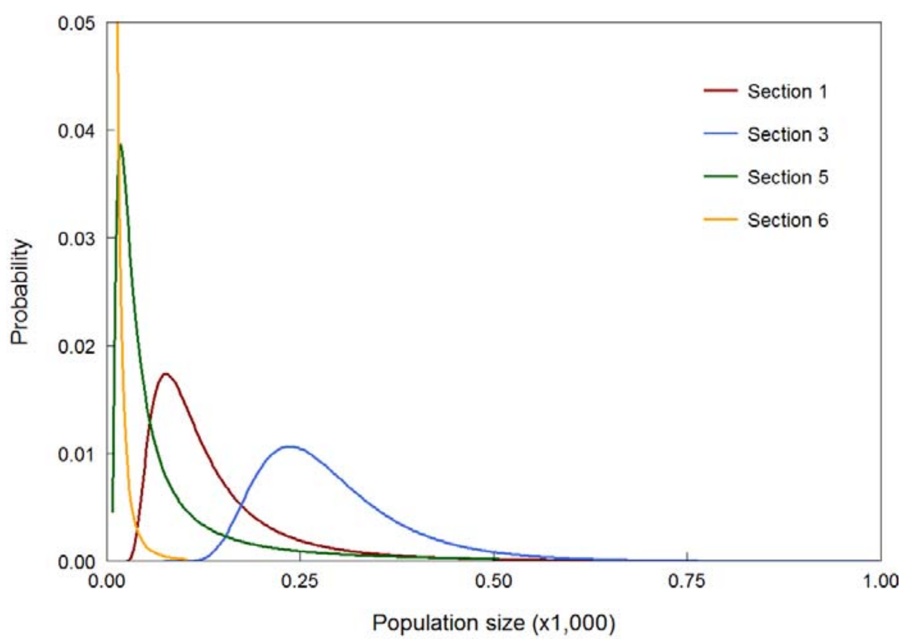


Figure G18 Final posterior distributions by section for Rainbow Trout.

APPENDIX H

Mountain Whitefish Synthesis Model

Introduction

In 2016, the Mountain Whitefish age structured stochastic model that was developed by Gazey and Korman (2016) was updated to include recent (i.e., 2015 and 2016) data in addition to historical data from 2002 to 2014 that were collected as part of the Peace River Large Fish Index Survey. 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

During the current study, an extensive review of the Peace River Fish Index Database identified inconsistencies with some of the historical (2002 to 2013) data where fish were erroneously "linked" to the incorrect sample information. These data were amended prior to data being extracted from the database. 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). Ten fish were censored as outliers (extreme length for estimated age). In total, 3048 fish were aged as age-3 and younger, and 194 of these fish were subsequently recaptured for a total of 3242 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, 106 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 252 logit parameters estimated by the synthesis model. The coefficient of variation (CVs) for these estimates were all less than 0.1 (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. Note that in 2014 through 2016, more small marked fish were sampled than predicted in all sections.

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 (1.73, 2.53, and

2.91, 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 28.5 mm, 56.2 mm, and 47.2 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 2014-2016 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. Ten outliers not included.

Section	Estimated age													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	6	103	233	415	17	16	12	8	3	5		1	1	1	821
3	40	424	586	530	35	19	14	13	5	6	3	4	1		1,680
5	40	234	234	203	9	4	6	1	3	3	1	2	1		741
Total	86	761	1,053	1,148	61	39	32	22	11	14	4	7	3	1	3,242

Table H2: Number (sum of Floy and PIT tags) of incremental length samples by section, release year, and recapture year. The model subsequently excluded 106 of these samples based on the outlier criteria (-15 mm/yr and > 50 mm/yr).

Release Year	Section	Recapture year														
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	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		477
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	705
	5							184	55	79	43	21	4	4	4	394

Release Year	Section	Recapture year														
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
2009	1								129	129	101	30	9	8	6	412
	3								203	189	90	40	8	7	7	544
	5								115	134	72	39	13	4	2	379
2010	1									153	106	36	22	17	9	343
	3									363	153	103	37	30	15	701
	5									148	66	32	21	16	5	288

Table H2 (concluded)

Release Year	Section	Recapture year														
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
2011	1										237	73	30	52	39	431
	3										392	219	62	66	45	784
	5										197	102	32	18	8	357
2012	1											203	98	58	45	404
	3											453	87	78	55	673
	5											229	49	27	9	314
2013	1												114	76	68	258
	3												197	189	113	499
	5												111	55	35	201
2014	1													128	72	200
	3													165	102	267
	5													74	32	106
2015	1														112	112
	3														238	238
	5														50	50
Total		**492**	**798**	**1,453**	**830**	**1,577**	**1,494**	**1,344**	**1,083**	**1,863**	**1,787**	**1,733**	**940**	**1,108**	**1,090**	**17,592**

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

Size Bin (mm)	Capture year														
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
200-209								1		2					3
210-219															
220-229								1					2	1	4
230-239		2											1		3
240-249			1		1					1				5	8
250-259		1	3		6	3	3	2	20	12	11	1		9	71
260-269	2	5	11	13	18	13	19	16	52	64	76	5	1	6	301
270-279	11	23	40	23	39	58	66	38	104	161	174	34	16	20	807
280-289	29	42	94	58	86	100	88	61	159	233	257	61	41	32	1,341
290-299	26	54	129	108	117	139	137	100	198	234	276	122	114	73	1,827
300-309	46	81	144	91	171	158	152	133	229	223	242	178	146	137	2,131
310-319	65	102	189	112	173	179	168	128	209	177	191	161	186	169	2,209
320-329	72	136	183	111	209	179	153	124	188	167	140	117	190	208	2,177
330-339	82	120	176	103	187	170	133	108	155	131	115	72	137	144	1,833
340-349	53	90	131	73	154	140	98	95	141	115	103	67	89	81	1,430
350-359	41	51	92	50	109	107	75	83	100	80	69	51	74	50	1,032
360-369	22	33	69	42	73	71	69	49	80	51	30	36	47	52	724
370-379	15	27	54	17	56	48	46	42	78	56	31	19	30	38	557
380-389	15	26	48	19	62	51	48	40	50	39	23	21	23	28	493

Size Bin (mm)	Capture year														
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
390-399	11	10	36	10	43	33	26	31	38	33	12	11	16	24	334
400-409	7	21	30	9	34	25	30	19	28	23	8	7	8	12	261
410-419	9	9	24	10	23	16	19	18	29	12	11	7	6	15	208
420-429	4	6	25	6	31	20	17	9	17	14	12	5	9	6	181
430-439	3	6	13	3	16	9	13	17	22	7	8	4	4	5	130
440-449	1	4	21	2	15	9	6	9	11	6	4	1	4	6	99
≥450		6	17	2	25	17	14	10	16	7	4	8	5	17	148
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**	**18,312**

Table H4: Length frequency of unmarked Mountain Whitefish.

