Peace Project Water Use Plan

Peace River Side Channel Monitoring

Implementation Year 2

Reference: GMSMON-7

Peace River Side Channel Monitoring 2014 Study

Study Period: 2014 January 1 to December 31

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GMSMON-7 PEACE RIVER SIDE CHANNEL MONITORING 2014 STUDY

BC Hydro
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Final Report
2015 February 13

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GMSMON-7
PEACE RIVER SIDE CHANNEL MONITORING
- 2014 STUDY -

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EXECUTIVE SUMMARY

For over 40 years the W.A.C. Bennett Dam (along with the GMS power station) and Peace Canyon Dam (PCN) have regulated downstream flow on the Peace River while generating power for British Columbia. Regulation of the Peace River has reduced the mean annual flood by approximately 70%, increased the winter flows, and increased diurnal variability. The reduction of the frequency and magnitude of large flood flows has resulted in a loss of side channel fish habit due to sedimentation of fines and vegetation encroachment. In 1995, the PCN minimum discharge was voluntarily set by BC Hydro to 283 m^3/s to reduce habitat losses and stranding in side channels. The 283 m^3/s flow requirement was formalized in the Peace Order, however the WUP committee noted some side channels may be re-watered if the minimum flow had an additional 141 m^3/s. Before changing minimum flow levels, the WUP committee agreed to first study a non-operating alternative, physical works at trial sites to restore fish habitat, under the 283m^3/s minimum flow regime (BCH 2008b).

The Water Use Plan Consultative Committee (WUP CC) established a number of monitoring programs to determine the trial's effectiveness. GMSMON-7 is one of the monitoring programs, tasked to address the following 3 questions:

1. What is the response of side channel water level to fluctuations in Peace River discharge?
2. What physical processes are occurring in the beds of side channels of the Peace River and is there a trend over time?
3. Which fish species and fish life stages are using the side channels of the Peace River and are changes occurring over time?

Northwest Hydraulic Consultants Ltd. (NHC) and Mainstream Aquatics Ltd. (Mainstream) began work on GMSMON-7 for BC Hydro July of 2013, with some data collection and instrumentation installation by NHC under a previous project in April 2013. A report was completed in January 2014 (NHC and Mainstream Aquatics Ltd., 2014) detailing collection of baseline data and recommendations for future monitoring from 2013 (Year-1). NHC and Mainstream have continued work on GMSMON-7 through 2014 (Year-2), and this report documents additional data collection and recommendations for continued monitoring. Originally two test side channels were selected for future improvement works along with two control side channels for GMSMON-7. Following the 2013 study, test side channel 32L and control side channel 40L were abandoned allowing the 2014 study to focus on test side channel 102.5R and control channel 112.5L.

Redevelopment of an historic side channel that crosses the right bank island at 102.5R was completed in April 2014 and as-built cross sections and bank locations were provided by BC Hydro. Within the first week the northeast bank of the channel migrated 20 m to the east with roughly 3 m of further migration over the next 15 weeks. Cross sections and bank locations were surveyed again in September 2014, confirming the stabilizing bankline and identifying 0.5 m of aggradation within the channel. Geomorphology was not investigated further in 2014, but is scheduled to be further investigated in the Year 3 study (2015).

NHC installed and maintained a hydrometric gauge within side channel 102.5R, referred to as gauge 102.5R Channel, and two hydrometric gauges within side channel 112.5L, referred to as 112.5L Upstream and 112.5L Pool, for the 2013 study. An additional hydrometric gauge was installed within side channel 102.5R post its construction (04 September 2014). Loss and damage of gauges resulted in discontinuous data since the 2013 fieldwork. However, the available stage data correlates well with stage data from WSC gauge *07FD002 Peace River near Taylor* allowing linear regression to have been developed to fill any data gaps.

Habitat characteristics recorded in 2014 were consistent with data collected during the 2013 study. Important findings were as follows. Water quality characteristics for most parameters were similar between years. Recorded differences in water clarity and dissolved oxygen concentrations likely were attributed to annual differences in river flow at the time of sampling. Fish habitats were influenced by water level fluctuations/water flow, which resulted in changes to water depth and velocity. Secondly, suspended sediments and sedimentation influenced water quality and substrate. Fines were a dominant component of side channel substrate. Rock substrates that were present were strongly influenced by sedimentation (i.e., high embeddedness and compaction).

Although the 2014 results were consistent with 2013 findings, results from Side Channel 102.5R indicated some change in habitat characteristics. Specifically, fine sediments were more prevalent and there was evidence of sedimentation (i.e., higher embeddedness rating) at fish collection sites in 2014 compared to 2013. No change in habitat characteristics was recorded in Side Channel 112L.

Side channel fish communities recorded by the present study were consistent with findings by the 2013 investigation. The side channel fish community consisted of up to 14 species which included sportfish, sucker, minnow, and sculpin species. The numerically dominant species/life stage were suckers (young-of-the-year unidentified sucker species) and minnows (all life stages of Longnose Dace and/or Redside Shiner). Sportfish and sculpin species were not numerous in either side channel. No change in species/life stage composition was recorded between the 2014 study and 2013 – young-of-the-year and juvenile fish dominated the sample. Based on this information, the 2014 results are sufficient to document changes to fish species/life stage presence or absence, at least for numerically abundant species.

The relative abundance of most fish species recorded by the 2014 study was lower than that recorded in 2013 for both the test and control site. The change likely reflects natural annual variation; however, more years of investigation are required before an assessment of fish abundance trends can be completed. Fish species relative abundance was variable in 2014, but application of recommendations by the 2013 study to use a single fish collection method (beach seine) and increase sample sizes did result in a reduction of the standard error around the catch rate estimate for most species. This approach will improve the ability to identify a change in fish relative abundance when one occurs.

The following two tables present the WUP Consultative Committee management questions and Fisheries Technical Committee developed hypothesis in the context of the 2014 study.

2014 Study compared with GMSMON-7 management questions

Questions and 2014 Study Findings	
Question 1:	What is the response of side channel stage to fluctuations in discharge?
Discussion 1:	Water level in side channels closely correlate mainstem flow fluctuations. Linear regressions were developed between the WSC 07FD002 gauge and the monitored side channels. The primary difference is that the side channels become dry or inactive at moderate to low flows within the mainstem (i.e., 112.5L Upstream). Additional years of data may identify changes in the correlation between side channel and main channel, such as reduced flow as channel inlets are choked off by sedimentation and encroaching vegetation. The surveys geomorphic sectional surveys and inspection may provide similar and or supporting data.
Question 2:	What physical processes are occurring in the beds of side channels of the Peace River and is there a trend over time?
Discussion 2:	Physical components – such as geomorphic process and substrate – are not studied in odd years. However, following the constructed re-establishment of the 102.5R side channel erosion occurred along the northeast bank and deposition of sediment was observed within the side channel. Year 3 study will include further investigation of the test and the control side channels. It is expected that data over multiple years of study will be required to support or disprove current understanding of general Peace River side channel trends; that is sedimentation and vegetation encroachment. Site 102.5R being located near the Pine River confluence could be subjected to increased sediment loading and channel changes that are not representative of other reaches along the Peace River.
Question 3:	Which fish species and fish life stages are using the side channels of the Peace River and are changes occurring over time?
Discussion 3:	Downstream of the Pine River the fish community is dominated by young-of-the-year and juveniles of sucker species, and minnows. The dominant species and life-stage encountered in the test and trial side channels (102.5R and 112.5L) are: Sportfish: Northern Pike (sportfish), young-of-the-year sucker species, and Redside Shiner (Minnows). Data are not sufficient to ascertain if there are changes over time.

2014 Study compared with GMSMON-7 hypothesis

Hypothesis	2014 Study Finding
Hypothesis 1	Morphology of side channel is changing
A) With time?	Primarily baseline data collected, and as such a determination is not yet possible.
B) In trial sites more than control sites?	Deposition within the trial site was observed within the first 15 weeks. Subsequent investigations will help to determine if the deposition is expected to continue or is a result of initial channel changes.
Hypothesis 2	Bed material armouring in side channel is changing
A) With time?	No indication of coarse substrate movement in the studied side channels since the last post spill assessment. Fine fluvial deposited sediment overlies much of the side channel substrate. Currently only one year of data has been collection, further study required to indicate change.
B) In trial sites more than control sites?	Trial sites 102.5R appears to be experiencing greater fine sediment deposition than expected at the control site based on habitat embeddedness. Currently only one year of data has been collection, further study required to indicate differences.
Hypothesis 2	Relative abundance of fish species, age/size class structure, fish numbers, and species present in side channels is changing
A) With time?	Catch rate (fish per unit area) and fish size decreased in Year 2 from Year 1 in both the trial and the control site. The cause is not yet defined, but could be an artefact of sampling period or difference in habitat conditions between the two years (temperature, flow, …).
B) In trial sites more than control sites?	Both the trial and control site showed similar reduction in catch rate fish size.

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NHC and Mainstream Aquatics Ltd. 2015. GMSMON-7 Peace River Side Channel Response, 2014 Study. Prepared for BC Hydro. 2015 January.

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1 INTRODUCTION

1.1 Background

W.A.C. Bennett Dam and the associated Gordon M. Shrum power station (GMS) were constructed at the head of the Peace River Canyon in 1967 providing long-term storage within the Williston Reservoir. Shortly afterwards the Peace Canyon Dam (PCN) was constructed, 14 km downstream, and without active storage.

Regulation of the Peace River has resulted in changes to flow, specifically the timing and magnitude of annual floods and the transport of sediment (Church 2005). Changes include a reduction in the mean annual flood by approximately 70%, an increase in winter flows for power generation and ice control, reduced variability in seasonal flows (30-50%), and increased variability throughout each day. The reduced flood flows under the current operational regime does not possess the stream power required to move the pre-existing bed sediments consisting of gravels and cobbles. Nor is there adequate stream power to move the material contributed as bedload by sizable tributaries, most notably the Pine River.

Regulation of the Peace River has impacted side channel habitat by reducing large flood flows that transport fine sediments from the secondary channels along the mainstem and control vegetation establishment. As a result, the river channel is narrowing (Church 1995, 2005). Furthermore, the regulated flow regime reduces natural water levels that would occur during the spring and summer, decreasing both the wetted area and side channel connectivity to the mainstem river; altering access to and value of fish habitat. These changes in concert with morphological and water quality changes have caused fish community changes in within the Peace River.

The Peace River Water Use Plan Committee (WUP CC) recognized that changes to river morphology due to flow regulation are causing loss and degradation of fish habitats in side channels (BCH 2008a). In 1995, the PCN minimum discharge was voluntarily set by BCH to 283 m^3/s to reduce habitat losses and stranding in side channels. The 283 m^3/s flow requirement was formalized in the Peace Order, however the WUP committee noted some side channels may be re-watered if the minimum flow had an additional 141 m^3/s. Before changing minimum flow levels, the WUP committee agreed to first study a non-operating alternative, physical works at trial sites to restore fish habitat, under the 283m^3/s minimum flow regime (BCH 2008b). In addition, the committee noted the PCN spills greater than 2,000 m^3/s could lead to changes in side channel fish and fish habitat, hence an opportunistic monitoring programs was Ordered under the WUP's Peace Spill Protocol (PSP).

The Peace River Side Channel Fisheries Program has been implemented with the intent to monitor changes to side channels and to assess the effectiveness of physical works and spill events to mitigate these effects:

1. The Peace River Side Channel Plan will improve fish habitat in selected side channels through physical works.

2. The Peace Spill Protocol will attempt to quantify environmental effects of a spill; PCN discharge exceeding the 2,000 m^3/s generation capacity[1].

Between 27 June and 09 July 2012, flow from the PCN exceeded normal operational flows with median daily average flows between 2,600 and 2,800 m^3/s (NHC and Mainstream 2013a). The spill triggered the Peace River Side Channel Response Monitoring Program (GMSMON-8), which is part of the Peace Spill Protocol. That 2012 study summarized existing information and collected physical and biological data from selected side channels potentially affected by the spill (NHC and Mainstream 2013a).

The Peace River Side Channel Fisheries Monitoring Program (GMSMON-7) was initiated in July 2013 building on the methods used GMSMON-8 study and tasked to address the following 3 questions:

1. What is the response of side channel water level to fluctuations in Peace River discharge?
2. What physical processes are occurring in the beds of side channels of the Peace River and is there a trend over time?
3. Which fish species and fish life stages are using the side channels of the Peace River and are changes occurring over time?

During Year-1 (2013) of the GMSMON-7 study, baseline data was collected and recommendations for future monitoring provided (NHC and Mainstream 2013b). Two test side channel sites, 32L and 102.5R, were selected for future improvement works along with two control side channels, 40L and 112.5R. Northwest Hydraulic Consultants Ltd. (NHC) and Mainstream Aquatics Ltd. (Mainstream) completed the study with NHC responsible for the physical component of the study (i.e., monitoring stage and flow, assessing degradation/aggradation and assessing bed-texture changes) and Mainstream responsible for the fish and fish habitat component of the study (i.e., determining abundance and distribution of small fish). The 2013 study concluded that side channel fish communities were consistent with findings by previous investigations and that the results were sufficient to document future changes to fish species/life stage presence or absence, at least for the numerically abundant species.

A number of changes were adopted for the Year-2 (2014) Peace River Side Channel Fisheries Monitoring Program:

1. Test side channel 32L and control side channel 40L were omitted from the study program based on direction from BC Hydro.
2. Fish collection efforts were restricted to use of beach seine, allowing the number of fish collection sites to be increased. This was in response to recommendations from the 2013 study.

This document presents the findings for the 2014 Peace River Side Channel Fisheries Monitoring Program, GMSMON-7.

[1] Spill and post-spill monitoring efforts are triggered at various release flows and durations, typically 2,000 m^3/s for 2 or more days (GMSMON-3, MON-9, MON-10, MON-11, MON-12) and 2,500 m^3/s for 2 or more days (GMSMON-6, MON-8, MON-9)

1.2 Purpose and Objectives

The purpose of the Peace River Side Channel Fisheries Monitoring Program is two-fold. The first is to collect baseline data from a selected side channel in order to document change caused by normal operational flows. The second is to assess response of a selected side channel to improvement caused by physical works and to spill events.

Objectives of the 2014 Peace River Side Channel Fisheries Monitoring Program were to:

1. Collect stage information and assess flow in each side channel.
2. Collect information that describes fish and fish habitat in each side channel.
3. Coordinate and share collected data with other active monitoring programs in order to maximize efficiencies and data value.
4. Summarize the collected information and provide recommendations for future monitoring in a concise report.

In addition to the above objectives, the 102.5R test side channel was surveyed September 2012 to allow initial comparison of channel response following initial commissioning.

1.3 Study Area

The study area is the Peace River downstream from the Peace Canyon Dam (Figure 1-2). Two side channels were monitored in 2014; the 102.5R test site located immediately downstream of the Pine River confluence (Figure 1-3) and 112L control site located 10 km downstream of the Pine River (Figure 1-4).

1.4 Study Period

The study period was dependent on measured parameters. Table 1-1 summarizes the timing and duration of major study components.

Table 1-1 Study periods of major components

Study Component/Parameter	Timing		Duration (d)
	Start	End	
River stage	2013 Aug 10	2014 May 16	Ongoing
Channel cross-sections	2014 Sep 02	2014 Sep 02	1
Water temperature[a]	2014 Aug 01	2014 Sep 15	46
Fish and fish habitat	2014 Jul 25	2014 July28	4

[a] Data collected by 2014 Peace River Productivity Program (GMSMON-5).

1.5 Year-2 Events

Under the GMSMON-7 program fish and fish habitat data is to be collected in even years, geomorphic data is to be collected in odd years, and hydrologic data is to be continuously collected.

At the onset of Year-2 the 32L test site and associated 40L control site were omitted from the study and budget for the GMSMON-7 program adjusted for the reduced scope.

Year-2 fieldwork was scheduled for mid-summer (end of July through start of August) to remain consistent with Year-1 study. Forest fires in the region lead to evacuation and evacuation alert of many of the nearby towns between July 16 and 22. Fieldwork was postponed due to concerns of the fires. Start of the fish component was postponed from July 23 to July 25 and start of the physical component was postponed from July 22 to September 2.

Snowpack and resulting freshet flows were not extraordinarily high in 2014. Flow release from W.A.C Bennett Dam and downstream PCN dam were within normal operating range (less than 2,000 m^3/s) throughout 2013 and spill protocol was not initiated. The following figure presents a plot of Peace River flow as measured by the Water Survey of Canada gauge near Taylor WSC (*07FD002*). The figure shows 2014 summer flow was generally less than 2013 flow and the average from the past 10 years.

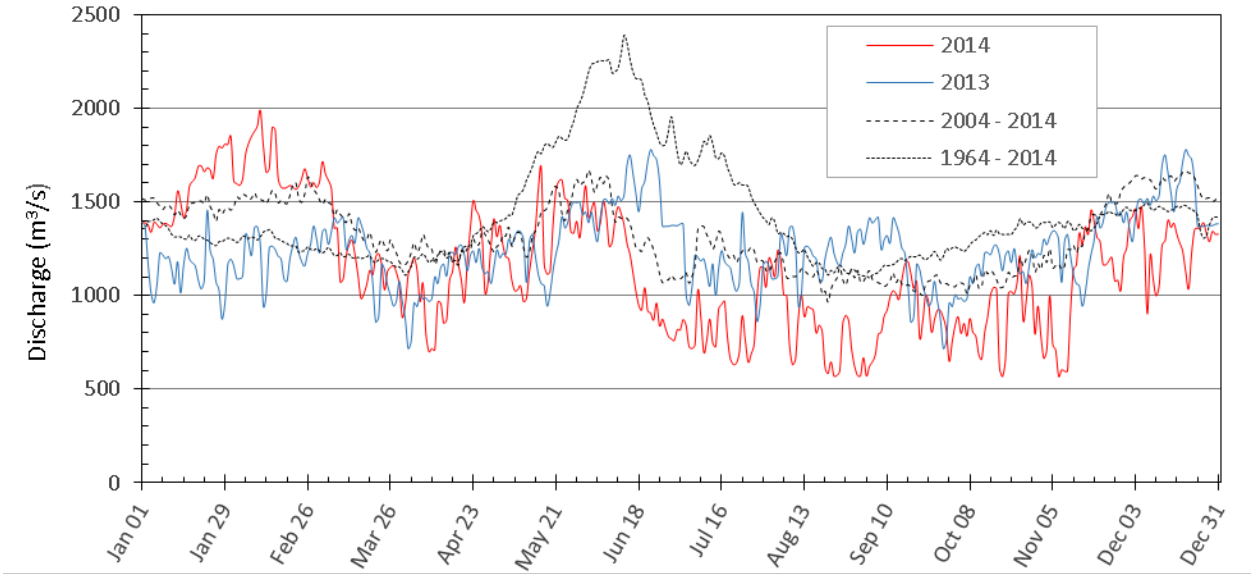


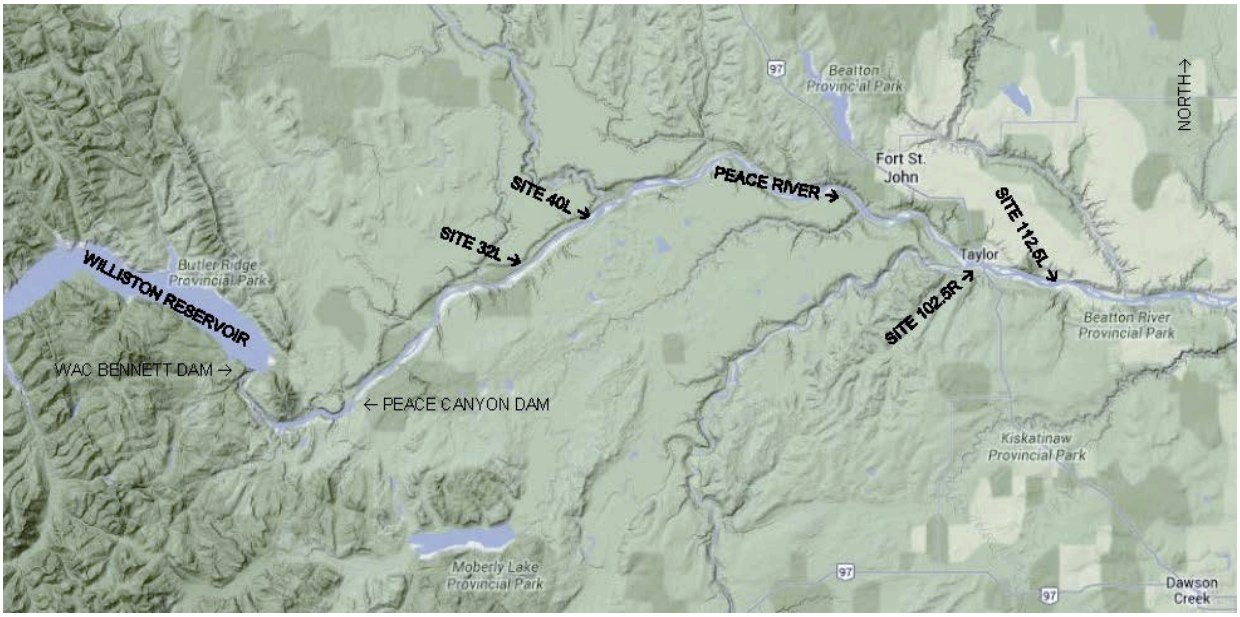
Figure 1-1 Peace River annual hydrograph (*WSC 07FD002 Peace River near Taylor*)

1.5.1 Construction of 102.5R Side Channel

Spring 2014 the 500 m long side channel that crosses the right island at 102.5R was re-established. The site is located 1200 m downstream of the Pine River confluence and 600 m upstream of the Taylor Bridge. It was selected as a test site to provide additional off-channel habitat and connectivity between an existing side channel along the right side of the island and the main channel of the Peace River along the left side of the island.

March 2014 construction began for the reestablishment of the pre-existing side channel that crosses the right bank island at 102.5R. Construction was led by 4 Evergreen Resources LP and lasted roughly 6 weeks, with certificate of completion granted by BC Hydro by May 9, 2014. The site was surveyed by the contractor prior to commissioning and as-built drawings produced. Initial flow within the channel resulted in erosion along the northeast bank, somewhat trending the channel to its historic alignment.

Eroded sediment deposited within the channel, primarily along the northwest end and middle reach of the re-established channel.



Base map from Google Maps ©2014

Figure 1-2 Overall study reach

Figure 1-3 Side Channel 102.5R study area, flow is from left to right

Figure 1-4 Side Channel 112L study area, flow is from left to right

2 APPROACH AND METHODS

The study encompasses a range of data collection to support the monitoring objectives. NHC focused on collection and analyses of physical data. In Year-2 this was to be limited to hydrology and hydraulics, but was expanded to include substrate texture and geomorphology of the recently constructed test channel 102.5R. Mainstream focused on data collection pertaining to fish and fish habitat.

2.1 Quality Assurance

Quality assurance was an integral part of the work program. Steps were taken at each level of the office and field studies, data entry, data analyses, and reporting to minimize data bias and data error. Quality assurance procedures included:

1. Experienced personnel who were familiar with previous year's work, the study reaches, sample methods, and fish populations.
2. Use of standardized sampling protocols to reduce variability.
3. Use of standardized data entry forms to minimize transcription errors.
4. Daily review of collected data to identify errors and inconsistencies.
5. Random checks of data during data entry.
6. Use of a standardized data storage and management systems.
7. Summaries to identify outliers and atypical trends.
8. Review of materials by senior personnel.

Surveys included post processing and post correction of GPS base station data with stationary logging of 4 to 8 hours. Multiple benchmarks at each site were used to compare and verify with past surveys confirming repeatability and precision of equipment and methodology. NHC owns and maintains a complete range of survey equipment to ensure equipment is properly maintained and configured prior to site deployment.

Water level sensors were initially tested at NHC's lab in static tanks prior to deployment to ensure correct operation. Water levels at hydrometric stations were surveyed when NHC was on site to identify any shifts or drifts in benchmarks or sensors. Discharge measurements were done in sets of two or more samples to ensure repeatability and identify any errors in equipment or implementation. NHC owns and maintains a complete range of flow measurement instrumentation, including ADCP, salt dilution, ADV, Swoffer, Price meter, and pygmy meter. Application of the various measurement approaches are tested and validated against each other with duplicate field measurements throughout each field season to verify correct operation. ADV and Swoffer instruments are calibrated and validated at NHC's lab and Price and pygmy metres are externally calibrated at the start of each field season or more frequently upon indication of drifting measurement.

2.2 Methods

The following table presents a summary of tasks, locations, and dates. Investigations done in Year 1 (2013) included baseline work for the trial sites 32L and 102.5R and the control sites 40L and 112.5L. Investigations done in Year 2 (2014) were limited to post reestablishment of the trial side channel 102.5R and the control site 112.5L. Further details are provided in the following subsections.

Table 2-1 GMSMON-7 fieldwork history

Component	Description	Date
Hydrometric stations	Install + flow msmt Maintenance + flow msmt Maintenance + flow msmt Install (102.5R), maintenance, + flow msmt	2013 Jun 10-12 2013 Aug 08-10 2013 Oct 02 2014 Sep 02-04
Geomorphic inspection	Survey + observations Survey + observations (102.5R)	2013 Aug 08-10 2014 Sep 02-04
Habitat transects		2013 July 30 - Aug 08 2014 July 25-28
Water quality		2013 July 30 - Aug 08 2014 July 25-28
Fish collection	Beach seine, backpack electrofish, and small boat electrofish Beach seine	2013 July 30 - Aug 08 2014 July 25-28

2.2.1 Physical Characteristics

In Year-1 NHC installed and maintained a hydrometric gauge within side channel 102.5R, referred to as gauge 102.5R Channel, and two hydrometric gauges within side channel 112.5L, referred to as 112.5L Upstream and 112.5L Pool (**Appendix H**). Following the 2014 reestablishment of the side channel crossing the island at 102.5R an additional hydrometric gauge was installed at the north end of the re-established channel, referred to as 102.5R Constructed. Table 2-2 lists the loggers deployed, the schedule of deployment, and download events that have occurred since initiation of the Peace River Side Channel Monitoring project.