Size Bin (mm)	Capture year														
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	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	68
80-89			17		4		19	8	5	1		4	80	80	50	268
90-99		2	23	6	11		7	8	17	1		5	164	64	47	355
100-109		1	6	3	18		5	3	19	2			97	35	7	196
110-119		1			14	3			10	3	2		34	6		73
120-129	1	2	3	1	2	22	1	1		15	1	7	4	1	2	63
130-139	3	7	5	22	2	101	17	11	1	19	5	35	2		11	241
140-149	10	24	17	93	1	267	76	51	4	33	19	73	6	6	68	748
150-159	27	77	110	146	29	266	91	180	39	6	31	90	56	55	152	1,355
160-169	10	80	256	96	102	113	63	224	163	18	24	44	341	198	140	1,872
170-179	5	28	188	28	203	57	38	101	231	28	9	10	570	232	75	1,803
180-189	16	3	43	34	143	27	220	31	84	94	44	18	205	159	18	1,139
190-199	40	18	21	140	48	55	387	65	36	162	112	43	62	60	24	1,273
200-209	36	75	84	238	67	175	484	212	61	179	126	73	56	15	64	1,945
210-219	32	82	236	261	243	286	300	217	229	115	156	65	189	67	163	2,641

Size Bin (mm)	Capture year															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
220-229	70	61	345	159	259	239	140	269	304	168	220	80	179	193	188	2,874
230-239	175	57	167	130	168	209	137	498	171	283	306	160	77	156	114	2,808
240-249	206	99	95	247	151	338	230	568	171	321	327	226	48	77	91	3,195
250-259	113	166	146	234	257	285	306	332	356	352	435	337	71	91	156	3,637
260-269	112	231	237	170	228	261	385	293	512	564	457	434	122	119	169	4,294
270-279	148	242	346	222	252	294	411	339	626	780	604	441	222	140	143	5,210

Table H4 (concluded)

Size Bin (mm)	Capture year														
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
280-289	150	195	454	317	293	349	398	330	535	908	632	482	319	133	175	5,670
290-299	188	175	527	368	343	291	393	335	451	745	506	411	379	250	207	5,569
300-309	305	229	563	339	340	337	365	310	412	615	392	337	335	301	318	5,498
310-319	441	284	602	366	289	306	343	244	316	449	286	239	298	313	403	5,179
320-329	517	336	618	383	278	293	296	226	315	365	216	148	193	272	418	4,874
330-339	416	295	502	341	205	234	256	203	237	288	170	135	121	182	246	3,831
340-349	291	196	373	251	150	184	182	167	180	244	144	85	93	127	149	2,816
350-359	158	119	253	191	80	127	162	143	169	201	103	83	81	75	101	2,046
360-369	85	82	232	141	69	136	130	99	125	138	74	66	39	60	67	1,543
370-379	72	60	130	126	35	85	95	90	100	100	58	36	44	39	56	1,126
380-389	67	53	94	74	34	69	70	56	75	67	60	22	34	52	36	863
390-399	45	46	92	58	24	64	62	55	58	48	45	21	20	30	21	689
400-409	24	31	73	51	19	51	43	32	39	52	27	17	10	14	12	495
410-419	27	24	65	53	24	45	43	33	37	39	18	10	13	12	21	464
420-429	15	15	61	25	14	30	28	15	16	25	26	11	8	5	10	304
430-439	10	5	37	24	12	28	12	14	11	17	8	7	8	5	15	213
440-449	9	9	37	30	7	19	8	8	9	13	7	3	4	8	4	175
≥450	9	12	81	36	10	37	22	16	14	21	9	10	6	8	10	301
Total	**3,833**	**3,422**	**7,140**	**5,405**	**4,428**	**5,685**	**6,228**	**5,789**	**6,138**	**7,480**	**5,659**	**4,269**	**4,610**	**3,655**	**3,985**	**77,726**

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

Year	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	830
	5	274	330
2005	1	182	966
	3	635	928
	5	352	658
2006	1	39	451
	3	276	309
2007	1	170	647
	3	412	825
	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

Year	Section	Length Bin	
		<250 mm	≥250 mm
	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
2015	1	85	480
	3	255	633
	5	182	289
2016	1	116	480
	3	346	668
	5	159	215

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

Year	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

Year	Section	Newly Marked	Previously Marked	Unmarked	Dead Unmarked	Dead Marked
	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

Table H6 (concluded)

Year	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	875	430	1,429	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	212	837	0	0
2016	1	1,301	371	1,789	1	0
	3	1,065	602	1,740	1	1
	5	352	159	572	0	0
Total		51,777	18,217	83,675	264	146

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

Release Year	Section	Recapture Year															
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	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		572
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
2008	1							161	200	85	87	56	23	6	2	4	624
	3							302	271	137	153	74	39	12	9	7	1,004
	5							168	184	54	79	43	21	4	4	4	561
2009	1								131	128	129	101	30	9	8	6	542
	3								215	203	189	90	40	8	7	7	759

Release Year	Section	Recapture Year															
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
	5								151	114	135	72	39	13	4	2	530
2010	1									83	153	106	36	22	17	9	426
	3									198	363	153	102	37	30	15	898
	5									85	147	66	32	21	15	5	371

Table H7 (concluded)

Release Year	Section	Recapture Year															
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
2011	1										244	235	74	30	52	39	674
	3										414	392	221	62	66	46	1,201
	5										206	197	102	32	18	8	563
2012	1											355	202	98	58	45	758
	3											534	452	87	77	55	1,205
	5											226	229	49	26	9	539
2013	1												126	113	76	68	383
	3												426	197	190	113	926
	5												230	111	55	35	431
2014	1													75	128	72	275
	3													82	167	100	349
	5													51	74	32	157
2015	1														75	106	181
	3														132	226	358
	5														46	48	94
2016	1															61	61
	3															148	148
	5															23	23
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**	**25,688**

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

Parameter	Year	Section 1		Section 3		Section 5	
		Estimate	SE	Estimate	SE	Estimate	SE
Nuisance length-at-age							
Length age-10 (mm)		322.0	4.1	328.5	3.2	364.0	7.2
Growth coefficient		0.400	0.018	0.354	0.010	0.254	0.014
Individual length SD (mm)		24.4	0.7	25.3	0.6	33.4	1.3
Growth							
Length age-0 (mm)		96.5	2.5	94.6	1.1	94.4	1.2
Growth coefficient		0.184	0.005	0.113	0.004	0.140	0.014
Individual length SD (mm)		28.5	0.7	56.2	1.7	47.2	4.0
Length age-10 (mm)	2003	290.5	2.4	279.7	3.1		
	2004	308.6	1.8	329.9	3.1		
	2005	280.2	1.8	284.7	2.7	308.6	6.0
	2006	291.7	1.9	323.8	3.1		
	2007	288.2	1.9	295.0	2.7	338.1	6.7
	2008	303.2	2.0	289.9	2.5	319.1	6.8
	2009	289.8	2.0	283.1	2.8	320.8	4.7
	2010	305.1	2.1	292.6	2.5	317.2	5.0
	2011	285.1	1.7	265.5	2.4	287.1	6.0
	2012	276.0	1.7	252.9	2.4	271.5	5.8

Parameter	Year	Section 1		Section 3		Section 5	
	2013	283.6	2.0	255.0	2.5	276.8	5.6
	2014	331.4	2.1	315.1	3.1	325.3	5.2
	2015	324.2	2.3	308.7	2.9	317.4	5.0
	2016	311.6	2.3	292.2	2.7	308.9	7.5
Selectivity							
Mid length bin (10 mm increments)	2002-13	29.5	0.36	30.7	0.32	33.5	0.79
	2014-16	34.3	1.23	100.0	0.02	100.0	0.14
Slope	2002-13	1.8	0.05	2.7	0.06	3.5	0.23
	2014-16	3.4	0.41	13.4	1.26	14.8	2.29

Table H8 (concluded)

Parameter	Year	Section 1		Section 3		Section 5	
		Estimate	SE	Estimate	SE	Estimate	SE
Asymptotic Survival (logit)	2002-04	-1.122	0.045	-1.322	0.031		
	2005-07	-0.923	0.057	-1.443	0.054	-0.947	0.052
	2008-10	-1.370	0.093	-1.305	0.059	-2.075	0.158
	2011-13	0.064	0.085	-0.568	0.068	-0.355	0.117
	2014-15			-2.051	0.368	-1.494	0.509
Recruitment ($\log_e$)	2002	12.04	0.17	11.74	0.12		
	2003	12.09	0.51	14.33	0.15		
	2004	13.97	0.31	10.94	0.66	12.88	0.25
	2005	14.01	0.33	14.27	0.14	14.23	0.38
	2006	12.51	0.63	11.47	0.81	12.62	0.89
	2007	12.63	0.63	10.80	0.60	10.69	0.62
	2008	13.31	0.36	10.72	0.58	10.19	0.50
	2009	11.91	0.58	10.74	0.60	9.97	0.53
	2010	11.83	0.57	11.80	0.79	10.37	0.55
	2011	12.36	0.67	12.27	0.67	10.61	0.63
	2012	12.88	0.63	11.41	0.62	11.89	0.38
	2013	13.04	0.46	10.14	0.50	10.26	0.55
	2014	11.48	0.53	9.88	0.39	9.89	0.48
	2015	11.91	0.60	8.70	0.40	10.05	0.44

Parameter	Year	Section 1		Section 3		Section 5	
	2016	12.15	0.68	9.04	0.42	10.01	0.44
Miscellaneous							
Capture probability coefficient		0.0354	0.0100	0.0256	0.0112	0.0663	0.0179
Negative binomial dispersion coefficient		1.73	0.11	2.53	0.15	2.91	0.21

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

	Section 1		Section 3		Section 5	
Year	Estimate	SE	Estimate	SE	Estimate	SE
2002	18,132	635	9,253	340		
2003	16,010	790	8,224	355		
2004	22,980	825	16,162	632	9,091	614
2005	13,636	482	9,486	309	9,604	713
2006	16,366	538	16,083	623		
2007	14,785	556	13,112	455	14,981	1,036
2008	19,727	902	15,611	601	11,719	764
2009	18,812	785	17,627	710	16,929	1,012
2010	39,309	2,172	26,219	1,000	22,726	1,293
2011	29,304	1,318	18,259	638	17,524	982
2012	18,944	732	13,021	426	11,100	601
2013	18,502	1,087	11,561	476	9,794	662
2014	16,828	1,008	14,529	889	13,997	1,204
2015	18,879	1,079	13,834	704	11,994	1,308
2016	19,220	934	12,256	1,008	10,191	1,873

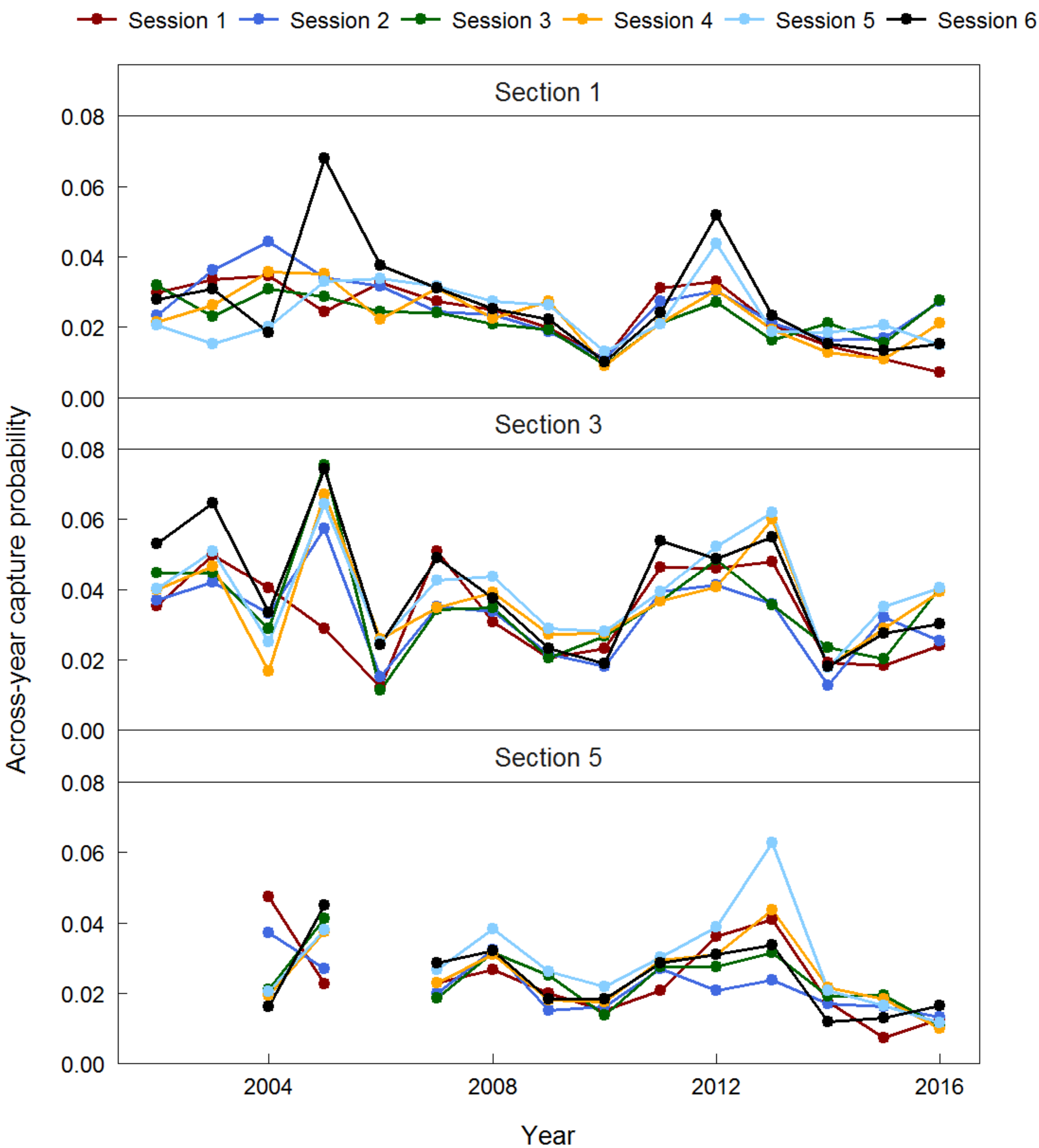


Figure H1: Across year capture probability estimates by section, year and session.