Each hydrometric gauge consists of a submerged Solinst Levelogger pressure transducer (+ 0.05% accuracy)(3001 LT Levelogger Edge, M10/F30) and is corrected for atmospheric pressure variability using a Solinst Barologger pressure transducer (+ 0.05 kPa accuracy) (3001 LT Barologger Edge, M1.5/F5) installed adjacent to channel 102.5R. When deployed under water, a Levelogger senses combined hydrostatic and atmospheric pressures. Local concurrent atmospheric pressure data from the Barologger, was used to correct for atmospheric pressure variability. These sensors are comparatively inexpensive to purchase, however Leveloggers are susceptible to damage during freezing. Installing the Leveloggers relatively deep in the side channels reduced their likelihood of freezing. In addition, the sensors were encased in an environmental glycol solution to further reduce the chance of freezing at the sensor.

A combination of Nikon Total Station and Trimble RTK GPS survey equipment was used to check benchmark elevations, measure physical water levels, and survey bank locations and cross sections.

Table 2-2 Levelogger and Barologger deployment and data download schedule, 2014.

Logger Name	Description	Event History	
102.5R Constructed	Levelogger within constructed side channel	Install	2014 Sep 02
102.5R Channel	Levelogger on existing active side channel near confluence of re-established channel	Install Lowered Downloaded Missing Reinstalled	2013 Jun 11 2013 Aug 08 2013 Aug 10 2014 Sep 02 2014 Sep 04
102.5R Barologger	Barologger, primarily for 102.5R and 112.5L	Install Download Memory filled Downloaded	2013 Jun 11 2013 Oct 02 2014 May 15 2014 Sep 02
112.5L Upstream	Levelogger on intermittent side channel at upstream end of bar complex	Install Downloaded Lowered Memory filled Downloaded	2013 Jun 11 2013 Aug 09 2013 Aug 09 2014 May 16 2014 Sep 04
112.5L Pool	Levelogger at downstream end of bar complex	Install Downloaded Lowered &moved Missing Discontinued	2013 Jun 11 2013 Aug 09 2013 Aug 09 2014 Sep 04 2014 Sep 04

2.2.1.1 Field Program

NHC inspected the Peace River side channel hydrometric gauges on September 2 and 4, 2014. Data were retrieved from the 102.5R Barologger and 112.5L Upstream Levelogger during this field inspection and a hydrometric gauge was installed within the constructed channel at 102.5R. Physical water level measurements were taken at the 102.5R Constructed and the 112.5L Upstream hydrometric gauges and a discreet discharge measurement was collected at the 102.5R Constructed hydrometric gauge using a Teledyne RDI River Ray Acoustic Doppler Current Profiler (ADCP). While NHC inspected the 102.5R Channel and 112.5L Pool hydrometric gauges, the Leveloggers from these sites went missing prior to September 2, 2014. The Leveloggers and data could not be recovered.

Cross sections and bank locations for the constructed portion of side channel 102.5R were surveyed on September 4, 2014 and compared to as-built survey cross sections and bank locations. Channel change were identified, primarily erosion along the northeast bank of the channel and deposition along the northern end of the channel bed. Rebar markers were used to identify the ends of monitoring cross sections and each section was geo-referenced and photographed.

2.2.1.2 Office Program

Aquatics Infomatics Inc. Aquarius software was used to organise, review, compare, and calculate errors for hydrometric data. The 112.5L Upstream hydrometric gauge and the local Water Survey of Canada

station (WSC gauge *07FD002 Peace River near Taylor*) are the only locations with water level data available for the 2014 program.

The stage record for the 112.5L Upstream hydrometric gauge was examined, adjusted to geodetic elevation and compared to physical water level measurements. Drifts or shifts in the stage record were identified, and pro-rated offsets were applied to the stage record between physical water level measurements if changes in offsets were necessary. Discontinuities related to sensor download and maintenance were also removed from the record. The stage record was then closely inspected and compared to water temperature records to ensure sensor was functioning properly and to identify any lower quality data; when possible, side channel water levels were compared to main channel Peace River water levels.

Discharge measurements and rating curve development is limited at the functioning hydrometric gauges by lack of flow, low channel gradient, and/or backwatering from the main channel and a sufficient number and range of flows have not yet been collected to support the development of stage-discharge rating curves.

2.2.2 Fish Habitat at Fish Collection Sites

The fish and fish habitat component targeted small fish (i.e., juveniles of large fish species and small fish species) in side channels. Quantitative data that describes small fish communities of the Peace River are not robust. The GMSMON-7 work therefore complements other programs, such as the ongoing Peace River Fish Index Project (GMSMON-2) which focuses on large fish species residing in the mainstem. The sample methods used and information collected were intended to add to the existing fish database developed by the recently completed Site C baseline fish studies program, 2012 Peace River Side Channel [Spill] Response Study (GMSMON-8), and 2013 Peace River Side Channel Fisheries Program (GMSMON-7).

Habitat mapping completed by Mainstream *et al.* (2012) and Mainstream (2013a) established that, under typical operational flows, side channels selected for monitoring contained areas completely isolated from the main river that are not available to fish (i.e., isolated ponds), areas that are dewatered on a regular basis that are potentially accessible to fish, and areas that are permanently wetted and always available to fish. Fish collection sites were located in areas of each side channel that remained wetted at most Peace River flows (i.e., 350 m^3/s to 1500 m^3/s based on work by Mainstream *et al.* 2012) in order to maximize the probability of fish use at the time of sampling and to reduce data variability.

As per recommendations from GMSMON-7 Year-1 (NHC and Mainstream, 2013b) beach seine was the method used to collect fish in 2014. Beach seine was found to be the most effective fish collection method in 2013 when compared to all other methods in terms of fish capture efficiency, number of species encountered, and number of dominant habitat types sampled.

Habitat characteristics selected for monitoring provide quantifiable measures of fish habitat quality. They have the potential to indicate changes in habitat quality associated with changes in flow regime or physical channel changes – such as purpose built side channel enhancements. Site specific habitat characteristics were measured at fish collection sites. In addition, habitat characteristics were measured

at transects that were uniformly distributed within each side channel. If the transect cross-section was wadeable at the time of sampling the full suite of habitat variables were measured; alternatively sampling, transects were traversed by boat and substrate characteristics recorded.

Specific aspects of the approach for the fish and fish habitat component were as follows:

1. Use of standardized fish collection protocols that adhere to RIC/RISC standards (RIC 1997, RISC 2001) and standardized fish habitat collection protocols that adhere to FHAP standards (Johnston and Slaney 1996).
2. Fish collections were stratified by habitat type.
3. A single field program was completed in mid-summer (late July).
4. Collection sites were identical to those previously sampled by other surveys, whenever possible.
5. Habitat maps developed by the Peace River Hydraulic Habitat Study (Mainstream *et al.* 2012) or Site C Peace River Habitat Assessment (Mainstream 2013a) were used as a basis for delineation and characterization of fish habitats.

2.2.2.1 Field Program

Fish collection sites were located within a discrete habitat type. Habitat type was classified according to O'Neil and Hildebrand (1986), which conforms to classifications described in RISC (2001). The differences between the two methods include the separation of grouped habitat complexes (i.e. Riffle-Pool) into Riffle or Pool and categorizing a Fast Glide as a Run and a Slow Glide as a Flat. Fish habitat assessment procedures followed those described in RISC (2001). Physical characteristics of the habitat unit within the fish collection sites were measured along a transect set perpendicular to shore.

Digital photographs were taken at each beach seine site as well, the following parameters were measured (definitions presented in Appendix B):

- Date and time
- Geodetic location
- Water temperature (± 0.1^{o}C)
- Water conductivity (± 2% full scale
- Water clarity (cm)
- Water depth (cm) and velocity (m/s)
- Instream habitat type
- Bank habitat type
- Substrate type (%)
- Available fish cover (%)
- D90 (cm)
- Substrate embeddedness (low, moderate, high)
- Substrate compaction (low, moderate, high)

Water depth and water velocity were measured at ¼, ½, and ¾ the sampled width using a Swoffer Model 2100 velocity meter and staff rod. Percent substrate composition was visually estimated using a classification system based on the Modified Wentworth Scale (Cummins 1962). D90 represented the average size of substrate particle that was in the 90th percentile and followed procedures outlined in MOE (1995). Embeddedness is the amount of fine particles (sand, silt, and clay) present within the substrate. Compaction evaluates the density or looseness of the substrate within the channel. Compaction and embeddedness were evaluated as low (1), moderate (2), or high (3). The percent cover was visually estimated for overhead cover, rock cover, large organic debris, submergent vegetation, emergent vegetation, and terrestrial vegetation. Finally, digital photographs were taken at each site.

Habitat Transects

The 2014 program resampled habitat transects established in 2013. Transects set perpendicular to the channel and uniformly spaced at approximately 100 m intervals were used to measure habitat characteristics of the side channel. Parameters (definitions presented in Appendix B) measured at each transect included:

- Date and time
- Start and end geodetic location
- Instream habitat type
- Wetted width (m)
- Channel width (m)
- Substrate type (%)
- Silt depth over rock substrate (cm)
- D90 (cm)
- Substrate embeddedness (low, moderate, high)
- Substrate compaction (low, moderate, high)
- Available fish cover (%)

When excessive water depth prevented wading, measured parameters were as follows:

- Date and time
- Geodetic location of each sample point
- Instream habitat type
- Wetted width (m)
- Channel width (m)
- Substrate class (rock or fines)

Water Quality

Point measures of general water quality parameters were taken at fish collection sites. A Hanna HI98311 EC/TDS meter was used to measure pH (± 0.01), conductivity (± 2% full scale), and water temperature (± 0.1^{o}C).

Surface water turbidity level (NTU) was measured in the field using a Hach 2100P Turbidity Meter (± 1% full scale). The average of three measurements taken from each sample was used.

Fish Collections

The beach seine was 4.5 m wide and 1.5 m high with a stretched mesh size of 5.0 mm (the depth of the capture bag was 1.4 m). A two-person crew sampled parallel to the channel margin for a predetermined distance (i.e., 15 m) before turning into shore. For each site three discrete hauls were conducted in a non-sequential order (i.e., haul end point at opposite end of start point of next haul). This approach limited the potential for fish to be pushed into the next haul location. All captured fish were placed in a 40 L holding bucket for processing.

Data recorded for fish included species (Table 2-3) and fork length (to the nearest 1 mm). Total lengths were measured for sculpin species and all fish < 20 mm total length. When the catch at a site exceeded 10 individuals per species a subsample was measured. The first 10 individuals of each species were measured, while the remaining fish were identified and enumerated before release. Very small suckers (i.e., < 30 mm) that could not be identified to species were categorized as “unidentified young-of-the-year sucker spp.”. GMSMON-7 Terms of Reference (ToR) identified fish weight as a metric to be

collected (BCH 2008c). However, fish weight was not collected by the 2014 field program due to the small size of sampled fish (i.e., < 2 gm). It is difficult to obtain a precise measure of weight for fish of this size unless they are sacrificed. Because an important goal of the monitoring program is to minimize fish mortality weight was not collected.

Sample Effort

Ten beach seine fish collection sites were sampled in each side channel – all sites were located in the FLAT habitat type. Each beach seine site was sampled twice during the field program. There was a one day rest period between sample events. The number of sampled habitat transects were 16 (102.5R) and 12 (112L). Appendix A provides location data for each site.

Table 2-3 Nomenclature and abbreviations used for fish species potentially recorded in monitored side channels

Group	Common Name	Scientific Name	Species Label
Sportfish	Bull Trout	*Salvenlinus confluentus*	BT
	Goldeye	*Hiodon alosoides*	GE
	Kokanee	*Oncorhynchus nerka*	KO
	Lake Whitefish	*Coregonus clupeaformis*	LW
	Lake Trout	*Salvelinus namaycush*	LT
	Mountain Whitefish	*Prosopium williamsoni*	MW
	Northern Pike	*Esox lucius*	NP
	Walleye	*Sander vitreus*	WP
	Yellow Perch	*Perca flavescens*	YP
Sucker	Sucker species	*Catostomus spp.*	SUCK
	Largescale Sucker	*Catostomus macrocheilus*	CSU
	Longnose Sucker	*Catostomus catostomus*	LSU
	White Sucker	*Catostomus commersoni*	WSU
Minnow/Trout Perch	Flathead Chub	*Platygobio gracilis*	FHC
	Lake Chub	*Couesius plumbeus*	LKC
	Longnose Dace	*Rhinichthys cataractae*	LNC
	Northern Pikeminnow	*Ptychocheilus oregonensis*	NSC
	Redside Shiner	*Richardsonius balteatus*	RSC
	Spottail Shiner	*Notropis hudsonius*	STC
	Trout-perch	*Percopis omiscomaycus*	TP
Sculpin	Prickly Sculpin	*Cottus asper*	CAS
	Slimy Sculpin	*Cottus cognatus*	CCG

2.2.2.2 Office Program

In the office, field data were compiled and visually compared to daily field forms for errors. The data was then subjected to several summary analyses including graphical examination to identify errors and outliers. The checked data were then imported into a single Microsoft Access™ file for data management and storage. Water temperature and light data were stored in Microsoft Excel™.

Data were analyzed using Microsoft® Excel and SPSS® software. Geodetic location information (UTM coordinates) were tabulated and plotted onto base maps using MapInfo Professional™. Airphotos taken

during a PCN Dam operational flow of 283 m^3/s for the Peace River Hydraulic Habitat Study (Mainstream *et al.* 2012) or the Site C Peace River Habitat Assessment (Mainstream 2013a) were used as underlying base maps.

Fish Habitat

Discharge

Hourly Peace River discharge during the field program is presented from preliminary data available from Water Survey of Canada Station 07FD002 (Peace River near Taylor).

Temperature and Water Quality

Point measures of water quality parameters were presented as daily averages and range. Hourly temperature data collected in the field by the Side Channel Productivity Study (GMSMON-5) were transferred from the temperature data loggers into Microsoft Excel™ files. After the quality assurance assessment, summary information presented for each side channel included:

- average daily temperature
- minimum and maximum daily temperature
- average daily temperature range

Habitat Characteristics and Fish Collection Sites

Summary analyses of fish collection site habitat data included the following:

- Substrate composition
- Physical cover
- D90
- Substrate compaction
- Substrate embeddedness

Because fish collection sites were sampled twice during the field program habitat values recorded in session one would be expected to be similar to values recorded during session two if sampling conditions were the same. To test this assumption, values for session one and session two for each habitat parameter were compared using relative percent difference (RPD) (Alberta Environment 2006). RPD was calculated by taking the difference between the measured parameter and dividing it by the mean of the measured parameter (RPD = [Value A – Value B] / [[Value A + Value B]/2] * 100%). Conditions would be considered different if the RPD was greater than 25%.

However, due to flow variability fish collection site habitat characteristics were different between session one and session two (Table 2-4). Specifically, RPD exceeding 25% for water depth, water velocity, substrate type, and D90. Because sampling conditions were not similar between sessions habitat data for each session are presented separately.

Fish

The analyses of fish included summaries for each side channel for the following:

- community structure
    - species composition
    - life stage presence/absence
- median length and range
- catch rate

Life stage was examined only for large fish species; that is sportfish, suckers, and Northern Pikeminnow. Life stage categories included young-of-the-year, juvenile, and adult. Life stage categories were assigned to each fish based on fork length at the time of capture using protocols and age-at-length information from Mainstream (2010, 2011, 2013b; NHC and Mainstream 2013a, 2013b). Table 2-5 summarizes the data used for life stage category designations.

Catch rate, which is used synonymously with catch-per-unit-effort (CPUE), was calculated for each side channel by dividing the number of fish captured by sampling effort. Beach seine catch rate was expressed as Number of fish per 100 m^2. Because fish collection site sampling conditions differed between session one and session two (see Table 2-4), data from individual sessions were combined for analyses (i.e., n = 20).

Table 2-4 Relative percent difference (RPD) in habitat characteristic values measured at fish collection sites during session one and session two

Parameter[a]	Percentage of Sites that Exceed RPD Criteria of 25% Difference	
	Side Channel 102.5R	Side Channel 112L
Habitat Type	0	0
Water depth (m)	40	50
Water velocity (m/s)	10	60
Substrate (%)		
Organic matter	-	-
Clay/Silt/Sand	30	0
Gravel/Pebble	40	10
Cobble	40	10
Boulder	-	-
Bedrock	-	-
D90 (cm)	40	20
Embeddedness	0	0
Compaction	0	0
Cover (%)		
Overhead	-	-
Rock	10	0
Large woody debris	-	-
Submergent vegetation	0	0
Emergent vegetation	50	0
Terrestrial vegetation	-	-

[a] See Section 2.2.1 for definitions.

Table 2-5 Life stage category designations of large fish species based on summer fork length (mm)

		Young-of-the-Year			Juvenile			Adult		
Group	Common Name	n	Median	Range	n	Median	Range	n	Median	Range
Sportfish	Lake Trout									
	Lake Whitefish				1	75.0				
	Mountain Whitefish									
	Northern Pike				16	121.5	92 – 151	1	275.0	
	Walleye									
	Yellow Perch				2	45.0	42 – 48			
Sucker	Largescale Sucker				7	58.0	50 – 73			
	Longnose Sucker				19	52.0	33 – 83			
	White Sucker	1	34.0		10	62.5	46 – 69			
	Sucker spp.	439	22.0	13 – 34	18	36.0	35 – 44			
Minnow	Northern Pikeminnow	1	22.0		20	59.0	32 – 94			

3 MON7 YEAR 2 RESULTS

3.1 Side Channel 102.5R

The test side channel 102.5R was constructed in the spring of 2013. Following reestablishment of the side channel erosion was noted along the northeast bank of the channel and deposition was noted throughout the channel. Channel geomorphology at this site was investigated despite not being scheduled for such monitoring until Year 3.

3.1.1 Physical Characteristics

The newly excavated channel at the side channel 102.5R site was redeveloped with a constant thalweg elevation of 401.75 m. This provided an expected minimum flow depth of roughly 0.4 m, based on the WSC gauge (*07FD002*) for a low flow of 360 m^3/s. The design prescribed side slopes of the re-established channel slope up at 5H:1V to 10H:1V for a 2 m gain in elevation before transitioning to 3H:1V above the normal operational water levels (NHC, 2013). The constructed channel appears to have followed the design, except that upper slopes are often less than the prescribed maximum 3H:1V (**Figure 3-2**). Being located immediately downstream of the Pine River, the 102.5R site is subjected to the hydrologic and geomorphic effects of the Pine River.

The Pine River is the most substantial tributary below PCN, with a sizable watershed of 13,665 km^2 and substantial sediment load. The additional unregulated flow and high sediment supply from the Pine River reduces the downstream effects of upstream regulation. Coarse sediment deposits at the confluence of the Pine and Peace River, with post regulation flow only sufficient to transport fine sediments and suspended loads. Ongoing deposition has resulted in local channel changes. Previously this resulted in the infilling of the channel re-established at 102.5R and in recent years the development and downstream growth of the mid-channel bar along the north side of the 102.5R island.

Generally there has tended to be an increase in island area and narrowing of side channels through deposition and relatively rapid channel change in the Peace River reach at and near the Pine River-Peace River confluence (NHC and Mainstream Aquatics Ltd. 2013). Peace River conditions change downstream of the Pine River confluence, with increased turbidity, increased temperature, and a more natural hydrograph.

3.1.1.1 Channel Morphology

Geometry and Processes

An as-built survey was conducted by the contractor at the end of April 2014 (April 23 +/-). Immediately following commissioning of the channel, erosion of the northeast bank was reported by site personnel. NHC went to site to inspect the erosion and survey the current bankline 01 May 2014. Cross sections throughout the re-established channel and the northeast bank line were surveyed again on 4 September 2014. Comparison of the bankline survey suggests the northeast top of bank migrated roughly 20 m to the east within the first week and then remained relatively constant with 3 m of further migration

occurring over the next 15 weeks (Figure 3-1). Flattening of the slope and coarsening of the surface material (gravel armouring over the predominantly sandy-loam deposits) has accompanied and is likely to decrease the rate of bankline migration.

Material eroded from the northeast edge of the constructed channel bank deposited within the channel. Flow entering the channel was concentrated along the east side of the channel, developing a low velocity eddy on the west side of the channel. Deposition was greatest at the location of this eddy – the northwest end of the channel – and within the middle portion of the as indicated by Table 3-1 channel (Figure 3-2). Although likely initially a small component, material eroded from the north bank of the island west of the channel, likely also contributes to deposition within the channel.

Located immediately downstream of the Pine River confluence, this area is susceptible to deposition of sediment from the Pine River as well as changing flow patterns as bars form and change and subsequently redirect flow. This is evident with the mid-channel bar north of the 102.5R island that continues to increase in size and propagate downstream. The bar directs overflow towards the island and then confines it between the island and the bar (except for flow that enters the re-established island crossing side channel). The resulting concentrated and directed flow along the north side of the 102.5R island has led to ongoing erosion and strong currents along the newly refurbished Taylor boat launch.

Table 3-1 Comparison of surveyed surface elevation for 102.5R re-established channel (m)

Section	Profile Station	2014 April Survey			2014 Sept Survey			Aggradation		
		10m East	Thalweg	10m West	10m East	Thalweg	10m West	10m East	Thalweg	10m West
1	3+60	402.66	401.75	403.22	402.75	401.66	403.29	0.09	-0.09	0.07
2	2+82	402.96	401.75	402.98	403.06	402.13	403.25	0.10	0.38	0.27
3	2+04	402.71	401.75	402.86	403.03	402.31	403.07	0.32	0.56	0.21
4	1+50	402.85	401.75	402.82	403.06	402.28	403.15	0.21	0.53	0.33
5	0+39	403.24	401.75	402.40	403.16	401.78	403.08	-0.08	0.03	0.68

Note: Stationing increases southward from the mainstem to the pre-existing side channel. Figure 3-2 provides a plan and section view of the transects.

Substrate

Substrate within the constructed and pre-existing side channel is predominantly sand and fine materials (sandy-loam). Occasional lenses of gravel are present predominantly in areas of erosion, such as the northeast corner of the constructed channel. The coarsening bed and reduced slope of the bank at the northeast corner is likely to result in reduced erosion rates, more in line with the rest of the north side of the island.

Photographs

The following photographs of the site (Photo 3-1 to Photo 3-6) taken September 2014 present the constructed (i.e. re-established) and pre-existing side channel, the sediment distribution within the

constructed channel (primarily fine material with localised lenses of gravel), and erosion along the northeast end of the channel as well as at unaffected areas along the north side of the island.

Figure 3-1 As-built (23 April 2014), May 2014, and 4 September 2014 surveyed bank locations showing erosion at northeast end of channel

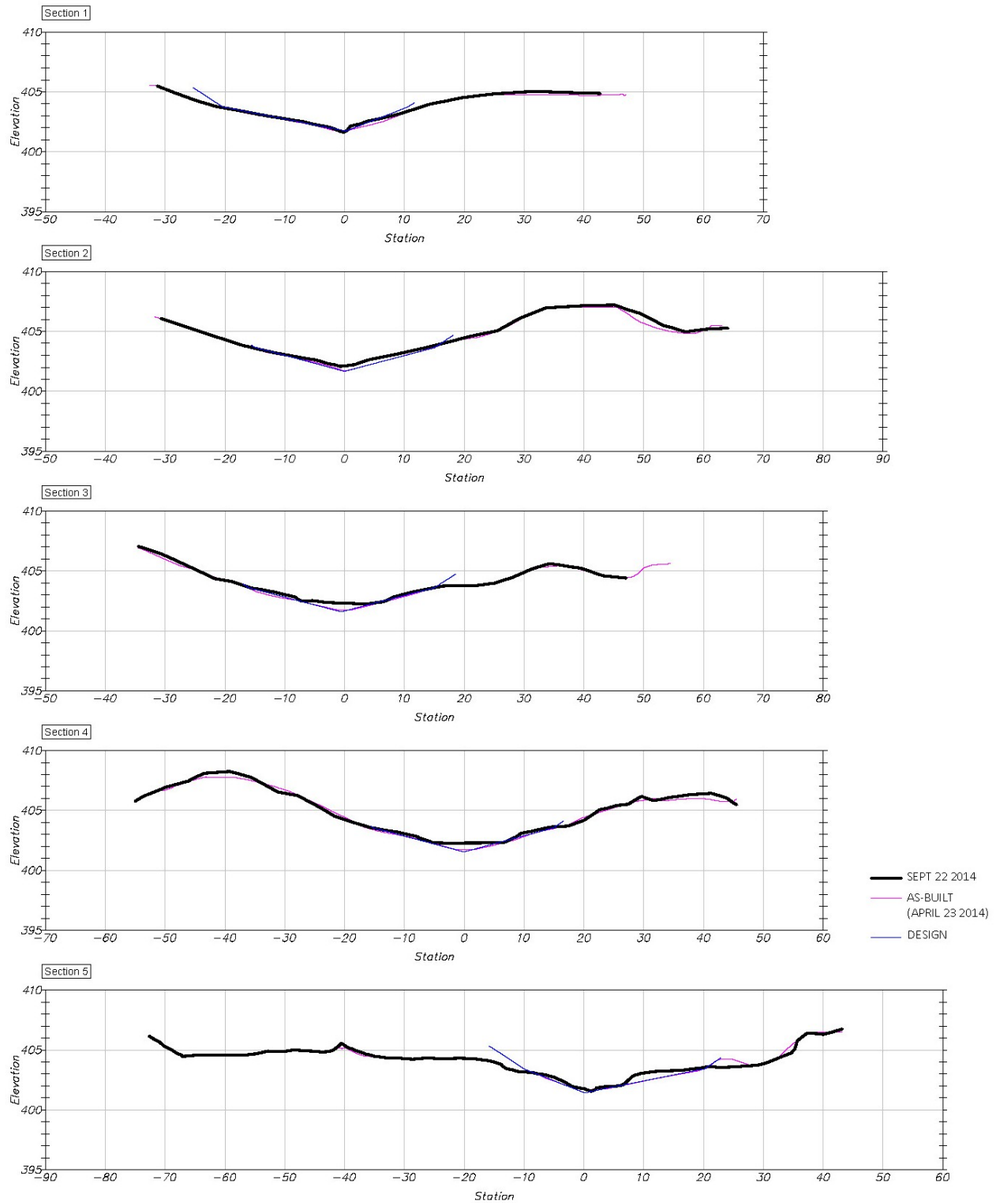


Figure 3-2 As-built (23 April 2014) and 4 September 2014 surveyed cross sections showing channel aggradation

Photo 3-1 Constructed 102.5R channel, view towards mainstem

Photo 3-2 Pre-existing 102.5R side channel, downstream view

Photo 3-3 Erosion at NE corner of constructed 102.5R channel

Photo 3-4 Erosion on north side of 102.5R island downstream of constructed channel

Photo 3-5 Bed substrate (fine sandy loam to gravel) across 102.5R constructed channel

Photo 3-6 Gravel substrate lenses within 102.5R constructed channel

3.1.1.2 Stage and Flow

The hydrometric gauge installed in the existing side channel, site 102.5R Channel, was lost prior to NHC's September 2014 field inspection. No additional data are available for this site. A replacement gauge was installed. Data from the replacement gauge has not yet been downloaded. Despite the loss of data a linear regression was developed relating hourly stage data at the WSC gauge *07FD002 Peace River near Taylor* to hourly stage at the side channel gauge (Figure 3-3). Regressions were also investigated between daily maximum and daily minimum stage, with little change in the regression from the hourly data regression. Although riffle sections of the pre-existing side channel dry during low flows, the channel section where the 102.5R Channel gauge was located is regularly activated by main channel Peace River flows for all stages observed during the period of record.