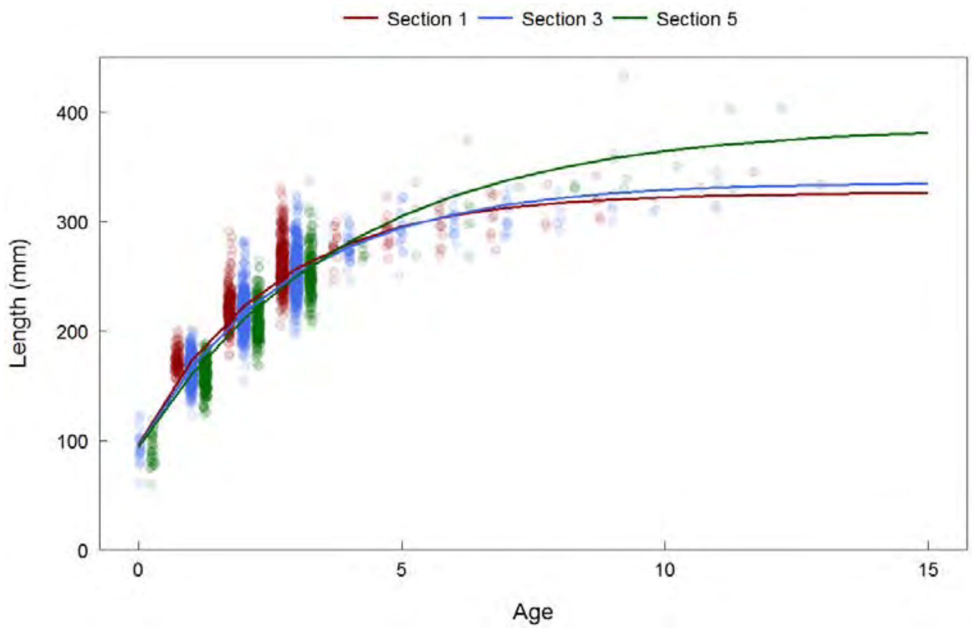


Figure H2: Observed (points) and expected (lines) length-at-age by section.

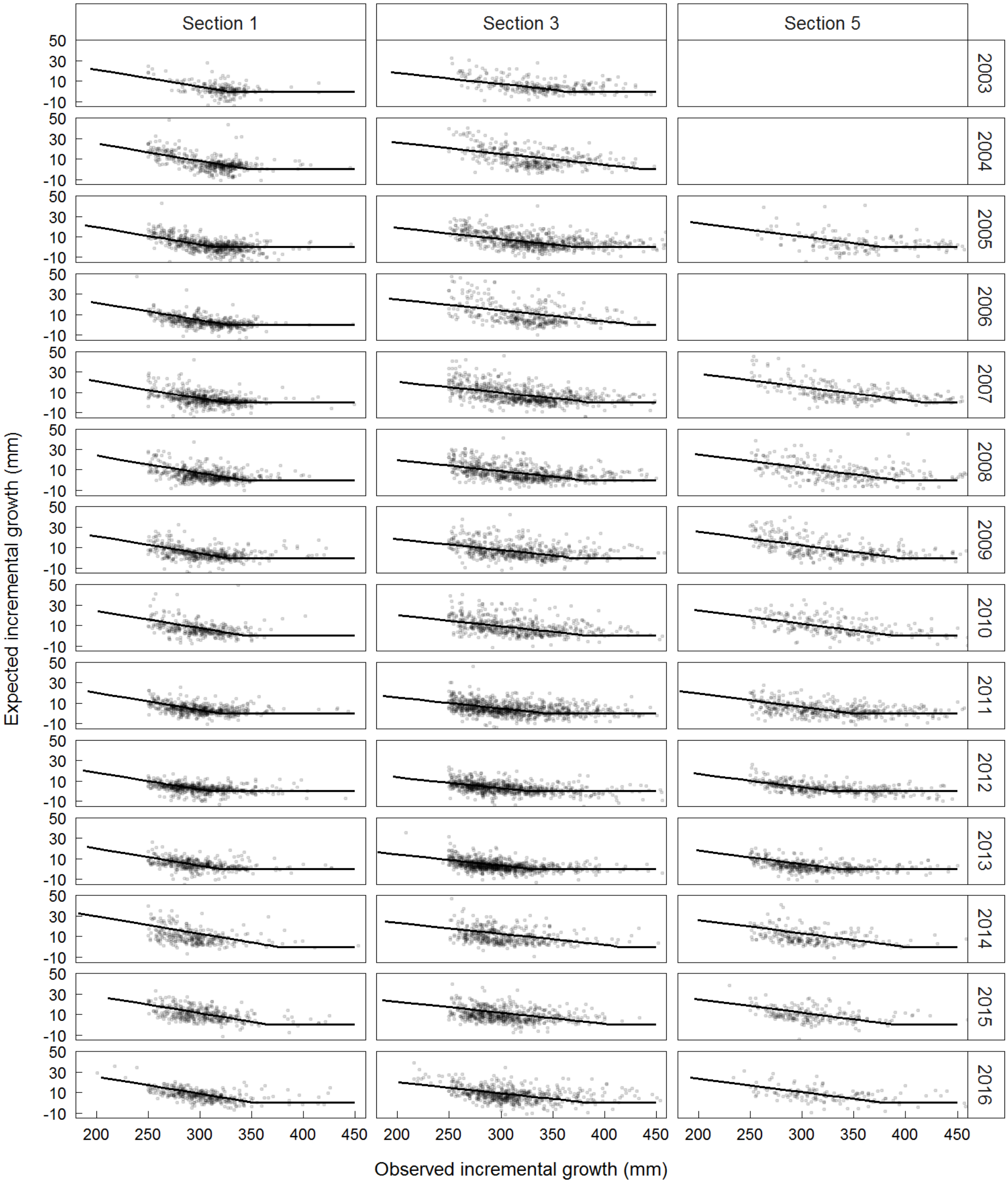


Figure H3: Observed (points) and expected (line) incremental growth of marked Mountain Whitefish as a function of size at release for Section 1 and year of recapture. Note that the expected increment is based on all observations, which include recaptures from adjacent years.

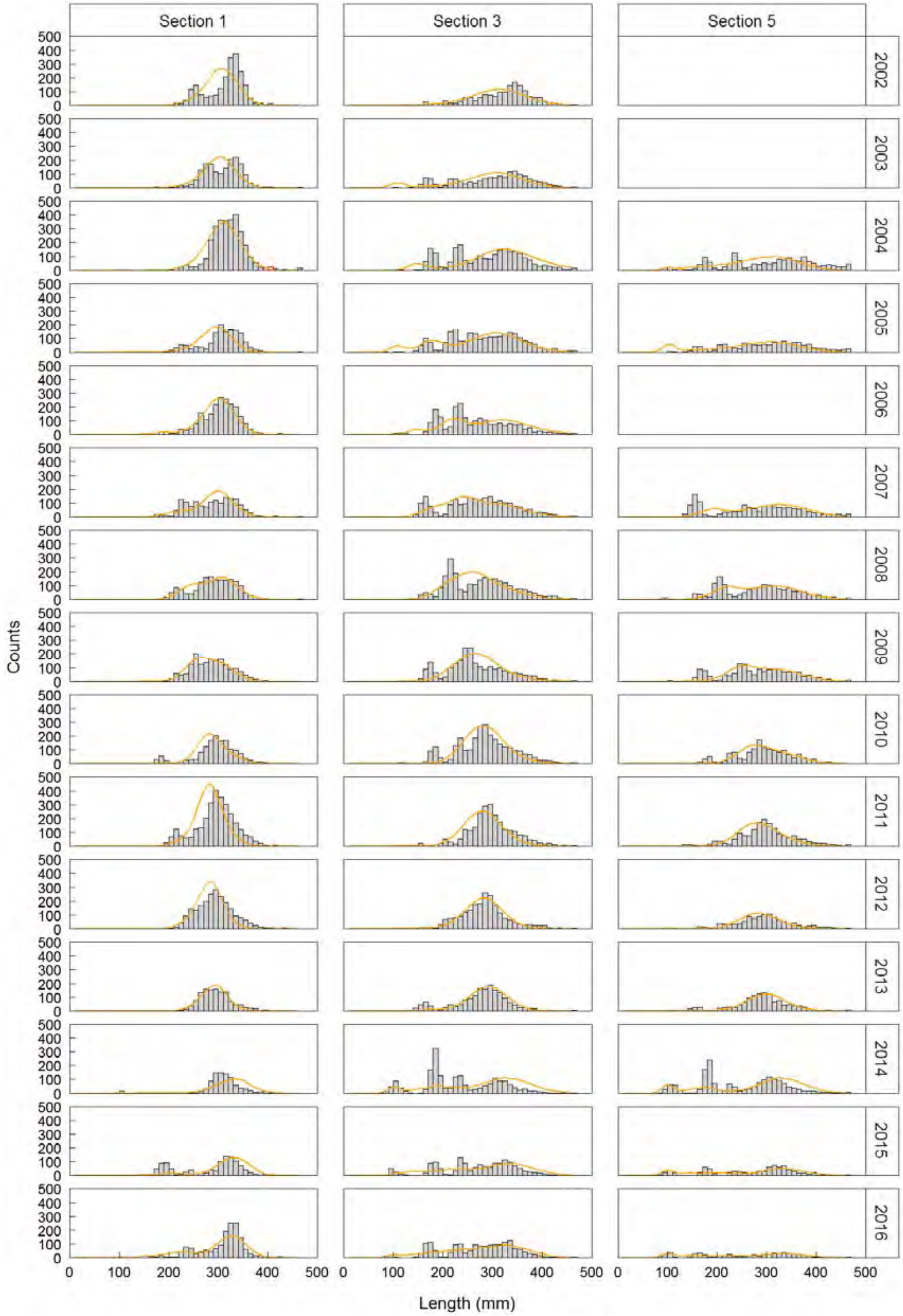


Figure H4: Length frequency of observed (histogram) and predicted (lines) by year for unmarked Mountain Whitefish by Section.

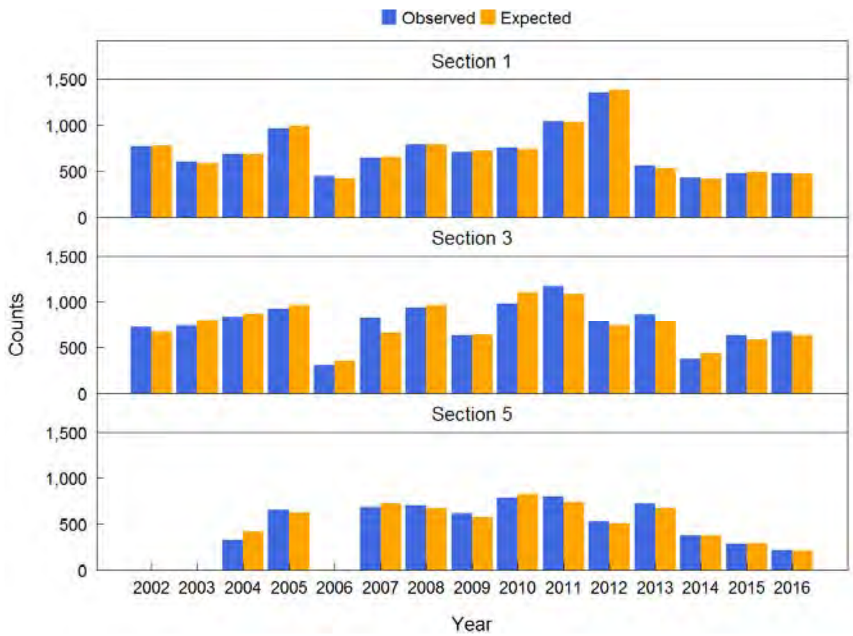


Figure H5: Observed and predicted number of unmarked and unmeasured Mountain Whitefish by section.

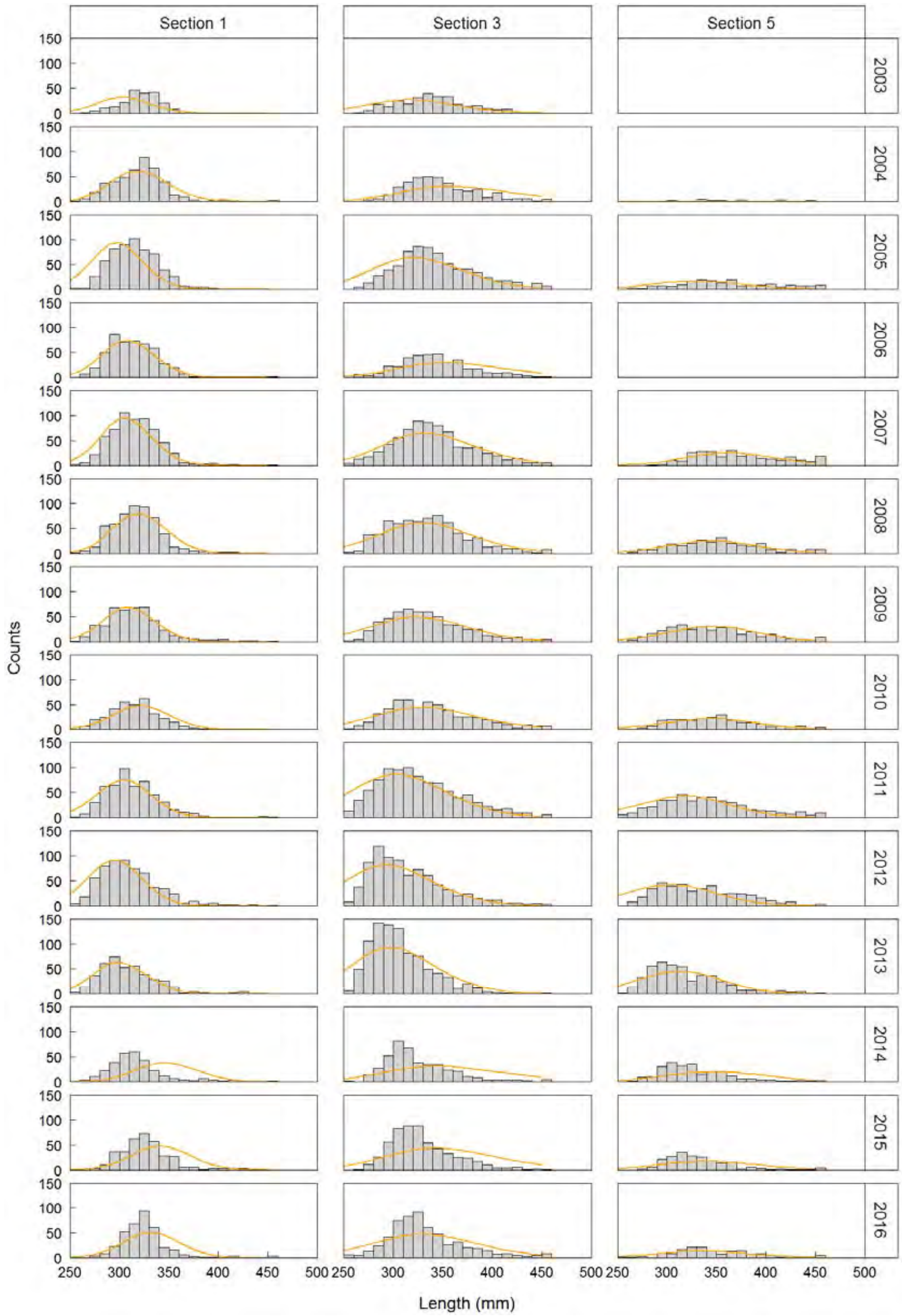


Figure H6: **Length frequency of observed (histogram) and predicted (lines) by year for marked Mountain Whitefish in Section 1.**