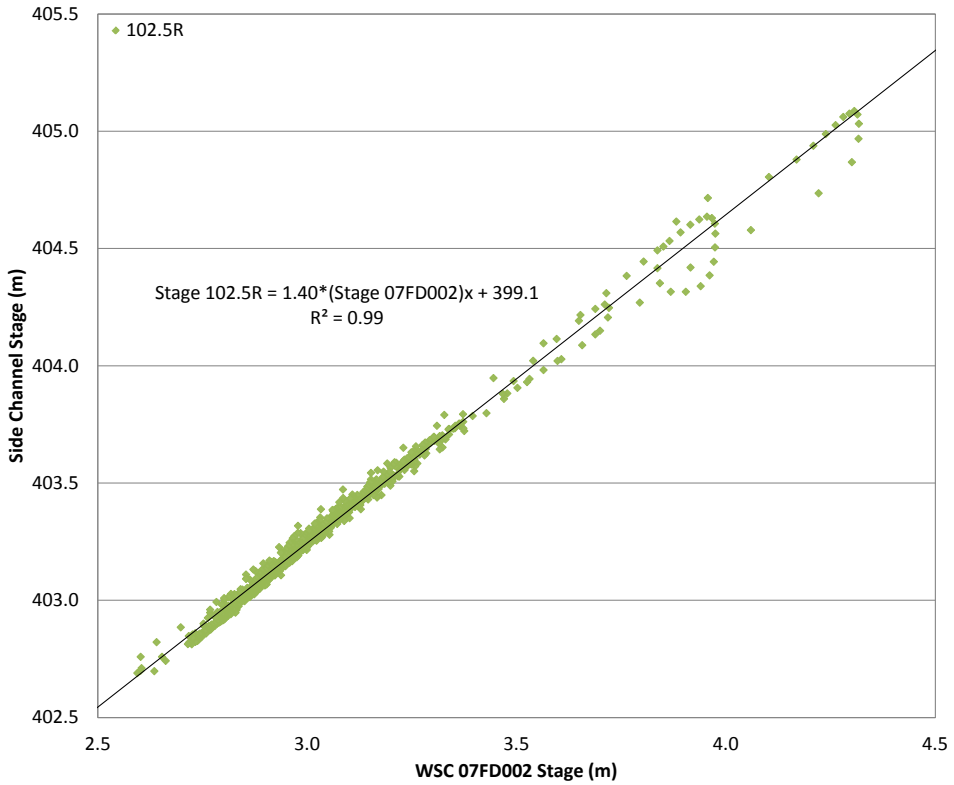


Figure 3-3 Stage at 102.5R Channel (pre-existing channel) compared to WSC 07FD002 stage, based on hourly data

Using the regression the stage record was generated for 2013 and 2014 at the 102.5R Channel gauge (Figure 3-11). Visual comparison of the stage record suggests that low flow was on average 0.3 m lower for the summer of 2014 than for the summer of 2013.

The location of the replacement gauge is nearly identical to the previous gauge. However, use of the existing curve should be limited as a coarse approximation until the stage-discharge relationship can be confirmed with additional flow measurements. Construction of the re-establishment 102.5R side

channel and any subsequent response in the pre-existing channel may have substantially altered the curve.

A new hydrometric gauge was installed within the constructed channel, referred to as site 102.5R Constructed, 2 September 2014. Data from this gauge are not yet available. A discreet discharge measurement was made at site 102.5R Constructed on the same day (2 September 2014). Flows at this time, however, were near zero and a rating curve has not yet been developed.

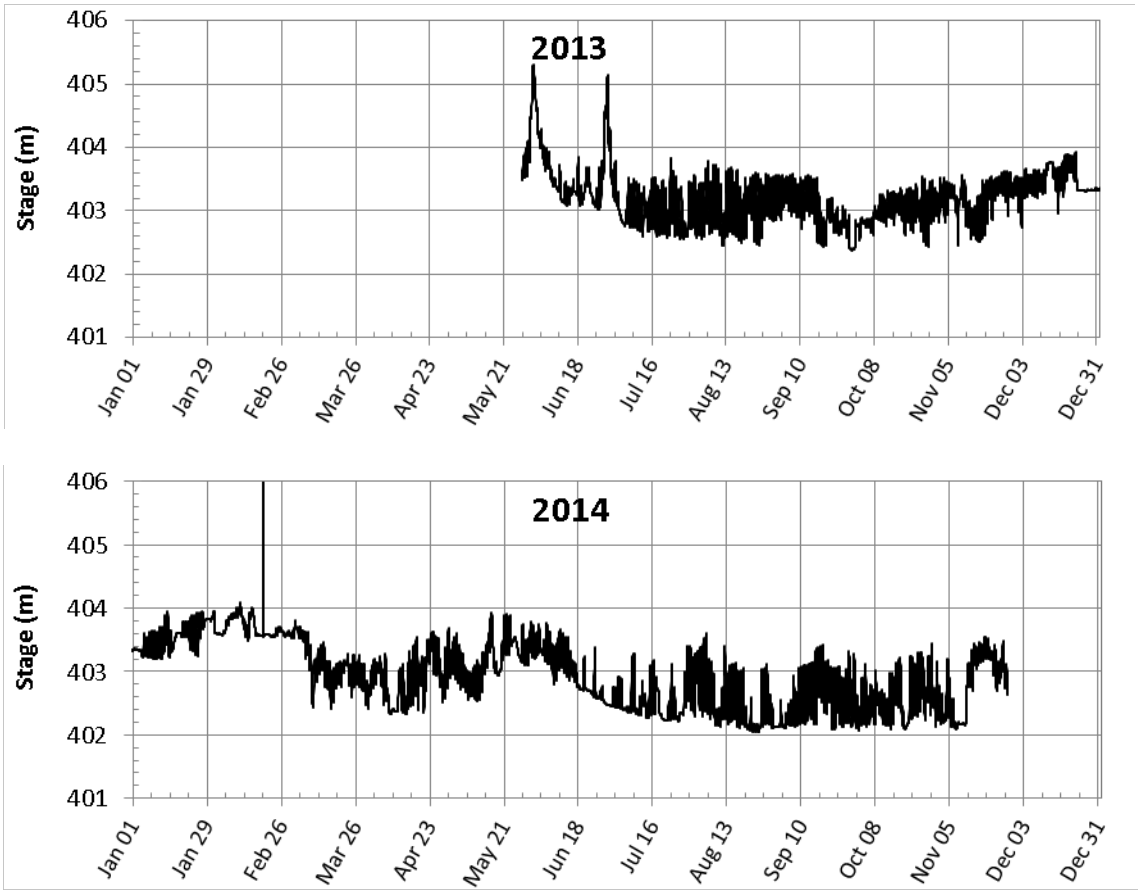


Figure 3-4 Stage record for 102.5R Channel (pre-existing channel) as transposed from WSC 07FD002

3.1.2 Fish Habitat

3.1.2.1 Discharge, Temperature and Water Quality

Discharge

Mean daily discharge of the Peace River ranged from 616 m^3/s to 1,286 m^3/s during the field program that occurred from 2014 July 25 to 28 (Figure 3-5). Hourly discharge did not fluctuate widely during each

24 h period on the first two sample days, but did fluctuate on July 28. In comparison, mean daily discharge was higher and hourly discharge more variable during the 2013 field program.

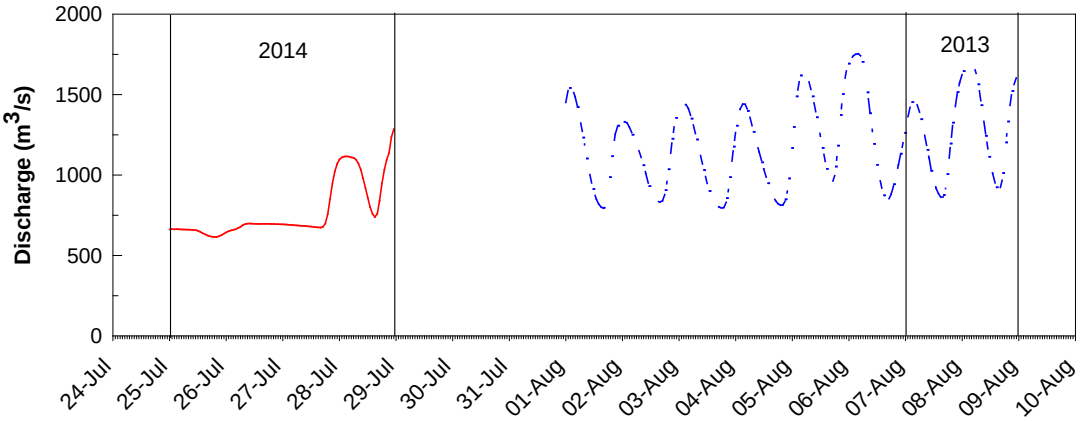


Figure 3-5 Peace River hourly discharge at Taylor during the 2013 and 2014 field programs

Water Temperature

Water temperatures in Side Channel 102.5R recorded between 1 August and 15 September 2014 ranged from 6.3°C to 24.1°C with an average of 15.5°C (Figure 3-6; Appendix C, Table C1). Average daily water temperatures were approximately 16°C at the beginning of the monitoring program and then decreased to approximately 11°C by the end of the program. Water temperatures recorded in 2013 were similar to those recorded in 2014.

The daily range of water temperature averaged 5.5°C in 2014. A drop in minimum water temperatures recorded between 21 and 25 August may have resulted from dewatering of the recorders. The range of water temperature was greater in 2013 and averaged 10.9°C. This also may have resulted from low minimum temperatures possibly caused by dewatering of the recorders.

General Water Quality

Water conductivity, pH, and dissolved oxygen measured at fish collection sites in Side Channel 102.5R were generally constant during the field program (Table 3-2, Appendix C, Table C2). Conductivity values ranged from 205 to 518 µS/cm, pH values ranged from 7.50 to 8.36 pH units, and dissolved oxygen ranged from 6.3 to 10.2 ppm (65 to 109%). The high conductivity value of 518 µS/cm was recorded at one site where evidence of ground water input was observed. Water clarity was high at the time of sampling whereas turbidity was low. Water clarity ranged between 0.73 m and TCB (to channel bottom), while turbidity ranged between 3 NTU and 9 NTU.

General water quality recorded during the present study was generally similar to general water quality recorded in 2013. The primary difference included higher water clarity with a corresponding lower water turbidity in 2014 and a lower dissolved oxygen concentration in 2014 compared to 2013.

The annual difference in dissolved oxygen concentration may be related to river stage and flow at the time of sampling. River stage was approximately 0.3 m lower in 2014 compared to 2013 (see Section 3.1.1.2). This likely caused reduced water flow through the side channel and a corresponding increase in biological/chemical consumption of available oxygen. The same general trend was recorded in Side Channel 112.5L (see Section 3.2.2.1)

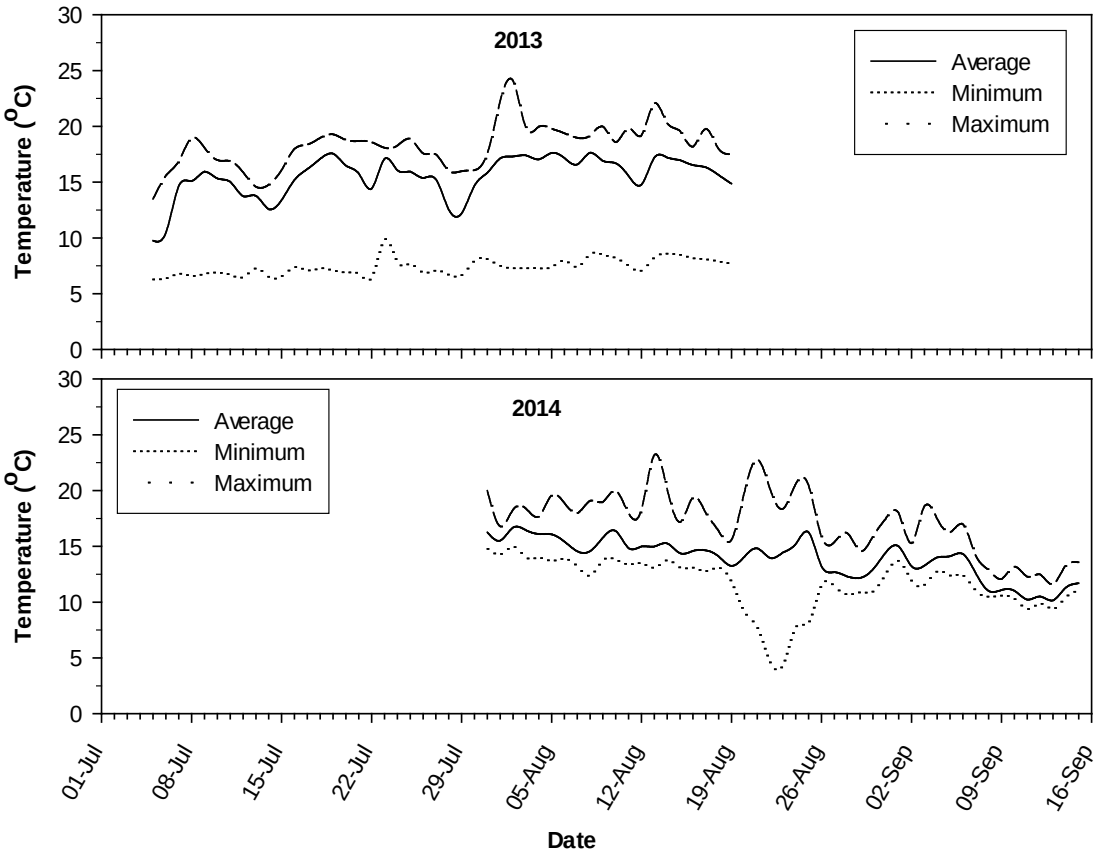


Figure 3-6 Daily water temperatures recorded in Side Channel 102.5R during 2013 and 2014

Table 3-2 Summary of water quality parameters measured in Side Channel 102.5R with comparison to 2013 data

Date	pH			Conductivity (µS/cm)			Dissolved Oxygen					Clarity (m)			Turbidity (NTU)		
							Concentration (ppm)		Saturation (%)								
	Mean	Range	*n*	Mean	Range	*n*	Mean	Range	Mean	Range	*n*	Mean	Range	*n*	Mean	Range	*n*
25-Jul-14	7.90	7.50 – 8.36	10	313.6	224 – 518	10	8.8	6.3 – 10.2	90.3	65 – 109	10	0.85	0.85 – TCB	6	5.25	3.00 – 7.50	2
27-Jul-14	7.80	7.52 – 8.12	8	345.8	281 – 452	8						TCB		6			
28-Jul-14	7.99	7.95 – 8.02	2	211.5	205 – 218	2	8.8	8.4 – 9.1	89.5	87 – 92	2	0.73	0.73 – TCB	1	9.00		1
2014	7.87	7.50 – 8.36	20	316.3	205 – 518	20	8.8	6.3 – 10.2	90.2	65 – 109	12	0.79	0.73 – TCB	13	6.50	3.00 – 9.00	3
2013	7.99	7.75 – 8.16	10	301.5	280 – 339	10	7.2	6.4 – 7.9	74.0	68 – 86	9	0.14	0.01 – 0.25	7	1,065	36 – 3,056	3

3.1.2.2 Habitat Characteristics

A summary of habitat characteristics measured at fish collection sites during Session 1 and Session 2 is presented in Table 3-3. Raw habitat data from fish collection sites and from habitat transects are presented in Appendix D, Tables D1 and D2, respectively. (Photo 3-7 to Photo 3-10) illustrate representative fish habitats at fish collection sites.

Site characteristics represented the Flat habitat type. Average water depth was approximately 0.5 m and average water velocity was close to 0 m/s. Substrate composition at fish collection sites was dominated by clay/silt/sand (79.0% and 76.5% during Sessions 1 and 2, respectively). Rock substrates contributed lower amounts to substrate composition. Cobble contributed 19.0% and 19.5% whereas gravel/pebble contributed 2.0% and 4.0%. Average D90 was 11.6 cm and 12.4 cm. Embeddedness and compaction values were high (3.0 out of 3.0 during both sessions). There were limited amounts of instream cover at fish collection sites – < 1% surface area for rock and < 5% for emergent vegetation.

Some habitat characteristic parameters at fish collections sites differed between the present study and 2013. Specifically, there was higher contribution of clay/silt/sand and corresponding lower contribution of cobble and gravel/pebble rock substrates in 2014 versus 2013. In addition, substrate embeddedness was higher in 2014 compared to 2013. The reduced contribution of rock substrates in 2014 likely caused the reduction in the surface area of rock type instream cover available to fish in 2014 compared to 2013 (approximately 0.5% versus 1.3%). It does not explain the absence of submergent vegetation instream cover recorded in 2014 compared to 2013 (0% versus 14.4%) or the presence of emergent vegetation instream cover in 2014 (approximately 4.0% versus 0.0%).

Table 3-3 Habitat characteristics (mean ± std error) measured at fish collection sites in Side Channel 102.5R with comparison to 2013 data

Parameter[a]	2014		2013
	Session 1	Session 2	
Habitat Type	Flat	Flat	Flat
No. Sites	10	10	8
Average depth (m)	0.46 ± 0.04	0.46 ± 0.05	0.42 ± 0.04
Average velocity (m)	0.01 ± 0.01	0.02 ± 0.01	0.01 ± 0.01
Substrate (%)			
Organic matter	0.0	0.0	0.0
Clay/Silt/Sand	79.0 ± 8.1	76.5 ± 9.1	55.0 ± 16.1
Gravel/Pebble	2.0 ± 1.1	4.0 ± 1.8	3.8 ± 3.8
Cobble	19.0 ± 7.3	19.5 ± 7.5	41.3 ± 15.1
Boulder	0.0	0.0	0.0
Bedrock	0.0	0.0	0.0
D90 (cm)	11.6 ± 1.5	12.4 ± 2.0	12.4 ± 0.2
Embeddedness	3.0	3.0	2.2 ± 0.2
Compaction	3.0	3.0	3.0 ± 0.0
Cover (%)			
Overhead	0.0	0.0	0.0
Rock	0.0	0.5 ± 0.5	1.3 ± 0.8
Large woody debris	0.0	0.0	0.0
Submergent vegetation	0.0	0.0	14.4 ± 9.7
Emergent vegetation	4.5 ± 1.6	4.0 ± 1.6	0.0
Terrestrial vegetation	0.0	0.0	0.0

[a] See Section 2.2.1 for definitions.

Photo 3-7 Site CBS10; example of sedimentation in Side Channel 102.5R

Photo 3-8 Site CBS13; low water level sampling condition in Side Channel 102.5R

Photo 3-9 Site CBS13; high water level sampling condition on Side Channel 102.5R

Photo 3-10 Site CBS11; example of emergent vegetation in Side Channel 102.5R

3.1.3 Fish Community

3.1.3.1 Fish Species and Life Stage

In total, 5,345 fish represented by 11 species were recorded in Side Channel 102.5R (Table 3-4). The species included three sportfish (Lake Whitefish, Northern Pike, and Yellow Perch), two sucker (Longnose Sucker and White Sucker), five minnow (Longnose Dace, Northern Pikeminnow, Redside Shiner, Spottail Shiner, and Trout-perch), and one sculpin (Slimy Sculpin). The most numerically important fish were unidentified suckers (84.1%), followed by lower contributions from Longnose Dace (15.0%). All other fish species represented ≤ 1.0% of the sample.

The composition of the fish community in 2014 was similar to the composition recorded in 2013. Ten species were recorded and unidentified young-of-the year suckers were the numerically dominant group followed by Longnose Dace. Annual differences included the absence of Mountain Whitefish, the addition of Lake Whitefish and Yellow Perch, and the absence of Largescale Sucker in the 2014 catch. In addition, Redside Shiner were less prominent in 2014 compared to 2013 (0.4% versus 3.1%, respectively).

Table 3-4 Species composition of fish recorded in Side Channel 102.5R with comparison to 2013 data (Numbers do not provide accurate representation of fish abundance)

Group	Species	2014		2013	
		No.	%	No.	%
Sportfish	Lake Trout				
	Lake Whitefish	1	0.02		
	Mountain Whitefish			1	0.11
	Northern Pike	12	0.22	5	0.54
	Yellow Perch	1	0.02		
Suckers	Largescale Sucker			10	1.09
	Longnose Sucker	3	0.06	9	0.98
	White Sucker	1	0.02	6	0.65
	Sucker spp.	4,495	84.10	782	85.19
Minnows[a]	Lake Chub				
	Longnose Dace	785	14.69	64	6.97
	Northern Pikeminnow	5	0.09		
	Redside Shiner	20	0.37	28	3.05
	Spottail Shiner	11	0.21	9	0.98
	Trout-perch	2	0.04	4	0.44
Sculpins	Prickly Sculpin				
	Slimy Sculpin	10	0.19		
Total		**5,345**	**100**	**918**	**100**

[a] Includes true minnows (Family Cyprinidae) and trout-perch (Family Percopsidae).

Three large-fish species life stages were present in Side Channel 102.5R (Table 3-5). The young-of-the-year life stage was recorded only for unidentified sucker species group. The juvenile life stage of five species was recorded – Lake Whitefish, Northern Pike, Yellow Perch, Longnose Sucker, and White Sucker. The Northern Pike adult life stage also was present.

Table 3-5 Large-fish species life stages recorded in Side Channel 102.5R with comparison to 2013 data

Group	Species	2014			2013		
		Life Stage			Life Stage		
		YOY	Juv	Adult	YOY	Juv	Adult
Sportfish	Lake Trout						
	Lake Whitefish		X				
	Mountain Whitefish				X		
	Northern Pike		X	X		X	
	Yellow Perch		X				
Suckers	Largescale Sucker					X	
	Longnose Sucker		X		X	X	
	White Sucker		X			X	
	Sucker spp.	X	X		X		
Minnows	Northern Pikeminnow	X	X				
Total Number		**2**	**7**	**1**	**3**	**4**	**0**

The results recorded in 2014 were similar to 2013 results. Juvenile was the primary life stage encountered followed by young-of-the-year fish. Adult fish were infrequently encountered, but this was due primarily to the fish capture method used -- beach seine targets small-sized fish.

3.1.2.2 Catch Rate

Beach seine catch rates were < 1.0 fish/100 m^2 for most species (Figure 3-7; Appendix E, Table E2). Beach seine catch rates for Lake Whitefish, Northern Pike and Yellow Perch were 0.03 fish/100 m^2, 0.32 fish/100 m^2 and 0.03 fish/100 m^2, respectively. Beach seine catch rates for all three sucker species were ≤ 0.08 fish/100 m^2). The most abundant fish in the beach seine catch were unidentified suckers (118.9 fish/100 m^2), followed by Longnose Dace (20.8 fish/100 m^2).

Fish catch rates for all species were lower in 2014 compared to 2013 (Figure 3-7). For more abundant species the difference was between 4 (unidentified suckers) and 1 times lower(Longnose Dace). For the less abundant species the difference was approximately an order of magnitude lower (10 times).).

3.1.3.2 Biological Characteristics

Median lengths of species/groups sampled in Side channel 102.5R are summarized in Table 3-6. Raw biological data are present in Appendix F. For species where annual data were available, median length tended to higher in 2013 compared to 2014. This difference may have represented annual differences in growth or the difference may have been an artefact of the later 2013 sample period (i.e., late July 2014 versus early August 2013).