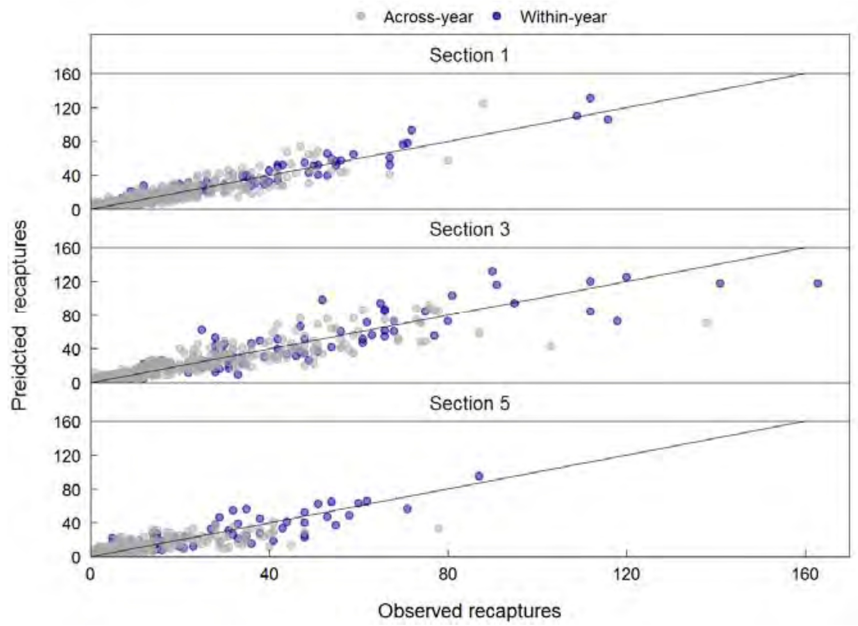


Figure H7: **Observed versus predicted recaptures by section. The line is the 1:1 association or line of equality. The solid points are within year and the grey points across year recaptures.**

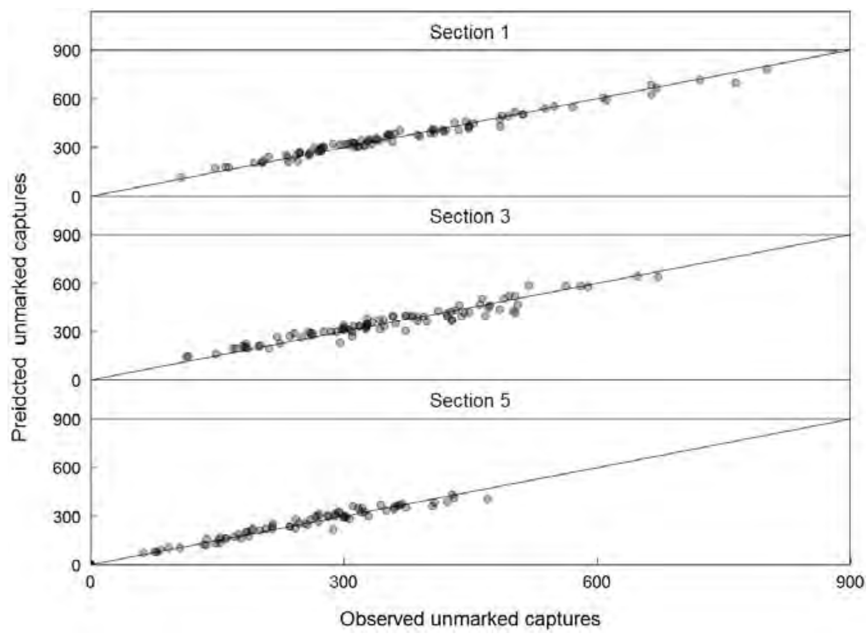


Figure H8: **Observed versus predicted unmarked captures by section. The line is the 1:1 association or line of equality.**

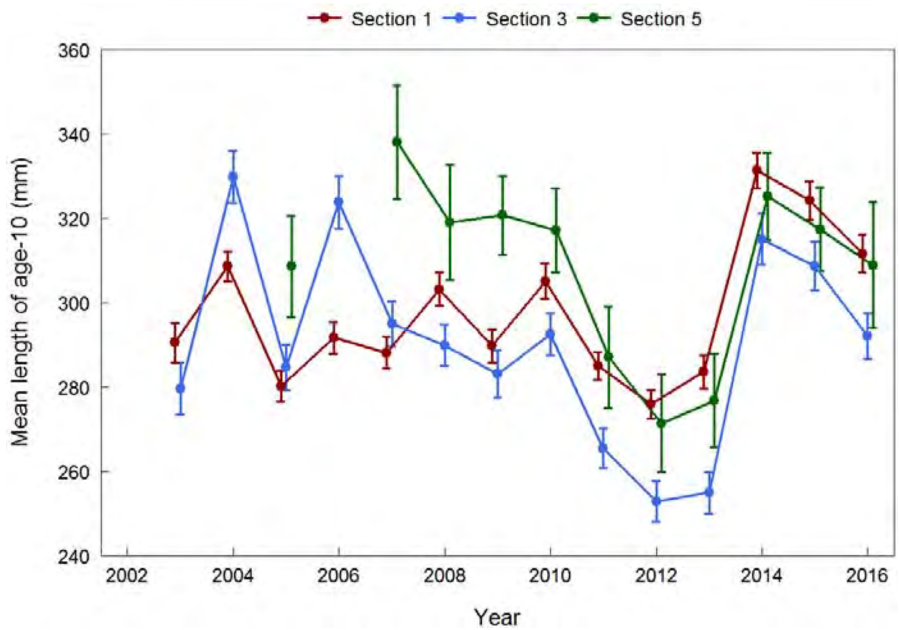


Figure H9: **Predicted mean length of age-10 Mountain Whitefish by section and year. The error bars represent ± 2 standard errors.**

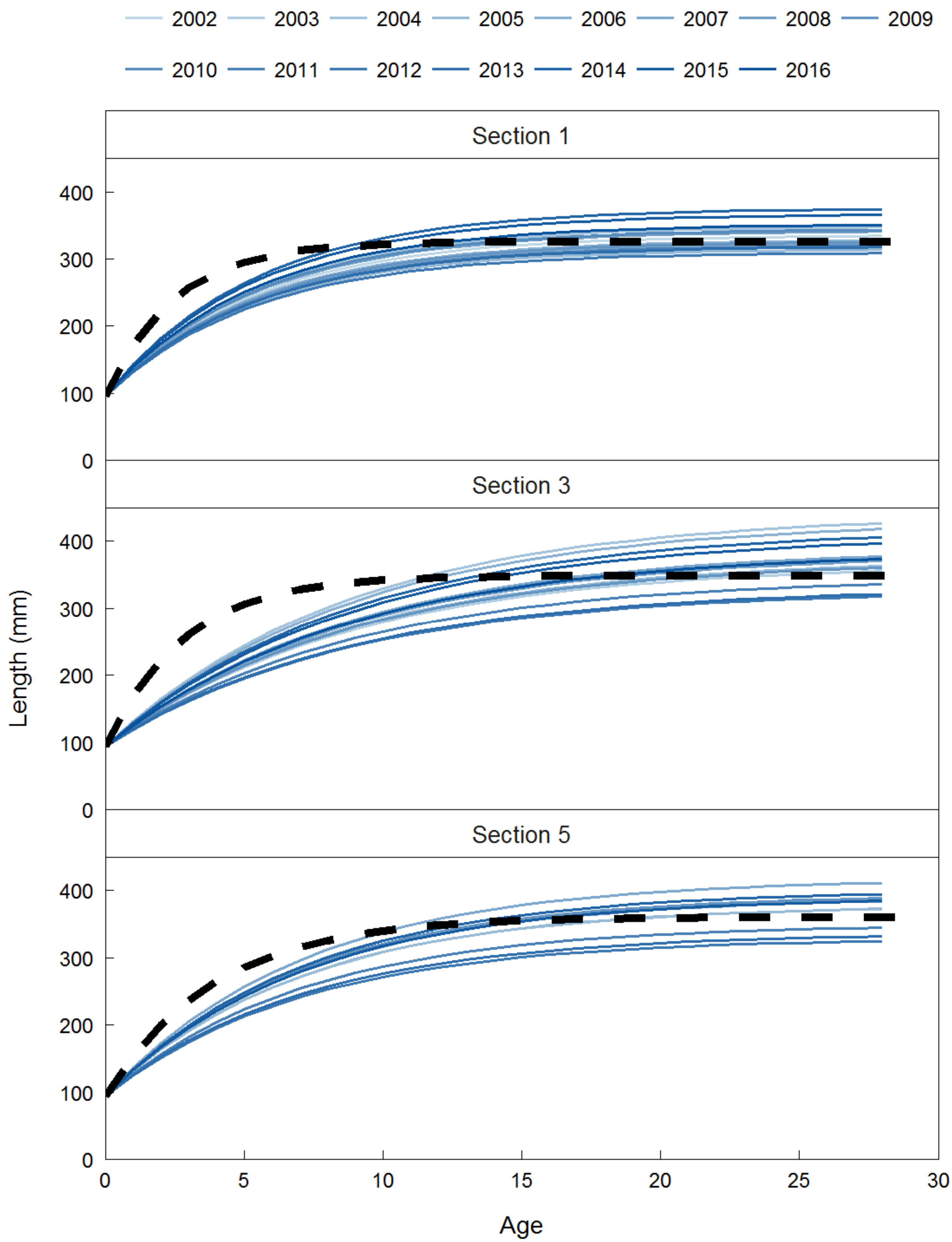


Figure H10: Predicted length-at-age by year and section. The predicted lengths based on age data (Age) are also overlaid.

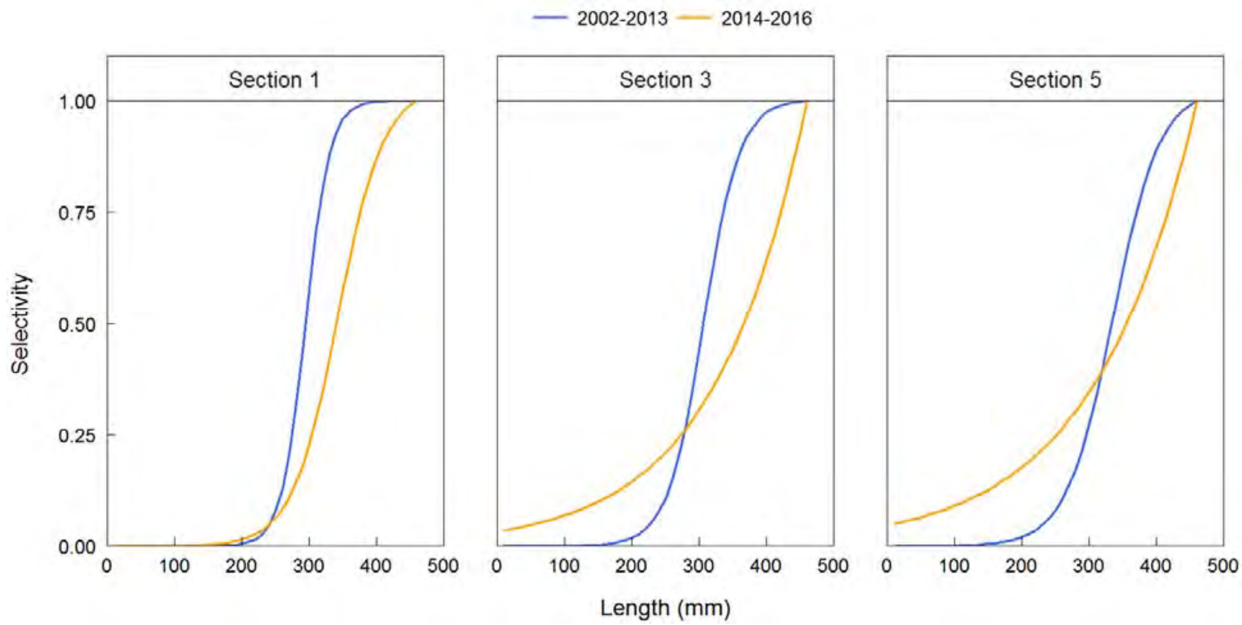


Figure H11: Predicted size selectivity by epoch and section.