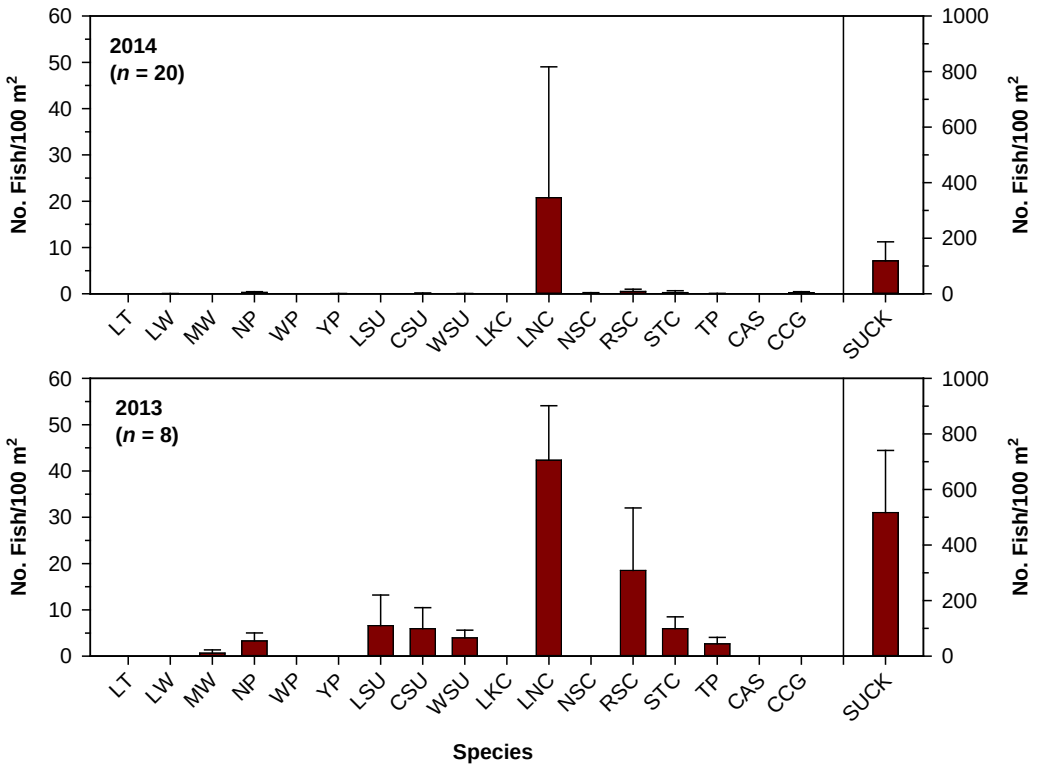


Figure 3-7 Average (± SE) catch rates of fish species/groups in Side Channel 102.5R with comparison to 2013 data

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Table 3-6 Fish species/group fork length characteristics in Side Channel 102.5R with comparison to 2013 data

Group	Common Name	2014			2013		
		n	Median	Range	*n*	Median	Range
Sportfish	Lake Trout						
	Lake Whitefish	1	75		1	43	
	Mountain Whitefish				5	159	135 – 167
	Northern Pike	12	127	92 – 275			
	Yellow Perch	1	42				
Sucker	Largescale Sucker				10	45	39 – 55
	Longnose Sucker	3	37	36 – 38	9	48	21 – 82
	White Sucker	1	46		6	49	45 – 55
	Sucker species	226	21	13 – 38	126	21	11 – 28
Minnow/ Trout-Perch	Lake Chub						
	Longnose Dace	20	16.5	11 – 21	58	21	12 – 54
	Northern Pikeminnow	5	42	22 – 48			
	Redside Shiner	5	37	36 – 41	28	42	32 – 47
	Spottail Shiner	11	26	19 – 32	9	32	26 – 37
	Trout-perch	1	43		4	35	22 – 49
Sculpin	Prickly Sculpin						
	Slimy Sculpin	10	22	14 – 27			
	Sculpin species				1	23	

3.2 Side Channel 112.5L

Side Channel 112.5L is located along the left bank of Peace River 7.5 km downstream of the Taylor Bridge. It is studied as a control site located near Side Channel 102.5R. The upper portion of Side Channel 112.5L is regularly inundated and dewatered, while the lower section is permanently wetted and open, often backwatered by Peace River flow.

3.2.1 Physical Characteristics

3.2.1.1 Channel Morphology

Three cross sections were surveyed and substrate characterised 9 August 2013. Channel morphology is scheduled for reassessment in 2015, Year 3. No survey or substrate characterisation were conducted in 2014.

3.2.1.2 Stage and Flow

Two hydrometric gauges were originally installed in Side Channel 112.5L, one near the upstream end, site 112.5L Upstream, and one near the downstream end, site 112.5L Downstream. The gauge at site 112.5L Downstream was lost prior to NHC's September 2014 field inspection. No additional data are available for 112.5L Downstream and it has been discontinued. The gauge at site 112.5L Upstream was

inspected, and data were retrieved on 2 September 2014. The memory of the logger, however, reached capacity and it stopped recording on 16 May 2014. On 17 November 2013 the logger became detached from its mounting post and dropped approximately 0.5 m to rest on the river bottom. While stage levels have been corrected to account for this, data following this time are of lower quality. A summary of gauge installation and history of deployment is provided in Table 2-2. The 112.5L Upstream Levelogger was installed 11 June 2013 and data are continuous from installation to 16 May 2014.

Site 112.5L Upstream is regularly activated by main channel Peace River flow. Taking into account a 45 to 50 minute lag between flows at WSC gauge *07FD002 Peace River near Taylor* and flows at 112.5L Upstream, the upstream portion of Side Channel 112.5L is expected to activate for stages above 2.7 m as measured at the WSC gauge (*07FD002*) (Figure 3-8). The maximum and minimum daily stage for sites 112.5L Upstream, 112.5L Pool, and the WSC gauge (*07FD002*) are shown in Figure 3-9.

Flow at the 112.5L Downstream gauge is limited under normal Peace River flow conditions and the site frequently experiences backwater effects with outflow either ceasing or reversing. The hydraulic gradient and hence the stage-discharge relationship varies with rate of change in mainstem water level. Development of a rating curve for these conditions is non-trivial. Discreet discharge measurements collected at 112.5L Downstream were similar to those from 2013, reporting near zero flow.

Linear regression was developed relating hourly stage data at the WSC gauge *07FD002 Peace River near Taylor* to hourly stage at the side channel gauge (Figure 3-10). Regressions were also developed for daily maximum and minimum stage between the WSC gauge and 112.5L gauges. Comparison of these regressions as well as visual comparison of maximum and minimum daily stage at the 112.5L Upstream gauge (Figure 3-8) provides no evidence of a reduced response – that is attenuation of flow variations – between the WSC mainstem gauge and 112.5L gauges.

Using the regression the stage record was generated for 2013 and 2014 (Figure 3-11). Visual comparison of the stage record suggests that low flow was on average 0.3 m lower for the summer of 2014 than for the summer of 2013.

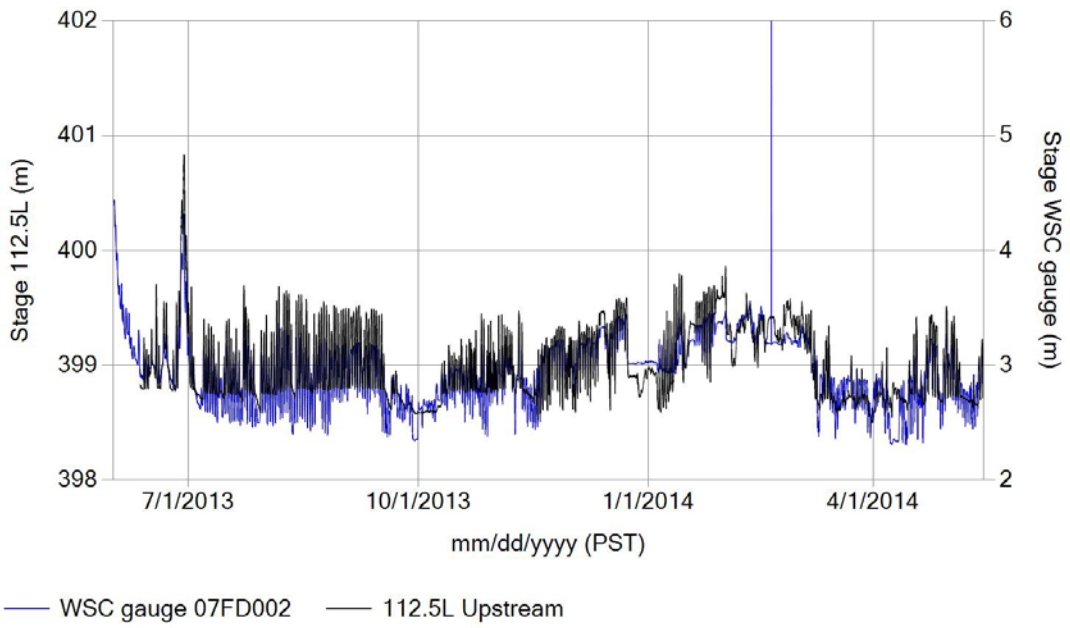

Figure 3-8 **Stage record for sites 112.5L Upstream compared to preliminary stage from Water Survey of Canada site 07FD002 Peace River near Taylor**

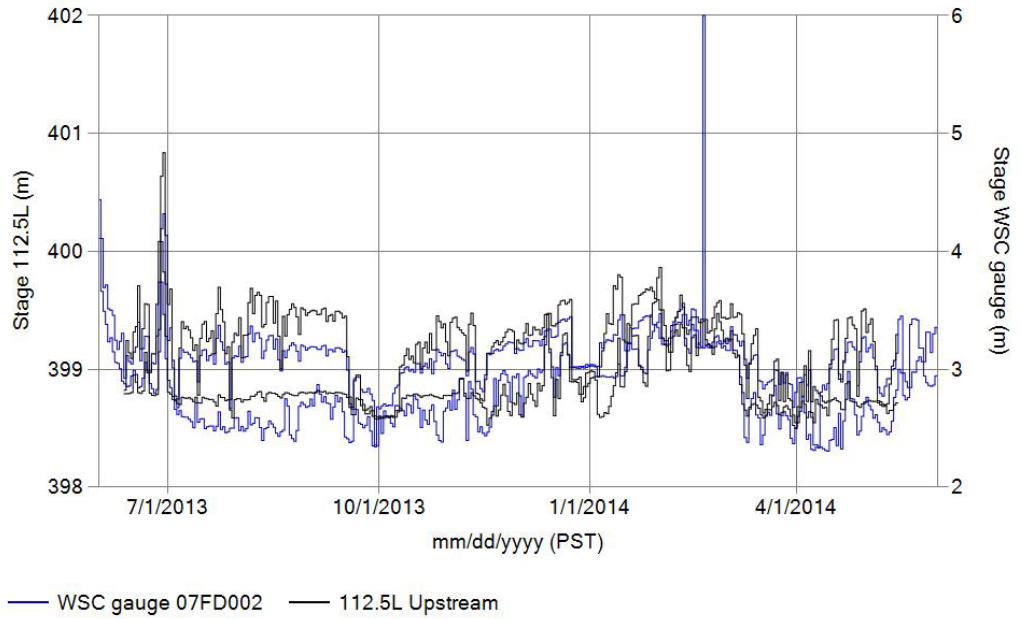

Figure 3-9 **Maximum and minimum daily stage for site 112.5L Upstream compared to the preliminary maximum and minimum daily stage from WSC site 07FD002 Peace River near Taylor**

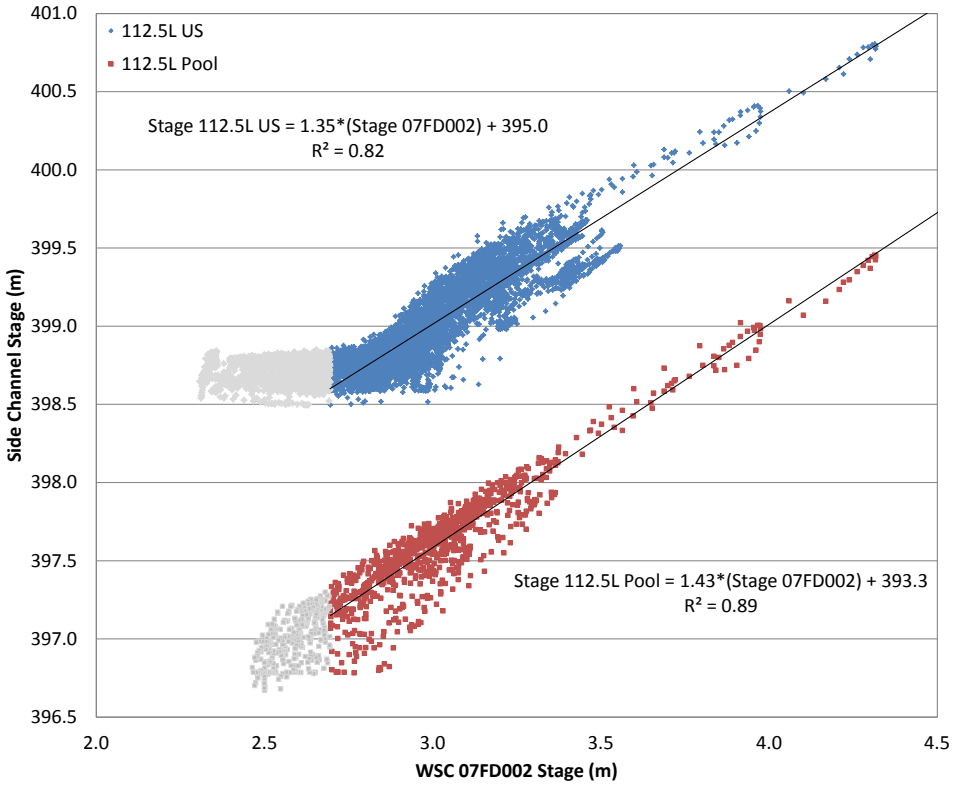

Figure 3-10 **Stage in side channel 112.5L compared to WSC 07FD002, based on hourly data. Side channel 112.5L upstream gauge is activated by main channel for stages above 2.7 m(WSC 07FD002); data for lower water levels are shown in grey. A 45 to 50 minute lag between changes in flow/stage at the WSC gauge and changes in flow/stage at 112.5L is expected, but has not been applied to these data.**

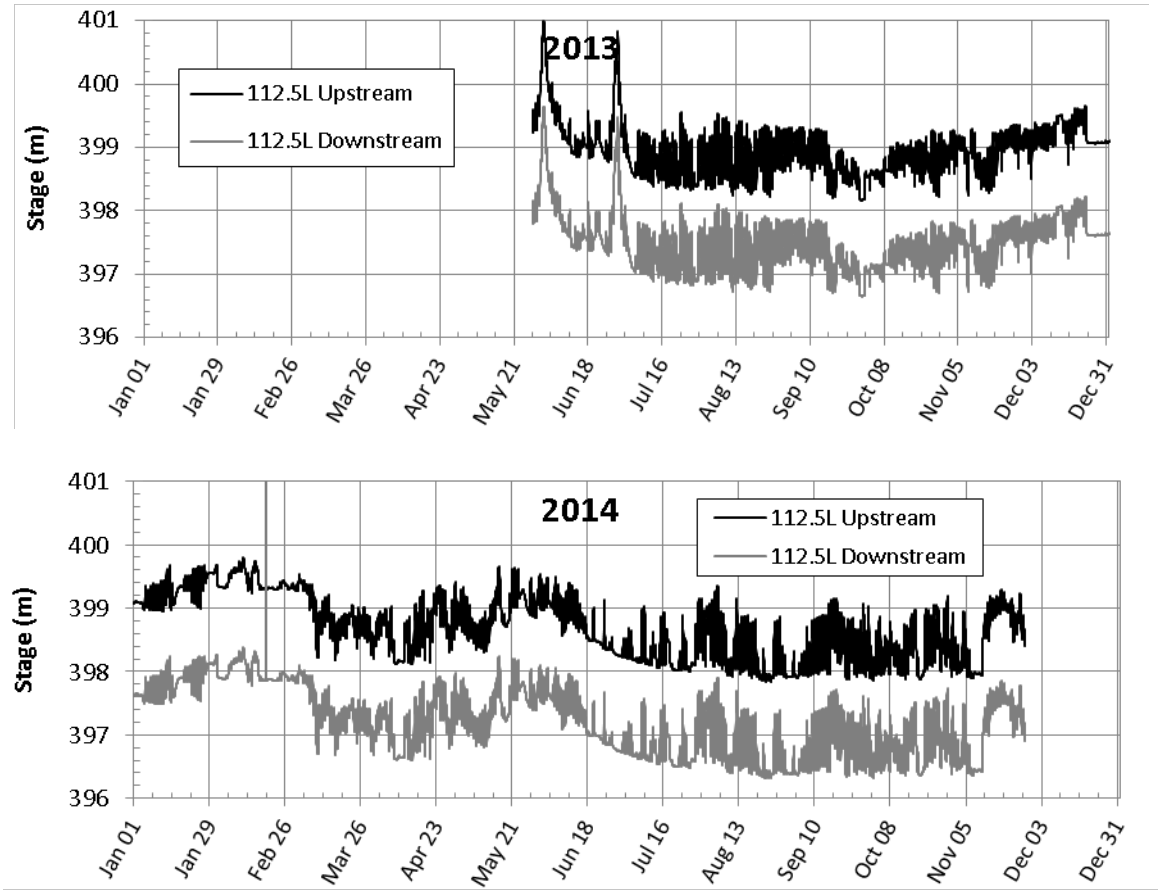

Figure 3-11 Stage record for 112.5L Upstream and 112.5L Downstream as transposed from WSC 07FD002

3.2.2 Fish Habitat

3.2.2.1 Discharge, Temperature and Water Quality

Discharge

Mean daily discharge of the Peace River ranged from 616 m^3/s to 1,286 m^3/s during the field program that occurred from 26 to 28 July, 2014 (Figure 3-12). Hourly discharge did not fluctuate widely during each 24 h period on the first two sample days, but did fluctuate on 28 July. In comparison, mean daily discharge was higher and hourly discharge more variable during the 2013 field program.

Water Temperature

Water temperatures in Side Channel 112L recorded between 1 August and 15 September, 2014 ranged from 9.3°C to 22.5°C with an average of 13.9°C (Figure 3-13; Appendix C, Table C1). Average daily water temperatures were approximately 15°C at the beginning of the monitoring program and then decreased

to approximately 11°C by the end of the program. The daily range of water temperature averaged 5.5°C in 2014. The range of water temperature was slightly lower in 2013 and averaged 3.0°C.

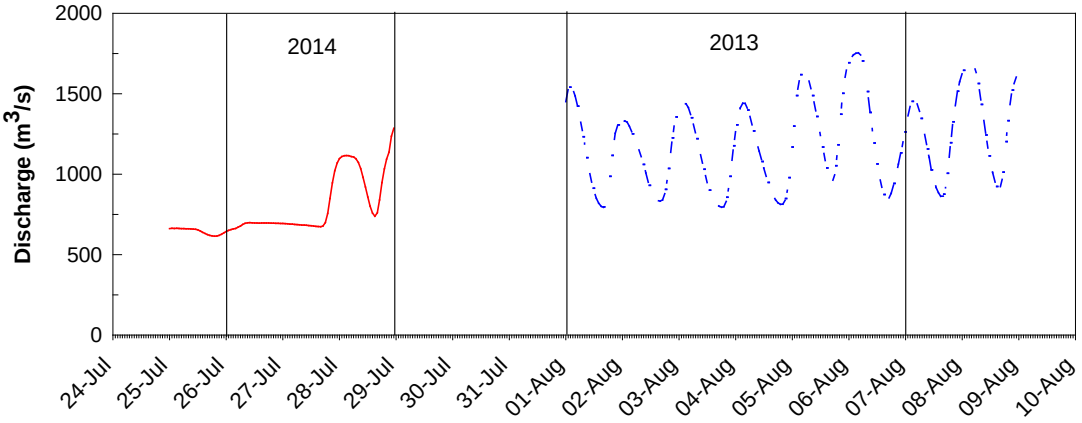

Figure 3-12 Peace River hourly discharge at Taylor during the 2013 and 2014 field programs

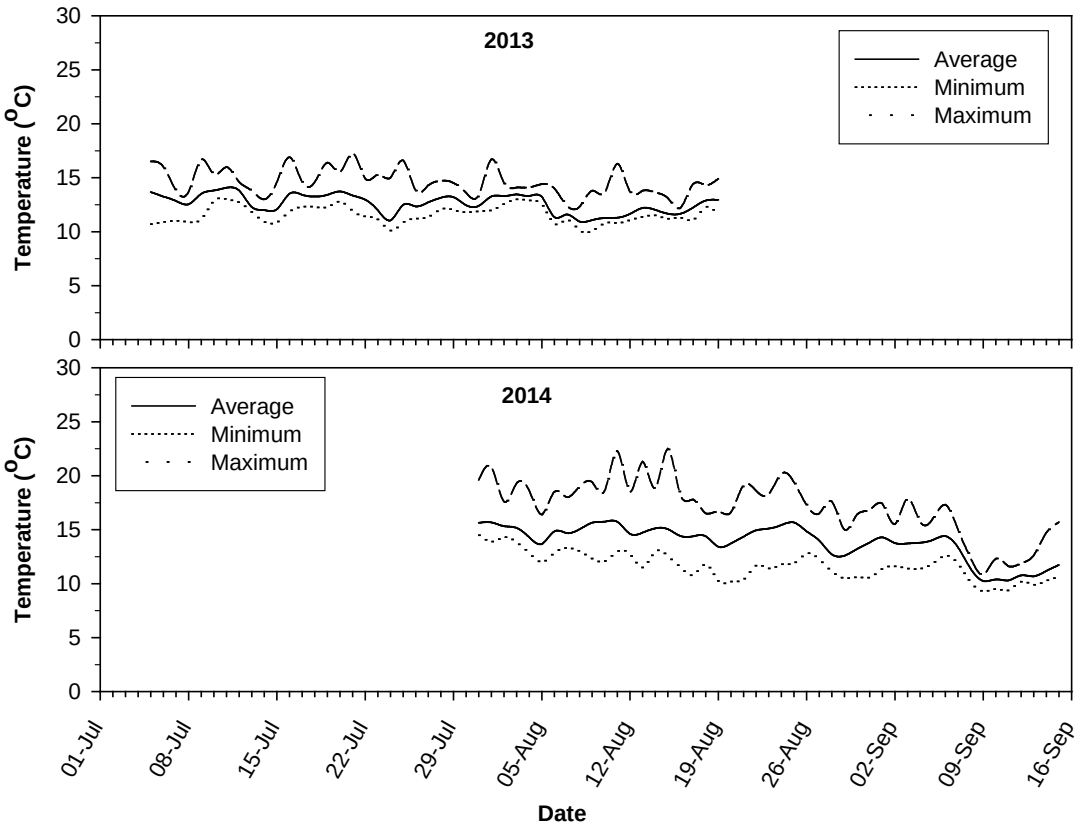

Figure 3-13 Daily water temperatures recorded in Side Channel 112.5L during 2013 and 2014

General Water Quality

Water conductivity, pH, and dissolved oxygen measured at fish collection sites in Side Channel 112L were generally constant during the field program (Table 3-7, Appendix C, Table C2). Conductivity values ranged from 252 to 517 µS/cm, pH values ranged from 7.21 to 8.31 pH units, and dissolved oxygen ranged from 8.6 to 9.7 ppm (100 to 110%). The high conductivity value of 517 µS/cm was recorded at one site and was likely due to ground water input. Water clarity was high at the time of sampling whereas turbidity was low. Water clarity ranged between 0.80 m and TCB (to channel bottom), while turbidity ranged between 4 NTU and 10 NTU. General water quality recorded during the present study was similar to water quality recorded in 2013. The primary difference included higher water clarity with corresponding lower water turbidity in 2014.

Table 3-7 Summary of water quality parameters measured in Side Channel 112.5L with comparison to 2013 data

Date	pH			Conductivity (µS/cm)			Dissolved Oxygen					Clarity (m)			Turbidity (NTU)		
							Concentration (ppm)		Saturation (%)								
	Mean	Range	*n*	Mean	Range	*n*	Mean	Range	Mean	Range	*n*	Mean	Range	*n*	Mean	Range	*n*
26-Jul-14	7.80	7.21 – 8.16	8	368.0	286 – 517	8	9.3	8.8 – 9.7	102.8	100 – 105	4	0.80	0.80 – TCB	4	8.00		1
27-Jul-14	8.20	8.09 – 8.31	2	300.5	297 – 304	2						0.80		1	10.00		1
28-Jul-14	8.04	7.95 – 8.13	10	284.3	252 – 357	10	9.0	8.6 – 9.4	103.8	100 – 110	9	0.93	0.85 - TCB	3	5.00	4.00 – 6.00	2
2014	7.96	7.21 – 8.31	20	319.4	252 – 517	20	9.1	8.6 – 9.7	103.5	100 – 110	13	0.86	0.80 - TCB	8	7.00	4.00 – 10.0	4
2013	7.86	7.00 – 8.12	15	217.9	187 – 277	15	8.9	6.9 – 9.8	89.3	69 – 98	15	0.23	0.15 – 0.26	8	66.0	35 – 97	2

3.2.1.2 Habitat Characteristics

A summary of habitat characteristics measured at fish collection sites during Session 1 and Session 2 is presented in Table 3-8. Raw habitat data from fish collection sites and from habitat transects are presented in Appendix D, Tables D1 and D2, respectively. Photos 5 to 8 illustrate representative fish habitats at fish collection sites.

Site characteristics represented the Flat habitat type. Average water depth was 0.35 to 0.45 m and average water velocity was close to 0 m/s. Substrate composition at fish collection sites was dominated by clay/silt/sand (93.0% and 94.5% during sessions 1 and 2, respectively). Rock substrates contributed lower amounts to substrate composition. Cobble contributed 3.0% and 1.0%; gravel/pebble contributed 4.0% and 4.5%. Average D90 was 5.0 cm and 7.0 cm. Embeddedness and compaction values were high (3.0 out of 3.0 during both sessions). There were limited amounts of instream cover at fish collection sites – ≤ 2.5% for submergent vegetation.

Habitat characteristic parameters at fish collections sites did not differ substantially between the present study and 2013. There was slightly lower contribution of clay/silt/sand in 2014 and D90 was smaller.

Table 3-8 Habitat characteristics (mean ± standard error) measured at fish collection sites in Side Channel 112.5L with comparison to 2013 data

Parameter[a]	2014		2013
	Session 1	Session 2	
Habitat Type	Flat	Flat	Flat
No. Sites	10	10	8
Average depth (m)	0.35 ± 0.05	0.45 ± 0.04	0.35 ± 0.05
Average velocity (m)	0.0	0.02 ± 0.01	0.00
Substrate (%)			
Organic matter	0.0	0.0	0.0
Clay/Silt/Sand	93.0 ± 4.7	94.5 ± 4.1	96.9 ± 2.5
Gravel/Pebble	4.0 ± 4.0	4.5 ± 4.0	1.9 ± 1.9
Cobble	3.0 ± 3.0	1.0 ± 1.0	1.3 ± 0.8
Boulder	0.0	0.0	0.0
Bedrock	0.0	0.0	0.0
D90 (cm)	5.0 ± 1.0	7.0 ± 2.0	11.0 ± 1.9
Embeddedness	3.0	3.0	3.0 ± 0.0
Compaction	3.0	3.0	3.0 ± 0.0
Cover (%)			
Overhead	0.0	0.0	0.0
Rock	0.0	0.0	0.0
Large woody debris	0.0	0.0	0.0
Submergent vegetation	2.5 ± 2.5	2.0 ± 2.0	0.0
Emergent vegetation	0.0	0.0	0.0
Terrestrial vegetation	0.0	0.0	0.0

[a] See Section 2.3.3 for definitions.