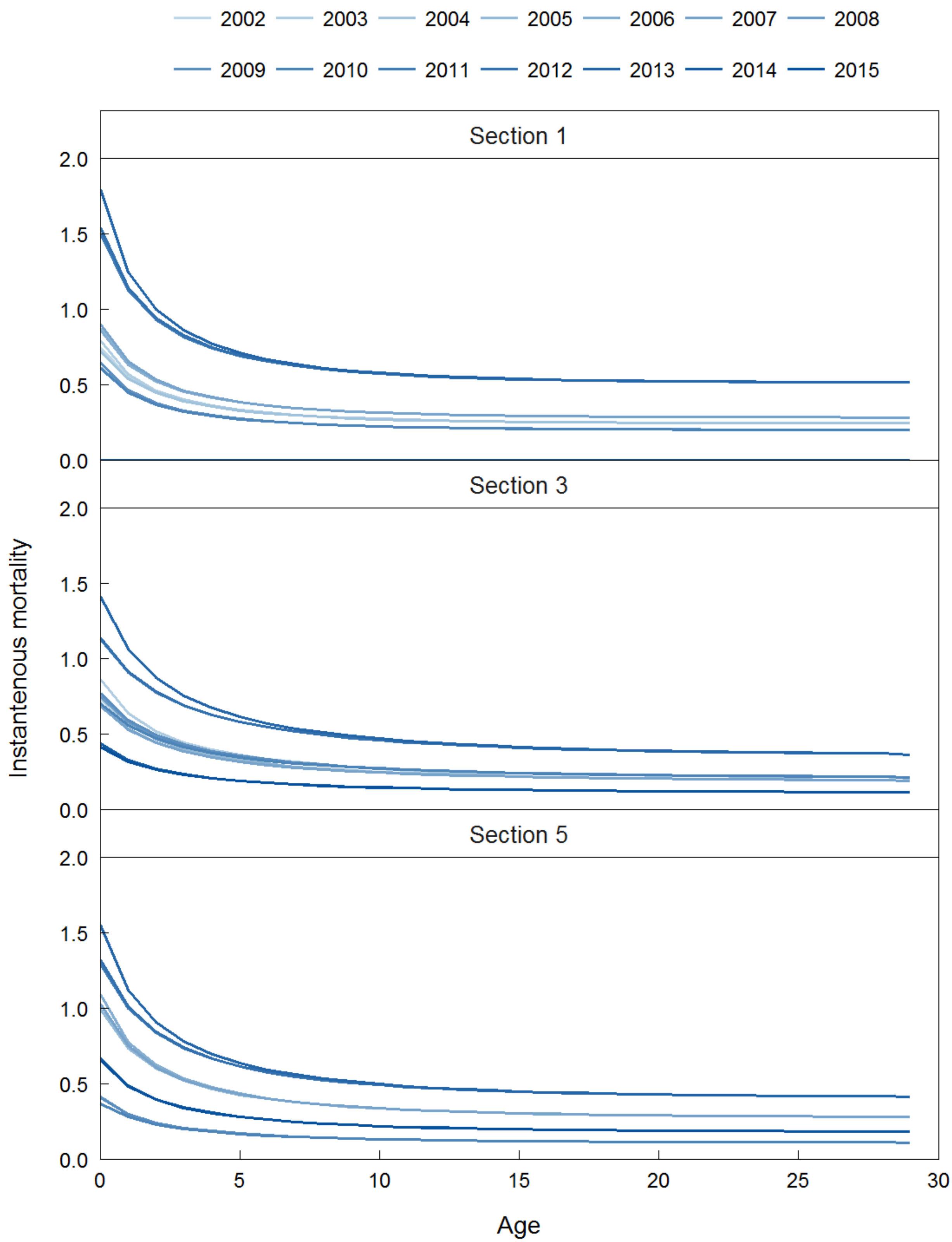


Figure H12: Predicted instantaneous mortality by age and section.

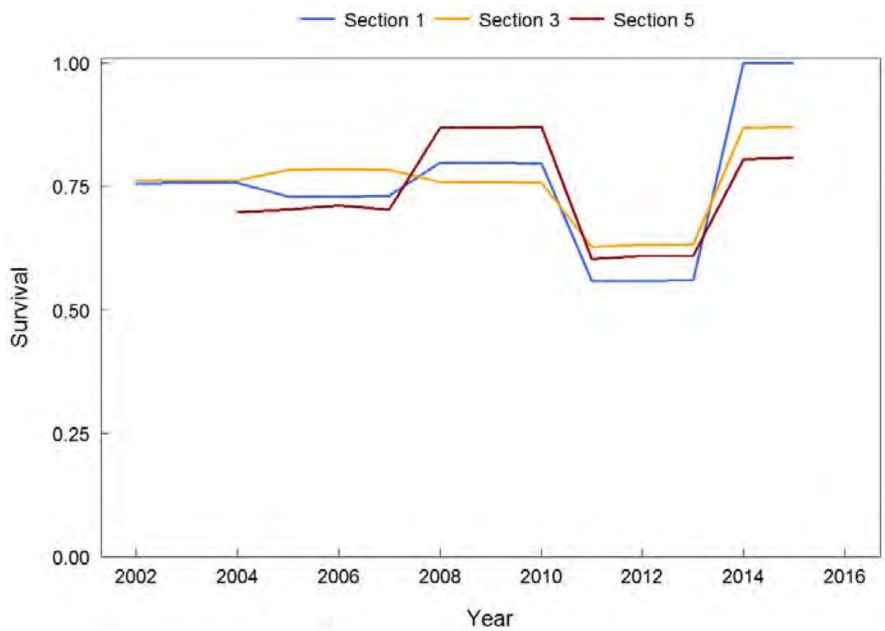


Figure H13: **Predicted mean survival of marked Mountain Whitefish by year, weighted by the number at age, and section.**

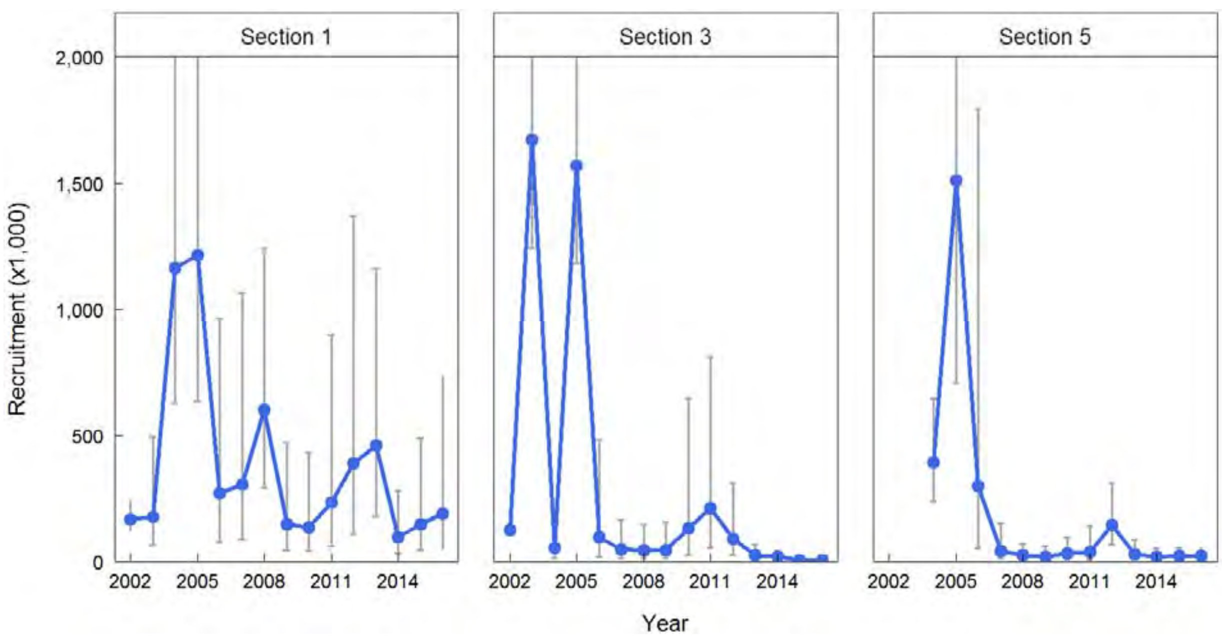


Figure H14: **Predicted recruitment by section and year. Error bars represent ± 2 standard errors. The error bars were truncated to 2.0 million.**

GOLDER

golder.com