Photo 3-11 Site DBS15; example of fine sediments in Side Channel 112.5L

Photo 3-12 Side DBS09; low water level sampling condition in Side Channel 112.5L

Photo 3-13 Side DBS09; high water level sampling condition in Side Channel 112L

Photo 3-14 Site DBS11; example of submergent vegetation in Side Channel 112.5L

3.2.2 Fish Community

3.2.2.1 Fish Species and Life Stage

In total, 13,124 fish represented by 12 species were recorded in Side Channel 112L (Table 3-9). The species included two sportfish (Northern Pike and Yellow Perch), three sucker (Largescale Sucker, Longnose Sucker, and White Sucker), six minnow (Lake Chub, Longnose Dace, Northern Pikeminnow, Redside Shiner, Spottail Shiner, and Trout-perch), and one sculpin (Slimy Sculpin). The most numerically important fish were unidentified suckers (93.2%), followed by lower contributions from Redside Shiner (2.4%) and Spottail Shiner (2.8%). All other fish species represented ≤ 1.0% of the sample.

The composition of the fish community in 2014 was similar to the composition recorded in 2013. Thirteen species and were recorded and unidentified suckers were the numerically dominant group. Annual differences included the absence of Mountain Whitefish and Lake Trout, and the addition of Slimy Sculpin in the 2014 catch. In addition, Redside Shiner were much less prominent in 2014 compared to 2013 (2.4% versus 74.2%, respectively).

Table 3-9 Species composition of fish recorded in Side Channel 112.5L with comparison to 2013 data (Numbers do not provide accurate representation of fish abundance)

Group	Species	2014		2013	
		No.	%	No.	%
Sportfish	Lake Trout			1	0.03
	Lake Whitefish				
	Mountain Whitefish			10	0.33
	Northern Pike	5	0.04	5	0.17
	Yellow Perch	1	0.01	4	0.13
Suckers	Largescale Sucker	17	0.13	7	0.23
	Longnose Sucker	28	0.21	28	0.93
	White Sucker	24	0.18	49	1.63
	Sucker spp.	12,231	93.20	531	17.64
Minnows[a]	Lake Chub	2	0.02	6	0.20
	Longnose Dace	46	0.35	9	0.30
	Northern Pikeminnow	65	0.50	2	0.07
	Redside Shiner	314	2.39	2,233	74.18
	Spottail Shiner	361	2.75	82	2.73
	Trout-perch	27	0.21	43	1.43
Sculpins	Prickly Sculpin				
	Slimy Sculpin	2	0.02		
Total		**13,124**	**100**	**3,010**	**100**

[a] Includes true minnows (Family Cyprinidae) and trout-perch (Family Percopsidae).

Two large-fish species life stages were present in Side Channel 112L (Table 3-10). The young-of-the-year life stage was recorded only for White Sucker and the unidentified sucker species group. The juvenile life stage of seven species/groups was recorded – Northern Pike, Yellow Perch, Largescale Sucker, Longnose Sucker, White Sucker, and Northern Pikeminnow. Adult life stages were not recorded.

Table 3-10 Large fish species life stage recorded in Side Channel 112.5L

Group	Species	2014			2013		
		Life Stage			Life Stage		
		YOY	Juv	Adult	YOY	Juv	Adult
Sportfish	Lake Trout				X		
	Lake Whitefish						
	Mountain Whitefish				X		
	Northern Pike		X			X	X
	Yellow Perch		X		X		
Suckers	Largescale Sucker		X			X	
	Longnose Sucker		X		X	X	
	White Sucker	X	X			X	
	Sucker spp.	X	X		X	X	
Minnows	Northern Pikeminnow		X			X	
Total Number		**2**	**7**	**0**	**5**	**6**	**1**

The results recorded in 2014 were similar to 2013 results. Juvenile was the primary life stage encountered followed by young-of-the-year fish. Adult fish were infrequently or not encountered, but this was due primarily to the fish capture method used – beach seine targets small – sized fish.

3.2.2.2 Catch Rate

Beach seine catch rates were < 1.0 fish/100 m^2 for most species (Figure 3-14; Appendix E, Table E2). Catch rates for Northern Pike and Yellow Perch were 0.13 fish/100 m^2 and 0.03 fish/100 m^2, respectively. Beach seine catch rates for all three sucker species were ≤ 1.72 fish/100 m^2). The most abundant fish in the beach seine catch were unidentified suckers (323.58 fish/100 m^2), followed by Redside Shiner (7.17 fish/100 m^2), and Spottail Shiner (8.31 fish/100 m^2).

Fish catch rates for most species were lower in 2014 compared to 2013 (Figure 3-14). The only exceptions were unidentified suckers (323.58 fish/100 m^2 in 2014 versus 351.19 fish/100 m^2 in 2013) and Northern Pikeminnow (1.72 fish/100 m^2 in 2014 versus 1.32 fish/100 m^2 in 2013). For the remaining species the difference was approximately an order of magnitude lower (10 times, i.e. 10% of the fish caught per unit area in 2014 versus that caught in 2013).

3.2.2.3 Biological Characteristics

Median lengths of species/groups sampled in Side channel 112L are summarized in Table 3-11. Raw biological data are presented in Appendix F. For species where annual data were available, trends in median length were variable with some species being higher and other species being lower in 2014 compared to 2013. For species with large sample sizes (i.e., $n > 15$) median length recorded in 2014 tended to be lower than median length recorded in 2013. This difference may have represented annual differences in growth or the difference may have been an artefact of the later 2013 sample period (i.e., late July 2014 versus early August 2013).

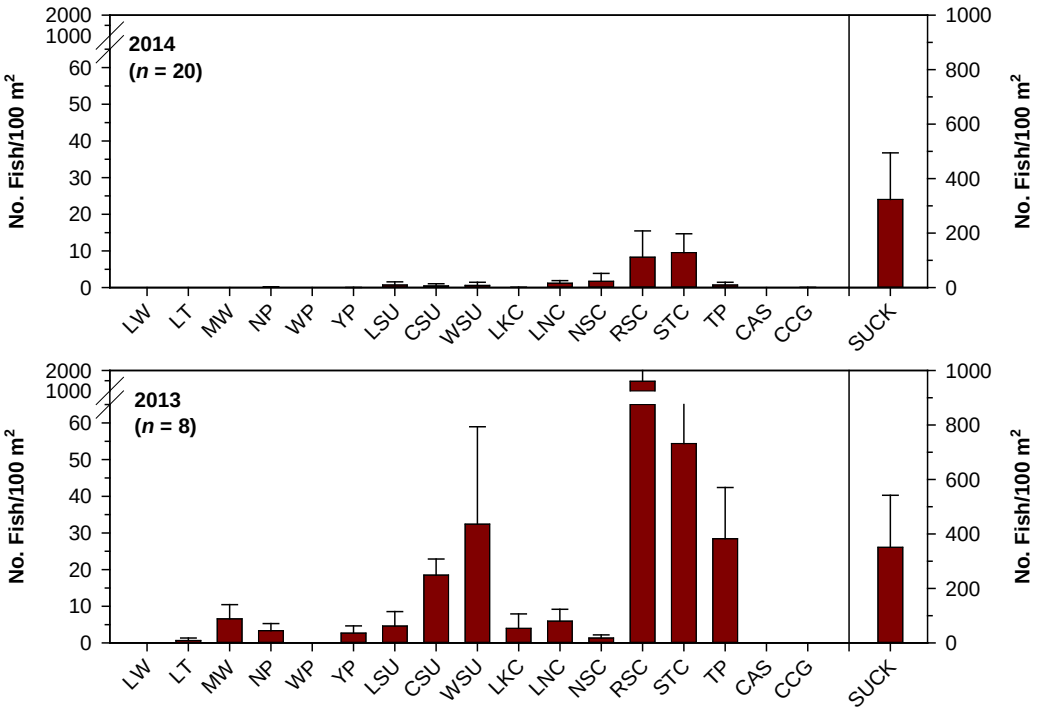

Figure 3-14 Average (± SE) catch rates of fish species/groups in Side Channel 112.5L with comparison to 2013 data

Table 3-11 Fish species/groups fork length characteristics in Side Channel 112L with comparison to 2013 data

Group	Common Name	2014			2013		
		n	Median	Range	*n*	Median	Range
Sportfish	Lake Trout				1	49	
	Lake Whitefish						
	Mountain Whitefish				10	49.5	41 – 63
	Northern Pike	5	122	108 – 151	5	450	123 – 558
	Yellow Perch	1	48		4	35	34 – 45
Sucker	Largescale Sucker	7	58	50 – 73	7	50	43 – 66
	Longnose Sucker	16	56.5	33 – 83	27	59	30 – 89
	White Sucker	10	62.5	34 – 69	22	58	50 – 79
	Sucker species	231	23	17 – 44	103	19	12 – 46
Minnow/ Trout-Perch	Lake Chub	2	30.5	29 – 32	6	63.5	55 – 68
	Longnose Dace	36	18	14 – 30	9	43	22 – 69
	Northern Pikeminnow	16	61	32 – 94	2	93.5	79 – 108
	Redside Shiner	74	26	18 – 63	38	42	35 – 64
	Spottail Shiner	81	29	18 – 68	20	67	43 – 79
	Trout-perch	16	27	18 – 62	42	51	16 – 71
Sculpin	Prickly Sculpin						
	Slimy Sculpin	2	23	21 – 25			
	Sculpin species						

4 DISCUSSION

4.1 Physical Characteristics

102.5R Side Channel Construction

March to April 2014 the 500 m long side channel that crosses the right island at102.5R was re-established. Initial flow within the channel resulted in erosion along the northeast bank. Flattening of this bank and armouring with coarser gravel accompanied the erosion. Bankline retreat was surveyed upon construction completion (April 2014) as well as at the end of summer (September 2014). Within 18 weeks, bankline retreat was roughly 1 to 3 times greater at the northeast bank of the re-established channel than along other unaffected portions of the island's north bank. More than half of the bankline retreat occurred within the first 3 weeks.

102.5R Geomorphology

The Pine River is the most substantial tributary below PCN. Coarse sediment deposits at the confluence of the Pine and Peace River, with post regulation flow only sufficient to transport fine sediments and suspended loads. Ongoing deposition has resulted in local channel changes. In recent years this includes the development and downstream growth of the mid-channel bar along the north side of the 102.5R island. Overflow across the bar directs flow against the north side of the island contributing flow to the side channel and eroding the north side of the island.

Sediment likely derived from local erosion of the re-established channel (northeast end) and island and possibly also from the Pine River has deposited within the constructed channel. Depth of deposition ranges from as great as 0.7 m at the northwest end of the constructed channel to 0.5 m along the thalweg in the middle portion of the constructed channel.

The constructed side channel has similar substrate composition as the pre-existing 102.5R side channel and downstream 112.5L control side channel; that is, sandy-loam with occasional seams of exposed gravel.

Stage and Flow

Stage was measured using leveloggers at two locations within the 102.5R test side channel (constructed channel – installed in 2014 and pre-existing channel) and within the 112.5L control side channel (upstream channel and downstream pool). Damage to the leveloggers due to debris and ice limited the continuous record of available data. Using the overlapping data record, regressions were made with the WSC gauge 7FD002 *Peace River near Taylor* to allow generation of the complete annual dataset.

Flow was extremely low during the site work and for much of the summer (Figure 1-1). Daily flow for the Peace River (07FD002) was on average 6% (98 m^3/s) less than that measured for 2013 and 14% (173 m^3/s) less than the 10 year average. Considering the summer period (June through August), the flow was 27% (356 m^3/s) less than 2013 and 24% (293 m^3/s) less than the 10 year average. Flow measurements in 2014 were at or near zero for all side channels.

4.2 Fish and Fish Habitat

The purpose of the fish and fish habitat component of the Peace River Side Channel Fisheries Monitoring Program is to collect data on habitat and fish use from selected side channels. The information will be used to document change caused by normal operational flows and to assess response of fish communities to physical works re-establishing or developing side channel habitat and to spill events. The key management question of the fish and fish habitat component is "which fish species and fish life stages are using side channels and are changes occurring over time?"

The 2014 GMSMON-7 program collected information that described the fish community and fish habitat in each of two side channels. The program used proven fish collection and habitat measurement methods (i.e., used by previous investigations in the study area) to collect standardized data for several parameters. For each side channel, fish habitat was described in terms of discharge, water temperature, general water quality, and physical characteristics. For each side channel, the fish community was described in terms of species and life stage diversity, species relative abundance, and biological characteristics. These data in combination with information being collected by the physical characteristics component of the program and by other studies (i.e., Peace River Side Channel Productivity Study) are to be used as a basis to achieve the goal of the program. To this end the 2014 fish and fish habitat component was successful – the required data were collected.

In 2013, examination of aerial photography indicated that fish habitats in both side channels were dominated by the Flat habitat type with small amounts of Riffle and/or Run habitat types, both in terms of number of units and surface area. These types of data were not collected in 2014. The baseline data collected in 2013 will be used for comparison to post-restoration and spill event conditions, when aerial photography data become available.

The habitat characteristics at fish collection sites recorded during the present study were consistent with data collected by the 2013 study and by Site C Peace River Fish Inventory Studies (Mainstream 2010, 2011, 2013b; NHC and Mainstream 2013a, 2013b). Important findings were as follows. Water quality characteristics were generally similar between years for most parameters. Recorded differences in water clarity and dissolved oxygen concentrations likely were attributed to annual differences in river flow at the time of sampling; river flow was on average noticeably through the summer of 2014 than that of 2013. Habitats were influenced by water level fluctuations/water flow, which resulted in changes to water depth and velocity. Secondly, suspended sediments and sedimentation influenced water quality and substrate. Fines were a dominant component of side channel substrate and rock substrates that were present were strongly influenced by sedimentation (i.e., high embeddedness and compaction).

Although the 2014 results were consistent with findings by previous investigations, results from Side Channel 102.5R indicated some change in habitat characteristics that were not recorded in Side Channel 112L. Specifically, fine sediments were more prevalent and there was evidence of sedimentation (i.e., higher embeddedness rating) at fish collection sites in 2014 compared to 2013. No change in habitat characteristics was recorded in Side Channel 112L.

In 2014, the side channel fish community consisted of up to 14 species, which was consistent with the 13 species recorded by the 2013 investigation and the 18 species expected to occur in Peace River side channels (Mainstream 2010, 2011, 2013b; NHC and Mainstream 2013a, 2013b). The differences between the present study and 2013 were the absence or addition of rare species such as Lake Trout, Lake Whitefish, and Mountain Whitefish.

The species/life stage composition of side channel fish communities recorded by the present study was consistent with findings by the 2013 investigation and other studies (Mainstream 2010, 2011, 2013b; NHC and Mainstream 2013b). During the present study, the numerically dominant species/life stage were suckers (young-of-the-year unidentified sucker species and minnows), Longnose Dace (all life stages), and/or Redside Shiner (all life stages). Sportfish and sculpin species were not numerous in either side channel. The juvenile life stage of sucker species were well represented. No change in species/life stage composition was recorded between the present study and 2013. Based on this information, the 2014 results are sufficient to document changes to fish species/life stage presence or absence, at least for numerically abundant species.

The relative abundance of most fish species recorded by the present study was lower than that recorded in 2013. Because fish abundance declined in both side channels in 2014 spatial effects likely are not the cause. As such, the difference may reflect natural annual variation. More years of investigation are required before an assessment of fish abundance trends can be completed. This issue is identical to the one faced by GMSMON-2 Large Fish Index Project that has been ongoing for thirteen consecutive years (Mainstream and Gazey, 2014).

Fish species relative abundance was variable in 2014, but application of recommendations by the 2013 study to concentrate sampling efforts on a single fish collection method (beach seine) and thus increasing sample size did result in a reduction of the standard error around the catch rate estimate for most species. This approach will improve the ability to identify a change in fish relative abundance when one occurs.

.1

5 SUMMARY

The Peace River downstream of the GMS and PCN experience a regulated flow regime with reduced peak flow levels and increased diurnal fluctuation of flow and water level. A consequence of the regulated flow regime is the infilling and encroachment of side channel habitat, leaving many of the side channels closed or intermittently isolated from the main channel and limiting the value of remaining habitat due to flow variability. GMSMON-7 is the monitoring of the habitat; that is, its physical characteristics, fish community, and fish habitat. This report documents the conclusion of the second year of the GMSMON-7 monitoring. Even years concentrate on fish and fish habitat and odd years concentrate on the physical characteristics. Year 2 was unique in that the first trial side channel was constructed, 102.5R.

The following two tables (**Table 12** and **Table 13**) re-states the WUP Consultative Committee management questions and Fisheries Technical Committee developed hypothesis in the context of the 2014 study.

Table 12 2013 Study compared with GMSMON-7 management questions

Questions and 2014 Study Findings	
Question 1:	What is the response of side channel stage to fluctuations in discharge?
Discussion 1:	Water level in side channels closely correlate mainstem flow fluctuations. Linear regressions were developed between the WSC 07FD002 gauge and the monitored side channels. The primary difference is that the side channels become dry or inactive at moderate to low flows within the mainstem (i.e. 112.5L Upstream). Additional years of data may identify changes in the correlation between side channel and main channel, such as reduced flow as channel inlets are choked off by sedimentation and encroaching vegetation. The surveys geomorphic sectional surveys and inspection may provide similar and or supporting data.
Question 2:	What physical processes are occurring in the beds of side channels of the Peace River and is there a trend over time?
Discussion 2:	Physical components – such as geomorphic process and substrate – are not studied in odd years. However, following the constructed re-establishment of the 102.5R side channel erosion occurred along the northeast bank and deposition of sediment was observed within the side channel. Year 3 will further investigate the test and the control side channels. It is expected that data over multiple years of study will be required to support or disprove current understanding of general Peace River side channel trends; that is sedimentation and vegetation encroachment. Site 102.5R being located near the Pine River confluence could be subjected to increased sediment loading and channel changes that are not representative of other reaches along the Peace River.

Questions and 2014 Study Findings	
Question 3:	Which fish species and fish life stages are using the side channels of the Peace River and are changes occurring over time?
Discussion 3:	Downstream of the Pine River the fish community is dominated by young-of-the-year and juveniles of sucker species, and minnows. The dominant species and life-stage encountered in the test and trial side channels (102.5R and 112.5L) are: Sportfish: Northern Pike (sportfish), young-of-the-year sucker species, and Redside Shiner (Minnows). Data are not sufficient to ascertain if there are changes over time.

Table 13 2013 Study compared with GMSMON-7 hypothesis

Hypothesis	2013 Study Finding
Hypothesis 1	Morphology of side channel is changing
A) With time?	Primarily baseline data collected, such a determination is not yet possible.
B) In trial sites more than control sites?	Deposition within the trial site was observed within the first 15 weeks. Subsequent investigations will help to determine if the deposition is expected to continue or is a result of initial channel changes.
Hypothesis 2	Bed material armouring in side channel is changing
A) With time?	No indication of coarse substrate movement in the studied side channels since the last post spill assessment. Fine fluvial deposited sediment overlies much of the side channel substrate. Currently only one year of data has been collection, further study required to indicate change.
B) In trial sites more than control sites?	Trial sites 102.5R appears to be experiencing greater fine sediment deposition than expected at the control site based on habitat embeddedness. Currently only one year of data has been collection, further study required to indicate differences.
Hypothesis 2	Relative abundance of fish species, age/size class structure, fish numbers, and species present in side channels is changing
A) With time?	Catch rate (fish per unit area) and fish size decreased in Year 2 from Year 1 in both the trial and the control site. The cause is not yet defined, but could be an artefact of sampling period or difference in habitat conditions between the two years (temperature, flow, …).
B) In trial sites more than control sites?	Both the trial and control site showed similar reduction in catch rate fish size.

Changes during the 2014 study included:

- test side channel 32L and control side channel 40L being omitted from current and future study.

- Test side channel 102.5 was constructed in spring 2014. The site was monitored indicating erosion at the northeast end of the channel (near the mainstem) and deposition within the re-established side channel.

Physical attribute monitoring in the 2014 program was to be limited to water level monitoring. Many of the water level gauges (leveloggers) were damaged or lost during 2014. Regressions between the side channel data and the WSC gauge allowed extension of the data record for the full study period.

The fish and fish habitat component of the 2014 program collected information that described the fish community and fish habitat in two side channels. The program used proven fish collection and habitat measurement methods to collect standardized data for several parameters. For each side channel, fish habitat was described in terms of discharge, water temperature, general water quality, and physical characteristics. For each side channel, the fish community was described in terms of species and life stage diversity, species relative abundance, and biological characteristics. To this end the 2014 fish and fish habitat component was successful – the required data were collected.

Three recommendations were made to adjust the fish and fish habitat component of the program. These recommendations are intended to fill data gaps for important factors that influence the fish community, to modify the design in order to increase the precision of data, or to focus the program to maximize the quality of the data. These adjustments will maintain continuity with previous studies and improve the component's ability to address the key management question "Which fish species and fish life stages are using side channels and are changes occurring over time?"

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APPENDIX A
FISH AND HABITAT SITE INFORMATION

Appendix A Table A1. Fish and habitat site information (Nad 83; Zone 10U), 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site Type	Site	Easting	Northing
102.5R SIDE CHANNEL				
	BEACH SEINE	CBS01	644461	6223484
	BEACH SEINE	CBS02	644035	6223523
	BEACH SEINE	CBS05	643608	6223619
	BEACH SEINE	CBS07	643227	6223754
	BEACH SEINE	CBS08	643907	6223555
	BEACH SEINE	CBS09	644012	6223507
	BEACH SEINE	CBS10	644178	6223466
	BEACH SEINE	CBS11	643954	6223547
	BEACH SEINE	CBS12	643658	6223634
	BEACH SEINE	CBS13	644401	6223493
112L SIDECHANNEL				
	BEACH SEINE	DBS05	654830	6222291
	BEACH SEINE	DBS07	654070	6222175
	BEACH SEINE	DBS08	654916	6222289
	BEACH SEINE	DBS09	654819	6222198
	BEACH SEINE	DBS10	654504	6222221
	BEACH SEINE	DBS11	654293	6222224
	BEACH SEINE	DBS12	654306	6222314
	BEACH SEINE	DBS13	654249	6222299
	BEACH SEINE	DBS14	654172	6222205
	BEACH SEINE	DBS15	654667	6222225

APPENDIX B
DEFINITIONS

Appendix – B1
Habitat and Substrate Type Classification Systems

Instream Habitat

Provides a qualitative assessment of the physical characteristics of a stream and its potential as fish habitat.

Riffle - Portion of channel with increased velocity relative to Run and Pool habitat types; broken water surface due to effects of submerged or exposed bed materials; shallow (less than 25 cm). Limited value as habitat for larger juveniles and adults (i.e., feeding), but may be used extensively by young-of-the-year and small juveniles.

RF - Typical riffle habitat type; provides limited cover for all life stages.

RF/BG - Riffle habitat type with abundance of large cobble and boulder substrates. Limited cover for juveniles and adults; but, may be used extensively by young-of-the-year fish.

Rapids (RA) - Portion of channel with highest velocity relative to other habitat types. Deep (>25 cm); often formed by channel constriction. Substrate extremely coarse; dominated by large cobble and boulder substrates. Habitat provided for juveniles and adults in pocket eddies associated with substrate.

Run - Portion of channel characterized by moderate to high current velocity relative to Pool and Flat habitats; water surface largely unbroken. Potentially high habitat value for all life stages. Can be differentiated into five types based on depth and cover.

R1 - Maximum depth exceeding 1.5 m; average depth 1.0 m. High cover at all flow conditions. Highest quality habitat for larger juveniles and adults; limited value for young-of-the-year-fish.

R2/BG - Maximum depth reaching 1.0 m and generally exceeding 0.75 m; presence of large cobble or boulder substrates in channel. High cover at all flows. Moderate to high quality habitat for larger juveniles and adults.

R2 - Maximum depth reaching 1.0 m and generally exceeding 0.75 m. High cover during most flows, but not during base flows. Moderate quality habitat for juveniles and adults; limited value for young-of-the-year-fish.

R3/BG - Maximum depth of 0.75 m, but averaging <0.50 m; presence of large cobble or boulder substrates in channel. Moderate cover at all flows. Moderate quality habitat for juveniles and adults; but, the value to young-of-the-year-fish is potentially high.

R3 - Maximum depth of 0.75 m, but averaging <0.50 m. Low cover at all flows. Lowest quality habitat for juveniles and adults; but, the value to young-of-the-year-fish is potentially high.

Flat - Area of channel characterized by low current velocities (relative to RF and Run cover types); near-laminar (i.e., non-turbulent) flow. Depositional area dominated sand/silt substrates. Differentiated from Pool habitat type by high channel uniformity and lack of direct association with riffle/run complex. Potential habitat value for all life stages is moderate to high. Can be differentiated into five types based on depth and cover.

F1 - Maximum depth exceeding 1.5 m; average depth 1.0 m or greater. High cover at all flows. Highest quality habitat for larger juveniles and adults; limited value for young-of-the-year-fish.

F2/BG - Maximum depth reaching 1.0 m and generally exceeding 0.75 m; presence of large cobble or boulder substrates in channel. High cover at all flows. Moderate to high quality habitat for larger juveniles and adults.

F2 - Maximum depth exceeding 1.0 m; generally exceeding 0.75 m. High cover during most flows, but not during base flows. Moderate quality habitat for juveniles and adults; limited value for young-of-the-year-fish.

F3/BG - Maximum depth of 0.75 m, but averaging <0.50 m; presence of large cobble or boulder substrates in channel. Moderate cover at all flows. Moderate quality habitat for juveniles and adults; but, the value to young-of-the-year-fish is potentially high.

F3 - Maximum depth of 0.75 m, averaging less than 0.50 m. Low cover at all flows. Lowest quality habitat for juveniles and adults; but, the value to young-of-the-year-fish is potentially high.

Pool - Discrete portion of channel featuring increased depth and reduced velocity (downstream oriented) relative to Riffle and Run habitat types. Normally featuring Riffle/Run associations. Principal habitat value for all life stages is cover. When in close association with Riffle/Run habitats, value can be very high. Can be differentiated into three types based on depth.

P1 - Maximum depth exceeding 1.5 m; average depth 1.0 m or greater; high cover at all flow conditions. Often intergrades with deep-slow type of R1. Highest quality habitat for larger juveniles and adults; limited value for young-of-the-year-fish.

P2 - Maximum depth reaching or exceeding 1.0 m, generally exceeding 0.75 m. High cover at all but base flows. Moderate quality habitat for juveniles and adults; limited value for young-of-the-year-fish.

P3 - Maximum depth of 0.75 m, averaging <0.50 m. Low instream cover; includes small pocket eddies. Lowest quality habitat for all life stages.

Special Features - Includes the following instream features:

Ledges (LG) - Areas of bedrock intrusion into the channel; often creates Chutes and Pool habitat.

Falls (FAL) - Channel section exhibiting distinct vertical falls over boulder and bedrock. Often a barrier to fish.

Cascade (CAS) - Area of channel exhibiting distinct drop over boulder and bedrock, but, no defined falls. Often a barrier to fish.

Tributary Confluence (TC) - Area of main river channel directly affected by tributary confluence.

Backwater (BW) - Well-defined zone of zero or reverse flow water velocity associated with a large bank irregularity.

Tributary Confluence/Backwater (TCBW) – area of main channel and backwater associated with bank irregularities formed by tributary confluence.

Snye (SN) - Well-defined back channel not subjected to mainstem currents.

Oxbow (OX) – Bend or meander in a stream or river that becomes detached from the stream channel from natural fluvial processes.

Bank Habitat

The zone within the immediate hydraulic influence of the bank-water interface. Typically extends from the annual high-water to low-water mark.

Armoured
Bank is stable and is composed of armoured cobble to boulder substrates that are not subjected to movement during annual floods; can be differentiated into categories based on the amount of bank roughness.
(A1 very rough, A2 moderately rough, A3 not rough)

Canyon
Bank is stable, is near vertical, and is composed of boulder to bedrock substrates; can be differentiated into categories based on the amount of bank roughness (C1 very rough, C2 moderately rough, C3 not rough).

Depositional
Bank exhibits low relief and is composed of silt to cobble substrates; characterized by high substrate mobility and low bank roughness (D1 cobble; D2 gravel; D3 sand and silts). Differentiated into tributary (TD) and mainstem (MD) depositional zones.

Erosional
Bank is dominated silt to gravel substrates that exhibit evidence of active erosion; note that large rock substrates can be present; can be differentiated into categories based on the amount of bank roughness
(E1 very rough, E2 moderately rough, E3 not rough).

Mesohabitat

To address issues caused by sampling several habitat types within on site using small fish and large fish boat electrofisher methods , sampled instream and bank habitat types were categorized into discrete groups based on differences in physical characteristics that included bank slope, water velocity, and the presence of physical cover (see table).

Four mesohabitat types sampled during the program were as follows:

- SFC - Moderate slope; shallow water; high water; velocity; physical cover
- SFN - Gradual slope; shallow water; high water velocity; no physical cover
- SSC - Moderate slope; shallow water; slow; physical cover
- SSN - Gradual slope; shallow water; slow; no physical cover

MesoHabitat Category	Bank Habitat[a]	Instream Habitat	Water Velocity[a]	Channel Bed Slope[a]	Physical Instream Cover	Substrate
SFN	A3	Run	Moderate to High	Low	Absent	Rock
SFC	A1/A2	Run	Moderate to High	Moderate	Present	Rock
SSN	A3	Flat	Low	Low	Absent	Rock or Sand
SSC	A1/A2	Flat	Low	Moderate	Present	Rock or Sand

[a] Based on subjective measure by field biologist.

Substrate Classification System

Modified Wentworth classification for substrate particle sizes (from Cummins 1962)

Category	Particle Size Range (mm)
Bedrock	-
Boulder	>256
Cobble	32 - 256
Gravel	1 - 32
Sand	0.0625 - 0.2-1
Silt	0.0039-0.0625
Clay	<0.0039
Organics	-

Appendix – B2
Site Characteristics Definitions

Habitat type:	See Appendix B1 for definitions.
Water conductivity:	Measured using Hanna HI98311 EC/TDS meter (μ*S*/cm) (± 2% full scale).
Water temperature:	Measured using Hanna HI98311 EC/TDS meter (± 0.1^{o}C).
Water pH:	Measured using Hanna HI98311 EC/TDS meter (± 0.01).
Water clarity:	Measured to the nearest centimetre using a secchi plate mounted on a pole (plate was 2.5 cm wide x 21 cm long partitioned into three equal sections of black, white, and black).
Sample effort:	Dependent on sample method. Boat electrofishing measured as number of fish/km, backpack electrofishing effort measured as number of fish/m, beach seine effort measured as number fish/100 m^2, gill net effort measured as number fish/100 m^2/24 h, and minnow trap effort measured as number of fish/trap/24 h.
Substrate type (%):	Material forming the bottom of the stream bed (see Substrate Classification System, Appendix B1). Visually rated within a predetermined area of stream bed.
Fish Cover (%):	Overhead (Ovh) cover, rock cover, large organic debris (LOD) cover, submergent (Sub) vegetation cover, emergent (Emer) vegetation cover, algal cover, that provide protection for fish within a predetermined area.
D90 (cm):	Represented the average size of substrate particle that is in the 90th percentile.
Embeddedness:	Degree to which rock substrates are surrounded and/or are covered by fines (Low, Moderate, High).
Compaction:	Looseness of substrate; ability to be moved during high flow (Low, Moderate, High).
Depth (m):	Depth of water at a point measured to nearest centimetre. At beach seines sites depth is measured at ¼, ½, and ¾ of the haul width. Depth at electrofisher sites depth is measured in the same manner across the width of sampled area.
Velocity (m/s):	Measured in the same place depth is taken at beach seine and backpack electrofisher sites. Measured with Swoffer Model 2100 flow meter wading wand (wand automatically determines depth at 0.6 m from water surface – best place to determine average velocity of water column in relatively shallow water) (m/s every 6.0 seconds).

Appendix – B3
Fish Life History Data Abbreviations and Codes

BC Label	Alberta Label	Common Name	Scientific Name	BC Label	Alberta Label	Common Name	Scientific Name
RB	RNTR	Rainbow trout	*Oncorhynchus mykiss*	BB	BURB	Burbot	*Lota lota*
GB	BNTR	Brown trout	*Salmo trutta*	CCG	SLSC	Slimy sculpin	*Cottus cognatus*
CT	CTTR	Cutthroat trout	*Oncorhynchus clarkii*	CRI	SPSC	Spoonhead sculpin	*Cottus ricei*
BT	BLTR	Bull trout	*Salvelinus confluentus*	CAS	PRSC	Prickly sculpin	*Cottus asper*
DV	DLVR	Dolly varden	*Salvelinus malma*	CAL	CSSC	Coastrange sculpin	*Cottus aleuticus*
LT	LKTR	Lake trout	*Salvelinus namaycush*	CCN	SHSC	Shorthead sculpin	*Cottus confusus*
AC	ARCH	Arctic char	*Salvelinus alpinus*	CLA	PSSC	Pacific staghorn sculpin	*Leptocottus armatus*
EB	BKTR	Brook trout	*Salvelinus fontinalis*	CBA	MTSC	Mottled sculpin	*Cottus bairdii*
GR	ARGR	Arctic grayling	*Thymallus arcticus*	CRH	TRSC	Torrent sculpin	*Cottus rhotheus*
MW	MNWH	Mountain whitefish	*Prosopium williamsoni*	BSB	BRST	Brook stickleback	*Culaea inconstans*
RW	RNWH	Round whitefish	*Prosopium cylindraceum*	NSB	NNST	Ninespine stickleback	*Pungitius pungitius*
PW	PGWH	Pygmy whitefish	*Prosopium coulterii*	TSB	THST	Threespine stickleback	*Gasterosteus aculeatus*
LW	LKWH	Lake whitefish	*Coregonus clupeaformis*	RSC	RDSH	Redside shiner	*Richardsonius balteatus*
KO	KOKA	Kokanee	*Oncorhynchus nerka*	NSC	NPMN	Northern pikeminnow	*Ptychocheilus oregonensis*
LSU	LNSC	Longnose sucker	*Catostomus catostomus*	PDC	PRDC	Pearl dace	*Margariscus margarita*
WSU	WHSC	White sucker	*Catostomus commersonii*	PCC	PEAM	Peamouth	*Mylocheilus caurinus*
CSU	LSSC	Largescale sucker	*Catostomus macrocheilus*	FHC	FLCH	Flathead chub	*Platygobio gracilis*
BSC	BRSC	Bridgelip sucker	*Catostomus columbianus*	LKC	LKCH	Lake chub	*Couesius plumbeus*
MSC	MNSC	Mountain sucker	*Catostomus platyrhynchus*	LNC	LNDC	Longnose dace	*Rhinichthys cataractae*
CMC	CHIS	Chiselmouth	*Acrocheilus alutaceus*	FDC	FNDC	Finescale dace	*Phoxinus neogaeus*
LSG	LKST	Lake sturgeon	*Acipenser fulvescens*	RDC	NRDC	Northern redbelly dace	*Phoxinus eos*
WSG	WHST	White sturgeon	*Acipenser transmontanus*	LDC	LPDC	Leopard dace	*Rhinichthys falcatus*
GE	GOLD	Goldeye	*Hiodon alosoides*	ESC	EMSH	Emerald shiner	*Notropis atherinoides*
NP	NRPK	Northern pike	*Esox lucius*	STC	SPSH	Spottail shiner	*Notropis hudsonius*
WP	WALL	Walleye	*Sander vitreus*	FM	FTMN	Fathead minnow	*Pimephales promelas*
	SAUG	Sauger	*Sander canadensis*	TP	TRPR	Trout-perch	*Percopsis omiscomaycus*
YP	YLPR	Yellow perch	*Perca flavescens*		IWDR	Iowa darter	*Etheostoma exile*

Sex and Maturity Descriptions

M	F	Class	Description
99		Immature A	Sex indeterminable due to small gonad size.
01	11	Immature B	Small gonad size; fish has never spawned and will not spawn during the coming spawning season.
02	12		Maturing but not ready to spawn; will spawn this year
06	16	Alternate	Small gonad size associated with large size; suggests alternate year spawner.
07	17	Gravid	Sexual organs fill cavity testes white, drops of milt fall with pressure; eggs completely round, some already translucent.
08	18	Ripe	Roe or milt are extruded by slight pressure on the belly.
09	19	Spent	Spawning completed; reabsorption of residual ovarian tissue is not yet complete.
10	20	External	Sex determined by external characteristics
97		Adult	Based on fish size; sex not determined.
98		Juvenile	Based on fish size; sex not determined.

Capture Method Codes

Code	Capture Method	Code	Capture Method
SL	Set line	ES	Boat electrofisher
DN	Dip net	EF	Backpack electrofisher
GN	Gill net	AL	Angling
BS	Beach seine	GE	Gee minnow trap
HN	Hoop net	RST	Rotary screw trap
TR	Trap		

Tag Codes

Code	Tag Code
Y, W, O	Color code for tag (Yellow, White, Orange)

Tag Type
PIT (Passive Integrated Transponder)
Radio (Radio transmitter tags)
Floy

Capture Codes

Code	Capture Code
0	First capture, released
1	First capture, mortality
2	Recapture, released
3	Recapture, mortality
5	Recapture, fin clip and lost tag

Age Structure Codes

Code	Age Structure	Code	Age Structure
SC	Scales	CL	Cleithra
OT	Otoliths	CS	Cleithra and scales
SO	Scales and otoliths	SF	Scales and fin rays
FR	Fin ray		

Identified to Family

BC/Alberta Label	Family
SU/SUCK	Catostomidae
CC/SCUL	Cottidae
MINN	Cyprinidae

Appendix – B4
Observed and Release-No-data Definitions

Small Fish Catch:	Count of small fish (≤ 200 mm fork length) caught and measured.
Total Catch:	Total count of fish caught and measured.
Adult Observed:	Adult fish (> 200 mm fork length) observed, but not caught.
Small Fish Observed:	Small fish observed, but not caught.
YOY Observed:	YOY (young-of-the-year) observed, but not caught.
All RND:	All age groups caught with (RND, released-no-data) no measurements taken.
Adult RND:	Adult fish caught with no measurements taken.
Small Fish RND:	Small fish caught with no measurements taken.
YOY RND:	YOY fish caught with no measurements taken.
Small Fish Number:	Count of small fish catch, small fish observed, YOY observed, small fish RND, and YOY RND.
Total Number:	Total count of all caught, observed and RND fish.

APPENDIX C
WATER QUALITY

Appendix C Table C1. Site water quality information, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Habitat	Date	Time	pH	Cond. (uS/cm)	Temp. (C)	Clarity (cm)	Dis. Oxygen (ppm)	Dis. Oxygen (%)	Turbidity (NTU)
102.5R SIDE CHANNE											
	CBS01	FLAT	28-Jul-14	9:36	8.02	218	14.8	0.73	8.4	87.0	9.0
	CBS01	FLAT	25-Jul-14	10:04	7.95	247	15.1		9.6	97.0	
	CBS02	FLAT	25-Jul-14	10:56	8.02	225	16.5		9.5	97.0	
	CBS02	FLAT	27-Jul-14	14:43	7.95	281	23.8	999.00			
	CBS05	FLAT	25-Jul-14	11:48	7.50	435	16.9	999.00	8.8	89.0	3.0
	CBS05	FLAT	27-Jul-14	13:36	7.52	452	22.8	999.00			
	CBS07	FLAT	25-Jul-14	13:04	7.52	385	16.5	999.00	6.3	65.0	
	CBS07	FLAT	27-Jul-14	13:24	7.57	401	18.1	999.00			
	CBS08	FLAT	27-Jul-14	12:12	8.12	312	22.2				
	CBS08	FLAT	25-Jul-14	11:30	7.98	280	16.0		9.7	98.0	
	CBS09	FLAT	25-Jul-14	14:23	8.36	227	18.3	999.00	9.2	98.0	
	CBS09	FLAT	27-Jul-14	14:15	7.93	288	22.3	999.00			
	CBS10	FLAT	25-Jul-14	9:32	7.86	518	13.9	0.85	7.6	72.0	7.5
	CBS10	FLAT	27-Jul-14	15:15	7.52	402	20.2				
	CBS11	FLAT	25-Jul-14	14:48	8.34	224	18.1	999.00	10.2	109.0	
	CBS11	FLAT	27-Jul-14	12:30	7.75	305	22.0	999.00			
	CBS12	FLAT	25-Jul-14	15:15	7.76	304	17.9	999.00	8.3	86.0	
	CBS12	FLAT	27-Jul-14	12:56	8.03	325	22.5	999.00			
	CBS13	FLAT	28-Jul-14	10:05	7.95	205	14.8		9.1	92.0	
	CBS13	FLAT	25-Jul-14	15:59	7.75	291	17.0		8.9	92.0	

Appendix C Table C1. Site water quality information, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Habitat	Date	Time	pH	Cond. (uS/cm)	Temp. (C)	Clarity (cm)	Dis. Oxygen (ppm)	Dis. Oxygen (%)	Turbidity (NTU)
112L SIDECHANNEL											
	DBS05		28-Jul-14	15:12	8.10	257	24.1		8.6	102.0	
	DBS05	FLAT	26-Jul-14	11:52	8.02	286	19.6		8.8	100.0	
	DBS07	FLAT	28-Jul-14	13:31	8.13	357	25.1	999.00			
	DBS07	FLAT	26-Jul-14	14:36	7.52	427	26.9	999.00			
	DBS08	FLAT	26-Jul-14	10:55	8.16	291	20.0		9.7	105.0	
	DBS08		28-Jul-14	15:40	8.02	256	22.8		9.4	106.0	
	DBS09	FLAT	26-Jul-14	16:25	8.15	291	21.7	0.80			8.0
	DBS09	FLAT	28-Jul-14	10:50	7.97	252	18.8		9.2	100.0	
	DBS10	FLAT	28-Jul-14	11:55	8.02	255	20.1		8.8	100.0	
	DBS10	FLAT	27-Jul-14	9:16	8.31	304	19.2	0.80			10.0
	DBS11	FLAT	26-Jul-14	15:36	8.06	321	19.9	999.00			
	DBS11	FLAT	28-Jul-14	12:39	8.13	269	21.5		9.4	110.0	
	DBS12	FLAT	28-Jul-14	14:34	8.02	316	24.2	1.00	8.9	105.0	4.0
	DBS12	FLAT	26-Jul-14	12:54	7.61	401	19.2		9.0	101.0	
	DBS13	FLAT	26-Jul-14	14:05	7.21	410	17.4		9.5	105.0	
	DBS13	FLAT	28-Jul-14	13:59	8.03	302	23.8		8.6	104.0	
	DBS14	FLAT	26-Jul-14	15:05	7.67	517	22.7	999.00			
	DBS14	FLAT	28-Jul-14	13:02	7.95	323	22.1		9.0	105.0	
	DBS15	FLAT	27-Jul-14	9:43	8.09	297	19.6				
	DBS15	FLAT	28-Jul-14	11:16	7.98	256	18.9	0.85	9.1	102.0	6.0

APPENDIX D
HABITAT DATA

Appendix D Table D1 . Habitat site parameters measured, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site Type	Site Label	Date	Time	Habitat	Depth (m)			Velocity (m/s)			Substrate %							D90 (cm)	Embed.	Comp.	Instream Cover (%)					
						1/4	1/2	3/4	1/4	1/2	3/4	Om	Si	Sa	PrGr	Co	Bo	Be				OH	R	LWD	TV	SV	EV
102.5R SIDE CHANNEL																											
	BEACH SEINE																										
		CBS01	25-Jul-14	10:04	FLAT	0.38	0.52	0.62	0.00	0.02	0.22	0	50	50	0	0	0	0				0	0	0	0	0	0
		CBS01	28-Jul-14	9:36	FLAT	0.17	0.31	0.53	0.07	0.18	0.16	0	50	50	0	0	0	0				0	0	0	0	0	0
		CBS02	25-Jul-14	10:56	FLAT	0.51	0.62	0.72	0.00	0.00	0.00	0	0	60	5	35	0	0	10	3	3	0	0	0	0	0	5
		CBS02	27-Jul-14	14:43	FLAT	0.23	0.47	0.75	0.00	0.00	0.00	0	0	55	10	35	0	0	8	3	3	0	0	0	0	0	15
		CBS05	25-Jul-14	11:48	FLAT	0.10	0.19	0.39	0.00	0.00	0.00	0	0	30	10	60	0	0	14	3	3	0	0	0	0	0	0
		CBS05	27-Jul-14	13:36	FLAT	0.35	0.36	0.53	0.00	0.00	0.00	0	25	25	10	40	0	0	16	3	3	0	0	0	0	0	0
		CBS07	25-Jul-14	13:04	FLAT	0.57	0.57	0.72	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	5
		CBS07	27-Jul-14	13:24	FLAT	0.53	0.64	0.73	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	5
		CBS08	25-Jul-14	11:30	FLAT	0.56	0.41	0.23	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	5
		CBS08	27-Jul-14	12:12	FLAT	0.18	0.41	0.58	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		CBS09	25-Jul-14	14:23	FLAT	0.42	0.47	0.47	0.00	0.00	0.00	0	0	70	0	30	0	0	8	3	3	0	0	0	0	0	15
		CBS09	27-Jul-14	14:15	FLAT	0.38	0.55	0.61	0.00	0.00	0.00	0	30	30	0	40	0	0	18	3	3	0	0	0	0	0	10
		CBS10	25-Jul-14	9:32	FLAT	0.38	0.50	0.60	0.00	0.00	0.00	0	0	80	5	15	0	0	10	3	3	0	0	0	0	0	0
		CBS10	27-Jul-14	15:15	FLAT	0.19	0.27	0.33	0.00	0.00	0.00	0	0	20	15	65	0	0	8	3	3	0	5	0	0	0	0
		CBS11	25-Jul-14	14:48	FLAT	0.33	0.66	0.79	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	10
		CBS11	27-Jul-14	12:30	FLAT	0.27	0.51	0.67	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		CBS12	25-Jul-14	15:15	FLAT	0.15	0.25	0.34	0.00	0.00	0.00	0	25	25	0	50	0	0	16	3	3	0	0	0	0	0	5
		CBS12	27-Jul-14	12:56	FLAT	0.21	0.29	0.39	0.00	0.00	0.00	0	40	40	5	15	0	0	12	3	3	0	0	0	0	0	5
		CBS13	28-Jul-14	10:05	FLAT	0.48	0.84	1.00	0.00	0.00	0.07	0	50	50	0	0	0	0				0	0	0	0	0	5
		CBS13	25-Jul-14	15:59	FLAT	0.27	0.42	0.66	0.03	0.00	0.03	0	50	50	0	0	0	0				0	0	0	0	0	0

Appendix D Table D1 . Habitat site parameters measured, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site Type	Site Label	Date	Time	Habitat	Depth (m)			Velocity (m/s)			Substrate %							D90 (cm)	Embed.	Comp.	Instream Cover (%)					
						1/4	1/2	3/4	1/4	1/2	3/4	Om	Si	Sa	PrGr	Co	Bo	Be				OH	R	LWD	TV	SV	EV
112L SIDECHANNEL																											
	BEACH SEINE																										
		DBS05	26-Jul-14	11:52	FLAT	0.31	0.76	0.86	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS05	28-Jul-14	15:12		0.28	0.51	0.80	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS07	28-Jul-14	13:31	FLAT	0.09	0.16	0.23	0.00	0.00	0.00	0	45	40	5	10	0	0	9	3	3	0	0	0	0	0	0
		DBS07	26-Jul-14	14:36	FLAT	0.07	0.11	0.12	0.00	0.00	0.00	0	0	70	0	30	0	0	6	3	3	0	0	0	0	0	0
		DBS08	26-Jul-14	10:55	FLAT	0.15	0.54	0.65	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS08	28-Jul-14	15:40		0.25	0.42	0.80	0.03	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS09	26-Jul-14	16:25	FLAT	0.12	0.24	0.36	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS09	28-Jul-14	10:50	FLAT	0.28	0.44	0.58	0.00	0.10	0.07	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS10	27-Jul-14	9:16	FLAT	0.20	0.37	0.44	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS10	28-Jul-14	11:55	FLAT	0.35	0.50	0.65	0.00	0.01	0.03	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS11	26-Jul-14	15:36	FLAT	0.15	0.22	0.24	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS11	28-Jul-14	12:39	FLAT	0.35	0.47	0.60	0.07	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS12	28-Jul-14	14:34	FLAT	0.36	0.56	0.57	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS12	26-Jul-14	12:54	FLAT	0.26	0.51	0.69	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS13	26-Jul-14	14:05	FLAT	0.23	0.44	0.66	0.00	0.00	0.00	0	0	60	40	0	0	0	4	3	3	0	0	0	0	0	0
		DBS13	28-Jul-14	13:59	FLAT	0.31	0.56	0.73	0.06	0.03	0.00	0	0	60	40	0	0	0	5	3	3	0	0	0	0	0	0
		DBS14	26-Jul-14	15:05	FLAT	0.27	0.39	0.39	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS14	28-Jul-14	13:02	FLAT	0.30	0.70	0.91	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS15	28-Jul-14	11:16	FLAT	0.19	0.31	0.34	0.00	0.05	0.06	0	50	50	0	0	0	0				0	0	0	0	0	0
		DBS15	27-Jul-14	9:43	FLAT	0.17	0.31	0.36	0.00	0.00	0.00	0	50	50	0	0	0	0				0	0	0	0	0	0

APPENDIX E
FISH CATCH DATA

Appendix E Table E1. Fish site sample effort information, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Side Type	Site	Date	Time	Beach Seine Effort		
					Width (m)	Len. (m)	Area (m2)
102.5R SIDE CHANNEL							
	BEACH SEINE						
		CBS01	28-Jul-14	9:36	4.2	45	189
		CBS01	25-Jul-14	10:04	4.2	45	189
		CBS02	25-Jul-14	10:56	4.2	45	189
		CBS02	27-Jul-14	14:43	4.2	45	189
		CBS05	25-Jul-14	11:48	4.2	45	189
		CBS05	27-Jul-14	13:36	4.2	45	189
		CBS07	25-Jul-14	13:04	4.2	45	189
		CBS07	27-Jul-14	13:24	4.2	45	189
		CBS08	27-Jul-14	12:12	4.2	45	189
		CBS08	25-Jul-14	11:30	4.2	45	189
		CBS09	25-Jul-14	14:23	4.2	45	189
		CBS09	27-Jul-14	14:15	4.2	45	189
		CBS10	25-Jul-14	9:32	4.2	45	189
		CBS10	27-Jul-14	15:15	4.2	45	189
		CBS11	25-Jul-14	14:48	4.2	45	189
		CBS11	27-Jul-14	12:30	4.2	45	189
		CBS12	25-Jul-14	15:15	4.2	45	189
		CBS12	27-Jul-14	12:56	4.2	45	189
		CBS13	28-Jul-14	10:05	4.2	45	189
		CBS13	25-Jul-14	15:59	4.2	45	189

Appendix E Table E1. Fish site sample effort information, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Side Type	Site	Date	Time	Beach Seine Effort		
					Width (m)	Len. (m)	Area (m2)
112L SIDECHANNEL							
	BEACH SEINE						
		DBS05	28-Jul-14	15:12	4.2	45	189
		DBS05	26-Jul-14	11:52	4.2	45	189
		DBS07	28-Jul-14	13:31	4.2	45	189
		DBS07	26-Jul-14	14:36	4.2	45	189
		DBS08	26-Jul-14	10:55	4.2	45	189
		DBS08	28-Jul-14	15:40	4.2	45	189
		DBS09	26-Jul-14	16:25	4.2	45	189
		DBS09	28-Jul-14	10:50	4.2	45	189
		DBS10	28-Jul-14	11:55	4.2	45	189
		DBS10	27-Jul-14	9:16	4.2	45	189
		DBS11	26-Jul-14	15:36	4.2	45	189
		DBS11	28-Jul-14	12:39	4.2	45	189
		DBS12	28-Jul-14	14:34	4.2	45	189
		DBS12	26-Jul-14	12:54	4.2	45	189
		DBS13	26-Jul-14	14:05	4.2	45	189
		DBS13	28-Jul-14	13:59	4.2	45	189
		DBS14	26-Jul-14	15:05	4.2	45	189
		DBS14	28-Jul-14	13:02	4.2	45	189
		DBS15	27-Jul-14	9:43	4.2	45	189
		DBS15	28-Jul-14	11:16	4.2	45	189

Appendix E Table E2. Fish catch data, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Date	Species	Catch Numbers				Catch Rate
				CATCH No.	OBS. No.	Sub No.	Total No.	Beach Seine (fish/100 m2)
102.5R SIDE CHANNEL								
	CBS01							
		25-Jul-14						
			SUCK	22	0	0	22	11.64
		28-Jul-14						
			LNC	1	0	0	1	0.53
			NP	2	0	0	2	1.06
			SCUL	4	0	0	4	2.12
			SUCK	17	0	0	17	8.99
			TP	1	0	0	1	0.53
	CBS02							
		25-Jul-14						
			NP	2	0	0	2	1.06
			SUCK	8	0	0	8	4.23
		27-Jul-14						
			SUCK	10	0	30	40	21.16
	CBS05							
		25-Jul-14						
			LNC	1	0	8	9	4.66
			NSC	1	0	0	1	0.53
			RSC	1	0	5	6	3.28
			SUCK	18	0	1724	1742	921.59
		27-Jul-14						
			NP	1	0	0	1	0.53
			SUCK	10	0	447	457	241.80
			WSU	1	0	0	1	0.53
	CBS07							
		25-Jul-14						
			SUCK	15	0	438	453	239.68
		27-Jul-14						
			SUCK	9	0	0	9	4.76

Appendix E Table E2. Fish catch data, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Date	Species	Catch Numbers				Catch Rate
				CATCH No.	OBS. No.	Sub No.	Total No.	Beach Seine (fish/100 m2)
	CBS08							
		25-Jul-14						
			SCUL	2	0	0	2	1.06
			SUCK	16	0	0	16	8.47
		27-Jul-14						
			LNC	1	0	0	1	0.53
			LNC	9	0	0	9	4.76
			NP	1	0	0	1	0.53
			SCUL	4	0	0	4	2.12
			STC	10	0	0	10	5.29
			SUCK	16	0	71	87	46.03
	CBS09							
		25-Jul-14						
			NP	2	0	0	2	1.06
			SUCK	8	0	0	8	4.23
		27-Jul-14						
			NP	1	0	0	1	0.53
			SUCK	10	0	127	137	72.49
	CBS10							
		25-Jul-14						
			SUCK	1	0	0	1	0.53
		27-Jul-14						
			NP	1	0	0	1	0.53
			SUCK	0	0	141	141	74.60
	CBS11							
		25-Jul-14						
			LNC	1	0	0	1	0.53
			SUCK	3	0	0	3	1.59
		27-Jul-14						
			NP	1	0	0	1	0.53
			SUCK	13	0	33	46	24.34

Appendix E Table E2. Fish catch data, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Date	Species	Catch Numbers				Catch Rate
				CATCH No.	OBS. No.	Sub No.	Total No.	Beach Seine (fish/100 m2)
	CBS12							
		25-Jul-14						
			LNC	1	0	3	4	2.12
			LSU	3	0	0	3	1.59
			NSC	1	0	0	1	0.53
			RSC	3	0	0	3	1.59
			SUCK	10	0	441	451	238.62
		27-Jul-14						
			LNC	3	0	754	757	400.53
			NSC	3	0	0	3	1.59
			RSC	1	0	10	11	5.69
			SUCK	10	0	660	670	354.37
	CBS13							
		25-Jul-14						
			LW	1	0	0	1	0.53
			STC	1	0	0	1	0.53
			SUCK	16	0	157	173	91.53
			TP	1	0	0	1	0.53
			YP	1	0	0	1	0.53
		28-Jul-14						
			LNC	3	0	0	3	1.59
			NP	1	0	0	1	0.53
			SUCK	14	0	0	14	7.41

Appendix E Table E2. Fish catch data, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Date	Species	Catch Numbers				Catch Rate
				CATCH No.	OBS. No.	Sub No.	Total No.	Beach Seine (fish/100 m2)
112L SIDE CHANNEL								
	DBS05							
		26-Jul-14						
			STC	5	0	2	7	3.70
			SUCK	12	0	282	294	155.56
			TP	2	0	0	2	1.06
		28-Jul-14						
			LNC	4	0	0	4	2.12
			RSC	3	0	0	3	1.59
			STC	4	0	0	4	2.12
			SUCK	11	0	399	410	216.93
			TP	9	0	11	20	10.58
	DBS07							
		26-Jul-14						
			LNC	11	0	3	14	7.41
			NSC	0	0	1	1	0.53
			RSC	2	0	0	2	1.06
			STC	1	0	7	8	4.23
			SUCK	10	0	401	411	217.46
		28-Jul-14						
			NP	1	0	0	1	0.53
			RSC	3	0	0	3	1.59
			STC	3	0	0	3	1.59
			SUCK	10	0	26	36	19.05
			WSU	1	0	0	1	0.53
	DBS08							
		26-Jul-14						
			LKC	2	0	0	2	1.06
			LSU	5	0	0	5	2.65
			NSC	1	0	0	1	0.53
			RSC	10	0	31	41	21.69
			STC	10	0	80	90	47.62
			SUCK	15	0	700	715	378.31
			TP	4	0	0	4	2.12
		28-Jul-14						
			LNC	2	0	0	2	1.06
			RSC	2	0	12	14	7.28
			STC	0	0	106	106	55.95
			SUCK	26	0	4089	4115	2,177.25

Appendix E Table E2. Fish catch data, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Date	Species	Catch Numbers				Catch Rate
				CATCH No.	OBS. No.	Sub No.	Total No.	Beach Seine (fish/100 m2)
	DBS09							
		26-Jul-14						
			CSU	1	0	0	1	0.53
			LSU	1	0	0	1	0.53
			NSC	1	0	0	1	0.53
			RSC	5	0	0	5	2.65
			STC	10	0	2	12	6.35
			SUCK	12	0	448	460	243.39
			TP	1	0	0	1	0.53
		28-Jul-14						
			LNC	1	0	0	1	0.53
			RSC	2	0	0	2	1.06
			STC	2	0	0	2	1.06
			SUCK	14	0	11	25	13.23
	DBS10							
		27-Jul-14						
			LNC	4	0	7	11	5.82
			NP	2	0	0	2	1.06
			NSC	2	0	0	2	1.06
			STC	2	0	5	7	3.70
			SUCK	15	0	6	21	11.11
		28-Jul-14						
			LNC	1	0	0	1	0.53
			SUCK	11	0	111	122	64.55
	DBS11							
		26-Jul-14						
			CSU	6	0	10	16	8.47
			LSU	10	0	12	22	11.64
			NSC	10	0	48	58	30.69
			RSC	11	0	182	193	102.12
			STC	5	0	0	5	2.65
			WSU	8	0	14	22	11.64
			YP	1	0	0	1	0.53
		28-Jul-14						
			STC	2	0	0	2	1.06
			SUCK	10	0	184	194	102.65

Appendix E Table E2. Fish catch data, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Site	Date	Species	Catch Numbers				Catch Rate
				CATCH No.	OBS. No.	Sub No.	Total No.	Beach Seine (fish/100 m2)
	DBS12							
		26-Jul-14						
			NP	2	0	0	2	1.06
			NSC	2	0	0	2	1.06
			RSC	4	0	0	4	2.12
			STC	2	0	0	2	1.06
			SUCK	11	0	2581	2592	1,371.16
		28-Jul-14						
			LNC	1	0	0	1	0.53
			RSC	13	0	7	20	10.58
			SUCK	10	0	592	602	318.52
	DBS13							
		26-Jul-14						
			RSC	8	0	0	8	4.23
			SCUL	1	0	0	1	0.53
			SUCK	10	0	70	80	42.33
		28-Jul-14						
			RSC	8	0	0	8	4.23
			STC	9	0	0	9	4.76
			SUCK	10	0	173	183	96.83
	DBS14							
		26-Jul-14						
			LNC	2	0	0	2	1.06
			SUCK	12	0	0	12	6.35
		28-Jul-14						
			RSC	3	0	8	11	5.95
			STC	11	0	44	55	29.10
			SUCK	11	0	619	630	333.20
			WSU	1	0	0	1	0.53
	DBS15							
		27-Jul-14						
			LNC	9	0	0	9	4.76
			SCUL	1	0	0	1	0.53
			STC	11	0	26	37	19.58
			SUCK	11	0	0	11	5.82
		28-Jul-14						
			LNC	1	0	0	1	0.53
			STC	4	0	9	13	6.61
			SUCK	10	0	1309	1319	697.88

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
102.5R SIDE CHANNEL						
	BEACH SEINE					
		CBS01	2	SU	19	0
		CBS01	3	SU	21	0
		CBS01	4	SU	18	0
		CBS01	5	SU	20	0
		CBS01	6	SU	19	0
		CBS01	7	SU	15	0
		CBS01	8	SU	17	0
		CBS01	9	SU	17	0
		CBS01	10	SU	20	0
		CBS01	11	SU	20	0
		CBS01	12	SU	22	0
		CBS01	13	SU	21	0
		CBS01	14	SU	16	0
		CBS01	15	SU	16	0
		CBS01	16	SU	16	0
		CBS01	17	SU	14	0
		CBS01	18	SU	19	0
		CBS01	19	SU	19	0
		CBS01	20	SU	17	0
		CBS01	21	SU	16	0
		CBS01	22	SU	16	0
		CBS01	23	SU	16	0
		CBS01	538	NP	117	0
		CBS01	539	NP	275	0
		CBS01	540	SU	16	0
		CBS01	541	CC	21	0
		CBS01	542	LNC	17	0
		CBS01	543	SU	23	0
		CBS01	544	SU	18	0
		CBS01	545	SU	21	0
		CBS01	546	SU	19	0
		CBS01	547	SU	20	0
		CBS01	548	SU	15	0
		CBS01	549	SU	18	0
		CBS01	550	SU	17	0
		CBS01	551	SU	16	0
		CBS01	552	SU	16	0
		CBS01	553	SU	17	0
		CBS01	554	SU	16	0
		CBS01	555	SU	20	0
		CBS01	556	SU	18	0
		CBS01	557	SU	16	0
		CBS01	558	SU	15	0
		CBS01	559	TP	43	0
		CBS01	560	CC	23	0
		CBS01	561	CC	25	0
		CBS01	562	CC	19	0
		CBS02	24	NP	121	0
		CBS02	25	NP	101	0
		CBS02	26	SU	19	0
		CBS02	27	SU	20	0
		CBS02	28	SU	20	0
		CBS02	29	SU	15	0

See Appendix B for definitions

APPENDIX F
FISH BIOLOGICAL DATA

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		CBS02	30	SU	19	0
		CBS02	31	SU	19	0
		CBS02	32	SU	14	0
		CBS02	33	SU	13	0
		CBS02	503	SU	23	0
		CBS02	504	SU	24	0
		CBS02	505	SU	22	0
		CBS02	506	SU	19	0
		CBS02	507	SU	15	0
		CBS02	508	SU	19	0
		CBS02	509	SU	20	0
		CBS02	510	SU	20	0
		CBS02	511	SU	20	0
		CBS02	512	SU	21	0
		CBS05	52	SU	24	0
		CBS05	53	RSC	41	0
		CBS05	54	SU	24	0
		CBS05	55	SU	22	0
		CBS05	56	SU	25	0
		CBS05	57	SU	24	0
		CBS05	58	SU	28	0
		CBS05	59	SU	24	0
		CBS05	60	SU	22	0
		CBS05	61	SU	23	0
		CBS05	62	SU	20	0
		CBS05	63	SU	21	0
		CBS05	64	SU	27	0
		CBS05	65	SU	25	0
		CBS05	66	SU	26	0
		CBS05	67	SU	25	0
		CBS05	68	SU	26	0
		CBS05	69	SU	24	0
		CBS05	70	SU	26	0
		CBS05	71	LNC	16	0
		CBS05	72	NSC	38	0
		CBS05	480	NP	104	0
		CBS05	481	SU	38	0
		CBS05	482	SU	25	0
		CBS05	483	SU	22	0
		CBS05	484	SU	30	0
		CBS05	485	SU	33	0
		CBS05	486	SU	22	0
		CBS05	487	SU	24	0
		CBS05	488	SU	20	0
		CBS05	489	SU	21	0
		CBS05	490	SU	20	0
		CBS05	491	WSU	46	0
		CBS07	73	SU	21	0
		CBS07	74	SU	19	0
		CBS07	75	SU	35	0
		CBS07	76	SU	22	0
		CBS07	77	SU	19	0
		CBS07	78	SU	25	0
		CBS07	79	SU	20	0
		CBS07	80	SU	21	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		CBS07	81	SU	22	0
		CBS07	82	SU	22	0
		CBS07	83	SU	21	0
		CBS07	84	SU	22	0
		CBS07	85	SU	21	0
		CBS07	86	SU	22	0
		CBS07	87	SU	24	0
		CBS07	471	SU	24	0
		CBS07	472	SU	23	0
		CBS07	473	SU	22	0
		CBS07	474	SU	18	0
		CBS07	475	SU	15	0
		CBS07	476	SU	22	0
		CBS07	477	SU	19	0
		CBS07	478	SU	22	0
		CBS07	479	SU	20	0
		CBS08	34	CC	20	0
		CBS08	35	SU	19	0
		CBS08	36	SU	16	0
		CBS08	37	SU	24	0
		CBS08	38	SU	20	0
		CBS08	39	SU	22	0
		CBS08	40	SU	14	0
		CBS08	41	SU	16	0
		CBS08	42	SU	18	0
		CBS08	43	SU	19	0
		CBS08	44	SU	22	0
		CBS08	45	CC	21	0
		CBS08	46	SU	19	0
		CBS08	47	SU	18	0
		CBS08	48	SU	18	0
		CBS08	49	SU	19	0
		CBS08	50	SU	14	0
		CBS08	51	SU	15	0
		CBS08	367	SU	16	0
		CBS08	368	SU	19	0
		CBS08	369	SU	26	0
		CBS08	370	SU	21	0
		CBS08	371	SU	18	0
		CBS08	372	SU	15	0
		CBS08	373	CC	27	0
		CBS08	374	CC	24	0
		CBS08	375	CC	26	0
		CBS08	376	LNC	18	0
		CBS08	377	LNC	21	0
		CBS08	378	LNC	16	0
		CBS08	379	LNC	19	0
		CBS08	380	LNC	16	0
		CBS08	381	LNC	11	0
		CBS08	382	LNC	16	0
		CBS08	383	LNC	16	0
		CBS08	384	LNC	15	0
		CBS08	385	STC	31	0
		CBS08	386	STC	25	0
		CBS08	387	STC	32	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		CBS08	388	STC	27	0
		CBS08	389	STC	21	0
		CBS08	390	STC	28	0
		CBS08	391	STC	27	0
		CBS08	392	STC	26	0
		CBS08	393	STC	26	0
		CBS08	394	STC	19	0
		CBS08	427	NP	137	0
		CBS08	428	SU	21	0
		CBS08	429	SU	26	0
		CBS08	430	SU	22	0
		CBS08	431	SU	26	0
		CBS08	432	SU	22	0
		CBS08	433	SU	24	0
		CBS08	434	SU	25	0
		CBS08	435	SU	27	0
		CBS08	436	SU	21	0
		CBS08	437	SU	20	0
		CBS08	438	LNC	17	0
		CBS08	439	CC	14	0
		CBS09	88	NP	95	0
		CBS09	89	NP	141	0
		CBS09	90	SU	30	0
		CBS09	91	SU	19	0
		CBS09	92	SU	22	0
		CBS09	93	SU	22	0
		CBS09	94	SU	19	0
		CBS09	95	SU	18	0
		CBS09	96	SU	17	0
		CBS09	97	SU	19	0
		CBS09	492	NP	144	0
		CBS09	493	SU	20	0
		CBS09	494	SU	25	0
		CBS09	495	SU	22	0
		CBS09	496	SU	19	0
		CBS09	497	SU	21	0
		CBS09	498	SU	18	0
		CBS09	499	SU	22	0
		CBS09	500	SU	20	0
		CBS09	501	SU	22	0
		CBS09	502	SU	21	0
		CBS10	1	SU	18	0
		CBS10	513	NP	133	0
		CBS11	98	SU	19	0
		CBS11	99	LNC	18	0
		CBS11	100	SU	18	0
		CBS11	101	SU	17	0
		CBS11	440	NP	135	0
		CBS11	441	SU	17	0
		CBS11	442	SU	21	0
		CBS11	443	SU	19	0
		CBS11	444	SU	18	0
		CBS11	445	SU	21	0
		CBS11	446	SU	26	0
		CBS11	447	SU	18	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		CBS11	448	SU	23	0
		CBS11	449	SU	16	0
		CBS11	450	SU	17	0
		CBS11	451	SU	15	0
		CBS11	452	SU	16	0
		CBS11	453	SU	16	0
		CBS12	102	SU	22	0
		CBS12	103	SU	29	0
		CBS12	104	SU	21	0
		CBS12	105	SU	23	0
		CBS12	106	SU	36	0
		CBS12	107	SU	30	0
		CBS12	108	SU	22	0
		CBS12	109	SU	25	0
		CBS12	110	SU	25	0
		CBS12	111	SU	32	0
		CBS12	112	LSU	36	0
		CBS12	113	LSU	38	0
		CBS12	114	LSU	37	0
		CBS12	115	NSC	22	0
		CBS12	116	LNC	18	0
		CBS12	117	RSC	39	0
		CBS12	118	RSC	36	0
		CBS12	119	RSC	37	0
		CBS12	454	SU	28	0
		CBS12	455	SU	25	0
		CBS12	456	SU	36	0
		CBS12	457	SU	31	0
		CBS12	458	SU	30	0
		CBS12	459	SU	25	0
		CBS12	460	SU	25	0
		CBS12	461	SU	29	0
		CBS12	462	SU	30	0
		CBS12	463	SU	24	0
		CBS12	464	RSC	37	0
		CBS12	465	LNC	16	0
		CBS12	466	LNC	15	0
		CBS12	467	LNC	18	0
		CBS12	468	NSC	42	0
		CBS12	469	NSC	43	0
		CBS12	470	NSC	48	0
		CBS13	120	LW	75	0
		CBS13	121	TP		0
		CBS13	122	SU	24	0
		CBS13	123	SU	19	0
		CBS13	124	SU	22	0
		CBS13	125	SU	24	0
		CBS13	126	SU	22	0
		CBS13	127	STC	21	0
		CBS13	128	SU	29	0
		CBS13	129	SU	25	0
		CBS13	130	SU	24	0
		CBS13	131	SU	24	0
		CBS13	132	SU	18	0
		CBS13	133	YP	42	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		CBS13	134	SU	28	0
		CBS13	135	SU	27	0
		CBS13	136	SU	24	0
		CBS13	137	SU	28	0
		CBS13	138	SU	26	0
		CBS13	139	SU	20	0
		CBS13	563	NP	92	0
		CBS13	564	SU	26	0
		CBS13	565	SU	21	0
		CBS13	566	SU	19	0
		CBS13	567	SU	20	0
		CBS13	568	SU	22	0
		CBS13	569	SU	18	0
		CBS13	570	SU	19	0
		CBS13	571	SU	19	0
		CBS13	572	LNC	19	0
		CBS13	573	SU	20	0
		CBS13	574	SU	20	0
		CBS13	575	LNC	17	0
		CBS13	576	LNC	16	0
		CBS13	577	SU	18	0
		CBS13	578	SU	15	0
		CBS13	579	SU	18	0
		CBS13	580	SU	16	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
112L SIDECHANNEL						
	BEACH SEINE					
		DBS05	187	SU	24	0
		DBS05	188	SU	23	0
		DBS05	189	SU	21	0
		DBS05	190	STC	29	0
		DBS05	191	STC	25	0
		DBS05	192	STC	21	0
		DBS05	193	STC	29	0
		DBS05	194	STC	30	0
		DBS05	195	TP	18	0
		DBS05	196	TP	19	0
		DBS05	197	SU	21	0
		DBS05	198	SU	24	0
		DBS05	199	SU	26	0
		DBS05	200	SU	31	0
		DBS05	201	SU	21	0
		DBS05	202	SU	23	0
		DBS05	203	SU	19	0
		DBS05	204	SU	20	0
		DBS05	205	SU	22	0
		DBS05	734	TP	21	0
		DBS05	735	SU	29	0
		DBS05	736	SU	28	0
		DBS05	737	SU	32	0
		DBS05	738	SU	29	0
		DBS05	739	SU	22	0
		DBS05	740	SU	26	0
		DBS05	741	SU	26	0
		DBS05	742	SU	28	0
		DBS05	743	SU	24	0
		DBS05	744	SU	19	0
		DBS05	745	SU	21	0
		DBS05	746	TP	21	0
		DBS05	747	TP	23	0
		DBS05	748	STC	27	0
		DBS05	749	TP	51	0
		DBS05	750	TP	31	0
		DBS05	751	RSC	24	0
		DBS05	752	STC	26	0
		DBS05	753	TP	33	0
		DBS05	754	LNC	19	0
		DBS05	755	LNC	16	0
		DBS05	756	STC	29	0
		DBS05	757	TP	43	0
		DBS05	758	LNC	15	0
		DBS05	759	TP	32	0
		DBS05	760	TP	62	0
		DBS05	761	RSC	25	0
		DBS05	762	LNC	15	0
		DBS05	763	RSC	35	0
		DBS05	764	STC	23	0
		DBS07	246	SU	27	0
		DBS07	247	SU	22	0
		DBS07	248	SU	20	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS07	249	SU	26	0
		DBS07	250	SU	22	0
		DBS07	251	SU	19	0
		DBS07	252	SU	18	0
		DBS07	253	SU	21	0
		DBS07	254	SU	18	0
		DBS07	255	SU	19	0
		DBS07	256	LNC	18	0
		DBS07	257	LNC	19	0
		DBS07	258	LNC	16	0
		DBS07	259	LNC	18	0
		DBS07	260	LNC	18	0
		DBS07	261	STC	19	0
		DBS07	262	LNC	18	0
		DBS07	263	LNC	17	0
		DBS07	264	LNC	14	0
		DBS07	265	LNC	15	0
		DBS07	266	LNC	17	0
		DBS07	267	LNC	18	0
		DBS07	268	RSC	19	0
		DBS07	269	RSC	18	0
		DBS07	665	NP	122	0
		DBS07	666	SU	35	0
		DBS07	667	SU	25	0
		DBS07	668	SU	32	0
		DBS07	669	SU	24	0
		DBS07	670	SU	23	0
		DBS07	671	SU	20	0
		DBS07	672	SU	25	0
		DBS07	673	SU	19	0
		DBS07	674	SU	21	0
		DBS07	675	SU	23	0
		DBS07	676	STC	28	0
		DBS07	677	STC	28	0
		DBS07	678	STC	28	0
		DBS07	679	RSC	22	0
		DBS07	680	WSU	49	0
		DBS07	681	RSC	23	0
		DBS07	682	RSC	22	0
		DBS08	140	RSC	33	0
		DBS08	141	STC	31	0
		DBS08	142	STC	31	0
		DBS08	143	SU	29	0
		DBS08	144	SU	21	0
		DBS08	145	SU	22	0
		DBS08	146	STC	28	0
		DBS08	147	STC	29	0
		DBS08	148	STC	33	0
		DBS08	149	SU	21	0
		DBS08	150	SU	23	0
		DBS08	151	SU	21	0
		DBS08	152	SU	22	0
		DBS08	153	SU	23	0
		DBS08	154	SU	20	0
		DBS08	155	SU	19	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS08	156	SU	30	0
		DBS08	157	SU	28	0
		DBS08	158	SU	23	0
		DBS08	159	SU	24	0
		DBS08	160	STC	27	0
		DBS08	161	STC	29	0
		DBS08	162	STC	27	0
		DBS08	163	STC	28	0
		DBS08	164	RSC	26	0
		DBS08	165	RSC	28	0
		DBS08	166	RSC	22	0
		DBS08	167	RSC	23	0
		DBS08	168	SU	22	0
		DBS08	169	STC	22	0
		DBS08	170	RSC	25	0
		DBS08	171	RSC	25	0
		DBS08	172	RSC	23	0
		DBS08	173	RSC	21	0
		DBS08	174	RSC	23	0
		DBS08	175	TP	38	0
		DBS08	176	LSU	49	0
		DBS08	177	TP	20	0
		DBS08	178	TP	21	0
		DBS08	179	LKC	32	0
		DBS08	180	LKC	29	0
		DBS08	181	LSU	41	0
		DBS08	182	NSC	74	0
		DBS08	183	LSU	33	0
		DBS08	184	TP	21	0
		DBS08	185	LSU	83	0
		DBS08	186	LSU	49	0
		DBS08	765	SU	20	9
		DBS08	766	SU	24	9
		DBS08	767	SU	20	9
		DBS08	768	SU	24	9
		DBS08	769	SU	22	9
		DBS08	770	SU	23	9
		DBS08	771	SU	21	9
		DBS08	772	SU	25	9
		DBS08	773	SU	29	9
		DBS08	774	SU	25	9
		DBS08	775	SU	27	9
		DBS08	776	SU	22	9
		DBS08	777	SU	26	9
		DBS08	778	SU	30	9
		DBS08	779	SU	28	9
		DBS08	780	SU	24	9
		DBS08	781	SU	24	9
		DBS08	782	RSC	33	0
		DBS08	783	SU	21	9
		DBS08	784	SU	25	9
		DBS08	785	LNC	21	0
		DBS08	786	SU	24	9
		DBS08	787	SU	26	9
		DBS08	788	LNC	18	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS08	789	SU	26	9
		DBS08	790	SU	27	9
		DBS08	791	SU	25	9
		DBS08	792	SU	26	9
		DBS08	793	SU	29	9
		DBS08	794	RSC	31	0
		DBS09	335	SU	28	0
		DBS09	336	SU	32	0
		DBS09	337	SU	29	0
		DBS09	338	SU	32	0
		DBS09	339	RSC	46	0
		DBS09	340	LSU	46	0
		DBS09	341	SU	29	0
		DBS09	342	SU	32	0
		DBS09	343	SU	29	0
		DBS09	344	SU	36	0
		DBS09	345	SU	34	0
		DBS09	346	STC	32	0
		DBS09	347	STC	65	0
		DBS09	348	RSC	44	0
		DBS09	349	SU	27	0
		DBS09	350	SU	34	0
		DBS09	351	SU	27	0
		DBS09	352	NSC	64	0
		DBS09	353	STC	27	0
		DBS09	354	TP	34	0
		DBS09	355	RSC	29	0
		DBS09	356	STC	29	0
		DBS09	357	STC	29	0
		DBS09	358	STC	28	0
		DBS09	359	STC	34	0
		DBS09	360	STC	46	0
		DBS09	361	STC	31	0
		DBS09	362	STC	68	0
		DBS09	363	CSU	50	0
		DBS09	364	RSC	48	0
		DBS09	365	RSC	32	0
		DBS09	581	SU	35	0
		DBS09	582	SU	32	0
		DBS09	583	SU	29	0
		DBS09	584	SU	28	0
		DBS09	585	SU	29	0
		DBS09	586	SU	28	0
		DBS09	587	SU	24	0
		DBS09	588	SU	35	0
		DBS09	589	SU	32	0
		DBS09	590	SU	26	0
		DBS09	591	SU	36	0
		DBS09	592	SU	24	0
		DBS09	593	SU	18	0
		DBS09	594	RSC	29	0
		DBS09	595	STC	25	0
		DBS09	596	SU	29	0
		DBS09	597	STC	27	0
		DBS09	598	RSC	25	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS09	599	LNC	18	0
		DBS10	366	SU	24	0
		DBS10	514	NP	151	0
		DBS10	515	NSC	32	0
		DBS10	516	NSC	94	0
		DBS10	517	STC	29	0
		DBS10	518	SU	22	0
		DBS10	519	SU	19	0
		DBS10	520	SU	24	0
		DBS10	521	SU	23	0
		DBS10	522	SU	22	0
		DBS10	523	SU	20	0
		DBS10	524	SU	21	0
		DBS10	525	SU	22	0
		DBS10	526	SU	21	0
		DBS10	527	STC	27	0
		DBS10	528	LNC	30	0
		DBS10	529	LNC	19	0
		DBS10	530	SU	22	0
		DBS10	531	SU	21	0
		DBS10	532	SU	23	0
		DBS10	533	NP	121	0
		DBS10	534	SU	23	0
		DBS10	535	SU	19	0
		DBS10	536	LNC	21	0
		DBS10	537	LNC	21	0
		DBS10	615	SU	37	0
		DBS10	616	SU	29	0
		DBS10	617	SU	27	0
		DBS10	618	SU	22	0
		DBS10	619	SU	29	0
		DBS10	620	SU	24	0
		DBS10	621	SU	24	0
		DBS10	622	SU	22	0
		DBS10	623	SU	23	0
		DBS10	624	SU	22	0
		DBS10	625	SU	19	0
		DBS10	626	LNC	19	0
		DBS11	284	RSC	49	0
		DBS11	285	RSC	42	0
		DBS11	286	RSC	48	0
		DBS11	287	RSC	45	0
		DBS11	288	RSC	50	0
		DBS11	289	RSC	47	0
		DBS11	290	RSC	48	0
		DBS11	291	RSC	45	0
		DBS11	292	RSC	45	0
		DBS11	293	RSC	46	0
		DBS11	294	RSC	48	0
		DBS11	295	NSC	57	0
		DBS11	296	NSC	54	0
		DBS11	297	NSC	61	0
		DBS11	298	NSC	54	0
		DBS11	299	NSC	55	0
		DBS11	300	NSC	71	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS11	301	NSC	56	0
		DBS11	302	NSC	68	0
		DBS11	303	WSU	59	0
		DBS11	304	LSU	58	0
		DBS11	305	WSU	60	0
		DBS11	306	WSU	69	0
		DBS11	307	LSU	64	0
		DBS11	308	NSC	62	0
		DBS11	309	LSU	60	0
		DBS11	310	LSU	68	0
		DBS11	311	LSU	55	0
		DBS11	312	LSU	58	0
		DBS11	313	NSC	61	0
		DBS11	314	CSU	58	0
		DBS11	315	LSU	65	0
		DBS11	316	WSU	67	0
		DBS11	317	LSU	72	0
		DBS11	318	CSU	59	0
		DBS11	319	STC	60	0
		DBS11	320	YP	48	0
		DBS11	321	WSU	68	0
		DBS11	322	CSU	68	0
		DBS11	323	CSU	58	0
		DBS11	324	STC	57	0
		DBS11	325	STC	67	0
		DBS11	326	CSU	57	0
		DBS11	327	LSU	51	0
		DBS11	328	STC	62	0
		DBS11	329	LSU	52	0
		DBS11	330	CSU	73	0
		DBS11	331	WSU	59	0
		DBS11	332	WSU	68	0
		DBS11	333	STC	53	0
		DBS11	334	WSU	65	0
		DBS11	627	SU	22	0
		DBS11	628	SU	25	0
		DBS11	629	SU	27	0
		DBS11	630	SU	24	0
		DBS11	631	SU	23	0
		DBS11	632	SU	23	0
		DBS11	633	SU	21	0
		DBS11	634	SU	24	0
		DBS11	635	SU	20	0
		DBS11	636	SU	19	0
		DBS11	637	STC	27	0
		DBS11	638	STC	33	0
		DBS12	206	SU	21	0
		DBS12	207	SU	26	0
		DBS12	208	SU	22	0
		DBS12	209	SU	22	0
		DBS12	210	SU	21	0
		DBS12	211	SU	22	0
		DBS12	212	SU	18	0
		DBS12	213	SU	21	0
		DBS12	214	SU	24	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS12	215	SU	22	0
		DBS12	216	SU	19	0
		DBS12	217	STC	25	0
		DBS12	218	STC	26	0
		DBS12	219	RSC	25	0
		DBS12	220	RSC	26	0
		DBS12	221	RSC	23	0
		DBS12	222	RSC	26	0
		DBS12	223	NSC	61	0
		DBS12	224	NP	123	0
		DBS12	225	NP	108	0
		DBS12	226	NSC	68	0
		DBS12	710	SU	25	0
		DBS12	711	SU	22	0
		DBS12	712	SU	23	0
		DBS12	713	SU	21	0
		DBS12	714	SU	19	0
		DBS12	715	SU	22	0
		DBS12	716	SU	21	0
		DBS12	717	SU	18	0
		DBS12	718	SU	19	0
		DBS12	719	SU	21	0
		DBS12	720	RSC	26	0
		DBS12	721	RSC	24	0
		DBS12	722	LNC	21	0
		DBS12	723	RSC	27	0
		DBS12	724	RSC	26	0
		DBS12	725	RSC	22	0
		DBS12	726	RSC	46	0
		DBS12	727	RSC	27	0
		DBS12	728	RSC	31	0
		DBS12	729	RSC	22	0
		DBS12	730	RSC	21	0
		DBS12	731	RSC	22	0
		DBS12	732	RSC	23	0
		DBS12	733	RSC	20	0
		DBS13	227	CC	21	0
		DBS13	228	RSC	43	0
		DBS13	229	RSC	29	0
		DBS13	230	RSC	30	0
		DBS13	231	RSC	22	0
		DBS13	232	RSC	23	0
		DBS13	233	RSC	23	0
		DBS13	234	RSC	24	0
		DBS13	235	RSC	63	0
		DBS13	236	SU	26	0
		DBS13	237	SU	23	0
		DBS13	238	SU	21	0
		DBS13	239	SU	20	0
		DBS13	240	SU	23	0
		DBS13	241	SU	20	0
		DBS13	242	SU	19	0
		DBS13	243	SU	21	0
		DBS13	244	SU	20	0
		DBS13	245	SU	22	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS13	683	SU	44	0
		DBS13	684	SU	40	0
		DBS13	685	SU	38	0
		DBS13	686	SU	36	0
		DBS13	687	SU	39	0
		DBS13	688	SU	43	0
		DBS13	689	SU	31	0
		DBS13	690	SU	32	0
		DBS13	691	SU	31	0
		DBS13	692	STC	31	0
		DBS13	693	STC	34	0
		DBS13	694	SU	37	0
		DBS13	695	STC	21	0
		DBS13	696	STC	28	0
		DBS13	697	STC	26	0
		DBS13	698	STC	32	0
		DBS13	699	RSC	29	0
		DBS13	700	STC	32	0
		DBS13	701	RSC	24	0
		DBS13	702	RSC	23	0
		DBS13	703	RSC	46	0
		DBS13	704	STC	32	0
		DBS13	705	STC	32	0
		DBS13	706	RSC	44	0
		DBS13	707	RSC	26	0
		DBS13	708	RSC	28	0
		DBS13	709	RSC	48	0
		DBS14	270	SU	29	0
		DBS14	271	SU	30	0
		DBS14	272	SU	32	0
		DBS14	273	SU	28	0
		DBS14	274	SU	26	0
		DBS14	275	SU	35	0
		DBS14	276	SU	30	0
		DBS14	277	SU	25	0
		DBS14	278	SU	20	0
		DBS14	279	SU	33	0
		DBS14	280	SU	28	0
		DBS14	281	SU	24	0
		DBS14	282	LNC	17	0
		DBS14	283	LNC	15	0
		DBS14	639	SU	18	0
		DBS14	640	SU	30	0
		DBS14	641	STC	22	0
		DBS14	642	STC	21	0
		DBS14	643	RSC	36	0
		DBS14	644	STC	18	0
		DBS14	645	SU	32	0
		DBS14	646	STC	35	0
		DBS14	647	STC	35	0
		DBS14	648	STC	30	0
		DBS14	649	STC	33	0
		DBS14	650	STC	29	0
		DBS14	651	STC	26	0
		DBS14	652	STC	29	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS14	653	STC	24	0
		DBS14	654	WSU	34	0
		DBS14	655	SU	23	0
		DBS14	656	SU	22	0
		DBS14	657	SU	20	0
		DBS14	658	SU	17	0
		DBS14	659	SU	30	0
		DBS14	660	SU	19	0
		DBS14	661	SU	18	0
		DBS14	662	SU	22	0
		DBS14	663	RSC	22	0
		DBS14	664	RSC	23	0
		DBS15	395	STC	29	0
		DBS15	396	STC	28	0
		DBS15	397	STC	28	0
		DBS15	398	STC	27	0
		DBS15	399	STC	32	0
		DBS15	400	STC	32	0
		DBS15	401	STC	28	0
		DBS15	402	STC	27	0
		DBS15	403	STC	28	0
		DBS15	404	STC	33	0
		DBS15	405	STC	22	0
		DBS15	406	LNC	18	0
		DBS15	407	SU	22	9
		DBS15	408	SU	21	9
		DBS15	409	SU	25	9
		DBS15	410	SU	18	9
		DBS15	411	SU	17	9
		DBS15	412	SU	21	9
		DBS15	413	SU	20	9
		DBS15	414	SU	21	9
		DBS15	415	LNC	18	0
		DBS15	416	SU	18	9
		DBS15	417	LNC	20	0
		DBS15	418	LNC	17	0
		DBS15	419	LNC	18	0
		DBS15	420	CC	25	0
		DBS15	421	SU	17	9
		DBS15	422	SU	24	9
		DBS15	423	LNC	17	0
		DBS15	424	LNC	20	0
		DBS15	425	LNC	22	0
		DBS15	426	LNC	15	0
		DBS15	600	SU	29	0
		DBS15	601	SU	24	0
		DBS15	602	SU	31	0
		DBS15	603	SU	33	0
		DBS15	604	SU	20	0
		DBS15	605	SU	22	0
		DBS15	606	SU	21	0
		DBS15	607	SU	21	0
		DBS15	608	SU	22	0
		DBS15	609	SU	20	0
		DBS15	610	STC	31	0

See Appendix B for definitions

Appendix F Table F1. Biological characteristics data for sampled fish, 2014 Peace River Side Channel Fisheries Program.

Side Channel	Type	Site	FishID	Species	Length (mm)	Capt. Code
		DBS15	611	STC	29	0
		DBS15	612	STC	33	0
		DBS15	613	LNC	21	0
		DBS15	614	STC	32	0

See Appendix B for definitions

APPENDIX G
HYDROMETRIC MONITORING SITE INSTALLATION AND DESCRIPTION SHEETS

Peace River 102.5 Constructed Channel								
Stream Name	Peace River (Constructed Side Channel)			**Date Printed**				2014 Nov 04
Installation Date	2-Sep-2014	**Installed By**	D. Meier, J Finn					
Logger Location	Mid Channel near the confluence with the Peace Mainstem							
Logger UTM	6223834.322N	644026.941E						
Logger Time	PST							
Sensor	**Range**	**Address/P**	**Sampli**	**Wiring**	**Serial**	**Dnld Fre**	**Last Dnl**	**Dnld Due**
Level Logger Edge	0-5m	N/A	5 MIN	N/A	2027864			1/18/2015
Barologger	N/A	N/A	10 min	N/A	2020319			---
Geodetic Elevation	402.026	PT BOLT						
Offset PT bolt to sensor	0.008m	PT ~8mm above PT Bolt						
Geodetic Datum	CGVD28							
Local Datum	PT bolt							
BM	**Geodetic**	**Description**						
PT BOLT	402.026	6223834.286N 644027.004E						
TOP OF T POST	402.357	6223834.322N 644026.941E						
NHC 1745	404.051	Rebar on Left bank 6223855.555N 644009.937E						
NHC 1703	403.917	Rebar on Left Bank U/S 6223827.567N 644000.68E						
NHC 1737	406.798	Rebar on Left high bank (in greenery) at start of constructed chanel 6223668.668N 643758.778E						

Install Document:

Location Photo:

Notes
Water Surface 2 SEPT 2014 at 15:50 (time of install) : 402.631

Barologger sharred with 102.5 natural channel
Last visit

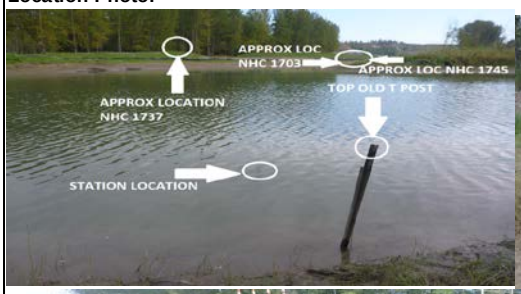
Comments

Peace River 102.5 Natural Channel								
Stream Name	Peace River (Natural Side Channel)			**Date Printed**				2014 Nov 04
Installation Date	4-Sep-2014	**Installed By**	D. Meier, J Finn					
Logger Location	Right bank near the confluence with the constructed side channel							
Logger UTM	6223580.08N	643715.13E						
Logger Time	PST							
Sensor	**Range**	**Address/P**	**Sampli**	**Wiring**	**Serial**	**Dnld Fre**	**Last Dnl**	**Dnld Due**
Level Logger Edge	0-5m	N/A	5min C	N/A	2024321			1/18/2015
Barologger	N/A	N/A	10min C	N/A	2020319			---
Geodetic Elevation	402.208	PT BOLT						
Offset PT bolt to sensor	0.008m	PT ~8mm above PT Bolt						
Geodetic Datum	CGVD28							
Local Datum	PT bolt							

BM	**Geodetic**	**Description**
PT BOLT	402.208	6223580.08N 643715.13E
TOP OF T POST	402.852	6223580.202N 643715.189E
NHC 1745	404.051	Rebar on Left Bank Constr. Channel 6223855.555N 644009.937E
NHC 1703	403.917	Rebar on Left Bank Constr. Channel 6223827.567N 644000.68E
NHC 1737	406.798	Rebar on Left High Bank (in greenery) at start of Constr. Chanel 6223668.668N 643758.778E
TOP OLD T POST	403.473	D/S of station Right Bank 6223578.737N 643714.733E

Install Document:

Location Photo:



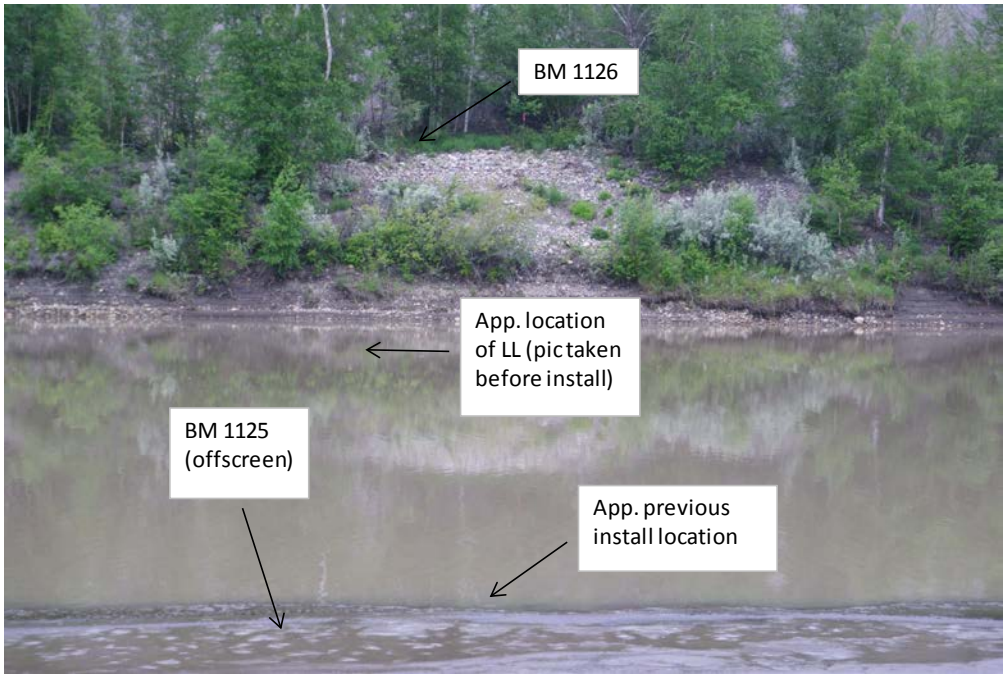
Notes
GPS Water Surface 4 SEPT 2014 at 09:56PST (time of install) : 402.888m

Barologger sharred with 102.5 constructed channel - No location info, ask Dawson
Last visit

Comments

Peace River Site 112.5R Pool			
River Name	Peace River		
Installation Date	9-Aug-2013		
Installed By	L. Costain/ D.Meier		
Sensor/Data Logger	Solinst Levelogger Edge		
Sensor/Data Logger Serial Number	2020096 (level)		
Logger Location	Left bank of side channel on Peace River		
Top T-Bar UTM	N - 6222291.305m E - 654478.146m		
Logger Time	PST		
Sampling Frequency	5 minutes (compressed)		
Download Frequency	When required/on site.		
Offset PT bolt to sensor	0		
Geodetic Datum	397.143		
Geodetic Elevation	CGVD28		
Datum	Top T-Bar		
BM	**Elev.**	**Geodetic**	**Description**
Top of T-bar	0	397.143	LB below cobble bed and BM 1126
BM 1125	7.943	405.086	Via T-bar on righthand side near treeline
BM 1126	2.132	399.275	Via 15mm rebar up LB on cobble bed

Location Photo:



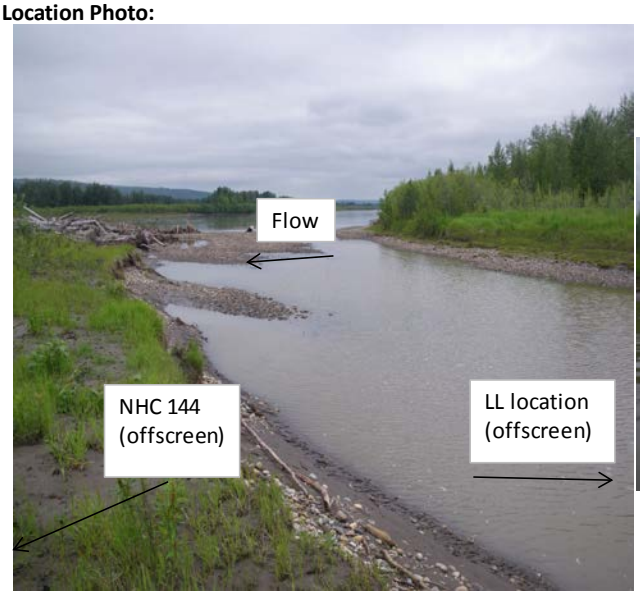
Notes
(see photos)

Last visit 9-Aug-2013

Comments
LL was discovered to be completely buried in mud on Aug 9. Therefore, the location was moved from RB to LB underneath the cobble bed on which BM 1126 is situated.

Peace River Site 112.5 Upstream			
River Name	Peace River		
Installation Date	11-Jun-2013		
Installed By	L. Costain		
Sensor/Data Logger	Solinst Levelogger Edge		
Sensor/Data Logger Serial Number	2021093 (level)		
Logger Location	Right bank of side channel on Peace River ~ 41m NW from BM 144		
Logger UTM	N - 6222334.148m E - 651980.639m		
Logger Time	PST		
Sampling Frequency	5 minutes (compressed)		
Download Frequency	When required/on site.		
Geodetic Elevation	398.474m		
Offset PT bolt to sensor	0		
Geodetic Datum	CGVD28		
Datum	PT bolt		
BM	**Elev.**	**Geodetic**	**Description**
PT bolt: oriented horizontally	0	398.474	Bolt is 9/16"
Top of T-bar	0.338	398.812	
NHC 144	3.007	401.481	Via 9mm rebar ~ 41m SE from logger on LB
NHC 848	-0.75	397.724	Via 9mm rebar ~ 128m SE from NHC 144

Location Photo:



Notes

Last visit	9-Aug-2013

Comments

APPENDIX H
SITE LAYOUT

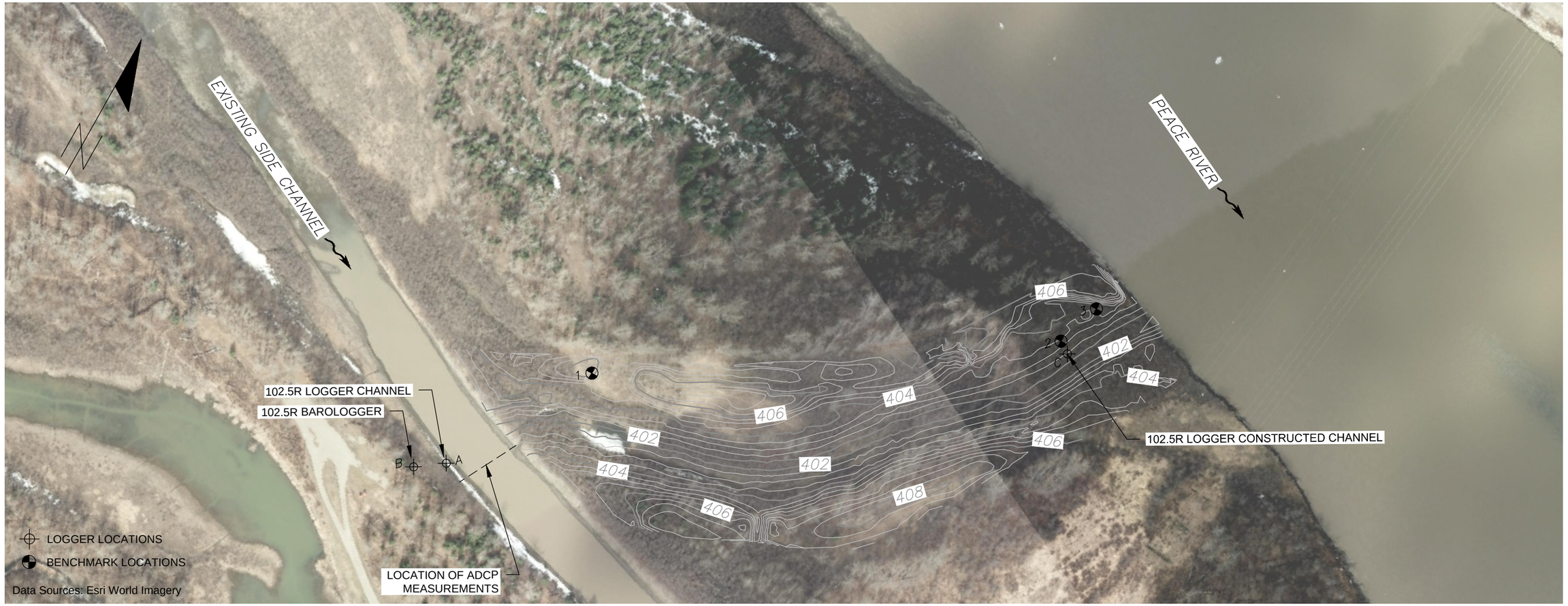


TABLE 1 – SURVEY CONTROL POINTS				
POINT	NORTHING (m)	EASTING (m)	ELEVATION (m)	DESCRIPTION
1	6223668.668	643758.778	406.80	NHC BENCHMARK No. 1737
2	6223827.567	644000.680	403.92	NHC BENCHMARK No. 1703
3	6223855.555	644009.937	404.05	NHC LOCAL BENCHMARK No. 1745

TABLE 2 – LOGGER LOCATIONS			
DESCRIPTION	NORTHING (m)	EASTING (m)	DESCRIPTION
A	6 223 578	643 717	APPROX. LOCATION OF LEVELOGGER
B	6 223 564	643 691	BARO APPROX. – IN TREE
C	6 223 822	644 007	APPROX. LOCATION OF LEVELOGGER

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Job:300220
Rev: 1
Drft: WES, JXD
Date: 28Jan15

PEACE RRIVER SIDE CHANNELS
102.5 RIGHT
OVERVIEW - PLAN

TABLE 1 – SURVEY CONTROL POINTS				
POINT	NORTHING (m)	EASTING (m)	ELEVATION (m)	DESCRIPTION
1	6 222 295.895	651 995.509	401.48	NHC BENCHMARK No. 144
2	6 222 207.272	652 087.465	397.72	NHC BENCHMARK No. 848
BM 1126	2000	1000	100.00	LOCAL BENCHMARK No. 1126
BM 1125	2100.98	972.955	105.78	LOCAL BENCHMARK No. 1125
PT BOLT	2022.624	989.090	97.71	NHC LOCAL SURVEY POINT

TABLE 2 – LOGGER LOCATIONS			
DESCRIPTION	NORTHING (m)	EASTING (m)	DESCRIPTION
A	6222334	651982	APPROX. LOCATION OF LEVELOGGER
B	6222234	654462	APPROX. LOCATION OF LEVELOGGER

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Job:300220
Rev: 3
Drft: WES, JXD
Date: 28Jan15

PEACE RIVER SIDE CHANNELS
112 LEFT
OVERVIEW - PLAN